

Reassembling Social Science Methods: The Challenge of Digital Devices

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Abstract

The aim of the article is to intervene in debates about the digital and, in particular, framings that imagine the digital in terms of epochal shifts or as redefining life. Instead, drawing on recent developments in digital methods, we explore the lively, productive and performative qualities of the digital by attending to the specificities of digital devices and how they interact, and sometimes compete, with older devices and their capacity to mobilize and materialize social and other relations. In doing so, our aim is to explore the implications of digital devices and data for reassembling *social science methods* or what we call the *social science apparatuses* that assemble digital devices and data to 'know' the social and other relations. Building on recent work at CRESC on the social life of methods, we recommend a genealogical approach that is alive to the ways in which digital devices are simultaneously shaped by social worlds, and can in turn become agents that shape those worlds. This calls for attending to the specificities of digital devices themselves, how they are varied and composed of diverse socio-technical arrangements, and are enrolled in the creation of new knowledge spaces, institutions and actors. Rather than exploring what large-scale changes can be revealed and understood through the digital, we argue for explorations of *how* digital devices themselves are materially implicated in the production and performance of contemporary sociality. To that end we offer the following nine propositions about the implications of digital data and devices and argue that these demand rethinking the theoretical assumptions of social science

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Keywords

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In the second industrial revolution, with its automation of the streams of information, the analysis of discourses has yet to exhaust the forms of knowledge and power. Archaeologies of the present must also take into account data storage, transmission, and calculation in technological media. (Kittler, 1990: 369)

Digital devices and data are becoming ever more pervasive and part of social, commercial, governmental and academic practices. Different digital platforms mobilize and generate ever growing volumes of data on social and other relations: Twitter, Facebook and MySpace organize and produce data on social networks; online purchasing and browsing on Amazon, LastFM and Google facilitate and generate data on usage and transactions; news media such as the BBC or *The Guardian* track and report data on viewing trends and the popularity of articles; apps on mobile phones generate records on user activities and movements; eGovernment sites log digital interactions between governments and citizens, businesses and employees, and government administrative databases register the service activities and movements of people; and eScience and eHumanities projects compile and analyse immense data sets. There are also numerous digital devices produced by software developers for tracing and visualizing data that is circulated on the worldwide web such as Google's PageRank, Technorati's blog post aggregator, or the Lexis Nexis media aggregator (Beer, 2009). Social worlds are thus saturated, being done and materialized by digital devices and what is increasingly being understood as 'big data' of various kinds.¹ Indeed, the other articles in this special issue take up examples such as visualizing devices in the field of proteomics, BBC social media experiments, new forms of digital cultural engagement and self-reported medical data using online medical research platforms.

It is clear that the digital is also the focus of much scholarly analysis. A quick scan of recently published social science books that engage with the digital reveals the myriad themes and concerns of researchers: computer technologies and infrastructures; networked cultures; living and communicating in a computer age; internet and social media activism; interoperability and standardization; Web 2.0, open access and online collaboration; e-social science; cyberwarfare; cyberspace security,

privacy, surveillance and censorship; and e-learning technologies. Many of these themes form part of what is called a growing field of 'digital studies'.

But the aim of our article is both broader and narrower than suggested by these developments. It is broader because we seek to unsettle debates about how the proliferation of the digital is implicated in large-scale social change and remaking the governance and organization of contemporary sociality (for instance, Castells' [1996] network society, or the notion of biopolitics [Rose, 2006; Thacker, 2005]). And it is also narrower in that we are concerned with the implications of digital devices and data for reassembling *social science methods* or what we call the *social science apparatus*. Here we build on our interest in elaborating the social life of methods (which is summarized in Savage's introduction to this special issue) through a specific concern with digital devices as increasingly the very stuff of social life in many locations that are reworking, mediating, mobilizing, materializing and intensifying social and other relations. Focusing, in the spirit of Kittler (2006), on issues of ontology, we argue that we need to attend to how these qualities of digital devices demand rethinking the theoretical assumptions of our social science methods and making those assumptions explicit. While digitization is a complex and indeterminate process of intensification whose effects are uncertain, we suggest that it has the potential to reawaken and rework long-established social and political relations (see also K uchler, 2008).

Our objective is thus to pose questions about the consequences of digital devices for social scientific ways of knowing. If digital devices mediate and are in considerable measure the stuff of social, cultural, economic and governmental lives in contemporary northern societies, then what does this mean for our methods for knowing those lives? When we speak of methods here we mean the specific apparatuses that assemble digital devices and data to 'know' the social and other relations. We are saying that digital devices and the data they generate are both the *material* of social lives and form part of many of the apparatuses for *knowing* those lives. So, for instance, devices such as Twitter materialize new forms of sociality and ways for people to interact and know about themselves and others. At the same time Twitter gives rise to various knowledge practices or methods: academic researchers, data journalists and police surveillance units develop combinations – let's call these *apparatuses* – of analytical procedures (algorithms, software), infrastructures (computers, networks) and personnel (analysts, IT experts) to analyse the data that it generates.² So our questions are: what are the relations between the elements that make up different apparatuses and how are digital devices reconfiguring those relations?

We argue that any answer to these questions demands a conceptual understanding of the *specificities* of digital devices and the data they

generate. It requires the exploration of their qualities, which are likely to be both similar to and different from those of longer-standing social science methods such as survey research. But before attending to those similarities and differences, we first want to step back to reflect on social theory accounts of how the digital is transformative. Our suggestion is that, despite the important issues that such accounts raise, the specificities of digital devices – their materialities, productivities and mediating capacities – are not explored in this literature. We then turn to briefly note how such specificities are being addressed in the development of social science digital methods. Here we note that digital devices are reworking and mediating not only social and other relations, but also the very assumptions of social science methods and how and what we know about those relations. We argue that this calls not simply for reworking methods technically but also addressing their ontological assumptions. In the second part of the article we thus introduce the notion of ‘the social life of methods’. Here we emphasize the constitutive role of social science research methods for modern capitalist societies and suggest that this role is changing. But we cast such change *relationally* by exploring how digital devices interact with other kinds of devices, and how they themselves are both varied and composed of diverse socio-technical arrangements. Then, in the third section, we examine how we can better register the significance of the digital in terms of the capacities it offers for elaborating and mediating transactional (and especially) social relations, and offer a set of propositions for rethinking the assumptions of social science methods.

In sum, we make three major arguments. First, we suggest that the challenge of informationalism can be understood genealogically by tracing how the material and productive effects of the digital are reconfiguring knowledge spaces and the social science apparatus. Second, we explore the limits of ‘external critique’ and the extent to which standard methods and conceptual tools help us to understand information from the outside. And then, third, in an attempt to handle the challenge of informationalism ‘from within’, we develop an immanent critique that draws on Foucault’s *dispositifs*, the STS (science and technology studies) concern with inscription devices and Bourdieu’s field analysis.

A Digital Age

There is much interest in – and much hyperbole about – the digital. But if we strip away the latter, the capacity of social scientists and cultural theorists to understand the significance of the digital challenge seems less certain. As Mackenzie (2005: 72) wrote:

Although there has been wide acknowledgement of the mobility, dynamism and operability associated with information

networks, understanding the cultural specificity of software or code objects remains difficult.

Towards addressing the cultural specificity of digital code, Mackenzie and Vurdubakis (2011: 4) recently assembled a special issue of this journal that seeks to 'go beyond the restricted (and often restricting) understanding of code as the language of machines'. Instead, they explore codes 'not only in terms of software but also in terms of cultural, moral, ethical and legal codes of conduct' and what they 'tell us about the ways in which the "will to power" and the "will to knowledge" tend to be enacted in the contemporary world'. Importantly, rather than a 'general theory of code', the special issue attends to the specificities of code in domains from social networks to highway engineering.

But Mackenzie and Vurdubakis's approach and contribution stand apart from how the digital is predominantly approached in social theory. One influential approach imparts intrinsic properties to the digital, which is imagined to grow and unfold so that its qualities become more widely disseminated. The suggestion that the digital marks a profound, epochal, rupture in social change is familiar. We are surrounded by claims about the distinctive characteristics of 'knowing capitalism' (Thrift, 2005), 'the information age' (Lash, 2002; Poster, 2001; Webster, 1995), and 'the network society' (Castells, 1996). However, a re-reading of many of these seminal texts a decade later suggests that they treat information technologies and the digital in a derivative way. Rather than offering novel arguments about its revolutionary capacities, reflections on the innovatory character of the digital tend to reflect concerns with epochal change originally developed in the context of other kinds of claims.³ So, for instance, in writing about the digital, both Castells and Lash rework familiar arguments about globalization, postmodernism, and reflexivity.

Castells' (1996, 1997) seminal work on the 'network society' remains a key reference. This work was responsible for introducing digital technologies fully into the debates about post-industrial social change that had been raging for two decades since Daniel Bell's (1976) *The Coming of Post-Industrial Society*. To this extent, Castells' intervention is the latest in a long line of debates preoccupied with the role of automation – for instance that represented by commentators such as Toffler (1980) and Bell (1976), and even the Marxist analysis of the labour process (Braverman, 1974).⁴ Yet at the same time Castells broke new ground by emphasizing the networked character of digital communication. He argued that information can be divided into 'packets' and thus distributed in a non-linear and distributed fashion, an operation essential to contemporary capitalism (see e.g. Castells, 1996: 351–2). In this way he provided a distinctive twist to the familiar claims of Harvey (1989), Giddens (1991) and Beck (1992) about the power of globalization, the

break-up of social collectivities, and the creation of new kinds of fluid and mobile identities.

Yet, for all the emphasis on ‘the culture of real virtuality’, the technological underpinnings of Castells’ treatise are relatively underdeveloped. In the way he treats it, the ‘information technology’ paradigm has five characteristics: (1) ‘technologies act on information’; (2) there is ‘pervasiveness of effects of new technology’; (3) there is a networking logic; (4) ‘flexibility’; and (5) ‘convergence of specific technologies into a highly integrated system’ (Castells, 1996: 61–2). But there are various problems here. For instance, until the formation of the worldwide web and networked computing, information technology did not obviously have a ‘networking logic’. Again, and more specifically, digital devices and their specific modes of operation do not feature in the list. Our suggestion is that Castells is claiming the digital to be of profound social importance, but his work is more easily understood as a restatement of more conventional, pre-digital themes.

It is perhaps Lash (2002) who has placed informationalism on a more elaborated conceptual basis. Following in the spirit of Castells, he sees it as an ushering in of epochal change, and argues that talk of

[i]nformation society is... preferable to postmodernism in that the former says what society’s principle is rather than saying merely what it comes after... Second, postmodernism deals largely with disorder, fragmentation, irrationality, whilst the notion of information accounts for both... order and disorder... Information is preferable and more powerful as a notion because it operates from a unified principle. (Lash, 2002: 1–2)

This is appealing, yet, in practice, this unified principle is difficult to tease out. Lash reworks Wittgenstein to invoke an idea of ‘technological forms of life’ (see e.g. Gane, 2004). His aim is to think through the immanent properties of information in order to find a basis for critique that is not external or transcendent to that which it criticizes. Yet it is unclear how successful this is. Like Bauman, he tends to treat the digital as if its deficiencies are its defining features. For instance, it is ‘non-linear’ and discontinuous:

technological forms of life are *really* stretched out. They are too long, stretched out too far for linearity. They are so stretched out that they tear asunder. Spatial link and social bond break. (Lash, 2002: 20)

How well this argument works is uncertain (see also Simondon, 1989). Thus it presupposes a linearity that is no longer at work. It poses the question as to how stretched out forms of life have to be before

they break. The relational qualities of information are relatively underplayed (it is whatever is transmitted to others; Yoshimi, 2006). And the argument also fits uncertainly with substantial empirical research that shows that the digital is profoundly associated with the making of what might be termed 'local' social relations. For instance, Woolgar's (2002) 'five rules of virtuality', which are derived from a series of detailed case studies of virtual social relations, lead us away from Lash's thesis. Thus Woolgar tells us that 'virtual technologies supplement rather than substitute for real activities', 'the more virtual the more real', and 'the more global, the more local'. Similarly, as Strathern (2000) argues, rather than being decontextualized, the digital actualizes relations and connections that are otherwise beyond perception and thus inherent to the very imagining of social relations. They are materializations of what Latour (1998) has called a traceable social that is being rendered visible. And finally, as Knox et al. (2007) show, the use of digital communication in large corporations is associated with intensive local negotiation. Rather than occupying a 'space of flows' or a virtual informationalized world, digital data is itself a materiality that is 'alive', embodied and mobile. Our point here is that to yoke the digital to epochalist accounts of social change is to treat it as a reflection of familiar theoretical arguments, and tends to direct attention away from the materiality and productivity of digital devices.

Finally, another set of literature relates the digital to emergent forms of biopolitics (Agamben, 2005; Thacker, 2005). Here, and in part drawing on Foucault, the interest is in the productive capacities of the digital to generate new kinds of emergent relations, and most particularly with new conceptions of 'life itself':

The molecular knowledge of life that has taken shape since the 1960s has been linked to all sorts of highly sophisticated techniques of experimentation that have intervened upon life at this molecular level . . . the laboratory has become a kind of factory for the creation of new forms of molecular life. And in doing so, it has fabricated a new way of understanding life itself. (Rose, 2006: 13)

Thacker (2005: 28) explicitly links these new forms of life to informational politics:

Information in biopolitics is precisely that which can account for the material and embodied and, furthermore, that which can produce the material, the embodied, the biological, the living – 'life itself'.

Thacker's argument about how digital technology erases boundaries between the natural and the social is also related to claims about

globalization and so carries epochalist overtones. For just as theorists of postmodernism made much of the flattening of affect and the dominance of self-referential simulacra, now life itself is seen as complicit with informational and representational processes. This body of literature has also cross-fertilized with recent work on vitalism (e.g. Barry, 2005; Fraser et al., 2006). Here, then, the digital is seen as a way of reconfiguring life 'to conceive life as not confined to living organisms, but as movement, a radical becoming' (Fraser et al., 2006: 3).

But if our interest is with digital devices, it may or may not be productive to focus on 'life itself'. Here the legacy of Foucault's concern with the production of the human subject in disciplinary and governing devices comes through. Yet, as several contributors to this special issue note, rather than privileging the life sciences it becomes important to attend to the more mundane uses of digital devices in information systems, marketing processes and cultural systems, all of which offer different vantage points. Here it isn't the redefinition of life that is important. Instead it is the 'liveliness of data' and the making of transformational agents that come into focus. So while these accounts are provocative and raise vital issues they do not place the digital, in its ubiquity, its routinization and its mundanity, at centre-stage. How then have social scientists engaged with these specificities? One way has been through the development of digital methods.

Digital Methods

Several social science research centres and initiatives have taken up the challenge of digital data and methods. In Europe this includes, for example, the National Centre for e-Social Science (NCeSS, UK), now the Manchester eResearch Centre (MeRC); the Digital Methods Initiative (DMI, Amsterdam); the Oxford e-Research Centre and Oxford Internet Institute (UK); the Bartlett Centre for Advanced Spatial Analysis (UK); the Centre for Research on Socio-cultural Change (UK); the médialab (Sciences Po, France); and the eHumanities Group at the Royal Netherlands Academy of the Arts and Social Sciences (KNAW). To a varying extent these initiatives seek to understand digital devices while, at the same time, developing conceptual framings and innovative methods for analysing their effects.

In the academy, researchers have also adapted social science methods to forms of the digital such as virtual ethnography (Hine, 2000), virtual methods (Hine, 2005, 2006), and digital methods such as the IssueCrawler (Marres and Rogers, 2005; McNally, 2005). The growing availability of digital traces is also promoting a new form of computational social science that relies on the computer-aided manipulation of huge quantities of data (Lazer et al., 2009). Manovich's (2009) work on 'cultural analytics' has shown that disciplines like cultural studies can be

transformed by the capacity to compile and analyse unprecedented volumes of digital records. Text mining is also being taken up in many other areas, such as scientometrics (Börner, 2010), computer assisted qualitative data analysis⁵ and controversy mapping, whereby text analysis enables tracking and visualizing the alignments and oppositions in actor discourses (Venturini, 2010).

These examples could be extended, but are sufficient to make our point that a number of initiatives are under way to develop social science methods for compiling and analysing digital data. Though varied, some tend to emphasize technical issues – how can we adapt social science methods (e.g. virtual ethnography) or develop new digital methods (e.g. cultural analytics) to know social worlds in new ways? At the same time, by attending to specificities some are identifying and suggesting that the digital is challenging theoretical assumptions of social science methods. This is because emerging methods rely upon and mobilize digital data and devices, which are mostly generated outside the academy in social, commercial and governmental sites. For others, digital methods are giving rise to a new ontology of the social (e.g. Latour, 2010; Rogers, 2009b). It is this direction that we find most promising and which we explore below. Our focus is on how digital data and devices are reconfiguring social science methods and the very assumptions about what we know about social and other relations. To think about this well we do not simply need to rework methods technically, but also to rethink their ontological assumptions including, for instance, their often humanist underpinnings.

Digital Devices and the Social Life of Methods

We need a better analytical grasp of the challenge of the digital than is offered in social theory and technical accounts of method. But how? No doubt there are many possibilities, but our approach is to explore how the social is materialized in and saturated with devices – or what Featherstone (2009) calls ‘ubiquitous media’ – that are also part of the apparatuses for knowing social lives. So the question is: how do those devices and data get assembled into specific apparatuses to ‘know’ social and other relations? We use the term ‘apparatus’ to suggest that methods are purposeful assemblages, just as Foucault used the notion of *dispositif* and Latour that of the inscription device. Foucault (1980: 194) maintained that a *dispositif* is:

a thoroughly heterogeneous ensemble consisting of discourses, institutions, architectural forms, regulatory decisions, laws, administrative measures, scientific statements, philosophical, moral and philanthropic propositions – in short, the said as much as the unsaid. Such are the elements of the apparatus.

For Foucault an *episteme* is discursive. It sets limits to what can and cannot be said in a field. However, a *dispositif* (often translated into English as ‘apparatus’) includes an array of material, institutional and behavioural elements. For example, in relation to sexuality, it consists of a heterogeneous ensemble that includes ‘the body, the sexual organs, pleasures, kinship relations, interpersonal relations and so on’ (Foucault, 1980: 210). But a similar argument works for the digital: it is composed of many different kinds of elements, ranging from computer networks, scanners, algorithms, software and applications to different actors, institutions, regulations and controversies. Devices generate digital data (versions of what Latour [1990] calls inscriptions) in the context of sets of social and technical practices and relations. And those devices and data are assembled together to analyse and visualize Castells’ ‘informatization’. It is through such cascades of inscriptions – for instance from reams of data to indices – that simpler and more mobile digital inscriptions are often generated. And if some of those inscriptions have become more or less stable, difficult to undo or immutable, then this is because of the scale of investment (literal and metaphorical) that has gone into making them up. It has become too ‘expensive’ to undo them. Latour (1990: 15–16, italics in original) warns us, therefore, that:

the precise focus should be carefully set, because it is not the inscription by itself that should carry the burden of explaining the power of science; it is the inscription as *the fine edge* and *the final stage* of a whole process of mobilisation. . . . So, the phenomenon we are tackling is *not* inscription per se, but the *cascade* of ever simplified inscriptions that allow harder facts to be produced at greater cost.

Latour is talking about natural science, but offers a valuable provocation for our concerns here. The suggestion is that we need to be attentive not only to the digital in general terms, but to the more specific mobilizations which allow the digital to be rendered visible and hence effective in particular locations. In this way, we can see the extensive history of ‘failed’ digital projects as entirely germane. Our first suggestion then is that social science methods can themselves be treated as situated cascades of *dispositifs* and inscriptions. For example, Rogers (2009a) distinguishes the ‘natively digital’ – that is, data generated by online devices – and the digitization of ‘traditional’ data-gathering devices such as surveys. Each enrolls different devices, arrangements and relations. And this leads us to our second suggestion that such cascades are simultaneously embedded in and shaped by social worlds, and can in turn become agents that act in and shape those worlds. In a nutshell, this is one meaning of ‘the social life of methods’, which is elaborated in the introductory essay to this special issue. But if we are to understand this in the context of the digital, then we need to attend to the lives and specificities of devices and

data themselves: where and how they happen, who and what they are attached to and the relations they forge, how they get assembled, where they travel, their multiple arrangements and mobilizations, and, of course, their instabilities, durabilities and how they sometimes get disaggregated too.

This approach draws in part on STS and more specifically from actor network theory's concern with the agency of objects. Thus much STS literature argues that scientific and technical objects are socially efficacious. Early STS work tended to explore natural science (Latour and Woolgar, 1986) and technologies (Callon, 1986; Law, 2002). However, more recently, there has been increasing STS work on social science techniques and methods, with Callon (1998, 2007) and MacKenzie's (2008) work on the performativity of economics, for example. There have been important studies of how social scientific censuses, mapping and survey techniques are associated with the generation of powerful social entities such as the 'national economy' (Mitchell, 2002), caste groups (Dirks, 2001), social aggregates such as classes (Savage, 2010) and populations (Ruppert, 2009, 2011).

The conclusion is that in relation to digital devices, then, we need to get our hands dirty and explore their affordances: how it is that they collect, store and transmit numerical, textual, aural or visual signals; how they work with respect to standard social science techniques such as sampling and comprehensiveness; and how they relate to social and political institutions. To tease out these specificities and qualities it is useful to consider, in a historical register, how digital devices compare with other, older, socio-technical devices, and consider the different affordances that they offer in a nuanced manner. This is an approach also taken up by 'media archaeologists' who challenge accounts of the 'newness' of various forms of digital media by examining how they often rework 19th-century technologies (Huhtamo and Parikka, 2011: 1).

The available work reveals that the digital has not displaced sensuous human interaction, but has instead reworked sophisticated sets of devices that pre-existed it. These include the technologies of surveillance and control dissected by Foucault (1976) together with the arts of government, but also and perhaps more critically, involve a battery of social science devices that proliferated in the second half of the 20th century. So, for instance, the period from 1950 to 2000 saw a dramatic intensification of social research methods, notably the sample survey (first conducted on a large national scale in the UK in the 1930s) and interview methods (see Savage, 2010). These methods were championed as mechanisms to elicit everyday, ordinary, and mundane accounts, and were not only embodied in research agencies but also in popular media and corporate customer services departments. They departed from previous research repertoires based on observational technologies, which depended on the implicit authority of the 'knowing' observer, who was

deemed able to delineate a moralized account of social relations. Again, as Thrift (2005) argues, new research methods became fully enmeshed in the circuits of 'knowing capitalism', in which the systematic gathering of information about customers, clients, employees and competitors became routine to corporate strategy.

Our suggestion is that it is the dominance of the 'social science apparatus' and its methods that is being called into question by the digital. Three features are important for our argument here. First, the devices that make up social science methods differ from many in the natural sciences by being physically unspectacular. They are not embedded in laboratories or huge pieces of machinery. Instead methods rely on chains of interconnected and cascading devices, and consist of largely statistical procedures, with relatively large corps of skilled 'administrators' (interviewers, surveyors, enumerators, etc.), and simple devices such as clip boards, sheets of paper and, more recently, laptop computers to record social evidence. In short, they have entered the mundane circuits of social relations with no consecrated 'laboratories'. But this mundanity is being challenged in part by the digital.

Second, these social science methods and their devices are deeply implicated in the formation of human subjects. The census and the survey both presuppose, yet also enact, the knowing, self-aware individual, who is able to account for him or herself. Ruppert (2007, 2011) analyses how censuses produce and engage subjects in identifying with classification schemes that principally measure biographical characteristics such as gender, income, occupation and ethnicity, self-elicited identifications that focus on social categories. Whether individuals or enumerators complete census forms, subjects require particular reflexive capacities and agencies for the device to operate, including the ability to categorize and creatively make themselves legible. Similarly, Osborne and Rose (1999) describe how the production of 'opinioned or opinionated people' was part and parcel of the creation of the technology of public opinion research in the early 20th century. They argue that genealogies of devices can be paralleled with genealogies of persons: in the case of public opinion polls, people 'learned' to have opinions, became opinioned or opinionated, which means that opinion polls 'made up' people.

In another example, Savage (2010) examines the way that the sample survey abstracts lone individuals from their household arrangements (which had been the traditional focus of community studies) and allows the very concept of the non-sexed individual to come to the fore. (Within earlier traditions of community research, sexed and household characteristics were seen as given, primordial.) If this is right, then social science research devices were critically implicated in the formation of the self-organizing and self-accounting individual. Those devices, together with the recent, largely post-Second World War, 'social science

apparatus', which were based on the primacy of enumerating and sampling individual accounts (through censuses, interviews and surveys), helped champion a biopolitics of the 'human individual', detached from his or her environment. But all of this is being challenged and indeed undermined with the development of digital devices (Savage, 2010).

Third, the social science apparatus was dependent on a specific infrastructure of humans and devices to generate appropriate 'social data'. Without teams of interviewers, survey instruments, census enumerators and the like, such an apparatus would not have existed. This kind of knowledge is not a by-product of *other kinds* of data-generating devices and processes. Rather, this apparatus operates in a similar way to the skilled physician, standing outside the social body, and intervening in it with various devices to collect, array, analyse and codify samples of social tissue. These procedures are in keeping with how Rose (1991) defines liberal expertise, which is dependent on the knowing expert, and with Bauman's (1987) invocation of the 'intellectual as legislator'.

But what does it mean if we argue that social science methods are becoming dependent on digital devices not of their making? One answer is that the digital is bound up with processes of re-territorialization, and the creation of new knowledge spaces, institutions, actors, devices and apparatuses. But *specificity* is needed if we are to make this argument. We need to be wary of large claims. It is, for instance, likely (we'll argue this below) that these apparatuses draw from, or resonate with, older technologies of surveillance. Rather than a large-scale and external emphasis on flows and mobilities, or epochal change, we are suggesting that it is important to attend to the emerging stabilizations and fixities being performed in cascades of (partly social science) devices in particular locations. And rather than simply exploring what can be revealed and understood through such devices, it becomes important to explore *how* digital devices themselves are materially implicated in the production, performance and knowledge of contemporary sociality. So how to think about this?

The Challenge of Digital Devices: Nine Propositions for Reassembling Social Science Methods

In line with what we have been saying about apparatuses, inscription devices and their agential capacities, we want to argue that *digital devices observe and follow activities and 'doings'* – often, but not always or exclusively, those of people. Such 'doings' might include physical movements, but have more to do with *actions* (transactions, choices, statements, interactions) and their *traceability*. From loyalty cards, online purchasing, blogs, mobile phones, websites, wikis and social networking sites to government administrative databases, patents, reports and scientific and

newspaper articles there are, as we have argued, heterogeneous and multiple cascades of devices. Included in such cascades are numerous applications and software for simplifying, summarizing, visualizing and analysing digital data. Within these cascades a device can make, compile and transmit digital data and/or remake, analyse and translate data into information and interventions. But, this is the crucial point, all of these digital devices are modes of observation that trace and track doings. In the context of people, instead of tracking a subject that is reflexive and self-eliciting, they track the *doing subject*.⁶

So how, then, do social relations emerge and how are they linked to the apparatuses of social science? On the one hand, we want to suggest, controversially, that we are seeing a partial return to an older, observational kind of knowledge economy, based on the political power of the visualization and mapping of administratively derived data about whole populations. On the other hand, as a genealogical approach demands, we need to attend to the differential problems, concerns and devices through which observation is being performed by the digital and its material and productive effects, including the reconfiguration of knowledge spaces and social science expertise. However, we cannot attempt such detailed genealogies here. Instead, we offer nine propositions that arise from social science analyses of digital data and devices and argue that these demand rethinking the theoretical assumptions of social science methods.

(1) *Transactional actors*. Whereas interview-based social science methods elicit individual accounts and make these the centrepiece of social research, digital devices record data switches (exchanges), as two (or more) parties (including people and things) do business, exchange and interact. They are thus not derived from conscious intervention by the knowing researcher, but are the by-product of switches and what Rogers (2009a) calls the natively digital (e.g. data generated from online purchasing). These switches can be multiple, complex and minute. For example, a graphic illustration of mobile phone transactions demonstrates the structure of communication flows between members of a network. It is a form of social network analysis, with no data at all on specific individuals, but instead a mapping of specific transactions between parties. It thus has affinities with the field analysis of Kurt Lewin's sociometric social psychology, the poverty studies of Charles Booth, and the inter-war Chicago School. Here, the focus of inquiry is not on the individual factors that affect behaviour, but on the spatial flows of behaviours and contacts: contagion, pollution, influence, etc. Similarly, data generated by digital devices allow non-individualist and non-humanist accounts of the social, where the play of fluid and dynamic transactions is the focus of attention.

(2) *Heterogeneity*. Building on this first point, the extent to which digital data sources relate to people – or indeed to populations of people – is limited. The fact that some of those transactions are then

pinned to people who are said to engage in doing is important, but it is not given in the logics of transaction. This thought can be extended in several directions. First, there are many transactions – consider the movement of items through logistics networks – that don't directly have to do with people at all. Entities quite other than people make up these networks and the patterns that they reveal. Second, even if people are involved – as often they are – they are being disassembled into sets of specific transactions or interactions. It may or may not happen that they are reassembled into 'people'. In some sense, then, transactional 'doers' may be people, but in and of itself this has no special significance. Indeed, to say as we just did that people 'are being disassembled into transactions or interactions' is already to risk missing the point. People aren't disassembled. Rather, and perhaps exceptionally, they are sometimes assembled. Third, then, and more generally, it needs to be said that the move to the digital is *a move to heterogeneity*. Perhaps, following Tarde and Latour, we need to say that the social is about *heterogeneous association* rather than societies and people. It is about factors, impulses, risk profiles, and circuits and the post-demographic, as Rogers (2009b) has suggested. To this extent, humanist conceptions of society are being eclipsed.

(3) *Visualization*. The re-emergence of visualization as key to social analysis is striking. This stands in stark contrast to the hegemonic use of numerical and textual devices within the social science apparatus (in this respect, the social sciences parted company from the natural sciences, where visualizations have always enjoyed more legitimacy). In the social science apparatus, the marked differentiation between numbers and text takes historical form, since the two have not always been defined in opposition (Kittler, 2006). But in the move to the digital visualization now becomes a means of showing how 'excessive' information can be reduced to a form in which it can be meaningfully, if partially, rendered for interpretation. In this way, as Amooore (2009) shows, aesthetic criteria can be re-introduced into the use of digital data sources. Rather than statistical analyses (through modelling procedures), visualization becomes a summarizing inscription device for stabilizing and representing patterns so that they can be interpreted. Although different in construction to (for instance) Booth's 19th-century poverty maps, they nonetheless share a common concern with observing patterns, circulation, flows, and boundary maintenance and leakage.

(4) *Continuous, rather than bundled time*. Both interviews and surveys can detect change, not by comparing disparate sources but through internal inspection of unitary data or linked datasets. In the qualitative interview, narratives disclose temporal sequencing through story devices. Surveys permit temporal analysis through comparison of age groups (quasi cohort analysis), or, in the case of panel studies, by tracking the same individual at different time points. Both thereby allow trends to be

discerned through internal analysis, rather than through the messy amalgamation of different sources, as practised by historians. These procedures involved the eclipse of landscaped and territorial approaches to the social, which were grounded in earlier generations of observational social research, due to the way that they depend on abstracting sampled individuals from their environment, increasingly by using the national boundary as the unit in which societies were deemed to operate. In these analyses, time is treated as linear, as a set of standardized points (e.g. years) between which comparisons can take place. Censuses take fixed 'snapshots' of populations every five or ten years and then compare quantities of social categories between intervals to reveal change. By contrast, new data sources such as social network platforms and digitized government administrative data deploy continuous time and constitute on-going and dynamic measurements of the movements and transactions of populations (Ruppert, 2010). For example, eBorders databases focus on the identification of factors that shape 'unknown futures' (Amoore, 2009). Such a perspective offers a shifting platform on which to view change as risk factors are modified. However, some digital data is not routinely archived and, because it is not focused on the individual, it has no identifying unit that can allow for comparison over time.⁷ In many cases it thus elicits flat, pliable registers of populations.

(5) *Whole populations*. Social science methods depend on sampling, and hence social knowledge is generated on the basis of data derived from only a small selection of points, which are then generalized into accounts of social aggregates through statistical procedures. New digital data sources work on the basis of entire systems of records, so that the aggregate is not as important as the individual profile. Through these means, there is a return to a problematic of 'whole populations', in which it is not enough to know aggregate properties of the social world, but to know how everyone and every transaction can be scanned, monitored, and subject to analysis and intervention. Every individual who uses a Tesco clubcard has a unique 'DNA' profile which records their spending patterns, and those who analyse such data insist on its value in allowing a granular knowledge that surpasses knowledge of aggregated social groups. (Instead, aggregated social groups are derived inductively as discussed below.) This concern with whole populations also elicits a descriptive mode of analysis, which clusters and classifies to produce social maps that are simultaneously moralized and normative. Good examples of these are the extensive geodemographic profiles widely used within marketing. It is instructive to note the similarities between the 'lifestyle' maps produced by these systems and the maps generated by Booth and Rowntree a hundred years earlier.

(6) *Granularity*. 'The devil lies in the detail' of new data sources. There is a suspicion of aggregated properties that are derived deductively. Instead, the focus is on particularistic identifiers. In credit scoring,

security services, social welfare or criminal targeting, and commercial marketing, it is particular suspect, risky or at-risk populations that are sought out and identified. Databases such as Experian, for example, classify unique postcodes. In such processes aggregates may also be derived (as clusters of granular cases), but these are inductively created and not 'imposed' onto data sources. Similarly, government administrative databases record multiple cross-agency transactions that reveal detailed and unique identifications of populations when they are joined up. This focus on granularity drives forward a concern with the microscopic, the way that amalgamations of databases can allow ever more granular, unique, specification.⁸ This is part of a desire for wholeness, an embrace of the total and comprehensive which is never-ending but which generates a politics of mash-ups, compilation and data assemblage. Perhaps this helps to explain the attraction of Deleuzian perspectives, where the empirical is held not to be outside the concept but in interaction with it.⁹ The subject is materialized by digital devices in new ways and may be understood as a monad, a conceptualization that Latour and others have advanced in relation to digital methods such as controversy mapping.¹⁰

(7) *Expertise*. Survey and interview methods demand intervention from the expert social scientist. The idea that these experts can actually intervene and generate empirical data is one that was largely new in the post-war years, and eclipsed their older, gentlemanly role in which they used by-product data generated by inspectors, social workers and the like. The idea that experts had to intervene in the social world to gather appropriate data that would otherwise be absent and would limit social science was absolutely central to the emergence of critical social science. However, new digital sources create data as a by-product. One does not have to conduct special questionnaire or interview research on Amazon customers to identify which other books customers are likely to buy. Such data is routinely gathered through normal transactional processes and allows customers to be bombarded with information about what people like themselves have bought. This is comparable to the way that social knowledge in the 19th and 20th centuries was generated from routine administrative practices of social workers, school inspectors and the like. This is now the source of population knowledge to which governments are 'returning'. Some governments, for instance, have replaced, or are planning to replace, traditional questionnaire-based censuses with administrative records, which at one time were the mainstay of population knowledge (Ruppert, 2010). Data generated as a by-product of everyday transactions with governments (registration, taxation, benefits) are recordings of exchange processes and do not rely on experts to intervene to elicit knowledge of populations. Whether in commercial or governmental domains, different experts, such as computing engineers and software designers or the emerging profession of 'data scientist', are becoming more prominent mediators.

(8) *Mobile and mobilizing*. Digital data sources, and especially Web 2.0 technologies, also allow various publics to be enrolled and enacted in the digital in active ways (Ruppert and Savage, 2012). There is a range of freely available online data, ‘apps’, software visualization devices and so on. For Stiegler, these produce ‘an associated milieu in the sense that all members belonging to the milieu participate in it and are functions of the milieu’ (Venn et al., 2007: 335). We once again need to remind ourselves that, rather than being new, this is in many regards a return to the tradition of Mass Observation and the various field research activities of the middle 20th century, all of which emphasized how publics could research themselves through writing and observing. This current persisted well into the 1960s, perhaps most notably in the Consumers Association journal *Which* that relied on letters from the public to judge the quality of products. By contrast, the social science repertoires of the post-war years sought to construct respondents in more passive forms so that their accounts could be rendered comparable and equivalent to each other. Be that as it may, what is different is both the location and relation of publics to the numerous devices that make up the digital. Publics are now enacted and enabled to intervene actively by making up their own devices as well as by contributing to the dominance of particular devices through their mass take-up. Here we need to account for the *mobility of the digital itself*, and the capacity for the circulation, sharing and take-up of devices and data across numerous sites that increasingly transcend institutional boundaries.¹¹

(9) *Non-coherence*. The proliferation of devices for tracking, tracing and visualizing relations has a further consequence. It is at least in some measure *distributed*. In an era of WikiLeaks it is important not to get caught up by hype. Nevertheless, it is nonetheless the case that much transactional data is widely, and in some cases generally, available for those with access to the internet. It is also the case that there are very large numbers of ‘apps’ available in the public domain for mining and visualizing that data. The consequence is that there are many distributed locations of socially relevant digitally derived knowledge. There are various ways of thinking about this. Some would claim that this represents a ‘democratization’ of knowledge, though we would be wary of such a large claim. At the other end of the spectrum, others would argue that this represents the erosion of properly validated knowledge of and expertise about the social.¹² We would be equally cautious about making this argument. What we would suggest, however, is that since both the *distribution* of digital devices and inscriptions is widespread, and that cascading devices work in different ways to produce different effects in different locations and circumstances, it is more readily apparent that knowledges do not cohere to generate a single authoritative representation of the social. In short, we want to suggest that social knowledge is more visibly non-coherent than it was in the recent past (though we

would need to emphasize that this does not mean that it is necessarily incoherent, which is a different and normative claim).¹³

Conclusion

We have suggested the need for a heterogeneous understanding of the digital, one that does not seek to ascribe fixed characteristics to it, but which emphasizes the contingencies by which it can be mobilized and deployed. But we also want to emphasize that digital devices and data imply a significant challenge to the social science apparatus. Where, then, in such cascades are social science methods located? What is their relative location and role within the productive, material and performative work of the digital?

We suggest that an analogy with Bourdieu's concept of field analysis will help. In this, agents are not seen to possess intrinsic qualities and capacities in and of themselves, but only with respect to other agents who are also struggling for position of advantage in a competitive field. Applied to digital devices, this suggests that they do not carry innate meanings in and of themselves, but are championed as competitors and (if we may extend the metaphor) are complementary to other devices. Overall, it is their comparative relationships with one another that define their efficacy or indispensability. Thus, for Latour (1990), it is investments in inscriptions and their mobilizations that are the sources of dominance. Rather than competition between ideas, it is competition between material devices where those that assemble and summarize can become 'centres of calculation'. But crucial to this is their mobility, transmission and circulation, and the similar movement of inscriptions. There is no room for epochs here. Instead we need to explore *fields of devices* as relational spaces where some devices survive and dominate in particular locations while others are eclipsed, at least for the moment.

In thinking about this, we have tried to argue that it does not help to imagine the digital in terms of epochal shifts or redefinitions of life. The lively and productive changes brought by the digital are no doubt large, but they need to be explored carefully, with due attention to their specificities. And, as a part of this, we have also argued that they often turn out to instantiate and reconstitute older practices, forms of stabilization and control. There are many productive devices in the representational landscape – and those that are new interact and sometimes compete with those that are older. Rather than assuming a simple teleology in which the former simply displace the latter, we have recommended a genealogical approach that is alive both to the ways in which digital devices reconfigure expertise and institutional circuits, and the ways that social agents of various kinds contest their value and efficacy. At the same time, we have argued that it is important to attend to their distinctive qualities as 'automated' devices in which data are by-products that do not require

the awareness or intervention of transacting individuals or academic experts. If we are to do this well we will need to vary the magnification as we explore the chains of relations and practices enrolled in the social science apparatus.

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Notes

1. While variously defined, 'big data' refers to large volumes of digital content that is generated either online or offline in social, commercial, scientific and governmental databases. But the term does not simply signify an increase in the volume but also the velocity of data collection and the increasing variety of data sources and formats. These qualities make it difficult to analyse data using traditional data management and processing applications. Thus, an additional defining characteristic is the innovation of data structures, computational capacities, and processing tools and analytics to capture, curate, store, search, trace, link, share, visualize and analyse big datasets. See, for example, discussions in boyd and Crawford (2012), Manovich (2011) and Schroeder and Meyer (2012).
2. This was well illustrated in the 2011 'riots' in England. Twitter data was analysed by the police, researchers and journalists to generate knowledge about the disturbances: for example, Manchester eResearch Centre's Twitter analysis project with *The Guardian* examined how the news of the riots spread (<http://bit.ly/w3IHS6>), and the Metropolitan Police trawled through Twitter and other social networking sites to gather evidence of people inciting rioting. Christakis (2012) has made a similar argument in relation to the internet: it is changing social science methods as well as its objects and subjects of analysis in different domains.
3. Though we should state that Lyotard (1979) did note the role of technoscientific transformations in cybernetics, communication theory, data storage and transmission as elements in his account of the postmodern condition.
4. See, for instance, the comments of Yoshimi (2006: 276):

it is generally assumed that information technology alone can fundamentally alter society. The exact nature of the technology cited as the explanatory variable has changed with the times. At one time it was television; later it was the main-frame computer; then it was the computer network, and most recently, mobile media.

And similarly:

Clearly, there is nothing 'post-' modern about information society theory. It is no more than a faithful reproduction of the principles of 'modern' industrialism adjusted to fit the 'new' conditions of information technology.

5. See: caqdas.soc.surrey.ac.uk.
6. In relation to social network analysis, Watts (2007: 489) has argued that new computational analytics of millions of network data enables the tracing of ties and social behaviour that does not rely on self-reports from participants which are full of 'cognitive biases, errors of perception and framing ambiguities'.
7. The detailed accounts of transactions collected as part of the Tesco loyalty card system, for instance, are not preserved for more than two years. However, other forms of digital data, such as certain archives and government databases, have longer durations.
8. Watts (2007: 489), for example, has argued that internet-based communication has now enabled the analysis of the 'real-time interactions of millions of people at a resolution that is sensitive to effects at the level of the individual'.
9. See, for instance, Rose: 'when I talk about empiricism a la Deleuze... I mean... an attempt to set up a constant dynamic engagement between thought and its object, and thus a concern with engaging the specificities of situations, cases and elements' (in Gane, 2004: 176).
10. The resurgence of monadology within contemporary social science has been marked by recent work on Tarde. See, for instance, Candea (2010). However, as we have just implied, it is also embedded in Deleuze's influential writing (see in particular Deleuze, 1993). Though it is often treated otherwise, actor network theory is also a form of monadology (see Latour, 1988).
11. Though there is still much boundary making, especially in government and commercial data and applications.
12. See, for example, the discussion in Savage and Burrows (2007).
13. We have phrased this carefully. Knowledges have always been different. It is the *visibility* of difference that has changed.

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