Digital Traces in Context

An Introduction

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A consequence of living in a media-saturated world is that we inevitably leave behind digital traces of our media use. In this introduction to the *International Journal of Communication*'s thematic section, we argue for a need to put those digital traces in context. As a starting point, we outline our basic understanding of digital traces, generally defining them as numerically produced correlations of disparate kinds of data that are generated by our practices in a media environment characterized by digitalization. On this basis, we distinguish three contextual facets that are of relevance when considering digital traces: first, the context of the scientific discourse in which research on digital traces is positioned; second, the context of the methods being applied to researching them; and third, the aforementioned context of the empirical field. With reference to the articles in this thematic section, this introduction argues that, in a single study, all three contextual facets interact as the scientific discourse relates to the methods being used, which in turn relates to the entire field of research.

Keywords: digital traces, contextualization, big data, digital methods, datafication

Digital Traces as a Phenomenon

Whatever we do, wherever we are, by living in a media-saturated social world we leave behind footprints of our media use that compile an archive of "digital traces." To some degree we do this consciously; when we upload photographs to or write comments on the timelines of digital platforms, we leave an enduring imprint of our presence there. On the other hand, however, we are often unaware of the process as an (unintended) side effect of our media-related practices. This can be the case, for example, when using a search engine, when reading newspapers online, or when posting on Facebook or

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Twitter. But the notion of digital traces can extend beyond ourselves: These traces can be produced not just by us but also by others; when our friends, family, or contacts interact online with reference to us, by synchronizing their address books with our digital addresses, or by tagging pictures, texts, or other digital artifacts with our handles, they inadvertently contribute to our own archive of digitally rendered echoes. When a mother's pregnancy is documented by a constant flow of communication through apps and platforms, constructing digital remnants of an expected child, digital traces are left to linger even before birth. This raises questions of agency—a need to interrogate the rights of those whose traces are unknowingly preserved and those that knowingly preserve them. In this sense, as Louise Merzeau argues, "we cannot not leave digital traces" (2009, p. 4) in our contemporary, media-saturated world.

Digital traces have evoked a sophisticated but nonetheless controversial methodological discussion that represents a new challenge to media and communications research. First, it is important that we remain cognizant of how digital traces constitute more than just (big) data. They are a kind of digital data that become meaningful because, as a sequence of "digital footprints," they represent a technical procedure of construction related to a certain actor or action, typically (of) an individual, but by no means less (of) a collectivity or an organization. Through such procedures of connecting data with entities of the social world, these footprints become meaningful as information, and this is why data processing companies and organizations are interested in this kind of aggregation. For the purpose of this thematic section, a good starting point would be to define digital traces as numerically produced correlations of disparate kinds of data that are generated by our practices in a media environment characterized by digitalization.[1]

The Challenge of Putting Digital Traces in Context

Digital traces as a phenomenon are meaningless unless we precisely contextualize them. At first glance, context is typically understood as the empirical context in which digital traces occur in everyday life, but in this thematic section we want to take a broader approach and distinguish three kinds of contexts that need to be taken into consideration when discussing digital traces. First, the context of the scientific discourse in which an analysis of digital traces is positioned; second, the context of the methods being applied; and third, the aforementioned context of the empirical field, that is the context of social relations and cultural meanings in which digital traces occur. In a single study, all three contextual facets interact as the scientific discourse relates to the methods being used in relation to the entire field of research. However, it remains analytically helpful to distinguish these three contextual facets because it offers us an insight into the challenges involved when doing the work of putting digital traces in context.

With regard to the context of the scientific discourse from which digital traces are being analyzed, it is immediately clear to what extent they have insinuated themselves into the more general discussion on the latest media-technological developments of our age. The origin of digital traces' persistent inclusion

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[1] The term *trace* suggests numerous meanings (to trace, track, traceable, traceability, tracing, etc.) and seems to connote an isolated object as well as an action or a process (Reigeluth, 2014, p. 249; Serres, 2002, p. 1). Because of the term's semantic richness, there can be a certain ambiguity when determining "digital traces" in a proper way.

in this discussion can be seen in the more prolonged reflections on whether or not "new" media require "new" ways of doing research (see, e.g., Hutchinson, 2016; Kember & Zylinska, 2012; Markham & Baym, 2008; Press & Livingstone, 2006). This means that they need contextualizing within the further-reaching discussion surrounding the "digital humanities." A more specific point of departure for us, however, is the discourse on deep mediatization. The term *mediatization* captures, on the one hand, the increasing spread of technologically based media across society; on the other hand, it captures the ways in which different social domains are becoming increasingly shaped by these media—a process that has fundamentally intensified over the past decade (Couldry & Hepp, 2013; Esser & Strömbäck, 2014; Hjarvard, 2013; Lundby, 2014; Thompson, 1995). Referring to the contemporary mode of mediatization as "deep" indicates that, with the recent wave of digitalization, mediatization has entered a new phase (Couldry & Hepp, 2017, pp. 34–56; Finnemann, 2014, pp. 312–315): It is no longer expedient to refer to the social impact of "the media" merely as the influence of a distinct domain (i.e., journalism) that is separate from others in the social world (Livingstone, 2009, pp. 2–4). Digital media transgress every sphere of society and in turn have become a constitutive part of its construction. Therefore, the emergence of digital traces is part of a more general, media-related transformation of culture and society and is suitably reflected in the discourse on deep mediatization.

Although the discourse on deep mediatization is more analytical, other scientific discourses position digital traces as a more specific question related to existing research paradigms; the discussion on "big data" is a prime example (Puschmann & Burgess, 2014). Initially, the discussion surrounding the so-called big data revolution articulated hope in the promise of new forms of analysis that digital traces might offer. The idea was that vast quantities of data-based information could be analyzed by automated procedures that would do away with any theoretical assumptions while being able to predict future developments. This was a promise of a new, purely data-oriented form of knowledge production that would allow academic research to cast away the ballast of theory. Proponents of big data evangelized at the time that we would no longer "require a valid substantive hypothesis about a phenomenon to begin to understand our world" (Mayer-Schönberger & Cukier, 2013, p. 55). Big data, argued the subtitle of a best-selling practical guide, is about "using smart big data, analytics and metrics to make better decisions and improve performance" (Marr, 2015 [book sub-title])

Digital traces were reduced to a "big data paradigm" that was more about "managing data and transforming it into usable and sellable knowledge" (Elmer, Langlois, & Redden, 2015, p. 3) than it was about constructive learning. Insubstantial guarantees were made based on what we might call a "mythology of big data," a mythology that maintained that "large data sets offer a higher form of intelligence and knowledge that can generate insights that were previously impossible, with the aura of truth, objectivity, and accuracy" (boyd & Crawford, 2012, p. 2). This notion of "social analytics," Dijck suggests, refers to the "gradual normalization of datafication" (Dijck, 2014, p. 198) emerging as a new, central paradigm in scientific and social inquiry. Big data researchers, she goes on, "tend to echo these claims concerning the nature of social media data as natural traces and of platforms as neutral facilitators" (Dijck, 2014, p. 199); they become, in a sense, big data fundamentalists. Their perspective takes the point of view that, once the easy work of gathering data is completed, the "data will speak for itself" (Mosco, 2014, p. 180).

By comparing divergent discourses such as the one on deep mediatization with the discussion on big data, we can more conveniently assess how important scientific context is to the phenomenon of digital traces. A comparison like this can clarify whether it is more an expression of a general transformation in culture and society that requires theoretical investigation based on already existing research, or if, conversely, it is an expression of a new way of accessing the social world, a phenomenon that can only be considered beyond theoretical assumptions.

Once we understand the context of the overarching scientific discourse at play, we can then use that understanding to more precisely distinguish the context of the methods being applied. The point here is that with their increasing digitalization, social science methodologies have entered into a kind of "crisis" that digital traces have promised to quell by virtue of their perceived accuracy compared with the loaded messiness of more traditional forms of data used in the field (Savage & Burrows, 2007). Although the sample survey and the in-depth interview once represented innovative contributions to a methodologically informed description and understanding of the social world, in the current research environment, traditional methods like these can be considered limited in their ability to adequately grasp the ever-increasing range of social constructions. Our dominant institutions—government, local administrations, private companies—now obtain much of their information through ongoing observation and analysis of the various digital traces left online. Against this backdrop, any assertion by academe that its research, based on surveys and interviews, is reliable can be challenged—and vice versa, a scenario that implies, as Ruppert, Law, and Savage (2013) argue, a need to "reassemble social science methods" (p. 22). Digitalization places many established methods under a certain kind of pressure if they fail to deliver adequate responses to the problems of the day—a situation that can be positioned as an issue associated with the "social life of methods" (Savage, 2013, p. 5). We can conclude, then, that there is a need to devise novel approaches to data collection and analysis based on the notion of "digital methods" (Rogers, 2013, pp. 1, 13) to complement the more established methodologies at our disposal; crawling, scraping, and data mining all depend on digital traces as sources for empirical research. Digital methods do not use special procedures of data collection to produce data that is then analyzed, they actually use digital traces as a primary source for subsequent analysis.

Some proponents go one step further, arguing that, for the first time, digital traces grant direct access to ongoing processes of social construction. Maybe the most prominent example is Bruno Latour's (2007) integration of digital traces into his overall approach to social analysis. A "digital traceability" (Venturini & Latour, 2010, p. 6) then becomes a potential tool for analyzing processes of social construction in situ: "Being interested in the construction of social phenomena implies tracking each of the actors involved and each of the interactions between them" (Venturini & Latour, 2010, p. 5). Digital traces, so the argument goes, permit this kind of direct access, allowing us to witness processes of assembling in the moment (see Latour, Jensen, Venturini, Grauwin, & Boullier, 2012; Venturini, 2012).

From our point of view, this move largely misunderstands the fundamental motives for putting digital traces into a methodological context. First of all, there remains the fundamental problem of misinterpreting the social world as "flat" and therefore reconstructable solely by means of an analysis of correlated "footprints" left across digital media. Indeed, this represents one point of access, but one that

reduces the present complexity of the social world to an ontology of a flat society.[2] Second, and perhaps more importantly, such an approach misunderstands digital traces as something "neutral" offering us "direct access" to the social world. However, digital traces are not "neutral phenomena"; rather, they rely on the technical procedures of governing institutions that actively produce this kind of information. By "governing," we mean that these institutions are in a powerful enough position to define the character and structure of data and metadata and to put them to use as they see fit. Therefore, as in any established social science method, digital traces, as indicators of social reality, have to be critically reflected on with regard to their residual biases.

The third context that we wish to address is that of the empirical field. Digital traces—contrary to what the scientific discourse on big data assumes—are deeply entangled with practices that are continually embedded in social situations and our dominant institutions (Scott & Orlikowski, 2014). In light of this entanglement, (meta)data cannot be solely considered as "raw resources" (Borgman, 2015; Bowker, 2014, p. 1797; Gitelman & Jackson, 2013, p. 7; Dijck, 2014, p. 201). In contrast, the main task for empirical research on digital traces is to demonstrate how meaningful they are within a respective field; that is, to explain the causalities and relations that go beyond pure aggregations and correlations as suggested by the data gathered in an automated process.

As a consequence, the challenge when researching digital traces is less of an automated analysis, as is often postulated: Rather, the challenge lies in how to relate digital traces to further data sources in the respective field so that they may become validated, interpretable, and can subsequently be referred to in more sophisticated procedures of theory building (see Crampton et al., 2013; Lohmeier, 2014).

We must take care to avoid possible misunderstandings at this point. When it comes to the context of the empirical field, we share the position that competences in new forms of "digital methods" (Rogers, 2013) and "automated analysis"' (Sommer, Wettstein, Wirth, & Matthes, 2014) are a necessity for media and communication research that endeavors to stay current and contribute to the discussion. At this point, the contextualizing power of methods refers back to, and is entangled with, the context of the field. It is for this reason that it is vital that the potential offered by "digital methods" and "automated analysis" does not become detached from the context of the empirical field and that further analyses strive to be fully conversant with the social domain(s) being investigated.

An Overview of This Thematic Edition

The three contextual factors—the context of scientific discourse, the context of methods, and the context of the empirical field—each play a part in every article in this thematic section. To some degree, we can read each article as a reflection on the intersection of these three contextual facets. In so doing, several contributions outline the field of research in more general terms, placing emphasis on challenges faced when addressing the context of scientific discourse while others focus on a more detailed analysis of digital traces and are, therefore, more concerned with how we can contextualize digital traces in the field.

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[2] Here the general problem of the idea of the social world as a sum of assemblages becomes replicated (for a critique of such an approach, see Couldry & Hepp, 2017, pp. 57–78).

By straddling these two contextual boundaries, we can position the context of methods—most relevant in the articles where a methodological discussion is taking place.

In his opening contribution to this thematic section, Richard Rogers discusses current approaches to measuring users' activity adopted by social media services. For him, these forms of measurement can be described as "vanity metrics": They are based on a simplified understanding of interaction by relying on page views and likes as indicators. Rogers suggests an alternative set of metrics—that is, critical analytics—that take into account issue networks and engagement. In this way, digital traces are put in context by integrating practices of online engagement.

"Media analytics" are at the center of Lev Manovich's critical reflection on the development of modern technological media. For Manovich, they represent a new stage of investigation offering a comprehensive, automatic, computational analysis. This analysis encompasses the content of all online media and personal and group behaviors and communications. To contextualize these digital traces, Manovich suggests an interdisciplinary approach to media studies that extends it to the world of computer science and the knowledge and skills offered by its practitioners.

Jean-Christophe Plantin analyzes Google Maps as a hybrid configuration of platform and infrastructure. Through this hybrid configuration, digital traces are collected through participation, crowdsourcing, or the harvesting of user data and are used to constantly improve its mapping service. Plantin argues that to fully understand Google Maps' approach to digital traces, this hybrid context must be taken into account, particularly when one is interested in the production of cartographic knowledge.

Stefania Milan explores the bottom-up data practices enacted by individuals and groups as part of organized collective action. She argues for putting digital traces in context by foregrounding human agency and meaning-making activities. Focusing on the possibilities opened up by digital traces, Milan considers how activists make sense of the ways in which social media structure their interactions. In her analysis, she demonstrates how digital traces trigger a quest for visibility that is unprecedented in the realm of social movements and how they can function as a kind of "agency machine."

Carolin Gerlitz and Bernhard Rieder shine a light on the sources of tweets. They emphasize the necessity to take into account the context of message production, the respective devices and clients being used, the platforms, and their developers when analyzing digital traces. They argue that there are many different ways of being on Twitter and demonstrate through an empirical data set what insights researchers can gain by including the clients and devices from which a tweet is sent.

Gerret von Nordheim, Karin Boczek, Lars Koppers, and Elena Erdmann address the public discussion on the Transatlantic Trade and Investment Partnership by comparing data from Twitter and traditional newspapers. By analyzing Twitter's digital traces in the context of traditional media coverage, they are able to discuss the parallels and differences that can be found in these traces. In their comparative analysis, they discover similarities with regard to an overall agenda, but they also identify evidence of a more differentiated spectrum of unique events and a more polarized discussion on Twitter.

Stefanie Walter, Fenja De Silva-Schmidt, and Michael Brüggemann investigate the digital traces that scientists left on social media during the 2015 United Nations Climate Change Conference summit. Using geolocated tweets, they compare the Twitter use of scientists who attended the conference with those who did not. Combining automated, quantitative, and qualitative content analysis, the study shows how scientists participating in the conference provided live reports and formed a transnational network. In sum, the article discusses the need for and the possibilities of a geographical contextualization of digital traces in the field.

The strategy of online networking platforms when accessing digital traces is critically discussed by Bernie Hogan. He demonstrates that the use of digital traces contextualized by partially conflicting interests of platform owners, users, and researchers. The competing stances can be summarized as a claim for control, privacy, and relational generativity. Relational generativity here refers to the potential for third parties developing innovative data insights to improve user experience and answer questions of societal relevance.

Tilo Grenz and Heiko Kirschner present an empirical analysis of digital traces already existing in big data environments by reconstructing the trajectory of the unique device identifier and its role within the ecosystem of Apple's App Store. They conceptualize digital traces as being continuously negotiated with because the tracing capabilities change while they are being produced. This highlights the contextual dependency of digital traces that are already in their moment of production, which requires a different methodological approach that they call "interpretative tracing."

By looking at the self-tracking movement and the data it produces, Bernadette Kneidinger-Müller takes a theoretical perspective on the framing conditions of data collection, distribution, and evaluation. With reference to the sociology of quantification, she identifies five contextual factors of self-tracking: preparation, collection, integration, reflection, and action. Contextualizing digital traces of self-tracking in the field, for Kneidinger-Müller, means taking these five factors into account.

Deborah Lupton, Sarah Pink, Christine Heyes LaBond, and Shanti Sumartojo analyze the ways in which the sensory and embodied aspects of digitized self-tracking are entangled with its technological and spatial dimensions. Focusing on the data practices and digital traces of commuting cyclists, they argue in favor of four key contexts to scrutinize these in the field: affordances, spaces, senses, and affects. They reveal that these contexts are intertwined, working together to contribute to users' personal data-collection practices and how they engage in data sense making.

Martin Hand and Michelle Gorea explore the temporal context of digital traces generated by self-tracking devices. They approach the subject by emphasizing the personal context of these data. They pay particular attention to how digital traces of individuals' behavior influence their perception of temporal possibilities and how they can influence the temporal structure of daily life.

Self-trackers and the quantified-self movement are the focus of a media ethnographic study by Ulrike Gerhard and Andreas Hepp. Although the availability of data from sensors and other devices reveals an assortment of interpretations, the authors point toward the contexts in which media appropriation

occurs. They identify two fundamental types: "pragmatists" and "enthusiasts," which demonstrates the context-dependency of digital traces, a dependency that arises because they are embedded in new forms of constructing the self.

Finally, this thematic section concludes with an essay by Nick Couldry. Reflecting on the variety of articles from a meta perspective, he argues that there is a need to critically contextualize digital traces by relating digital traces to a "tracing capitalism" and the new datafied "context" of everyday life. In adopting this approach, Couldry sheds light on the risks involved when tracing practices in an increasingly datafied economy.

Overall, we hope that this thematic section stimulates a discussion on digital traces that takes contextualization seriously. As the variety of contributions demonstrate, any research that considers digital traces to be a "neutral" phenomenon or as "direct access to the social world" is lacking in that it does not consider the various contexts in which they are embedded and those that they produce. Only by taking this as a point of departure can we fully understand digital traces as a phenomenon of our present, deeply mediatized, and therefore highly media-saturated social world.

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