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A sociology of technology perspective on current trends in data, digital security and the internet

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1 Digitalization & society—Introductory remarks on conceptual designs of a close relationship

Modern society is in the thick of digitalization. In almost all areas of social life, we find a wide array of different practices that are subject to digital change. The Internet and social media platforms have changed how we receive information and experience entertainment, socialize, shop, and present ourselves. We develop and are confronted with new digital business models that are based on the “new gold” of user and process data. Apps and “smart” machines are designed to make sense of these data in order to automatically understand patterns or to control industrial processes in the context of Industry 4.0 (the Fourth Industrial Revolution). Algorithms, autonomous vacuum cleaners, cars or weapons and humanoid robots are in different stages of development and implementation. All of these manifestations and practices are obviously connected to questions of digital security, democracy, and how politics and legislation deal with these new phenomena of digitalization.

Against this background, it is no wonder that there are extensive and occasionally controversial discussions about this omnipresent process of digitalization. Political and economic leaders worldwide evoke its significance for the future of wealth and prosperity. For example, German chancellor Angela Merkel aims to continue to ensure a leading role for Germany and Europe in Artificial Intelligence (AI) in the future, arguing that future wealth is strongly dependent on this leading position. She continues by proposing not only that future economic wealth relies on this leading

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role in AI but also that “European values”, human dignity and privacy protection depend highly on it¹.

That Merkel statement explicitly demonstrates that digitalization does not happen accidentally: it is fundamentally based on (strategic) human and societal action. From a Sociology of Science and Technology standpoint, the close entanglement of digital technology (AI) with socio-economic (wealth) and societal (values) aspects is obvious. That means, among other things, that digitalization and the specific ways digitalization is manifested are something that need to be enacted (again and again) by people such as politicians, entrepreneurs, engineers, users, and many more. As the close rhetorical alliance of digitalization with “European values” shows, there is not only one way of doing digitalization; there are many more that align with other values and other cultures such as those of the US-American. The highlighting of “European values” might be also interpreted as a political answer to widespread fears regarding the disruptive and alarming effects of digitalization. Current examples are the potential loss of jobs through new digital technologies, data scandals such as the Facebook-Cambridge Analytica at the tip of an iceberg, or just the everyday feeling of the Smartphone perceived as being a destructive force within established social relations and interactions.

These widespread fears among the public are often associated with dystopias, which conceal a certain understanding of the socio-technical change well-known as “technological determinism” (cf. Wyatt 2008). Such a view implies that technological change is an autonomous process determining social change to a great extent (cf. Degele 2002, p. 24 ff.).

In the next section, we show that this perspective has always met with great approval within social theory (1.). Our brief overview of major contributions reflecting the relationship between technology and society also highlights the role attributed to digitalization in terms of social change today. In Sect. 2, we sketch the different and more nuanced ways Science and Technology Studies (STS) conceptualize the relationship between digitalization and society. This, by the way, outlines important theoretical foundations of the contributions presented here. Finally, we provide a short outline of the 13 articles collected in this book (3.). To precisely explore the relationship between digitalization and society, we have invited colleagues from various areas of sociology to draw on current case studies and empirical research.

1.1 Digitalization, society, and social theory

With a view to Social Theory, the issue of digitalization for the first time received greater attention in the context of the discussion on the “Rise of the Network Society” (Castells 1996). At that time, Castells registered a correspondence between technological innovation and social change. With the rise of Information and Communication Technology (ICT) and digitalization, processes emerged at the social level, which he summarized in the terms of globalization, deregulation, flexibiliza-

¹ Interview (14.11.2018) “Merkel erklärt ihren Plan für Deutschlands digitale Zukunft” https://www.t-online.de/nachrichten/deutschland/gesellschaft/id_84778790/angela-merkel-im-interview-ihr-plan-fuer-deutschlands-digitale-zukunft.html.

tion, and decentralization. The synchronisation of global communication in real time through advanced digitalization caused the epochal break that separates the industrial era and the information age. Even if Castells refers to the social preconditions of technology and associates the blossoming of information technologies in the 1970s with the libertarian spirit of the 1960s, a kind of technological determinism is reminiscent here that was already noticeable in Marx's writings when he famously described the hand-mill as the basis of feudal society and the steam-mill as the basis of industrial society. For Castells, the Internet is the driving force of post-industrial society.

This determinism, by the way, was not limited to sociology (of technology) but is also found in media theory. An influential paradigm widely adopted in media and communication studies (medium theory), and famously represented by the works of Marshall McLuhan (1968) and Harold Innis (1951), proposes that media technologies rather than the media content shape how people act and think. Media technologies such as the radio or television are considered to be "powerful social forces, affecting how we perceive and understand the world" (Croteau et al. 2012, p. 299). According to McLuhan, the shaping of human senses by electronic media technologies is determining, leading to specific inevitable social effects (ibid., p. 300).

Marxist thinkers, in particular of the early Critical Theory, were sensitive to the social implications of modern technology. In an unjustly forgotten 1941 paper, Herbert Marcuse considered "technological rationality" as being emblematic for what was then called late capitalism (Marcuse 1982). He drew this technical rationality in sharp contrast to the individualistic, critical reason of the early, liberal capitalist epoch, in which the primacy of free thought and individual conscience was still valid. Technical rationality, programmed on efficiency, standardization, and quantification, understood early Critical Theory as the specific world approach of (late) modern man. In this way, technology no longer appeared simply as an artefact or apparatus but as a universal form of reflection and interpretation, as a specific form of encountering the world, of dealing with things, with people, with nature.

Using the example of travel, Marcuse illustrated his line of thought: In the technical age, we do not travel individually but in a technically determined way. Road maps structure the landscape; motorways regulate our travel route; cities, lakes and mountains appear as obstacles; references to "scenic views" that appear next to the road standardize our experience of nature—and all this in the service of comfort, safety, and efficiency. In the end, any individual experience and alternative points of view are excluded. Nature is designed and experienced from the perspective of technology. This rationalisation process, we might say today, is once again driven forward on the basis of digital navigation aids. Today, anyone who does not use "Google Maps" or an equivalent for travel planning is considered a technology denialist or even an old geezer.

Marcuse's critique of technology received a strong echo in Jacques Ellul's description of the "technological society" (Ellul 1964). The French sociologist's diagnosis: We live in a society in which technology has swung to absolute sovereignty. Without requiring democratic legitimation, the imperatives of technology permeate society as a whole. Thus, the economy (in East and West) is determined by the planning

idea. Politics is reduced to promoting technical innovation. Liberal capitalism is thus transformed into a centrally controlled state capitalism. And man also regresses to the object of technology, that is, of plan, administration, propaganda, and advertising. Even Habermas shares this view in his famous paper on “Wissenschaft und Technik als ‘Ideologie’” (Habermas 1969). His warning then: A state that depends on the perfection of technology for legitimization purposes contributes to the erosion of democratic foundations. Science and technology, formerly—in the spirit of Enlightenment—considered as genuine opponents of dogmas and ideologies, become themselves an ideology in late capitalism.

While in the 1960s and 70s technology was portrayed as a threat to democracy, in the 1980s it soon appeared as a threat to mankind as a whole. In the course of the controversies about nuclear energy and genetic engineering, the catastrophe potential of technology, with its ecological and health risks, increasingly became a topic of public debate. This widespread scepticism about technology and fear of progress were successfully mirrored by Ulrich Beck’s “risk society” (Beck 1986). In that book, he takes the view that the unwanted side effects generated by successful mechanisation and rationalisation shake industrial society to its foundations. Due to the public perception of technically caused risks, the basic credo of modern society (“technological innovation leads to economic growth which finally results in prosperity for all”) is fundamentally questioned. From Beck’s perspective, this opens up two possible paths for the further development of society: either we deny the risks, define them away, and consequently simply continue as before—or we take the risks as an opportunity to break with problematic traditions of industrial modernity, to question the concept of progress, to stop the exploitation of nature, and thus to thoroughly renew society (“reflexive modernization”).

Less sophisticated was a diagnosis that caused a sensation in the 1990s and also problematized the advancing mechanization as a basic problem of modernity. In “The McDonaldization of Society,” George Ritzer portrayed the world as a fast-food restaurant (Ritzer 1993). The success of McDonald’s is regarded by Ritzer as an expression of the worldwide implementation of principles that set technocratically controlled, assembly-line-driven, dehumanized, and uniform societies to work on a global scale. Eating and drinking, working and living become an assembly line activity in the McDonald’s age. The technical, the artificial, triumphs over the living, the natural, because it promises us comfort, security, predictability, and control. This is why, Ritzer criticizes, more and more children, for example, are born by Caesarean section and not in a natural way. Ritzer describes McDonaldization as a linear, inevitably progressive and therefore inescapable process, making his diagnosis potentially appear to us also a bit technical in its streamlined nature.

In sharp contrast to Ritzer’s McDonaldization, Andreas Reckwitz recently claimed that the typically modern logic of rationalisation, formalisation, and standardisation is replaced by the logic of the special, the extraordinary, and the original (Reckwitz 2017). In late modernity, people, places, or things must have an aura, “style”; they must be interesting, authentic. In this way, people become personalities, and mere consumer goods become exclusive goods. Technology, in particular digitalization, plays a central role in fostering this new era. After all, the construction of uniqueness is based on practices of valuation and thus on the logic of the

general. This means that it is only the omnipresence of quantification, measurement, and comparison—in the form of ratings, rankings, and scores—that ultimately contributes to the predominance of the special, supported by the exponentially growing possibilities of data production and processing in the digital age. Only on the basis of carefully maintained profiles in the social media can we make something special out of ourselves; only on the basis of constant comparisons of key figures can we know which universities really belong to the elite, which cities are worth living in, and which clinics are recommendable. In brief: “The Metric Society” (Mau 2019) is considered the basis of “The Society of Singularities” (Reckwitz 2017).

This short overview illustrates the importance of technology and—with a view to our present—digitalization for sociological theory formation and social theory, respectively. While steam engines and railways represent industrial modernity, the social media and the Internet symbolise late modernity, according to influential sociologists. This assumption tends to create a proximity to technological determinism and makes it clear that social theories that want to be up-to-date need a solid basis in the sociology of technology if we are to get a closer look at the complex connection between digitalization and social or cultural change. It is therefore worth seeing how technology and society, and hence digitalization and society, are drawn from the perspective of the sociology of technology and the wider field of “science and technology studies” (STS), respectively.

1.2 Conceptualizing the relation of digitalization and society

As the sociology of technology has extensively substantiated, digitalization doubtlessly is not a pure technological issue nor is it something outside of human or societal action, as technological determinism might indicate. Digitalization is not an exogenous factor, as mainstream economists and social theory may have treated technology in general (Pinch and Swedberg 2008, p. 1). It is also not a transcendent mirror of reality (Jasanoff 2004, p. 3). To understand and grasp digitalization and its relation to societal aspects conceptually, we are able to draw on different established and well-known approaches from the sociology and anthropology of science and technology and STS. Most of these approaches can be applied or assigned to digitalization as they focused, amongst others, on technologies that are associated with the digital (e.g., automation). Basically, there are at least three different ways to conceptualize the relation of technology/digitalization and society: (1) Social constructivism, (2) co-production, and (3) post-humanism or material-semiotic approaches. While there are many interconnections and interactions between those three, it makes sense to analytically describe the main lines of argumentation and the differences between the approaches.

(1) *Social constructivist approaches* indicate that technologies do not evolve outside of social processes in a linear way (as a “linear model of innovation” starting with basic research leading to applied research and into development might suggest²) but are the outcome of a variety of societal activities and negotiations. The Social Shaping of Technology (MacKenzie and Wajcman 1985) emphasized that there is

² For a critical discussion of the history of the concept of the linear model see Godin 2006.

not a single and dominant determinant of technology (such as technological engineers). Instead, technology is created by different social forces and at different sites. Social shaping means that technology is arranged, amongst others, in cultural, economic, political, or organizational contexts. Analytically, these “others” are not different or less important than the technical shaping of technology.

Building on these insights, the Social Construction of Technology (Bijker et al. 1987) stresses the multidirectional nature of technological development. As technological artifacts and systems are subject to “interpretative flexibility” and different “relevant social groups” interpret and use technology in different ways, there is not only one linear way a specific technology can develop; a multiplicity of different variations and selections are possible. In the German-speaking countries, research on the emergence of technology (“Technikgenese-forschung”, see Dierkes and Hoffmann 1992; Rammert 1993) showed that the best available technology in terms of technical superiority does not always prevail. The prevailing technology is highly influenced by path dependency, resulting in the use of technologies that are established successfully by familiarity or institutional pervasiveness despite being technologically inferior (cf. Degele 2002, p. 51). To sum up, social constructivist approaches conceptualize technology as a product of society. In sharp contrast to technological determinism, here society changes technology and not the other way round. In this view, digitalization is considered a process in which society, and thus relevant social groups, transforms existing technologies to a digital form. The impact of digitalization on society is of minor importance as digitalization is explained as a process emerging out of social practices.

(2) *Approaches of the co-production of technology and society* focus on the mutual shaping and alignment of these two categories. In this view, technology and society influence each other not in one way or one direction but in both directions at virtually the same time. While notions of co-production or co-evolution are used in different contexts and in a wide array of categories and entities to describe mutual formations, the most explicit concepts were introduced by Jasanoff (2004) and Harbers (2005), following in the footsteps of Rip and Kemp (1998). Co-productionist approaches have in common that they avoid both social and technological determinism, stressing that “developments in science and technology cannot be explained exclusively by their social and political context” and vice versa (Harbers 2005, p. 257). Thus, co-production is symmetrical (Jasanoff 2004, p. 3). It pays attention simultaneously to the social and the cultural dimensions (e.g., practices, norms, values, ideas, institutions) of the development, implementation, adaption, reconfiguration, and use of technology while at the same time focusing on how the social and cultural are formed by the material or digital manifestations of technology.

Accordingly, digitalization is considered a phenomenon where the social and the technical meet and where social practices of development, discourse, norms, and use and the order, arrangement and infrastructures of the digital—whether these are technologies, technological systems, artifacts, or data—constantly co-constitute each other. In short, data and society are mutually constitutive (Houben and Prietl 2018). Digitalization is both social and technical in its very nature. In such a conceptualization, there is actually no need to put digitalization on a level with or next to society, as the concept already contains the social as well. Still, this special is-

sue puts digitalization and society together quite prominently. This may be useful for two reasons: First, digitalization is what we in the social sciences and beyond want to understand; second, it is in an ontological state able to generate action and implications, similar to what Star and Griesemer (1989) famously described as ‘boundary object’. In this view, digitalization might be “robust enough to maintain a common identity across sites” (ibid., p. 393) while at the same time it is adaptable and alterable in place and time.

(3) *Post-humanist and material-semiotic approaches* would pay (more) attention to what digitalization, as an actor with its own identity, does as well. Actor network theory (ANT), in particular with its focus on the agency of non-human entities, considers what these non-human actors (e.g., discursive concepts, technical artifacts, but also chemical substances, animals, plants) do and how they take effect while they are always associated and associate themselves with other actors (cf. Callon 1986; Law and Hassard 1999; Latour 2005). This approach conceptualizes the technology-society relation as one of many hybrid networks of human and non-human actors and thus breaks the “modern”-western-human-made separation of the categories of technology and society (cf. Latour 1993). While Jasanoff understands ANT as a form of “constitutive co-production” (Jasanoff 2004, p. 22 ff) and Brey understands it as “hybrid constructivism” (Brey 2005, p. 74 ff.)—and there are good reasons to do so—, ANT’s approach can be aligned on a more general level in post-humanism. As post-humanist approaches “... seek to decenter the human subject—and more particularly, reconfigure notions of agency—especially in studies of everyday life” (Orlikowski 2007, p. 1437 f.), ANT can be attributed to them. It is clear that “to decenter the human subject” does not mean to leave humans out and to center exclusively on non-humans instead but to allow both humans and non-humans to be focused on in social scientific analysis. Referring to the principle of “generalized symmetry”, ANT would add “on the same level” as humans and non-humans are treated equivalently in the way they possess and perform agency. This principle is highly contested as the question arises of how much agency actually needs to be allocated to humans and non-humans (cf. Suchman 2007, p. 225).

Amongst others, Suchman has questioned this equal and symmetrical treatment as she registers a “sense of human-machine difference” but, at the same time, also considers “the distributed and enacted character of agency” (ibid., p. 260). Her approach of “sociomaterial assemblages” (Suchman 2008, p. 150 ff.) is a “rearticulation (...) of dissymmetry” (Suchman 2007, p. 269). Similar to ANT, humans and nonhumans are inextricably linked, but “culturally and historically constituted differences among them” (ibid., p. 270) are acknowledged as an important means to be considered in any “material-semiotic” (Haraway 1991) or “material-discursive” (Barad 2007) analysis. In this view, technology and society are split into many different pieces and heterogeneous practices that mesh together in sociotechnical assemblages. In this regard, Barad’s “new materialist” approach of “posthuman performativity” highlights that phenomena and their components get fixed and meaningful only in and through the process of what she calls “agential intra-actions” (Barad 2003: 815). Here, the properties of elements and their causal relations do not preexist but are configured in this process of intra-action.

Digitalization in this strand of post-humanist and material-semiotic approaches might be described as the process in which a wide array of heterogeneous human and non-human actors entangle in more or less durable socio-digital assemblages or actor networks. While socio-digital assemblages allow for (more) differences in how much agency is allocated to human or non-human actors, the actor-network view of digitalization calls for generalized symmetry in terms of agency of all of the involved heterogeneous material and semiotic actors. All in all, the multiple processes of digitalization seem to give rise to revisiting the (inner) dynamics and agencies of non-humans, materialities, digital (media) technologies, or, infrastructures, and how they (re)configure and shape the world as a kind of “naturalized background” (Edwards 2003). Here, with the presence, performativity and (autonomous) power of black-boxed (Latour 1999) or smart-boxed (Musik 2018) entities, new questions of and about technological determinism arise that need to be taken seriously in discussions about digitalization (Wyatt 2008, p. 176).

1.3 On data, digital security and the internet—Outline of this book

This special issue of the Austrian Journal of Sociology (“Österreichische Zeitschrift für Soziologie”, ÖZS) gathers contributions that, in one way or another, follow the above-mentioned paths of sociological analysis of digitalization processes. Conceptually, they all start from the assumption that the relationship between digitalization and society is to be understood as a “seamless web” (Hughes 1986). This assumption also implies, by the way, that the repercussions of digitalization on sociological theory formation and methodology must be reflected upon. Some essays also deal with this aspect. Even if all contributions look at the phenomenon of digitalization from the perspective of sociology (of technology) or STS, this does not mean that we have set our sights on the greatest possible homogeneity in the selection of contributions. It is not our intention to make a certain theoretical perspective within sociology the standard, so to speak. For this reason—in order to take into account the diversity of sociological standpoints and positions—we have also included contributions that can be attributed to media sociology, legal sociology, or the sociology of space.

With a view to societal debate, this book aims at contributing to a number of pressing issues that concern science, the public, and politics alike, such as: How to deal with processes of digitalization and datafication? How to guarantee privacy and digital security? How to assess the rise of platform capitalism? What is the added value of digital protest and new forms of public participation in politics and science (citizen science)? While there seems to be a tendency among the public to refer to phenomena of digitalization in striking astonishment—whether this astonishment is enthusiastic or resentful—on a case-by-case basis, describing what is new, magnificent or shocking about it, there is often a lack of how to apprehend and make sense of these phenomena in a more conceptual and analytic way. This tendency of day-by-day amazement of digitalization blocks out this conceptual social science view that adds depth, guidance, and explanation to what we experience compartmentalized in everyday life. Thematically, the articles take up different aspects of digitalization, with three focal points: (1) Datafication, automation, and algorithm, (2) Risk governance and digital security, and (3) Social media, Internet and platforms.

1.3.1 Datafication, automation, and algorithms

In the first contribution of this book, *Martina Franzen* develops the thesis that digitalization will lead to a new, automated form of scientific knowledge production. Against this background, she regards current forms of digital citizen science as being a transitional phenomenon—an intermediate step on the way from the individual search for truth to the crowdsourcing of routine scientific activities. In other words, contrary to the popular belief that citizen science contributes to the democratization of science, Martina Franzen argues that, in research projects, public participation based on cloud computing and mobile devices tends to force a new division of labor within knowledge production. The outsourcing of simple research activities to laypeople makes it realistic to expect that machines could replace the “human element” in scientific knowledge production in the future.

Jacqueline Lemm, Caner Dogan, and Elina Raddy discuss in their contribution the consequences of datafication for the relationship between space and sociality. Basing their work on a case study illustrating current trends of digitalization in architecture, the authors reveal the role information and communication technologies play in the constitution of spaces. By analyzing software that translates the method of parametric spatial planning into a manageable software design, the authors show that the sociology of space could benefit from considering a sociology of technology perspective. Accordingly, the authors argue that the constitution of space should be understood as a socio-technical process.

In his contribution, *Thilo Hagedorff* conceptualises the close and permanent interplay between human action and technical artefacts as a form of value transfer. This aspect, as he argues, has received particular attention in the context of digitalization and especially with the increased use of machine-learning applications. Focusing on several examples of value transfer processes, the author reveals that we are facing a new form of discrimination called algorithmic discrimination. In this process, different forms and practices of datafication and categorization and the obscurity and intransparency of these processes are key elements to focus on. Finally, he proposes concrete measures that may be useful in achieving the goal of a non-discriminatory use of machine-learning techniques.

Wolfgang Aschauer, Alexander Seymer, Martin Weichbold, Thomas Herdin, and Andreas Röser address the implications of digitalization from a methodological point of view. Using two research projects experimenting with Big Data-based tools to, respectively, identify and analyse policy-relevant security issues, the author team highlights the potentials and limits of automated research. With a view to their experiences in using a software tool called WebLyzard for an automated analysis of online news and social media sources, the authors conclude that we should not overestimate the potentials but also critically assess the shortcomings of digital tools in research. Compared to conventional, quantitative content analysis, the automated examination results in misunderstandings in many places and, particularly, has difficulties with assigning cynical or irrelevant statements correctly.

Alexander Schmidl in his conceptual contribution connects Postphenomenology with the Microsociology of Technology to critically assess questions of the “newness” of digital technologies. From this theoretical discussion, he develops the thesis

that it is characteristic of the digital age and late modern society that technologically-produced and digitally-manipulated data allow specific competences to arise. Central to these competences to cope with new technological forms and data-information richness are the ability for abstraction, selection, and relationing. These competences, he concludes, result in a different understanding of the world and of reality. Here, Schmidl refers to manifestations of these changes in the fields of quantified self or self-tracking, health, sports, and science.

1.3.2 Risk governance and digital security

Christian Haddad and *Clemens Binder* outline the argument that cybersecurity is a major site where understandings of the digital society are collectively imagined, negotiated and, thus, ultimately created. In a sociotechnical imaginaries approach, by looking at cybersecurity policies, they propose that exactly here what we understand as the digital society becomes clearly visible. In this regard, questions of how to prepare the “unskilled citizenry” for the digital future are inextricably linked with questions of cybersecurity. Haddad and Binder elaborate this co-production of cybersecurity and the digital society by analyzing the political strategies in Austria that aim to cope with and implement a globalized “culture of cybersecurity”. This contribution carefully explores new geographies of responsibility at the interface of global developments in cybersecurity, the state, society, and individuals.

Freya Gassmann, *Zinaida Benenson* and *Robert Landwirth* focus on tangible and widespread security risks of digital communication. In everyday-life, we counter this risk in particular in connection with links in electronic messages containing malware or phishing attacks. In their quantitative research (field experiment and online survey), the authors studied reactions of people who received a message with a link from a non-existing person via Facebook or email. Their empirical analysis shows that people who pay more attention to the message are more likely to click on the link. In sum, 20% of recipients respond to email phishing messages, while for Facebook, with 42%, the number is more than twice as high. In contrast, people with appropriate knowledge and caution are in much less danger of clicking on the link. This result gives rise to new questions of digital security literacy of individuals and to what extent awareness building can be a way to cope with digital risk.

Peter Müller and *Nikolaus Pöchhacker* in their article discuss the issue of algorithmic risk assessment in the legal system. The authors focus on sentencing decision support systems (SDSS), such as the software COMPAS in US county courts, and their new role in the judiciary system to assist in determining the degree of penalty. Working with an analysis of the controversies around SDSS, Müller and Pöchhacker discuss the contribution of a sociology of legal technology to these discussions. Linking to SDSS, they describe three different shifts in the US judiciary system: The first shift refers to new statistical populations, models, and methods that shape knowledge production and the subsequent rise of discursive sensitivities and controversies. The second shift is the blurring of inter-institutional boundaries between law and economy, punitive justice, and penitentiary. Finally, the third shift affects the performativity of punitive judiciary and its practices of law and civic subjectivation.

1.3.3 Social media, internet and platforms

Ulrich Dolata analyses the role of commercial platforms on the Internet such as networking, booking, or media platforms. The rise of these platforms has initiated a wide array of social and economic discussions and led to the analysis of a substantial change towards a “digital platform economy” or “platform capitalism”. Building on these debates and diagnosis, Dolata deals with the basic structures, functions, and impact of platforms and what role concentration, competition, and market power play in this regard. Dolata strongly advocates more emphasis on the historical dimensions of platforms and digitalization, as their significance as something radically new or disrupting can be called into question when looking at it based on *longue durée*. This means that platforms neither fundamentally constitute new economic sectors or types of firms nor do they bring with them a wide and novel array of new business models. The novelty of these platforms is rather, in Dolata’s words, “that they extend well beyond the structuring of purely economic contexts and reach deep into society: Through them, large parts of private and public exchange are privately organized, curated, and commodified.”

In their article, *Marc Mölders* and *Jan-Felix Schrape* bring Luhmann into conversation with the sociology of technology. This serves the purpose of critically examining high expectations, namely that in the course of the digital, i.e., accelerated communication, the coordination between societal subsystems (e.g., media, politics, economy) can be improved or made more efficient. These expectations suggest that it is easier to consciously shape or improve society in the digital age. In contrast, the authors argue that the attempt to influence a subsystem from outside, e.g., politics through the media, remains dependent on organizational conditions. Using empirical case studies on social protest movements, investigative journalism, and online petition platforms, the authors show that the organizational capacity of protest movements and their particular “timing”, i.e., their capacity to synchronize their operations with the operational speed of the addressed subsystem, thus have a special role to play.

Natalia Wächter fundamentally questions the relationship between digitalization and democratization. In her contribution, she empirically deals with the basic question of whether social media supported the protest movement of the young generation in the Arab Spring. With a view to social media, she particularly focuses on the extent to which the use of media reveals differences between generations. From international survey data from Egypt, Iraq, Jordan, Libya, Morocco, and Tunisia, Wächter shows that, even though young people were not more active in the protests than older generations, with the help of social media they had initialized the protest and were able to mobilize the adult population. Her findings support and differentiate the public perception that social media had a participatory role for this transnational protest movement.

Werner Reichmann re-conceptualizes the social situation under the conditions of an increasingly digitally mediated world. He starts from the premise that digital media technologies such as social media platforms and the mediated communication taking place there have significantly changed the ways of social interaction. This change must also lead to a new conceptualization of well-established and widely

known sociological concepts such as the “social situation”, a fundamental micro-sociological unit that was, for a long time, associated with a “body-to-body” situation only. Reichmann grounds his re-conceptualization of the social situation in the confrontation with what Knorr Cetina (2009) described as “synthetic situation”, and, empirically in an exploratory experimental setup. This setup aimed at systematically comparing the interaction order of “synthetic situations” with “naked situations” under controlled circumstances. A major result of the experiment is the observation of the dynamization of interaction under synthetic conditions and the constitutive role of “synthetic actors” (e.g., algorithms) in co-ordinating the interaction order.

Andreas Wenninger and Sascha Dickel address the fundamental question of whether digitalization contributes to the often longed-for democratization of science. Digital technologies, it is hoped, enable new forms of public engagement with science and, therefore, help to close the gap between science and the public and support levelling the traditional hierarchy between experts and laypeople. Focusing on recent forms of public engagement in knowledge production (citizen science) and science communication (science blogs), the authors show that the far-reaching hopes for a fundamental opening-up are not fulfilled. They show that, with a view to science blogs, the asymmetries are multiplying, i.e., boundaries between experts and uninformed laypersons continue to be drawn, but the sustainability of these boundaries in the context of non-moderated discussions on the Internet becomes less transparent. With a view to citizen science, it becomes obvious that the hierarchy between experts and laypeople is confirmed by the particular division of labor in research projects and by the communicative distinction between the (anonymous) crowd and the (individual) scientific expert.

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References

- Barad, Karen. 2003. Posthumanist Performativity: Toward an understanding of how matter comes to matter. *Signs: Journal of Women in Culture and Society* 28:801–831. <https://doi.org/10.1086/345321>.
- Barad, Karen. 2007. *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning*. Durham, London: Duke University Press.
- Beck, Ulrich. 1986. *Risikogesellschaft. Auf dem Weg in eine andere Moderne*. Frankfurt am Main: Suhrkamp.
- Bijker, Wiebe E., Thomas P. Hughes, and Trevor J. Pinch (eds.). 1987. *The social construction of technological systems. New directions in the sociology and history of technology*. Cambridge, London: MIT Press.

- Brey, Philip A.E. 2005. Artifacts as social agents. In *Inside the politics of technology. Agency and normativity in the production of technology and society*, ed. Hans Harbers, 61–84. Amsterdam: Amsterdam University Press.
- Callon, Michel. 1986. Elements of a sociology of translation: Domestication of the scallops and the fishermen of st Brieuc Bay. In *Power, action and belief: A new sociology of knowledge?*, ed. John Law, 196–233. London: Routledge.
- Castells, Manuel. 1996. *The rise of the network society*. The information Age: Economy, society and culture, Vol. 1. Oxford: Blackwell Publishers.
- Croteau, David, William Hoynes, and Stefania Milan. 2012. *Media/society: Industries, images, and audiences*, 4th edn., London: SAGE.
- Degele, Nina. 2002. *Einführung in die Techniksoziologie*. München: Wilhelm Fink.
- Dierkes, Meinolf, and Ute Hoffmann (eds.). 1992. *New technology at the outset – social forces in the shaping of technological innovations*. Frankfurt, New York: Campus.
- Edwards, Paul. 2003. Infrastructure and modernity: Force, time, and social organization. In *The history of sociotechnical systems. Modernity and technology*, ed. Thomas J. Misa, Philip Brey, and Andrew Feenberg, 185–226. Cambridge, London: MIT Press.
- Ellul, Jacques. 1964. *The technological society*. New York: Vintage Books.
- Godin, Benoît. 2006. The Linear Model of Innovation: The Historical Construction of an Analytical Framework. *Science, Technology, & Human Values*, 31:639–667. <https://doi.org/10.1177/0162243906291865>
- Habermas, Jürgen. 1969. *Technik und Wissenschaft als "Ideologie"*. Frankfurt am Main: Suhrkamp.
- Haraway, Donna. 1991. *Simians, cyborgs, and women: The reinvention of nature*. New York: Routledge.
- Harbers, Hans (ed.). 2005. *Inside the politics of technology: Agency and normativity in the co-production of technology and society*. Amsterdam: Amsterdam University Press.
- Houben, Daniel, and Bianca Prietl (eds.). 2018. *Datengesellschaft. Einsichten in die Datafizierung des Sozialen*. Bielefeld: transcript.
- Hughes, Thomas P. 1986. The seamless web: Technology, science, etcetera, etcetera. *Social Studies of Science* 16:281–292. <https://doi.org/10.1177/0306312786016002004>.
- Innis, Harold. 1951. *The bias of communication*. Toronto: University of Toronto Press.
- Jasanoff, Sheila. 2004. *States of knowledge. The co-production of science and social order*. London, New York: Routledge.
- Knorr-Cetina, Karin. 2009. The synthetic situation: Interactionism for a global world. *Symbolic Interaction* 32:61–87.
- Latour, Bruno. 1993. *We have never been modern*. Cambridge: Harvard University Press.
- Latour, Bruno. 1999. *Pandora's hope: Essays on the reality of science studies*. Cambridge: Harvard University Press.
- Latour, Bruno. 2005. *Reassembling the social: An introduction to actor-network-theory*. Oxford: Oxford University Press.
- Law, John, and John Hassard (eds.). 1999. *Actor network theory and after*. Malden: Blackwell.
- MacKenzie, Donald, and Judy Wajcman (eds.). 1985. *The social shaping of technology*. Milton Keynes, Philadelphia: Open University Press.
- Marcuse, Herbert. 1982. Some social implications of modern technology. In *The essential Frankfurt school reader*, ed. Andrew Arato, Eike Gebhardt, 138–162. New York: Continuum.
- Mau, Steffen. 2019. *The metric society. On the quantification of the social*. Cambridge: Polity Press.
- McLuhan, Marshall. 1968. *Understanding media: The extensions of man*. New York: McGraw-Hill.
- Musik, Christoph. 2018. It's the camera! A special one: The smartboxing of image processing algorithms and their uncertainties in media representations of surveillance technology. *Surveillance & Society* 16:6–19. <https://doi.org/10.24908/ss.v16i1.6337>.
- Orlikowski, Wanda J. 2007. Sociomaterial practices: Exploring technology at work. *Organization Studies* 28:1435–1448. <https://doi.org/10.1177/0170840607081138>.
- Pinch, Trevor, and Richard Swedberg (eds.). 2008. *Living in a material world. Economic sociology meets science and technology studies*. Cambridge, London: MIT Press.
- Rammert, Werner. 1993. *Technik aus soziologischer Perspektive. Forschungsstand – Theorieansätze – Fallbeispiele*. Opladen: Westdeutscher Verlag.
- Reckwitz, Andreas. 2017. *Die Gesellschaft der Singularitäten. Zum Strukturwandel der Moderne*. Berlin: Suhrkamp.
- Rip, Arie, and René Kemp. 1998. Technological change. In *Human choices and climate change*, Vol. 2, ed. Steve Rayner, Elizabeth L. Malone, 327–399. Columbus: Battelle Press.

- Ritzer, George. 1993. *The McDonaldization of society. An investigation into the changing character of contemporary social life*. Thousand Oaks: Pine Forge Press.
- Star, Susann Leigh, and James R. Griesemer. 1989. Institutional ecology, 'translations' and boundary objects: Amateurs and professionals in berkeley's museum of vertebrate zoology, 1907–39. *Social Studies of Science* 19:387–420. <https://doi.org/10.1177/030631289019003001>.
- Suchman, Lucy. 2007. *Human-machine Reconfigurations. Plans and situated actions*, 2nd edn., Cambridge, New York: Cambridge University Press.
- Suchman, Lucy. 2008. Feminist STS and the sciences of the artificial. In *The handbook of science and technology studies*, 3rd edn., ed. Edward Hackett, Olga Amsterdamska, Michael Lynch, and Judy Wajcman, 139–164. Cambridge, London: MIT Press.
- Wyatt, Sally. 2008. Technological determinism is dead; long live technological determinism. In *The handbook of science and technology studies*, 3rd edn., ed. Edward Hackett, Olga Amsterdamska, Michael Lynch, and Judy Wajcman, 165–180. Cambridge, London: MIT Press.

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