

POSITION PAPER

Archaeological Practices, Knowledge Work and Digitalisation

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Defining what constitute archaeological practices is a prerequisite for understanding where and how archaeological and archaeologically relevant information and knowledge are made, what counts as archaeological information, and where the limits are situated. The aim of this position paper, developed as a part of the COST action *Archaeological practices and knowledge work in the digital environment* (www.arkwork.eu), is to highlight the need for at least a relative consensus on the extents of archaeological practices in order to be able to understand and develop archaeological practices and knowledge work in the contemporary digital context. The text discusses approaches to study archaeological practices and knowledge work including Nicolini's notions of zooming in and zooming out, and proposes that a distinction between archaeological and archaeology-related practices could provide a way to negotiate the 'archaeologicality' of diverse practices.

Keywords: archaeological practices; practices; knowledge work; information work; digital practices; digital tools; technology

Introduction

Much has been written about archaeological practices but a critical understanding of the practices of knowledge production in and about archaeology, based on explicit and openly problematizing interrogative reflection, remains fragmented. Consequently, insight into what constitute archaeological practices and knowledge work in the contemporary context remains vague. The introduction of new tools, techniques and infrastructures to support archaeological and archaeology related work has broadened the field and diffused boundaries between traditional disciplines. Simultaneously, the expansion and reorganisation of archaeological work, its closer integration with land development, and an increasing focus on public archaeology, have altered the archaeological sphere of interest along with a growth of interest in archaeology in society at large.

Even if the question of defining or describing what constitute archaeological practices might sound like a non-question for practicing archaeologists, it is a prerequisite for understanding where and how archaeological and archaeologically relevant information and knowledge are made, what counts as archaeological information, and where the limits are situated. It has been recognized for some time (cf. Geser & Selhofer 2014; Lambourne et al. 2014) that a major limiting factor in the development

of archaeological work and its infrastructures is not so much available technologies or tools, but an insufficient understanding of how archaeological remains are documented, how the documentation and archaeological collections are used to create archaeological knowledge about the past, how collections are digitised, preserved and made available, and how the various stakeholders from land development and academia to education and tourism conduct their work. Even if individual actors are able to describe their ways of working, practices tend to become routinized and only a few have time to reflect on their work to an extensive degree amidst their daily work. Furthermore, practices vary from one project, organisation, and country to another, and a precise understanding of how others are engaging with archaeology leaves much to desire. Recent initiatives have begun to address this issue, including a number of research projects and national initiatives focusing on archaeological work (e.g. Atalay 2008; Bernbeck 2012; Castañeda & Matthews 2008; Edgeworth 2006; Hug et al. 2012; Huvila 2006; Huvila 2014), as well as multi-national projects such as CARARE (Gavriliş, Dallas & Angelis 2013; Gavriliş et al. 2013; Hansen & Fernie 2010), LoCloud (Angelis et al. 2013), DIPIR (Faniel et al. 2013; Faniel & Yakel 2017), Europeana Cloud (Versprille et al. 2015), ARIADNE (e.g. González-Pérez & Hug 2013; Selhofer & Geser 2015) and DARIAH (e.g. Dallas et al. 2016) and other transnational efforts such as the work of the *Europae Archaeologiae Consilium* (e.g. Perrin et al. 2014; Van der Haas & Schut 2014). These have contributed to the emergence of new knowledge on archaeological practices both through evidence-based

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research and by bringing together practitioners and their perspectives in the context of policy, methods and tools development. However, as long as these efforts and the critical understanding of the breadth and diversity of archaeological practices remain disparate, their impact on both theoretical and practical aspects of archaeological work and knowledge production, the development of infrastructures and tools, and the role of archaeological knowledge in society will be limited.

The aim of this position paper, developed as a part of the COST action *Archaeological practices and knowledge work in the digital environment* (www.arkwork.eu), is to highlight the need for at least a relative consensus on the extents of archaeological practices in order to be able to understand and develop archaeological practices and knowledge work in the contemporary digital context. To this end, a working framework based on practice theory, and in particular the work of Nicolini (2009a), is proposed as a potential apparatus for explicating and analysing digital archaeological practices.

Practices and knowledge work

Both 'practices' and 'knowledge work' are terms with multiple meanings. In general, the notion of practices is loosely used to refer to activities (i.e. what is being done), often with an implicit or explicit assumption of their relative recurrence, stability, and their individual or communal nature. The notion is used with more specific meanings in different theories and approaches in different fields from software engineering (e.g. Henderson-Sellers et al. 2014) to social sciences (Huizing & Cavanagh 2011). In the context of practice theory, practice is a theoretically grounded term best described as an interdisciplinary constellation of theories with the general aim of providing an understanding of how things are being done. A central common denominator of the practice approach is to first obtain an in-depth understanding of what people actually do and use that understanding to develop theories, rather than vice versa (Huizing & Cavanagh 2011), since social life is in a constant state of making (Feldman & Orlikowski 2011). Similarly, contemporary practice theory tends to deny a sharp distinction between objects and subjects: hence there would be no archaeologists without archaeological stratum or the tools of their trade, or vice versa. Both people and objects make things happen i.e. they have 'agency', even if the question of how much and what type of agency objects and subjects has differed between individual theorists (Pels et al. 2002). For instance, practice can be seen as a "mode, relatively stable in time and socially recognized, of ordering heterogeneous items into a coherent set" (Gherardi 2006: 34), or following Schatzki (2001: 11), as "embodied, materially mediated arrays of human activity centrally organized around shared practical understanding".

Earlier practice-oriented theorising tended to be closer to the casual understanding of practices, emphasising recurrence and habituality (e.g. in the context of the notion communities of practice, cf. Wenger 1999) whereas more recent views tend to underline heterogeneity and temporality of practices and their material convolutions

(Huizing & Cavanagh 2011). There has therefore been something of a shift from the (primarily) anglophone tradition of conceptualising practices as behaviour (Lucas 2012) towards what was originally a continental and francophone focus on the performance and spatial aspects of practices. Similarly, instead of explicating individual practices and their constituents, practice theory has begun to put increasing focus on the fields (Schatzki 2001) or textures (e.g. Nicolini 2009a) of practices (i.e. constellations of practices in context) and how these emerge. Of course, there is far more diversity in the theorisation of the notion of practice than can be reasonably covered here.

'Knowledge work' is similarly an ambiguous term (Stettler 2014) that has avoided stable definition. The broad origins of the notion can be traced to theorising in the 1960s and early 1970s around the role of information and knowledge as central resources of post-industrial societies (e.g. Bell 1973; Drucker 1968). A traditional view of knowledge work is tied to Drucker's notion of the knowledge worker (Drucker 1968), referring to a specific group of people working with particular types of knowledge-intensive duties (Elliman & Hayman 1999). More recent perspectives tend to emphasise knowledge work as a work or activity engaged in by everybody (Stettler 2014) or nearly everybody (Liu 2010), much like information work is defined as an integral part of everyone's professional and leisurely pursuits (Huvila 2009). For some, knowledge and information work can be the principal task, whereas for others it is sub-work (Gasser 1986) that supports primary work. The relation between information and knowledge work can be defined in a similar sense, in that information work 'sustains' knowledge work and is its medium (Liu 2010). In this respect information work (or use) can be seen as a form of epistemic work (Savolainen 2009) and knowledge work as a parallel activity that supports and paves the way to knowing (Edwards 2017).

Clearly, a comprehensive overview of how practices and knowledge work can be conceptualised is beyond this paper. However, as a preliminary for an exploration of archaeological practices, it is enough to be sensitive to the diversity of theoretical and colloquial conceptions of practices in the literature, and to the two major perspectives to knowledge work as primary work of a limited group of people or as a sub-work of all or almost all workers.

Archaeological perspectives on practice and knowledge work

While the archaeological literature has embraced the notion of practice, discussion of archaeological knowledge is more sporadic. For example, Bernbeck refers to knowledge work when discussing the political dimensions of archaeological practices and the conditions of archaeological "knowledge labor" (Bernbeck 2012, 91). Dallas has referred to archaeological knowledge work in conjunction with its infrastructural support (Dallas 2009, 2015), and Huvila (2006) makes a distinction with the notion of information work.

When it comes to practice, casual references to 'archaeological practices' tend to be the most prolific ones in the literature. A common, often implicit, convention is to use

'archaeological practice' to refer to what is being done in archaeology, or more specifically, what is being done by archaeologists (e.g. Aitchison 2009; Carter & Robertson 2002; Gordon et al. 2016; Joyce 2008; Schofield et al. 2011). In some cases, definitions have limited archaeological practice to refer to field practices (e.g. Jensen 2012). Another recurring use is in highlighting the contrast between archaeological theory and what is being done 'in practice' (e.g. Lucas 2012).

In the literature, it is common to suggest that there is a disciplinary umbrella practice of 'doing archaeology' and at the same time, the complex field of archaeological activities is untangled by identifying different types of archaeological practices (e.g. Beale 2012; Berggren & Hodder 2003; Berggren et al. 2015; Dent 2016), national variations (e.g. Foka et al. 2017) and their value and significance (Lafrenz Samuels 2008). Different authors have explored how archaeological practices differ from one place to another (Holtorf 2006; Jensen 2017; Shoocongdej 2011) and from time to time (Lucas 2001; Jensen 2012). Beale (2012) has contrasted institutionalised archaeological practice with 'open practice' and (community based) participatory practices. Bernbeck (2012) has highlighted the political nature of archaeological practices. A special issue of *Internet Archaeology* edited by Beale and Reilly (2017) and the volume *Mobilizing the past for a digital future* (Counts et al. 2016) represent concerted endeavours to identify and highlight digital practices emerging in archaeology even if the both remain somewhat unspecific on what counts as a practice. The volumes edited by Jensen (2012) and Edgeworth (2006) bring together work on historical archaeological practices and ethnographies of contemporary archaeological practices with a more specific emphasis on the notion of practice. Moreover, the on-going work on public and community archaeology practices (e.g. Beale 2012; Bonacchi & Moshenska 2015; Carman 2018; Castañeda 2009; Clarke 2016; Gomes 2006; Holtorf 2015; Marshall 2002) represent another line of inquiry with a direct aim of multiplying the perspectives on what counts as archaeological practice. The understanding of archaeology as a practice has been one of the cornerstones of archaeological theory in the writings of many prolific theorists from Trigger (2006) to Hodder (2012a), Shanks (2012), Olsen (2012) and others. In broader sense, the conceptualisation of archaeology as a 'craft activity' (Beale & Reilly 2017; Caraher 2016) with its focus on the interplay between the material world, archaeologists, and their tools comes close to the tenets of practice perspectives either implicitly or by explicit references to the interdisciplinary literature (e.g. Lucas 2012; Wendrich 2012).

So there is a close, if not always explicit relationship between discussions of archaeological practice and practice theory. Many researchers of archaeological work, both theorists and empiricists, refer to authors such as Bourdieu, Callon, Latour and Knorr Cetina who are generally acknowledged to play a central role in the evolution of practice-oriented theories (e.g. Edgeworth 2006; Hodder 2012b; Lucas 2012). Olsen (2012) and Witmore and Shanks (2013) have built on Stengers' (2005) notion of the ecology of practices

for their analysis of archaeology. Khazraee (2013) refers to social informatics and Actor Network Theory in his analysis of information recording in archaeology. Pruitt's (2011) analysis of authority in archaeological knowledge production employs Latour and Pickering, among others. Further, some of the theoretically-oriented studies of archaeological practices have turned to additional concepts such as assemblage (Hamilakis & Jones 2017).

The importance of understanding archaeological practices and knowledge work

It would be difficult to deny the influence of *how* things are done, the importance of understanding how people put theories and tools into action, and so how archaeologists and others do their work when they are engaged in archaeological activities. Archaeological practices – literally how archaeology is done in practice – are constitutive of the boundaries and distinctions that define what archaeology is (Yarrow 2006: 23). What makes archaeology and distinguishes it from other disciplines that likewise are defined by an interplay between specific sets of people, tools, contexts, and objects of study, is what is specific in the *particular* people, tools, contexts and objects of the study engaged in archaeology. Wylie underlined the significance of critical science studies as a premise of understanding archaeological knowledge production and as "an integral part of archaeological practice" (Wylie 2006: 34), a suggestion which could be extended beyond critical science studies to cover a plethora of other perspectives on scholarly, professional, social and other aspects of archaeological activities. It is essential to have a working understanding of what are considered to be archaeological practices since framing the practices that produce archaeology is intertwined with the question of being able to say what counts as archaeology, as archaeological documentation and information, and ultimately, as archaeological knowledge. This is needed both for conducting research *about* archaeology or archaeology-related phenomena but also *in* archaeology to understand the link between doing, practices, their associated tools and materials, and their consequences.

Foregrounding attention to practices is especially important when archaeological work is reorganised, when new stakeholders are entering the field, and when new tools and techniques are developed and taken into use. For example, structural changes in the archaeological sector in many countries have led to reconfiguration of archaeological work and its stakeholders, and these changes have implications for how archaeology is practiced (e.g. Dent 2016; Evans 2015; Zorzin 2010) even if so far the principal focus of attention has been on the working conditions and increasing precarity of archaeological work. Similarly, knowing changes along with the techniques and tools used to support it (Strathern 1995), which suggests that the introduction of digital practice(s) may impact archaeological practice(s) more generally and the critique of the relatively atheoretical appropriation and development of digital technologies (Daly & Evans 2006; Perry & Beale 2015) can be extended to many changes in practice across the field.

Archaeological practice and digital archaeological practice

The use of digital tools leads to digital and digitalised practices that are different from earlier non-digital ones (Beale & Reilly 2017). Although it remains perfectly possible to practice a non-digital archaeology, or to adopt a hybrid approach employing both digital and non-digital tools (Gordon et al. 2016, 8), there is plenty of evidence within archaeology and in other fields of the ways in which the introduction of digital technologies has changed practices of working. For instance, in seeking and working with information (e.g. Byström et al. 2017; Gregg 2011; Huvila 2016), archaeological field documentation, the management of data and collections, and public communication have all changed and are changing with the introduction of digital tools (Börjesson et al. 2016), despite sometimes considerable inertia. Even if it would be possible to construct systems that would “respect [...] the current workflow of archaeological practice” (Ross et al. 2013: 107) it is probably impossible for them to be fully “unobtrusively within existing practices” (Ross et al. 2013: 117), even if unobtrusiveness can be seen to be a useful design goal. In general, there is too little research on the “role of the non-human, ontological actors in the production of archaeological knowledge” (Pruitt 2011: 256). In the absence of this, digital archaeological practices become an elusive concept. In part, this is also due to the increasing ubiquity of the digital (understood as a compound phenomenon consisting of digital technologies and their direct and indirect impact in the society, e.g. Kaufmann & Jeandesboz 2017) within archaeology. Indeed, is it even possible any longer to be an archaeologist without being ‘digital’ in some way? To what extent can non-digital practices exist in a society where the presence of digital tools has become ubiquitous? Morgan and Eve (2012: 523) declared that “... we are *all* digital archaeologists” given the extent to which we delegate a significant share of our work and life as archaeologists to digital devices, and archaeologists are not unique in this: for instance, Ell and Hughes (2013: 24) echoed the claim, saying that “We are all digital humanists now”. Costopoulos (2016) picked up on this, arguing that digital archaeology was the not-so-new ‘normal’, and that we should stop talking about it and get on with doing (or practicing) it. The ‘digital turn’ has already happened in archaeology (although it is still debated in other Humanities and Social Science subjects): digital technologies now regularly and habitually mediate, augment, and simulate archaeology. Consequently, archaeologists are witness to, engaged with, entangled in archaeologies *through* the digital, archaeologies *produced* by the digital, and archaeologies *of* the digital (after Ash et al. 2018: 27), but it is as yet unclear how these are reshaping archaeological practice.

Although the focus here will be on the identification of the digital as both a component of and contributor to existing archaeological practice, this is not a straightforward or simple relationship. As has frequently been emphasised in the context of the introduction of new technology (e.g. Grint & Woolgar 1997; Webster 1995; Winograd & Flores 1986), the digital alters what is already going on in practice and leads to reorganisation and restructuring into new practices. New roles emerge, what is routine and

what is exceptional changes, actions change, the routes to success and failure change, and old ways of doing things are often not preserved with the change of medium. In the face of the adoption of the digital, the human components of the practice are frequently required to adapt to new ways of doing things.

Introducing a new technology results in what has been characterised as a pattern of reverberations on the existing field of practice (Woods 2002; Woods & Dekker 2000). So, for example (following Woods & Dekker 2000: 274), introducing a new technology into an existing practice gives rise to new capabilities, which might include increased productivity, increased coupling across different tasks and practices, and increased speed of operation, as well as new and/or increased demands on the human agents themselves. New complexities arise from the new capabilities offered but may also result from awkward or inefficient use of the new technology. Human practitioners adapt their practice to the new technology in order to continue to operate (for instance, adapting to the idiosyncrasies of interface and design) even when the technologies are seemingly designed to follow and support old practices rather than explicitly to transform them. These added complexities and adaptations may give rise to surprising, unintended side-effects which may or may not be beneficial – indeed, there may be failures as a consequence of poor adaptation or encountering unanticipated circumstances. Finally, the adaptations of the practitioners may disguise the flaws and complexities in their work-arounds, which may mean the designers see failure as a consequence of human error rather than problems with the technology. These reverberations arise from the collision between an often black box technology with an existing field of practice, and they underline that, for example, introducing a new technology frequently does not make the human practitioner’s lot necessarily easier: rather it increases expectations in terms of the speed, volume, and complexity of the work capable of being undertaken (Woods & Dekker 2000: 273).

Seeking digital reverberations in archaeological practice

It should therefore be possible to identify and trace digital practice in archaeology through the reverberations it creates in practice more generally. Similarly, it should be possible to dig into the digital in archaeological practices and scrutinise how, when, and to what extent the digital is having an influence on how archaeology is achieved. However, the fact that as digital archaeologists we are embedded in the very practices we seek to disentangle makes the process of critical scrutiny much harder to do and consequently it is rarely undertaken (e.g. Huggett 2000: 5–7; 2012: 204–205; 2015: 87–89). Nevertheless, being an informed participant rather than a distant observer can be a distinct advantage in understanding the development as well as use of technologies (e.g. Ihde 2004: 91); indeed, it is questionable whether we can ever be isolated and decoupled from our practices and those of others. Furthermore, the multifaceted nature of practice makes it unlikely that any single approach can do more than illuminate one dimension of that practice.

Nicolini (2009a: 1395), for example, proposes a ‘collage’ or ‘toolkit’ approach to investigating practice which adopts different angles for observation and different frameworks for interpretation without prioritising any one (2009a: 1396). He outlines a methodological approach entailing a series of theoretical lenses which enable practices to be examined in detail, along with the relationships among their practitioners and the ways in which those patterns of practice are established and maintained, and at the same time look at the relationships and dependencies *between* practices, at what he calls the ‘texture of practice’, tracing the connections and associations between practices. The switching between these theoretical lenses is characterised by Nicolini as simply zooming in and zooming out of practice.

Zooming in on practice

Following Nicolini (2009a) and adopting a digital focus, there are at least five lenses that support a zoomed-in focus on practice. First, there is the question of what people say and what they actually do. This goes beyond capturing the rules, formal descriptions, etc. and hence what essentially constitutes canonical practice, but also seeks to capture what actually takes place: the day-to-day reality of the practice. From a digital perspective this may extend into the formal definitions of tasks in software as well as the unanticipated ways in which the digital is adapted to practice. For instance, the need for ethnographic studies of the origins and development of archaeological digital tools has been identified (e.g. Huggett 2015; Dufton 2016) but such deep studies of process and effects on practice have yet to be undertaken.

Secondly, there are the objects, technologies, tools, and resources, and their performative role within the practice. This recognises that the accomplishment of a practice is not only due to skilled human actors, but to the active contribution of a variety of tools and artefacts. For instance, digital tools are essentially cognitive artefacts (Huggett 2017): they carry embedded within them scripts, norms, assumptions and functions inscribed by their designers, who in most cases are not archaeologists and in any case are likely to be distanced from the practitioners in time and space. These computational artefacts bring to their practice a broad range of affordances (e.g. Kaufmann & Jeandesboz 2017: 316–319) amongst which are their materiality (as an artefact); the malleability of their numeric as well as material character; their provision of storage (both durable and volatile, structured both by users and by infrastructures); their searchability (of both content data and contextual metadata); their transferability in terms of connectivity (expanding and shrinking spatial experiences and interactions) and disconnectivity (disembedding items from their context and reconnecting them); their network provisions (social and digital communication and the data trails they leave); and their creation of information (data are not raw but always fabricated, interpreted and organised into digital structures – it is not simply discovered and hence it is always situated). These and other affordances characterise the digital cognitive artefact and through determining its capabilities, influence its performative role within the practice.

For example, while tablet computers used in excavation recording (e.g. Ellis 2016; Wallrodt 2016) may reproduce many aspects of traditional paper forms, at the same time they transform practice in ways ranging from the enforcement of specific recording requirements through to the physical detachment from the physical remains, leading to what Taylor et al. (2018: section 10.1) refer to as a “digital wedge” inserted into the interpretative process.

Thirdly, there is the purpose or objectives behind the practice: practices are always performed to accomplish something and, in this accomplishment, will be mediated in various ways by the digital. These might be specifically designed to support the specific achievement of purpose, or they may be generic devices which are combined or cannibalised to that specific end. For instance, bespoke software is used in performing certain kinds of archaeological practice (e.g. radiocarbon calibration) but many other practices employ generic, off-the-shelf packages. What determines such choices, and where does the tipping point for the transition from bespoke to generic lie? What practice-based compromises or opportunities are entailed in such a shift? Discussion of digital tools employed in archaeological practice in these terms is rare, although Ducke (2015) and Dufton (2016), for example, begin to address some of these questions.

Fourthly, there is the question of the boundedness of the practice: the tensions between the repetition of the practice and its consequent creative re-production as it changes, expands, and evolves. The digital tools we bring to bear operationalise these boundaries through the limitations and restrictions they impose; at the same time, however, they may facilitate creative practice through making those boundaries indeterminate and revealing possibilities beyond the immediate horizon. The introduction of Geographical Information Systems software into common archaeological usage is an example of such operationalisation but has rarely been critically approached in such terms. For example, Hacgüzeller (2012: 257) asks: “... how did our GIS representations and practices come into being across time and place and how did/can they become part of the complex process of creating past worlds in the present?” but this question concludes a consideration of archaeological GIS rather than introduces it.

Fifthly, there is the durability and persistence of the practice. This entails learning and hence the process by which novices become progressively proficient practitioners is important, as is the community of practitioners who share similar skills, practical concerns, understanding of the boundaries etc. The reproduction of knowledge and learning may be conceived as practice-based, with the digital simply part of the toolkit, or technology-based, where the digital is the driving force to the practical end. For example, we can identify a range of educational programmes which cover aspects of digital practice in archaeology, but there is as yet no discussion of their different approaches and methodologies. Similarly, large communities of practice exist such as the Computer Applications in Archaeology (CAA) international organisation with its annual conferences, national chapters, journal, and collection of published proceedings. Nevertheless, the nature of such communities, their place in supporting and shaping

digital practice, and their role in communicating and reinforcing skills and knowledge are presently poorly understood, although what is frequently apparent is a tendency to focus on technologically-driven forms of practice.

Zooming out of practice

According to Nicolini, zooming out of practice “requires ... moving between practice in the making and the texture of practices which causally connects this particular instance to many others” (2009a: 1407). This recognises that practices do not exist alone but are almost always dependent on or contributors to others, and consequently a practice cannot be fully understood in the absence of the texture of practices of which it is a part. Again, there are at least two lenses that support this zoomed-out focus on practice (Nicolini, 2009a: 1408–1412).

The first entails zooming out in order to understand the inter-connectedness of practices in space and time: how local practices participate in larger configurations as ingredients, elements or resources, and tracing the practice-network and the means by which it is established and maintained. Increasingly, of course, these connections are established digitally, maintained through social networking etc.

The second builds on the first by seeking to understand the local and broader effects of the practice networks: how practices become implicated in a variety of states of affairs which may arise far from where the practising actually takes place. The communicative and transferability affordances of the digital come to the fore again, both in terms of coordinating and managing the networks and in communicating their outputs to a wider community beyond the immediate field of practice.

A number of the international projects identified at the outset of the paper have gone some way in ‘zooming out’ of practice although they have frequently done so from a rather different perspective. Many of these projects, including CARARE, Europeana Cloud, and DARIAH are based upon the development of infrastructures, which implies some knowledge of existing structures, their practices and interrelationships. For example, the ARIADNE

programme has sought to integrate archaeological research data infrastructures, and in the process identified a range of research portals, domains, and communication outlets (e.g. Selhofer & Geser 2015). One might therefore assume that some elements of the kinds of issues outlined above – mapping the interconnectedness of practices, tracing networks, understanding the effects of practice networks etc. – has been undertaken if not presented in those terms.

Nicolini’s model of zooming in and out of practice provides a useful way of visualising and structuring our approach to understanding practice: moving from a focus on the specific to the general (from practice to community to society) and from the general back to the specific. Furthermore, it can be simply modified in order to focus explicitly on the nature and derivation of digital practice (see **Table 1**).

An obvious question is how to zoom in and out in practice. For zooming out, Nicolini (2009a) refers to qualitative methods including interviewing and conducting shadowing and ethnographic observation of daily activities but also refers to the historical method of studying past practices. For zooming in, alongside many other possible approaches he suggests a specific method called ‘the interview to the double’ (see Nicolini 2009b) based on an exercise where individuals are asked to imagine that they have a double that enters their workplace the following day and to explain what the double needs to do in order not to be revealed as a substitute. Nicolini (2009a: 1404) suggests that using this method it is possible to get individuals to express their current concerns but also to understand how codes of behaviour function in the studied context. Nicolini’s suggestions stem from a background in which a social scientist (e.g. ethnographer or sociologist) enters a workplace and conducts research on individuals who are initially unrelated to the researcher and research field. There is, however, no reason why an archaeologist could not interview or observe their colleagues (as in Edgeworth 2006, for example), or conduct auto-ethnography or self-reflection (Ellis et al. 2010) to zoom in or out as a part of their daily work. Other possible methods include

Table 1: A digital focus on zooming in and out of practice (following Nicolini, 2009a, Table 3).

Zooming in

<i>Focus on:</i>	What practitioners say and what they actually do with the digital
	The role of the digital components and associated resources
	The physical choreography of practitioner and digital devices
	The mediation of the digital in achieving the practice objectives
	The boundaries of practice maintained and extended by the digital
	The reproduction of knowledge and training through the digital

Zooming out

<i>Focus on:</i>	Associations between practices and their digital configurations
	The effects of the practice network on local and global digital practice
	The mediation of the digital in creating and maintaining the practice network

surveys (Faniel et al. 2013) and bibliometrics (Börjesson 2015) which are equally usable by archaeologists and non-archaeologists alike for studying archaeological practices.

Discussion and conclusion

Assuming that archaeology is defined in practice by what archaeologists do and how archaeology is carried out, and that it is conducted according to that defined practice, the question of defining archaeological practice and knowledge work is a primarily theoretical question to be resolved by archaeologists. It could be argued that it is enough that archaeologists understand and reflect upon what they do and the implications their choice of tools, perspectives and organisation of work have on what we know about the past. However, the question is equally relevant for those working with archaeologists: for example, for someone conducting empirical research about archaeology (how to frame the object of study?), for computer and information scientists developing tools for archaeological analyses and information management (what are the implications of the proposed approach and how do digital practices align with archaeological practices?), for the members of the general public (how can both archaeological and public priorities and interests be rationalised?), and for heritage administrators, policy makers, and developers (how to confront the often conflicting priorities of development and archaeological preservation?). Understanding practices and what counts as a practice is a premise of both self-understanding but also that of planning and getting others to do what they are supposed to do, as Levin and Donnison (1969) famously suggested.

As a part of the endeavour of understanding what an archaeologist does, both by the archaeologists themselves and others working with archaeology, it might be useful to make or at least think about certain distinctions of different aspects of practices even if the characterisations are kept analytical rather than ontological by their nature. An obvious distinction is the question of the boundaries of what counts as archaeological, what is merely related to archaeology and what (if anything) falls categorically out of the domain of archaeology. In this sense it might be useful to see *archaeological practices* as encompassing all activities that belong to the domain of archaeology, directly contribute to its aims, and follow its epistemological norms and ideals. This covers various forms of scholarly and professional inquiry and public and community archaeology that, in a broad sense, share a common understanding of how things should be known to be archaeological and that aim to make contributions to a shared archaeological body of knowledge. The outcomes and aims of archaeological practices should be (reasonably) commensurable (Strathern 1995) and reside under same regime of worth (Boltanski & Thévenot 2006) even if they would overlap with multiple epistemological and ontological jurisdictions. In contrast to archaeological practices, *archaeology-related practices* could be used to describe practices that exert influence on or are influenced by archaeological work or archaeological pursuits of knowledge. By this characterisation, it would be possible to discuss such activities in other scholarly and scientific

disciplines ranging from history and cultural anthropology to forensic science and climate studies. The distinction of these two categories open up the possibility to negotiate the 'archaeologicality' of diverse practices and to discuss how and when something becomes or ceases to be archaeological. It is apparent that the status of a specific practice is dependent on situation and perspective, and there is a grey-zone whether a specific practice should be seen as archaeological or archaeology-related especially when it comes to such undertakings that are somewhere between core and periphery from the perspective of archaeology, or that overlap with other epistemological and ontological fields. For example, an archaeological excavation is undoubtedly an archaeological practice from an archaeological perspective whereas it can be seen as development-related practice from the from the viewpoint of the land developer. Similarly, the teaching of history, especially when it acknowledges the role of material culture, can be seen as an archaeology-related practice from an archaeological perspective but there is no reason why it could not be seen at the same time as a core practice in the context of education broadly defined.

Another obvious distinction is the question of digital versus non-digital. The particular case of digitalisation in the midst of all these cases is that the undeniable ubiquity of both specialised and mundane digital technologies, digital tools, as well as their absence in some cases, has implications throughout the landscape of archaeological practices and knowledge work from digital practices (Beale & Reilly 2017) to practices that are primarily not-so-digital.

The debates surrounding archaeological practice and the digital raise a series of questions which, at present, have no answers. For example, zooming in to archaeological practices, what are our digital repertoires? What are the digital work routines, methods, tools, procedures held in common? How were these created and developed? Are they resources for local practice or for practice-networks? What is the nature of the identity of the members of the community? What determines membership, and who is on the outside? *Are we all digital archaeologists now?* How is learning and knowledge reproduced, communicated, and passed on? Is it practice-based or technology-based (i.e. do we learn the practice, or do we learn the tool)? Zooming out from archaeological practices, how has archaeological practice changed with the adoption of the digital? Do the digital reverberations extend from archaeological practice to archaeological theory? Is there a wholly digital practice distinct from practice more generally?

A better conceptual understanding of what constitute archaeological practices will be broadly useful for archaeological and archaeology-related inquiries, but importantly the particular relevance of archaeological and archaeology-related knowledge and information work pertains to the scrutiny of archaeological documentation practice and its outcomes, to archaeological information and information practices including information creation, seeking, organisation, management, use and preservation, to knowledge making both in and in relation to archaeology, and, not least, to archaeological computing and information processing. This has several possible benefits.

For example, if it were desirable to codify and propose standardised ways of working and develop formal descriptions of methods and approaches, the kind of understanding outlined here is a necessary starting point for mapping and modelling sociotechnical activity systems ranging from activity theory (Sannino et al. 2009) to cognitive work analysis (Pejtersen & Rasmussen 2004), soft systems methodology (Checkland 2000) and situational method engineering (Henderson-Sellers et al. 2014).

Alternatively, this more naturalistic approach allowing practitioners to define what they themselves consider as their practices is an important first stage in mapping the diversity of what might count as archaeological practices, knowledge work, and more specifically as digital archaeological practices. This then becomes a precursor to a much deeper, conceptual and theoretical understanding of the broader field. In this sense, it provides a response to Caraher's (2016) appeal for a "slow archaeology" by providing a means and methodology for reflecting upon and documenting archaeological digital practices and, in doing so, going well beyond the presumption criticised by Caraher that introducing digital tools do little more than improve efficiency and streamline practice (if they even do that). This is because the kind of undertaking outlined here is a critical precondition for improving, developing and/or changing digital practice in order to align with the aims of archaeological work both in the present as well as in the future when new technologies and tools are introduced which will in turn influence archaeology in as-yet unforeseen ways. As Caraher concludes, "Slow archaeology argues that the rapid pace of technological change and critical, reflexive archaeology requires renewed attention to the place of digital tools in both field practices and methodology." (2016: 437). Without a proper understanding of how archaeology is conducted in practice and how archaeological knowledge is produced, it is difficult to pursue such a critical, reflexive approach, and, absent this understanding, it is problematic to avoid a technologically deterministic approach to both contemporary archaeological practices and knowledge work, and future ways of practicing archaeology.

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Competing Interests

The authors have no competing interests to declare.

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