

Social Networks

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Abstract: This article outlines network research in German-speaking countries since the turn of the millennium. After briefly clarifying what is meant by network research in this context, it provides a short retrospective of German-language sociology's contributions to network research in the previous century. It then focuses on the socio-political activities of sociological network research in German-speaking countries over the past 20 years. German-language network research exhibits two unique features in international comparison: a far-reaching debate on qualitative methods in network research (Section 4) and a theoretical debate on what has been coined *relational sociology* (Section 5). The article goes on to outline the contributions of network research to special sociologies in Section 6. Section 7 deals with the applications and developments of special methods of network research. The article ends with an outlook on the future of network research.

Keywords: Social network research, relational sociology, qualitative methods in network research, mixed methods, bimodal network analyses, computational social science

1 Preliminary Remarks

The present paper is limited to a discussion of those network approaches in German-language sociology that rely on formal methods of network analysis. This strand of network research differs from approaches that use the network concept only metaphorically and without analyzing network structures and relational dynamics at the methodological-empirical level.¹ Formal network analysis offers a broad spectrum of methods to explore networks in their structure and dynamics. Since the so-called Harvard breakthrough at the latest—which advocates for the methodical consolidation of network research (see below)—it has become clear that this is not only a method-driven and empirical research direction but one that also inspires theorems and theoretical concepts. This applies even to the major work of Harrison White (1992), which is largely of a theoretical nature but has subsequently sparked a wide range of empirical and methodological research. A special feature of network research can be seen in the fact that it closely interlinks empirical research and theory in a new way: the development of theory in network research always focuses on how theory can be operationalized empirically, and, vice versa, methodological developments as well as

¹ These approaches, which will not be discussed here, include actor-network theory (see, e.g., Latour, 1988; Callon, 1986; Law, 1987), large parts of sociological innovation research (see, e.g., Geels, 2002), and governance research.

empirical findings often trigger theory development. Its understanding of theory is also unique. The type of theory-building that network research pursues is less to develop a theory of a single mold than theory modules that can be connected with each other and with concepts from other theories (such as rational choice or systems theory; see Section 5).

2 German-Language Sociology and Network Research in the 20th Century—A Brief Retrospective

From a historical perspective, German-language sociology has many roots in modern network research. Some of the predecessors who come to mind here are Georg Simmel's sociology (1908), which reflects a mode of thinking in terms of reciprocal action, Leopold von Wiese's (1933) theory of relationships, or Norbert Elias' sociology of figuration (1970).² As far as further developing these roots toward formal network research is concerned, World War II marked a decisive break in German-language sociology. Interestingly, Simmel's relational thinking was continued in the USA. Other theoretical traditions converged there, in particular Anglo-Saxon social anthropology (Radcliffe-Brown, 1952; Warner, 1937; Barnes, 1954; Bott, 1957) and Jacob L. Moreno's (1936) sociometry. However, the decisive step forward, the "Harvard breakthrough", took place in the 1970s in the wake of a further method of empirical network analysis: block-model analysis (White, Boorman, and Breiger, 1976). This method made it possible to perform more abstract calculations of social networks than before, such as role patterns and position analysis. Accordingly, it might come as no surprise that a first wave of attention directed toward modern network research came to German-speaking countries via the USA in the second half of the 1970s.³ In this respect, particular mention must be made of the German Research Foundation's research group *Analysis of Social Networks* (1977–1981), in which nearly all important sociological protagonists of network research at the time and in subsequent years collaborated (see, e.g., Laumann and Pappi, 1976; Hubert Feger, Hans J. Hummell, Franz Urban

² An even earlier root could of course be found in Karl Marx, for whom society does not consist of individuals but of the sum of relationships that he calls social conditions (cf. Marx, 1976: 188). Alfred Schütz should also be mentioned (alongside Simmel, von Wiese, and Elias), who in his proto-sociology distinguishes between different forms of relationships (cf. Schütz and Luckmann, 1975: 90–124). Furthermore, the other protagonists of so-called formal sociology—besides von Wiese—shall be mentioned as well: Ferdinand Tönnies (1912), Alfred Vierkandt (1928), Theodor Litt (1926), and Johann Plenge (1930).

³ Little attention was paid to the early attempts to reintroduce network research into German-language sociology by Jiri Nehnevajsa (1955; 1962), Renate Mayntz (1967), Hans Lenk (1964; 1969), Rolf Ziegler (1972), or Hans J. Hummell (1972).

Pappi, Edward O. Laumann, Wolfgang Sodeur, and Rolf Ziegler).⁴ We must also not forget Dorothea Jansen, who not only wrote one of the first German-language introductions to network research (Jansen, 1999) but also made important contributions to network-analytical approaches in governance research (Jansen and Schubert, 1995). Nevertheless, in comparison with its triumphal march through America in the 1980s and 1990s, network research in German-speaking countries was limited to a small group of sociologists during this period.

3 Science Policy Activities Since the Turn of the Millennium

This once rather marginal status of network research in German-language sociology has changed considerably. Since the turn of the millennium, network research in German-speaking countries has been an extraordinary success story. There are several reasons for this. First, a theoretical and cultural turn within network research has taken place—initiated by the work of the probably most important individual scholar in this field: Harrison C. White (1992). In the wake of White’s work, network research captured the attention of sociologists interested in theory building as well as in qualitative social research. In other words, the circle of interested scholars became much wider.

A second reason for the wider dissemination of network research is that a new generation of network researchers proved very successful in institutionally promoting network research at the level of science policy. Among the individuals to be mentioned here are (in alphabetical order) Rainer Diaz-Bone, Jana Diesner, Martin Diewald, Roger Häussling, Marina Hennig, Betina Hollstein, Boris Holzer, Lothar Krempel, Per Kropp, Christian Stegbauer, and Florian Straus. Some of the above were appointed to professorships and were able to establish network analysis and network theory in research and teaching at their places of work. In this context, it is particularly worth mentioning that the research cluster of excellence *Social Dependencies and Social Networks* was conducted at the University of Trier, with the significant participation of sociologists. The group of researchers assembled there, have also established an annual summer school where the methods of network analysis can be learned. The establishment of the *Network Research* working group in 2009 and the *Sociological Network Research* section of the German Sociological Association (Deutsche Gesellschaft für Soziologie; DGS) in 2010—initiated mainly by Christian Stegbauer and the author of this article—was at least of equal importance. From then on, network research had the same status within the discipline as, for example, the subject areas of “modelling and simulation” or “social indicators,” both of which had already been

⁴ The list would have to be supplemented by these names: Peter Kappelhoff (1984) and Michael Schenk (1983).

granted the status of sections within the DGS much earlier. Right from the start, these network initiatives attracted a great deal of attention, as a network conference with more than 100 active participants in Frankfurt in September 2007 showed early on. This conference can be seen as a kick-off event that was followed by further conferences in short intervals thereafter. In addition, a book series entitled *Network Research* was launched by Springer VS, in which 20 volumes have been published so far.

Although sociology can be understood as a leading discipline in the context of network research, the latter is in fact an interdisciplinary field of research which more and more disciplines are joining. The spectrum is impressive: it ranges from history, ethnology, geography, consumer research, and rehabilitation research to physics and computer science—to name but a few. This was one of the reasons why a further initiative was formed in recent years in parallel to the DGS activities mentioned above, which resulted in the founding of the German Society for Network Research e.V. (DGNet) in Darmstadt in December 2016. The interdisciplinary orientation of DGNet follows the example of other international scientific communities of network research. Both, the worldwide network research umbrella organization, International Network for Social Network Analysis (INSNA), and the European Conference of Social Networks (EUSN) are interdisciplinary organizations. In 2013, Betina Hollstein brought the INSNA's international symposium, the SUNBELT Conference, to Hamburg. And Marina Hennig did the same for the corresponding symposium of the EUSN, held at the University of Mainz in 2017.

If one compares the possibilities of exchange and cooperation among network researchers in German-speaking countries at the beginning of the new millennium with the possibilities that exist today, it is no overstatement to say that they are poles apart. These increasing possibilities are also reflected in the publication activities in this area: Meanwhile, there are excellent introductions to network research also in German such as Trappmann, Hummell, and Sodeur, 2011; Krempel, 2005; Hollstein and Straus, 2006; Heidler, 2006; Holzer, 2006; Stegbauer, 2010; Fuhse and Mützel, 2010; Stegbauer and Häußling, 2010; Hennig, Brandes, Pfeffer and Mergel, 2012; Weyer, 2014; and Holzer and Stegbauer, 2018. Only Harrison White's *Identity and Control* (1992; 2008), probably the most important theoretical work of the past 100 years in the field of network research, still awaits being translated into German. Due to the fact that it is a very sophisticated book with passages that are almost incomprehensible even to native speakers, a careful translation would lead to it receiving much broader attention among German-speaking sociologists.

As indicated above, this work by White has also provided important stimuli for network research in German-speaking countries. Two debates in particular are of outstanding importance for the German-speaking reception of his work: one has revolved around qualitative research methods in network research and involved a "cultural turn," and the other has been a theoretical discussion ignited by White's work. (Hollstein/Kumkar, QUALITATIVE METHODS, this volume)

4 The Debate on Qualitative Methods in Network Research

The debate on the possibilities of a greater integration of qualitative methods into network research, which attracted international attention in the community of network researchers, was driven primarily by Betina Hollstein. Her anthology *Qualitative Netzwerkanalyse (Qualitative Network Analysis)*, edited together with Florian Straus, is still regarded as a key publication in the field (Hollstein and Straus, 2006). While there has been a more intense international discussion on how to integrate qualitative methods into formal network analyses, the debate among German-speaking researchers has always focused on whether there can be completely independent qualitative research designs in network research and how these can be realized methodologically. There have been a number of attempts to do so that have applied thoroughly innovative approaches to their research settings. One of the most important of these is the qualitative method of network mapping (e.g., Straus, 2002). According to Hollstein, the use of non-standardized observation and interview techniques intends to provide insights into the progression of individual action in actors' network contexts. This is precisely where Hollstein sees the possibility of methodically uncovering the interrelations between network structures and actors with the help of qualitative methods of analysis. In an insightful critique, Rainer Diaz-Bone (2008) pointed out that the term "qualitative network analysis" is misleading. On the one hand, an essential root of network research itself lies in qualitative research. On the other, the qualitative approaches presented in the anthology do not change the fact that the analysis of the network structure itself is still left to standardized methods. In response to this criticism, Hollstein has extended her methodological approach toward a mixed-methods approach that now triangulates qualitative with quantitative methods. Here, too, she has published a well-received English-language anthology together with Silvia Dominguez (2014). (Knappertsbusch/Langfeldt/Kelle, MIXED-METHODS AND MULTIMETHOD RESEARCH, this volume; Barth/Blasius, QUANTITATIVE METHODS, this volume)

5 The Theoretical Debate on Relational Sociology

In addition to the aforementioned activities to embed qualitative methods more firmly in network research, the debate on network theory has also been an important focus in German-language network research. White's work (1992; 2008) has been the central driving force. His elaboration of an abstract terminology (such as identity and control), which can be applied to various levels of social aggregation, is of fundamental importance. The idea of self-similarity is fundamental: process patterns are repeated in small as well as large networks. At least as important is that White introduces cultural aspects to network research by including such terms as "story," "catnets,"

“netdom,” “rethorics,” “styles,” and “cultural ambiguity”. This is also the key step towards a “relational sociology” (Emirbayer, 1997). It takes as its starting point neither individual actors and their desires, needs, and decision-making nor normatively underpinned structures, expectations, or given social framework conditions but rather *relational patterns*, that is, relationships, network structures, and network dynamics. Relational sociology thus sees itself as a consistent interpreter of the theoretical implications resulting from the focus on relations, positions, network structures, and dynamics and applying the methods of network analysis in analyzing them. However, this does not mean that network methods are only used within this paradigm. Rather, other theoretical positions, such as methodological individualism or systems theory, also make use of network methods in order to extend their prevailing focus—be it on individuals and their decisions or on systems and their operations—to relational aspects. Only when relational constellations and processes become the starting point of argumentation can one speak of a paradigm of relational sociology. (Schneider, SOCIAL THEORY, this volume)

The anthology *Relational Sociology* by Jan Fuhse and Sophie Mützel (2010) summarizes the German-language debate in a concise form. It presents at least four theoretical perspectives: (1) The first of these links White’s theory to considerations from science and technology studies, actor-network theory in particular (cf. Mützel, 2009; Laux, 2010). Mützel argues that some conceptual similarities have turned into methodological points of convergence in data analysis. In this respect, economic sociology provides a particularly suitable field for achieving a productive link between the two approaches. Her PhD thesis on the relocation of the German capital from Bonn to Berlin, in which she traces the networks, the logics, and the emergence of capital-city journalism, also attracted attention (cf. Mützel, 2002). (2) Three representatives of the second strand of relational sociology are Jan Fuhse, Boris Holzer, and Athanasios Karafillidis, who have their theoretical roots in Luhmannian systems theory (see also Holzer and Schmidt, 2009; Holzer and Fuhse, 2010). With different emphases, all three explore the possibilities of making White’s thinking fruitful for systems theory. Fuhse’s research focus is on culture and communication (cf. Fuhse, 2015; Fuhse and Stegbauer, 2011) and political sociology (cf. Fuhse, 2004). Boris Holzer’s (2010) research is devoted to political sociology as well as modern American economic sociology. Drawing on Dirk Baecker and Spencer-Brown, Karafillidis (2010) works on a relational sociology of forms. (3) Per Kropp (2008) represents a third strand. He shows that methodological individualism can also be connected to relational sociology. (4) Representing the fourth perspective, Marco Schmitt, Christian Stegbauer, and the author of this article investigate a further development of the theoretical foundations of relational sociology without integrating other major sociological theories, but do so in the vein of a relational paradigm à la Emirbayer and White. Drawing on the sociological founders of relational thought (Simmel, von Wiese), Christian Stegbauer (2002) deals with questions of reciprocity as forms of mutuality. His current theoretical concerns revolve around deriving a micro foundation of culture from relational constellations (cf. Stegbauer, 2016). In his doctoral thesis, Marco Schmitt (2009) investi-

gates the phenomenon of memory from a relation-sociological perspective. My own research pursues a relational theory of the interface, which especially focuses on the coupling of heterogeneous processes that follow different processual logics (cf. Häußling, 2008; 2009).

Besides the aforementioned two particularly prominent debates in German-speaking countries on qualitative methods and on relational sociology, there has been a large amount of exciting, empirically oriented network research that I will present in an overview below. This research can be further differentiated into genuine network research contributions to special sociologies on the one hand and contributions that are more strongly geared toward developing and applying specific methods of network analysis on the other.⁵

6 Network Research Contributions to Special Sociologies

Over the past two decades, network research in German-speaking countries has focused on a number of special sociologies: media sociology (cf., e.g., Stegbauer, 2001; 2009; 2018), economic sociology (cf., e.g., Hillmann and Aven, 2011; Krenn, 2012; Heiberger and Riebling, 2016a), the sociology of work (cf., e.g., Sattler and Diewald, 2010; Lutter, 2013; Ellwardt, Steglich, and Wittek, 2012), organizational sociology (cf., e.g., Häußling, 2015; Hasse, ORGANIZATION, this volume), gerontology (cf., e.g., Ellwardt, Aartsen, and van Tilburg, 2017; Höpflinger, DEMOGRAPHY AND AGING, this volume), migration research (cf., e.g., Gamper, 2011; Herz, 2014; 2015; Windzio, 2018), and science and technology studies (cf., e.g., Heidler, 2011; Helbing and Grund, 2013; Weyer, 2014; Edelmann, Moody, and Light, 2017; Ahrweiler, 2017; Häußling, 2008; 2009). Dealing with all of these studies individually would go beyond the scope of this overview article. For this reason, it will be limited to examining four focal points in more detail.

(1) While the Internet research was still young, Christian Stegbauer (2001) engaged in structural analyses of Internet-based communication platforms from the perspective of media sociology (Hepp, MEDIA AND COMMUNICATION, this volume). His study on Wikipedia in particular has attracted much attention (cf. Stegbauer, 2009). This study focuses on a positional analysis of the actors around Wikipedia. Using block-model analyses, Stegbauer showed that Wikipedia has a fixed positional structure—the positions of the administrator, the vandals, and the vandal hunters, among others, which mutually stabilize each other. According to Stegbauer (2018), events can trigger a wave of indignation that can involve both individuals and institutions and can incite a self-reinforcing discourse of rage in Internet forums that operates with crude images of the world and their ostensible enemies. Because user data in the field

⁵ Not all of the following sociologists can be clearly categorized under these two rubrics.

of social media are traces of people's actions and often have a relational structure, such data equips network researchers with a constantly growing stream of activity for their studies. However, this data also raises new questions of data validity and reliability as well as ethical questions with regard to research designs and the handling of the results.

(2) Work done in U.S. economic sociology has also sparked increased interest in network approaches and the inclusion of network analytical methods in economic sociological research in German-speaking countries in recent years. (Maurer, *ECONOMIC SOCIOLOGY*, this volume) Henning Hillmann (2008) studied multiple networks of mercantile and political elites before the English Civil War. According to Hillmann, an effective mediation of alliances between interest groups requires political mediators who are equally connected among these different networks. The success of mediation depends on the mediators' structural positions between the groups and the diversity of relations within their personal networks. Raphael Heiberger analyzed the influence of culture, networks, and institutional rules on stock prices. Together with Jan Riebling, Heiberger investigated the networks of scientists in economics (cf. Heiberger and Riebling, 2016a). Karoline Krenn (2012) examined the structure of networks involving the personnel of German-speaking companies at the beginning of the 20th century, particularly with regard to the role of banks. On the basis of empirical material, Krenn traced the interdependencies of these companies through multiple appointments to supervisory boards and reconstructed the formation process of the so-called Deutschland AG.

(3) An important area of German-language network research is migration research. (Pries, *MIGRATION*, this volume) Using exponential random graph models, Windzio (2018) analyzed the networks of global migration. Furthermore, he examined the multiplex networks of immigrant children and their integration into social networks in comparison to the integration behavior of their parents (cf. Windzio, 2015). Using a new methodological approach of non-recursive analysis, Windzio demonstrated how connections in one network dimension influence connections in another. Andreas Herz (2014; 2015) also conducted a network analysis of social communities of migrants with a focus on identifying structures of transnational social support. Herz showed that it is less structural aspects—as most studies in this field postulate—than relationship aspects of personal communities that are an important constituent in providing everyday help to migrants. Such network-analytical migration research can be expected to increase in number and importance in the coming years, especially in light of the issue's socio-political explosiveness in German-speaking countries.

(4) In his research on science, Richard Heidler (2011) investigated the structure and dynamics of the science network of astrophysics. (Kosmützky/Krücken, *SCIENCE AND HIGHER EDUCATION*, this volume) To do so, he developed an integrated theory of scientific networks that includes both the level of individual researchers and that of structural factors (e.g., the reputation of researchers) as well as the macrostructure of scientific cooperation networks and applied these to the network of the worldwide elite of astrophysicists. With a dual focus on how social networks and cultural

meanings interact and how scientific ideas and debates develop, Achim Edelmann, James Moody, and Ryan Light analyzed the field of biomedical research (cf. Edelmann, Moody and Light, 2017). In technology research—innovation research to be more precise—Petra Ahrweiler (2017), Johannes Weyer (2014), and Thomas Grund in collaboration with the physicist Dirk Helbing (Helbing and Grund, 2013) explored the extent to which multi-agent simulation of networks can explain the diffusion of new things. (Rammert, TECHNOLOGY AND INNOVATION, this volume)

7 Application and Development of Specific Methods of Network Analysis

The overview of simulation methods at the end of the previous section provides a transition to the contributions that I would like to deal with now, which focus on applying and further developing specific methods of network analysis. Christoph Stadtfeld investigated the dynamics of social networks with the aim of developing and implementing specific theories and methods (cf., e.g., Stadtfeld, Hollway, and Block, 2017). The identification of similar structural principles and dynamics also plays a prominent role in what has been called “small-world research.” Sebastian Schnettler (2013) is one sociologist who has effectively pursued this line of research. The modelling of network dynamics and the simulation of network progressions represent two important areas of network research that promise enormous potential for development. But even seemingly well-proven methods, such as egocentric network analysis, have been a subject of methodological reflections among German-speaking sociologists (Wolf, 2006; Gamper and Herz, 2019). The analysis of personal networks has also been an important research focus, for instance, of Sören Petermann (2014). He is concerned with the effects of socio-spatial context conditions on social well-being and social coexistence, in particular, trust-based exchange in personal networks and the causes and effects of this form of social capital. Questions of social capital play an increasingly important role in research on social media and echo chambers, an area in which much work still needs to be done.

As the object of network research has theoretical implications in terms of complexity, it is by no means trivial how networks are visualized. In particular, the representation of large, unimaginable networks becomes a problem since each form of representation suggests or excludes specific possibilities of interpreting the network. Lothar Krempel’s (2005) book on this topic is still regarded as the key work in this field. In her doctoral thesis, Katja Mayer (2011) investigated the visualization strategies of networks in different scientific disciplines in terms of a sociological approach to science. The anthology by Michael Schönhuth, Markus Gamper, Michael Kronenwett, and Martin Stark (2013) focuses on the use of visual methods in the process of data collection and, in this respect, specifically on the software programs VennMaker and EgoNet.QF. This branch of discussion on the visualization of networks is also partic-

ularly pronounced in German-speaking countries—especially with regard to its range of practical survey and evaluation tools, research reports on the use of visualization tools, and theoretical-epistemological questions.

As network research, along with data mining and machine learning, is one of the most prominent procedures in big-data analyses, it is not surprising that network researchers have written a large number of articles on computational social science and digital sociology in recent years (e.g., Mützel, 2015; Heiberger and Riebling, 2016b; Krenn, 2017; Häußling, 2019a). As part of the Swiss national research program *Big Data*, Sophie Mützel is carrying out the research project *Facing Big Data: Methods and Skills Needed for a 21st Century Sociology*. The project investigates the far-reaching changes in data and methods, caused by digitization, in the three fields of sociology, data journalism, and data sciences. There is a considerable gap between the methods, skills and tools used and those needed (Mützel, 2015). Henning Laux and Marco Schmitt (2018) have conducted an exemplary network-driven big-data analysis of the Twitter hashtag #Bautzen. In autumn 2016, a violent clash between refugees and far-right supporters occurred in the German city of Bautzen. Drawing on Bruno Latour's modes of existence, Laux and Schmitt's essay investigates how the event was discussed in the digital public. In my own research, I consider a relational sociology of datafication in the digital sphere conceptually by treating data as interfaces between algorithmic and social processes (cf. Häußling, 2019a; 2019b). I differentiate between five forms of coupling via data, which enables a more appropriate analysis of the manifold phenomena in the digital sphere. In the field of computational social science (CSS), it is to be hoped that the interdisciplinary entanglement between the social sciences and computer science proves successful, so that methodologically rich and theoretically founded big-data analyses will lead to completely new research designs and insights. CSS is currently very informatics-oriented in German-speaking countries. Here, social science network research could serve as an important corrective since cooperation between the social sciences and computer science has already been successful in this area.

8 Outlook

German-language sociological network research never had as many participants and never was as diverse as it is today. The conditions are therefore extremely favorable for a promising future. As the outline above has hopefully shown, network research is being conducted in a number of special sociologies, but by no means in all of them. In this respect, it can be assumed that network research approaches will find their way into other special sociologies in the future. Coupled with relational thinking, network research can be expected to give new impetuses to these special sociologies, as the focus will be directed toward relations, network structures, and dynamics that can hardly be researched in any other way. For example, the identification of actor constellations, positional structures, and/or possible structural holes can yield insights

that remain hidden when using survey research methods; or bimodal network analyses can identify connections between occasional structures and actor networks that the participants are neither aware of nor can be triangulated by other methods. With regard to theory building, too, a great deal can be expected in the future. This is because it is not yet possible to speak of a coherent and complete theoretical edifice. In other words, there is still a lot to do here. The development of methods on the other hand has always been a major driving force behind the development of network research. In addition to the development of specific methods for relational constellations, the advancement of mixed-method approaches will play a central role in the future. In particular, sociological network research will play a key role in the constitution and design of computational social science and digital sociology. A crucial challenge in this context will be for sociologists to meet computer scientists on equal footing and to define the research agenda in close cooperation with them. Hopefully, other German-speaking network researchers will also be involved in introducing genuinely sociological topics into these emerging disciplines.

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