1

Mixed Methods Social Networks Research: An Introduction

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Over the past 20 years there has been increasing recognition that focusing on *either* quantitative *or* qualitative research techniques alone leads researchers to miss important parts of a story. Researchers have found that better results are often achieved through combined approaches. In line with this observation, an increase in so-called mixed methods studies and research designs as well as in work providing overviews and systematic accounts of such research has been witnessed in various disciplines and fields of study since the early 1990s (Morse 1991; Creswell 2003 (first ed. 1994); Greene and Caracelli 1997b; Tashakkori and Teddlie 2003; Axinn and Pearce 2006; Bryman 2006; Creswell and Plano Clark 2007; Bergman and Bryman 2008; Teddlie and Tashakkori 2008). Of course, the combination of different methodical approaches is anything but a recent phenomenon in field research – one might think of the Marienthal study (Jahoda, Zeisel, and Lazarsfeld 1933), the Hawthorne studies (Roethlisberger and Dickson 1939), as well as of several studies by the Chicago School. In many areas of research, the combined application of different methods goes back a long time without being explicitly referred to as a mixed methods design.[1] However, the increased interest in and the systematic review of mixed methods designs and the results they yield are indeed new aspects in this development.

This interest in mixed methods designs can probably be explained in that their bringing together the strengths of both quantitative and qualitative strategies holds the promise of compensating for the respective weaknesses of both approaches. In view of the usually small sample

[1] Articles discussing the combination and integration of methods have been published in such journals as *Field Methods* and *International Journal of Social Research Methodology* right from the outset.

3

sizes, so-called qualitative (or interpretive, less standardized) research faces criticism for an allegedly arbitrary selection of samples and a lack of representativity, which in turn is said to raise questions as to the generalizability of results and to cause difficulties in the systematic comparison of cases and testing of causal models. Skepticism toward so-called quantitative (or quantifying, standardized) research, on the other hand, is mainly voiced with respect to its apparent neglect of the particular social context in which actors attribute meaning to their actions and to its potentially lower sensitivity to new, unexplored, or marginal social phenomena and developments. Mixed methods designs attempt at engaging quantitative and qualitative research strategies in an intelligent dialogue that benefits both sides. In their definition of mixed methods, Johnson and Onwuegbuzie aptly describe the aim and motivation underlying the mixed method approach: "Mixed methods research is the type of research in which a researcher or team of researchers *combines* elements of qualitative and quantitative approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) *for the purpose of breadth and depth of understanding and corroboration*" (Johnson and Onwuegbuzie 2007:123; emphasis added by BH).

Upon close inspection, a wide range of different approaches fall within this definition. Johnson and Onwuegbuzie asked 21 researchers for their definition of mixed methods and received 19 different responses. It seems safe to say that their definition represents the smallest common denominator of a variety of different definitions used to describe mixed methods. The various definitions offered by Johnson and Onwuegbuzie's respondents, which give a quite accurate picture of the definitions also found in the literature, can be distinguished as to what precisely is combined (methods, methodologies, or types of research), at what stages of the research process methods are combined (formulation of the research question, data collection, data analysis, data interpretation or inference), and to what end methods are combined (e.g., to achieve breadth or for corroboration or triangulation). In any case, when we speak of *combining* approaches, we are referring to more than a simple process of mere *addition*. As Creswell et al. put it, "A mixed methods study involves the collection or analysis of both quantitative and/or qualitative data in a single study in which the data are collected concurrently or sequentially, are given a priority, and involve the *integration* of the data at one or more stages in the process" (Creswell 2003:212; emphasis added by BH). Instead of simple addition, the task is to systematically relate quantitative and qualitative strategies or data at at least one stage of the research process. Due to this systematic integration of qualitative and quantitative strategies, mixed methods designs create special

opportunities for improving data quality, thereby increasing the significance of results (Greene, Caracelli, and Graham 1989; Tashakkori and Teddlie 2003; Axinn and Pearce 2006; Bryman 2006).

In the discussion to come, we speak of mixed methods studies when at least three conditions are met: (1) First, the studies make use of qualitative as well as quantitative *data*. This does not necessarily mean that both qualitative and quantitative data must actually be collected. Making use of the two types of data may also take the form of data conversion; for instance, qualitative data are collected and converted into quantitative data for analysis. (2) Second, both qualitative and quantitative *strategies of data analysis* are applied. (3) And, finally, at at least one stage of the research process, there must be some form of *integration* of either data, or of data analysis or of results (meta-inference).

In reviewing network research, we notice that there has been no systematic consideration of mixed methods studies so far, neither with regard to possible research designs nor their potential for the study of social networks. If we look at the relevant manuals and handbooks in the field, it is quite obvious that the methodical repertoire of current social network analysis for the most part consists of sophisticated, highly standardized, and formalized methods of analysis (cf. Wasserman and Faust 1994; Degenne and Forsé 1999; Scott 2000; Carrington et al. 2005; Scott and Carrington 2011).[2] Although there is a significant number of network studies that combine qualitative and quantitative methods of data collection and analysis (e.g., Wellman et al. 1988; Provan and Milward 1995; McLean 1998; Diani and McAdam 2003; Smith 2005; Small 2009), we still lack a compendium that provides a systematic account of the field. The present volume contributes to this end as it is the first systematic overview on the use of mixed methods for investigating social networks.

We will present different ways of mixing qualitative and quantitative strategies and discuss the challenges and benefits for research on social networks. The chapters assembled in this book illustrate that the application of such designs can improve the quality of data and enhance the explanatory power and generalizability of results. Moreover, with respect to social network research, mixed methods studies promise to provide empirically sound contributions to current

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[2] The application of qualitative research methods in network studies is mentioned only with respect to the collection of relational data (such as interviews, observations, or archival records; Wasserman and Faust 2005). Mixed methods designs for data collection are not described in detail, and qualitative methods and mixed methods designs for analyzing network data are not considered. For the first English language review on qualitative network research, cf. Hollstein (2011).

issues, especially concerning the processes, dynamics, and consequences of social networks.

We will take a closer look at these issues later on. Before we do so, we will first give a brief overview of the objects, questions, and approaches of network research. We must also clarify what the terms "quantitative," "qualitative," and "mixed methods" actually mean in the context of social networks.

The Concept of Social Network

According to J. Clyde Mitchell's classic definition, networks can be described as a "specific set of linkages between a defined set of social actors" (Mitchell 1969:2), whereby both the linkages and the social actors can refer to quite different social entities. Actors can be organizations, political actors, households, families, or individuals. The linkages or relationships may, for instance, refer to interactions or relations defined by a specific content, such as power relations, information exchange, or emotional proximity.[3] Social networks are typically the subject matter of anthropology and sociology, of communication studies as well as political science, but they also play an increasingly prominent role in computer science, economics, history, and medical science. Research topics range from communication networks, the formation of subcultures, and social movements to networks of local power elites, informal networks within and between organizations, and on to personal or private networks, including virtual and semantic networks (cf. Scott 2000; Scott and Carrington 2011).

The particular attractiveness of the network concept lies in the fact that it focuses attention on the "totality" of social relations and their social context and hence on the "embeddedness" of social action (Granovetter 1985). Going beyond single relationships, network research investigates the relations between the various relationships of a network (e.g., the formation of clusters or cliques) and the influence of structural properties of networks and social relations on social integration. For instance, information flow is a lot faster and norms are more effectively established in dense networks where a large number

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[3] Even though the linkages between actors are defined by their *content*, the network concept as such rather refers to the *formal structure* of those social relations, e.g., the size of a network, the frequency of interactions between its members (*alteri*), or its density (the number of actual as compared to potential relationships between alteri). Therefore, network concepts are often combined with concepts aimed at the functions or the content of relationships (e.g., concepts capturing social support or social capital; cf. Marsden 1990, 2011).

of people are acquainted with one another than in networks marked by a low density of relationships. At the individual level, dense networks provide more social support but also exert more social control (Coleman 1990). Another well-known structural property of networks are so-called "structural holes" (Burt 1992). Occupying such structural holes gives privileged access to information, power, and influence (Padgett and Ansell 1993).

Due to its relational perspective, the network concept integrates both the societal micro- and macro-levels and offers a specific starting point for tracing the mechanisms of social integration as well as the conditions and implications of social change. Moreno's sociometric studies in the 1930s and American community studies in the 1940s were early antecedents of contemporary network research in the social sciences. The term "social network" was first introduced in the 1950s by British cultural anthropologists who investigated small-scale social settings at the time, such as rural communities, neighborhoods, and subcultural environments (Barnes 1954; Bott 1957; Mitchell 1969). However, it was not until the 1970s that network analysis was established in the social sciences as a distinct empirical paradigm for analyzing systems of social relationships, parallel to the development of its mathematical foundations (cf. Freeman 2004; Knox et al. 2006; Carrington, this volume). Within the scope of this paradigm – known as "structural network analysis" – an extensive set of methodical instruments has been developed since then. Structural network analysis is characterized by the use of highly differentiated standardized methods of data collection (e.g., established name generators like Burt generator, position generator, resource generator, etc.), various measures of network structures (e.g., density and centrality measures), as well as sophisticated analytical procedures and calculation models, comprising block models, random graph models, and as of recently also advanced models for the analysis of longitudinal data (cf. Wasserman and Faust 1994; Carrington et al. 2005; Scott and Carrington 2011; Snijders 2011). As Peter J. Carrington (this volume) points out, precisely this "mathematization of social network analysis" can be assumed to have played a key role in rendering the network concept compatible across a wide range of academic disciplines, thus contributing to its remarkably widespread use.

In spite of the obvious strengths and benefits of the network approach, the structuralist paradigm that has dominated it has also attracted criticism since the early 1990s: Critics claim that the significance of action has been overlooked due to this preoccupation with structure. Such criticism is mainly directed against approaches that are either committed to "structural determinism" (Emirbayer and Goodwin 1994) or involve utilitarian

models of action ("structural instrumentalism"; Emirbayer and Goodwin 1994).[4] According to these critics the challenge of network research is to link the structural level with the actors involved. This would particularly concern the systematic integration of their capacity to act and actively shape their (social) environment as well as their reference to norms, symbols, and cultural practices (Emirbayer and Goodwin 1994; Mizruchi 1994; Schweizer 1996; Emirbayer 1997). As Dorothea Jansen (1999) put it, "A significant theoretical problem [of network research; BH] lies in the sparsely reflected relation between concrete networks and interactions, on the one hand, and subjective attributions of meaning, norms, and institutions, [as well as] cultures and symbolic worlds, on the other. In their dispute with structural functionalism of the Parsonian kind, network researchers have possibly thrown out the baby with the bathwater in claiming absolute priority for concrete structures of interaction vis-à-vis norms and symbolic worlds of any kind" (p. 258 f.; translated from German by BH). However, in recent network research, work has been done that seeks to conceptually integrate agency and to take cultural symbols and norms into account. Research from the quarters of phenomenological network theory comes to mind (White 1992; Mische 2003; Gibson 2005; Yeung 2005).[5] As we will show, mixed methods studies can provide stimulating contributions in this respect as well.

What Do We Mean by "Mixed Methods" in Social Network Research?

Let us now turn to the question of how network research can be positioned in relation to both quantitative and qualitative methods and what

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4   Emirbayer and Goodwin (1994) differentiate three theoretical positions with respect to how social structure, culture, and agency are conceptualized in network research: "The first of these implicit models, that of *structuralist determinism*, neglects altogether the potential causal role of actor's beliefs, values, and normative commitments – or, more generally, of the significance of cultural and political discourses in history. It neglects as well those historical configurations of action that shape and transform pregiven social structures in the first place. A second and more satisfactory – but still deeply problematic – approach is that of *structural instrumentalism*. Studies within this perspective accept the prominent role of social actors in history, but ultimately conceptualize their activity in narrowly utility-maximizing and instrumental forms. And finally, the most sophisticated network perspective on social change, which we term *structuralist constructivism*, thematizes provocatively certain historical processes of identity conversion and 'robust action.' It is the most successful of all of these approaches in adequately conceptualizing human agency and the potentially transformative impact of cultural idioms and normative commitments on social action" (Emirbayer and Goodwin 1994:1425f.; emphasis in the original).
5   Other approaches pointing in this direction are symbolic interactionism (Fine and Klineman 1983), Bourdieu's theory of practice, Latour's actor-network theory (cf. Knox et al. 2006), and Luhmann's theory of social systems (cf. Fuhse and Mützel 2010).

"mixed methods" means precisely in social network research. Clearly positioning network research in the spectrum of empirical methods is no easy task if we rely on the common systems for the classification of methodology offered in the literature. Or, in the words of Peter J. Carrington, "Social network analysis itself is neither quantitative nor qualitative, nor a combination of the two. Rather, it is structural"[6] (this volume; similarly Bellotti 2010). Like qualitative methods, network research places special emphasis on the contextuality or "embeddedness" of social action. Yet unlike qualitative methods, network research employs established standardized instruments to this end, and network structures are typically described in terms of measured values and numbers, thus in a formalized or quantified manner. Nevertheless, the concept of representativity usually cannot be applied to network studies – at least not without some restrictions. (For sociocentric or whole networks, it is impossible to determine the statistical population. And if egocentric[7] network data are collected within the scope of representative samples, representative conclusions can only be drawn about the attributes of ego but not about the relations existing with or between the alteri; cf. Belotti 2010). That, of course, rules out the use of inferential statistics, and reliable statements on the prevalence of networks and network structures can be made only to a limited extent. We also have to consider that we are often dealing with relatively small sample sizes, especially when investigating whole networks.

In the following we distinguish quantitative and qualitative network *data* and quantitative and qualitative *strategies of network analysis*. In line with a commonly made distinction, we understand by quantitative data numerical data and by qualitative data data in text form (cf. Bernard 1994). Accordingly, what we call *quantitative network data* refers to all data describing relations, interactions, and structures of networks in formal terms using numbers (e.g., the number of relationships between the members of a network). We speak of *qualitative network data* when aspects of networks are described in text form (e.g., when actors explain the strategies of action adopted vis-à-vis other members of a network).

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[6] Or in the words of an anonymous reviewer, "There is an argument that social network analysis, as a method of formal analysis, is not quantitative but uses numbers in order to grasp the quality of social relationships. It is, at the very least, different from obvious quantitative approaches that focus on attributes rather than relations."

[7] Whole (sociocentric), complete, or "entire" networks – e.g., entire communities – are investigated less often. If so, the respondents can, for instance, be selected by means of snowball sampling (on sampling strategies, cf. Frank 2011). In contrast, so-called "ego-centered" (egocentric) networks refer to the networks of individual actors who are in most cases the only source of information about their networks (cf. Carrington, this volume; Wald, this volume). The present volume assembles studies on ego-centered as well as on whole networks.

Quantitative strategies of analysis are defined as strategies of data analysis to describe in quantitative terms empirical regularities, the frequency and prevalence of social phenomena, as well as causal mechanisms and processes. The basic strategies of data analysis consist of descriptive measures, statistical methods, and path or causal models. More recently, we are also observing an increasing trend toward computer simulations. In network research, quantitative methods are geared toward mathematical descriptions and analyses of interactions, relations, and network structures. Measured values and numbers, for instance, are density and centrality measures or the triad census (e.g., Gluesing, Riopelle, and Danowski, this volume). More sophisticated analyses apply formal models and statistical procedures, such as block model analysis, exponential random graph modeling, or regression analysis (cf. Wasserman and Faust 1994; Carrington et al. 2005; Scott and Carrington 2011). In this sense, we consider most of the methods used in social network analysis to be "quantitative."

Qualitative analysis refers to all those methods in empirical social research that aim at gaining an understanding of meaning and its frames of reference (cf. Hollstein 2011). Qualitative data will generally come as text and are meant to provide insight into contexts of action as well as systems of meaning. If no such data are readily available, researchers will turn to open-ended methods of data collection, such as interviewing or unstructured observation methods, and interpretive methods of data analysis. Interpretive strategies of data analysis allow one to reconstruct cultural practices and interaction patterns. Moreover, they are especially well suited for capturing the actors' own systems of relevance, perceptions, interpretations, and action orientations. With respect to network research, qualitative methods are therefore most appropriate for investigating network practices and network perceptions and interpretations (cf. Hollstein 2011). In principle, perceptions, attributions of meaning, and systems of relevance can also be investigated with standardized methods (e.g., Maya-Jariego and Dominguez; Gluesing et al., this volume). An open, inductive approach, however, is indicated in cases where the research question is of a more exploratory nature. The same holds true for settings where we expect great variations in individual meanings and/or systems of relevance (cf. Wald, this volume).

As we now have established a more precise understanding of what is meant by mixed methods, qualitative and quantitative data, and qualitative and quantitative strategies of analysis in network research, we can proceed to define more precisely mixed methods in network research. We will speak of mixed methods network studies when three conditions are satisfied:

- The studies are based on both *quantitative, numerical network data* – that is, data describing nodes and relations – and *qualitative textual data*. As mentioned earlier, this does not imply that both types of data actually must be collected; data may also be converted from one type into another (e.g., Verd and Lozares, this volume).
- In analyzing relations and networks, both *quantitative, mathematical strategies* and *qualitative, interpretive strategies* are used. While the former are tailored toward analyzing the structural dimensions of relationships and networks, the latter are designed to capture practices, meanings, and the social contexts of relationships and networks.
- And finally, at at least one stage of the research process, the data or strategies of analysis must be *integrated* in some form, at either the stage of data collection, data analysis, or interpretation of results (meta-inference). When we speak of integration in the following, we refer to systematically relating or linking qualitative and quantitative data or strategies of analysis.[8] Such integration is a key element in mixed methods studies. Were it not for this integrative component, these studies would be no more than the mere addition of qualitative and quantitative analyses.

Mixed Methods Research Designs

We now turn our attention to the ways in which qualitative and quantitative data and strategies can be integrated. Relating qualitative and quantitative data and analyses can take very different shapes depending on the research in question (Creswell et al. 2003; Greene and Caracelli 1997; Johnson and Onwuegbuzie 2004; Morgan 1998; Morse 1991, 2003). For instance, studies may differ in the *number of strands* or phases included (monostrand, multistrand). A strand of a research design is a phase of a study that comprises three main stages (steps, components): the conceptualization stage, the experiential stage (methodological/analytical), and the inferential stage (Tashakkori and Teddlie 2009:288). Most mixed methods designs are "multistrand designs" that consist of a complete quantitative cycle (including quantitative data collection, quantitative data analysis, and inference) and a complete qualitative cycle accordingly. Yet there are differences in *implementation*. For instance, the designs may differ in terms of chronological order, as

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[8] In contrast, we may also speak of "combining" data or strategies of analysis in a broader sense to also include merely additive approaches.

quantitative and qualitative strands of a study can be employed either simultaneously or consecutively. Apart from simultaneous or consecutive implementation, we also observe conversion as a third mode in which either qualitative data are transformed or converted into quantitative data, or vice versa (Teddlie and Tashakkori 2006; Tashakkori and Teddlie 2009). When considering implementation, the sampling methods employed in mixed method research must also be taken into account: Are the samples identical; do they overlap – for instance is one a subset of the other – or are the sample compositions completely different (Tashakkori and Teddlie 2009; cf. Bernardi et al., this volume)? Whatever the case may be, an especially important aspect is at what stages and at how many different stages in the research process the *integration* of approaches takes place: during conceptualization, data collection, data analysis, and the interpretation of data (inferential stage). In some studies, the qualitative and quantitative strands of the research are given equal importance; in other cases, one strand has priority over the other. Finally, depending on the underlying logic guiding research, some studies place emphasis on exploratory forms of inquiry while others focus on the testing of hypotheses.

Drawing on the classifications suggested by Teddlie and Tashakkori (2006), Tashakkori and Teddlie (2009), Creswell et al. (2003), Creswell and Plano Clark (2007), and Greene et al. (1989), we differentiate between five families of mixed methods designs[9]: sequential designs (exploratory, explanatory), parallel designs, fully integrated designs, embedded designs, and conversion designs. This classification distinguishes designs mainly along the following dimensions: type of implementation process, stage of integration, and priority of one approach. It also takes into consideration the logic guiding the research (exploratory or explanatory sequential design) and the number of strands (monostrand conversion design or multistrand conversion design). All five of these families of designs and subtypes are represented in this volume.

Sequential Design

Sequential designs are multistrand designs. The characteristic feature of sequential designs is the consecutive use of quantitative and qualitative strands. Conclusions drawn based on the results of the first strand determine the questions, data collection, and analysis of the next strand (Teddlie and Tashakkori 2006:21). According to the underlying rationale of

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[9]   A note is in order here that these design families are neither exhaustive nor completely non-overlapping. It has frequently been pointed out that developing an exhaustive typology of mixed methods designs is impossible (e.g., Teddlie and Tashakkori 2006).

research, we distinguish between "sequential exploratory" and "sequential explanatory" designs (Creswell et al. 2003).

A *sequential exploratory design* starts with a qualitative phase, which is then followed by a quantitative phase. In many studies, the qualitative part figures only as a prestudy to the actual quantitative research, for instance, if important issues and events or relevant actors and forms of cooperation have to be identified first, such as in investigations of political networks or cooperative research networks (cf. Baumgarten and Lahusen 2006; Wald, this volume). The primary purpose of the qualitative pretest is to support the development of instruments for the main (quantitative) study with the purpose of enhancing the validity of the collected data. Thorough qualitative prestudies or pretests are particularly advisable in advance of any standardized research into sociocentric networks. Since such studies typically require a massive effort in terms of data collection, a good knowledge of the field is a precondition for obtaining meaningful results (Baumgarten and Lahusen 2006).

The qualitative study, however, can also represent an independent element of inquiry in its own right. In that case, it may be used to explore new or yet unexplored types of networks and network practices, for instance, regarding networks of particular ethnic groups (Smith 2005), migrants (Menjivar 2000), or social movements (Mische 2008). Additional quantitative strands will then help to identify the prevalence of such types of networks and network practices. It can also help to obtain a more comprehensive picture of the conditions (e.g., institutional settings) under which such patterns have effects (Mische 2003, 2008; Smith 2005). Yet another option is to use a simulation to analyze network consequences. For instance, based on an ethnographic study, Rogers and Menjivar (this volume) use agent-based modeling to investigate the long-term development of social networks of Salvadorian migrants living in San Francisco. In this case, the qualitative analysis serves as input to create a computational model.

A *sequential explanatory design*, in contrast, starts with the collection and analysis of quantitative data, which is then followed by a qualitative strand. In some cases, the qualitative inquiry is meant to deepen and further elucidate the results obtained by the quantitative analysis (Bearman and Parigi 2004).[10] The quantitative strand can also lay the groundwork for selecting and locating cases to be examined more closely by qualitative means (so-called "mapping"; e.g., McLean 1998; Wong and Salaff 1998; Hollstein 2002). Cases can then be selected, for

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[10] For instance, in a qualitative follow-up study to the General Social Survey, Bearman and Parigi (2004) examine what precisely the GSS respondents had in mind when declaring that they would talk to other people about "important matters" (Burt name generator question).

instance, using multidimensional scaling (McLean 1998) or based on the network structure (Maya-Jariego and Dominguez, this volume). Case selection can be guided by quite different criteria: Sometimes emphasis is placed on extreme cases or "outliers"; at other times it is more about identifying particularly typical cases. In their analysis of migrant acculturation, Maya-Jariego and Dominguez identify host individuals by a process of screening based on the structure of personal networks. The individuals thus selected are then studied from an ethnographic perspective for their relationships to migrants, attitudes, and the value systems they subscribe to.

On the whole, sequential designs consisting of two consecutive studies are generally a little less complex and easier to do than parallel designs, which we will discuss later. This is why Teddlie and Tashakkori (2006) recommend sequential designs to researchers who are just beginning to work with mixed methods designs. A disadvantage, however, is that because they require performing one step after another, sequential designs tend to be more time and thus cost intensive compared to parallel designs (Bernardi et al., this volume).

Parallel Design

Parallel designs are multistrand designs in which quantitative and qualitative strands are employed more or less simultaneously. This does not mean that the individual stages (data collection and data analysis) of the qualitative and quantitative strands necessarily have to be conducted at the same time; they can take place at different points in time just as well. In contrast to sequential designs, parallel designs allow for data to be collected synchronously since the data collected for one strand do not rely on the results of the other strand. For precisely this reason, it seems more appropriate to speak of "parallel" instead of "concurrent" design (Tashakkori and Teddlie 2009). Both parts are usually also analyzed separately. Only once the results from the individual strands of analysis are available are meta-inferences made. Parallel designs are a suitable means of pursuing both exploratory and confirmatory research questions. They are especially useful for triangulating data and checking for complementarity, that is, to gain a more complex and complete picture of the subject matter. Parallel designs with special emphasis on the triangulation of data are aimed at validating and at the same time corroborating results (cf. the methodological discussion by Wald, this volume, and the empirical study by Gluesing et al., this volume). Parallel designs can also be employed to increase the explanatory power as well as the generalizability of results by generating a broad, complex, and – to the greatest possible degree – comprehensive understanding of social phenomena. Such an approach thus looks for complementarity rather than convergence.

Empirical examples in this line of research are the longitudinal study by Bidart and Lavenu (2005) on changes in the networks of young adults and the study by Bernardi et al. (this volume) on the influence of social networks on family formation. A theoretically and empirically instructive case of a so-called *multilevel parallel design*[11] is Häussling's study (this volume) on the restructuring of a car manufacturer's sales department. He analyzes different levels of interaction: semantic contexts and networks of interaction as well as individual action orientations. He relates all of these levels and shows that the implementation of knowledge management systems fails because it is systematically undermined by the employees' informal network relationships.

Compared to sequential designs, parallel designs are less time consuming. The obvious drawback of parallel designs, however, is that studying the same phenomenon by applying two different approaches simultaneously yet separately requires considerable expertise. In this light, it comes as no surprise that most of the empirical contributions to this volume are collaborations between authors with different methodical backgrounds. Teddlie and Tashakkori (2006:21) direct attention to yet another kind of problem in this respect. The novice or the researcher working alone may face particular problems when the results of the qualitative and quantitative analyses yield discrepant results and the researcher is challenged to interpret or resolve these inconsistencies to draw inferences at the meta-level.

Fully Integrated Design

The fully integrated mixed design is a specific kind of multistrand parallel design or, in Teddlie and Tashakkori's (2006:23) words, "the 'Full Monty' of mixed methods designs." This is the variant that most closely meshes and integrates qualitative with quantitative approaches. The different approaches are integrated interactively and dynamically along all stages of the research process. In this way, the fully integrated design manages to combine the benefits of both the parallel and sequential designs, which makes it a potentially especially fruitful endeavor. Because of its complexity, however, it at the same time places the greatest demands on the researcher in terms of coordinating the various elements across the whole process. This type of design is illustrated by Avenarius and Johnson's study (this volume) on the acceptance of newly established legal institutions in rural China. The study not only combines survey and ethnographic data but manages to do so in such a way that the qualitative and quantitative approaches inform one another at several points

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[11] In so-called *multilevel designs* (Tashakkori and Teddlie 2009), the qualitative and quantitative strands address different levels of analysis.

in the research process: at the points of sampling and collecting data, and in the course of analyzing and interpreting the findings. The study is also an instructive illustration of the fact that mixed methods studies are often initially not planned as such. At times it is seemingly contradictory phenomena, not clearly explicable observations, or the open questions of a previous study that motivate researchers to consider new paths in collecting and analyzing data involving different and complementary methods.

Embedded Design

In principle, the qualitative and quantitative parts can be given equal weight in the multistrand designs considered so far (both in terms of their significance for the research project and regarding the share of research activities devoted to the two strands). Of course, one approach may also be dominant or have priority over the other. Because this is an important aspect in planning the research process and the allocation of resources, we have included the "embedded design" (Creswell and Plano Clark 2007) in our collection. In the case of an embedded design, either the qualitative or the quantitative strand constitutes only a small part of the study, which may be conducted in parallel with, subsequent to, or as a prestudy to the major part of the research. Embedded designs are also referred to as *nested designs* (Creswell 2003). An example of a network study of this kind is the contribution by Gluesing et al. (this volume) on the patterns of communication and the effectiveness of innovation networks in multinational corporations. Apart from tens of thousands of e-mails, the data collection in this study also included in-depth interviews as well as participant observation of interactions between team members who were "shadowed" by the researchers for days. The observational data serve to validate the quantitative information and help classify and comprehend the relevance of the e-mail communication. The analysis of the different types of data reveals surprising differences in e-mail use between Americans and Germans. (The former handle many things by e-mail even if the addressee is located in the office next door while in that particular case Germans prefer face-to-face communication.) The chapter demonstrates how ethnographic methods provide both relevant content and context that can be incorporated into IT-based techniques for data mining.

An advantage of embedded designs is that they are often less costly than designs in which the qualitative and quantitative parts are given equal weight in terms of their significance for the research project and also regarding the share of research activities devoted to the two strands. The cost advantage results from the fact that the embedded part of the research is usually applied to objects and areas with well-defined

boundaries. On the other side of the coin, the results that embedded designs yield are mostly limited to narrowly focused research questions.

Conversion Design

Conversion designs are designs that involve the transformation of data of one type into data of the other type for purposes of analysis: qualitative data are converted into numerical codes and re-analyzed quantitatively (quantitizing strategy), or quantitative data are transformed into data that can be analyzed qualitatively (qualitizing strategy).

Conversion mixed designs are a type of multistrand parallel design that involves mixing qualitative and quantitative parts at all stages while the data are either qualitized or quantitized and analyzed accordingly as the case may be (Teddlie and Tashakkori 2006; Tashakkori and Teddlie 2009). Hollstein and Wagemann (this volume) illustrate this approach with their study on the significance of network resources for young adults' successful transition to employment. Qualitative data on network support are converted into fuzzy sets, that is, numerical codes, and, in a dynamic interactive process, subjected to alternate rounds of qualitative analyses involving the reconstruction of individual cases, on the one hand, and quantitative analyses on the other (Ragin 2008). The chapter demonstrates how fuzzy set Qualitative Comparative Analysis (QCA; Ragin 2008) facilitates systematic case comparisons while it also enables developing typologies that strongly build on individual cases.

In Hollstein and Wagemann's chapter, network data are described in terms of individual attributes, which are used to explain individual behavior, in this case the successful transition to employment. While Verd and Lozares (this volume) also convert qualitative into quantitative data or, in other words, apply a "quantitizing strategy," their focus is on how biographical narrative interview data are used to derive data on network structures. Based on a thorough interpretive text analysis, Verd and Lozares transform interview data on the relationships of young adults into data on the structure of networks. They then use these data to perform further quantitative analyses. In essence, they apply what is called a *monostrand conversion design* or *simple conversion design* or a *quasi-mixed methods design*, as it is also sometimes referred to (Tashakkori and Teddlie 2009:288). This study is not a "typical" mixed methods design since data of one type are collected and converted while the data thus transformed are analyzed using only one type of method. We have included this study because it is an especially interesting strategy for studying networks: As opposed to procedures using automated coding, Verd and Lozares analyze textual data and extract network information using interpretive strategies of analysis.

Monostrand designs are generally less demanding in terms of time and cost compared to multistrand designs. The latter require closely coordinating the steps in converting and analyzing qualitative and quantitative data throughout the entire process. In this respect, they are similar to fully integrated mixed methods designs.

Benefits and Drawbacks of Mixed Methods Network Research

In a nutshell, the *benefits* of mixed methods designs can be summarized as follows: In general, mixed methods studies provide special opportunities for enhancing both the quality and explanatory power of data (cf. Greene et al. 1989; Tashakkori and Teddlie 2003; Axinn and Pearce 2006; Bryman 2006). They contribute to a broader and deeper understanding of social phenomena. In combining different perspectives on social phenomena, mixed methods studies support the development of measurement and improvement of implementation, the validation and confirmation of results, and contribute to a more comprehensive picture by giving a more complex account of social phenomena (Greene et al. 1989). As the chapters in this book illustrate, mixed methods designs facilitate the process of selecting individual cases and positioning them in social space while shedding light on the prevalence of patterns of social action and network practices, the conditions upon which they rest, as well as the consequences they entail. It should be added that the findings obtained by the different methods can relate to one another in a number of ways: Often they are complementary, sometimes they corroborate each other, but occasionally they can also be contradictory or lead to unexpected insights. Such observations can in turn initiate follow-up studies – which lead to a broader and deeper understanding of the subject matter and further enhance the explanatory power of results.

Apart from these general benefits, mixed methods studies can be expected to provide *specific contributions to investigating social networks*, especially in three areas. The first area is thick descriptions of networks, network practices, and interpretations. The second area is network effects, and the third is network dynamics.

Thick Descriptions of Networks, Network Practices, and Interpretations

Combining qualitative and quantitative approaches gives special insight into networking practices and the perceptions of networks. *Network perceptions and interpretations* are important factors, for example, in

studying how individuals position themselves in relation to their social environment, as in analyses of the integration patterns of young adults (Verd and Lozares, this volume), the elderly (Hollstein 2002), members of social movements (Hofer et al. 2006), or of migrants (Molina et al.; Maya-Jariego and Dominguez, this volume). Network practices are relevant aspects, for instance, in exploring patterns of contact and cooperation between organizations (Wald, this volume) or workflows and interaction patterns within organizational networks (cf. Häussling; Gluesing et al., this volume). Other studies investigate exchange patterns in networks of migrants (Menjivar 2000; Maya-Jariego and Dominguez, this volume), the "art of networking" among Florentine nobility (McLean 1998), or discourse patterns and conversation dynamics in Brazilian youth movements (Mische 2008). Qualitative data can give a detailed account of individual cases by way of *"thick descriptions"* (Geertz 1973) that are geared toward tracing how actions or events unfold and the impact they have in order to make them comprehensible in terms of social meaning (*Verstehen*). It must be emphasized, however, that we cannot make valid statements about networks based on qualitative data alone without linking them with data on network structures. Formal descriptions of network structures are the prerequisite for making any kind of valid statements about social networks at all and not simply speaking of networks in a merely metaphorical sense (Johnson 1994).

Network Effects

Furthermore, combining qualitative and quantitative approaches can contribute to a better understanding of how networks matter and of what mechanisms and conditions figure in when producing certain network outcomes. Network perceptions, for instance, can be helpful in assessing the functioning of exchange relations or the effectiveness of networks, for instance, when investigating the reasons for a research group's success or failure (Wald, this volume), studying the departments of a company (Häussling, this volume), or examining the innovation networks of global players (Gluesing et al., this volume). Members of organizations can be considered as experts on the networks of which they are part, for instance, with regard to the reasons why cooperation between research teams failed or concerning the strategies and contexts of action, for example, when studying learning processes in decentralized systems (Lazer et al. 2011). Other studies are concerned with the effects of personal networks, for example, when studying decision-making about higher education and the role of personal networks (Fuller et al. 2011). Using both survey and ethnographic data, Avenarius and Johnson (this volume) show how network structures play a role in the decision

of Chinese peasants to take a dispute to court or seek the assistance of a traditional mediator. Bernardi et al. (this volume) use qualitative and quantitative data from interviews to reconstruct how personal networks influence the decision to start a family. Hollstein and Wagemann (this volume) investigate what aspects of networks facilitate or impair the transition from school to work.

Network Dynamics

Apart from the question of how networks function, combining quantitative and qualitative approaches also helps to understand the formative conditions, dynamic processes, and change of networks. This concerns not only fluctuations or changes in networks over time but also fluctuations and changes in networks in physical space (e.g., migrant networks). How to deal with changes in networks was one of the major trouble spots of network research in the past (cf. Borgatti 2009). In the meantime, sophisticated quantitative methods for describing and analyzing network change have been developed (cf. Snijders 2011; Gluesing et al., this volume). On the other hand, qualitative social research provides special means for understanding (in the sense of *Verstehen*) network constitution and the mechanisms of network change (e.g., Hollstein 2002; Crossley 2009; Small 2009). Actor strategies can be one source of insights into network formation and change. However, since network dynamics always involve at least two actors, analyses of interaction and network practices are keys to understanding the dynamic side of network development. In cases where research on network dynamics also seeks to understand connections between network orientations and actual network changes, longitudinal data on social networks, changes in those networks, actor orientations, and shifts in such orientations are most suited. The study of dynamics in the social integration of young adults by Bidart and Lavenu (2005) is an example of such research. If the inquiry is concerned with the influence of concrete social interaction and actor practices on network dynamics, observation over lengthy periods of time can be expected to deliver the best data basis for this purpose. Ann Mische's (2003, 2008) studies of Brazilian youth movements or Gluesing et al.'s study (this volume) of innovation networks in global teams are cases in point. Finally, Rogers and Menjivar (this volume) demonstrate how computer simulations (agent-based modeling) based on a qualitative strand are a useful tool in predicting the prospective development and dissolution of Salvadorian immigrants' networks.

Relating data in this way also has theoretical implications. Since qualitative data are better attuned to capturing individual actors and their systems of relevance compared to relational data on the structure of relationships and networks, incorporating qualitative and quantitative

network data provides a way of linking theoretical perspectives that focus on either structure or agency (Hollstein 2001; Häussling, this volume). Advocates of a relational sociology have been arguing to that effect since the early 1990s (White 1992; Emirbayer and Goodwin 1994; Mizruchi 1994). We can thus expect empirical studies along such lines to also yield theoretically inspiring insights.

Drawbacks of Mixed Methods Designs

Last but not least, it needs to be pointed out that all the benefits notwithstanding, mixed methods designs also have drawbacks compared to monomethod studies (cf. also Wald, this volume; Bernardi et al., this volume). The main downside is resource intensity: It is not unusual for mixed methods studies to require considerably more time and thus more research funds than monomethod studies. This can have methodological consequences. For example, applying the qualitative and the quantitative strands to the same sample to enhance validity limits the sample size, which in turn limits the possibility of running statistical tests (Wald, this volume).[12] A key issue, however, is that mixed methods studies are very demanding in terms of the skills required to apply both approaches at equally high levels of sophistication and integrate them at the metalevel. This is reflected in the contributions assembled in this volume. The empirical studies on which the chapters in Parts II and III are based are all the product of collaboration, mostly of the interdisciplinary kind. Conducting a mixed methods study requires a huge coordination effort and presupposes not only the knowledge but also the readinesses of researchers to embark on mixed methods research as well tackle the practical questions of data management (Wald, this volume; Bernardi et al., this volume). With this in mind, it seems fair to say that mixed methods designs are generally not well suited for the novice researcher. As we have shown, there are of course differences in the complexities and resource intensities of the designs. Parallel designs and especially fully integrated designs are particularly demanding in terms of coordinating the qualitative and quantitative strands. The advantage of sequential designs is that they allow conducting the research consecutively one stage at a time. On the other hand, this limits the ability to make adjustments at later stages. Moreover, sequential designs are generally less time and cost intensive compared to parallel designs. For well-defined aspects of the research question, it may therefore make good sense to use embedded designs.

Due to the resource intensity of mixed methods studies, the researcher should carefully consider whether to employ a mixed methods design or

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[12] For the challenges connected to mixed methods sampling, confer Bernardi et al. (this volume), Maya-Jariego and Dominguez (this volume), and Avenarius and Johnson (this volume).

qualitative or quantitative methods only. As Andreas Wald (this volume) elaborates, the selection of a mixed methods design should be guided by the research question, the research objective, and the nature of the phenomenon under study. Mixed methods designs are best suited for highly complex research questions (partly predetermined, partly open), for confirmatory and exploratory research objectives, objectives where "individual meaning, perception, frameworks of relevance and additional context factors play an important role" (Wald, this volume) while mathematical evidence is called for at the same time, and finally, for research phenomena for which prior knowledge of the field and of relevant context factors exists but is incomplete (Wald, this volume).

Organization of the Book

This book is the first to give an overview of research strategies that make use of mixed methods in studying social networks. It provides the reader with detailed accounts of the research designs and methods used in investigating social networks of various sorts. The chapters discuss the strengths of the different mixed methods designs and the specific methods they employ for particular fields and considering the kinds of results they can be expected to achieve. The chapters address important questions and engage in cutting-edge debates in the different areas on which they focus, thus making a substantial contribution to the field of social networks.

The contributions in this volume have been assembled to represent the most important types of mixed methods designs (sequential, parallel, fully integrated, embedded, and conversion designs). Furthermore, they illustrate how new methodological approaches can be employed in mixed methods network studies (like network visualizations and simulations). Finally, they provide excellent illustrations of how a variety of research questions are implemented in network research and the insights such research can be expected to yield in terms of network descriptions, network effects, and network dynamics (cf. Table 1.1).[13]

The book consists of four parts. The chapters in Part I, "General Issues," acquaint the reader with social network research as such (Carrington, Chapter 2) and discuss fundamental theoretical and methodological

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[13] Table 1.1 gives an overview of the specific contribution provided by each chapter: the specific methodological contribution (mixed methods design and methodological approach) and the specific contribution to the respective field or topic under study made possible by integrating qualitative and quantitative approaches (thick network description, network effects, or network dynamics). In addition, Table 1.1 provides an overview of the different research topics of the chapters, the different network types investigated, as well as the methods and data used.

questions, such as triangulation and validity of network data (Wald, Chapter 3) and the theoretical perspectives that might be employed in mixed methods network research (Häussling, Chapter 4). The contributions in Part II, "Applications," demonstrate the use and the potential of the different mixed methods research designs for the investigation of social networks: a parallel design (Bernardi et al., Chapter 5), a sequential explanatory design (Maya-Jariego and Dominguez, Chapter 6), a fully integrated design (Avenarius and Johnson, Chapter 7), and an embedded design (Gluesing et al., Chapter 8). The contributions in Part III apply "New Methodological Approaches" in mixed methods network studies: Qualitative Comparative Analysis (QCA; Hollstein and Wagemann, Chapter 9), semantic network analysis and data mining (Verd and Lozares, Chapter 10), as well as mixed methods designs that make use of network visualizations (Molina, Maya-Jariego, and McCarty, Chapter 11) and computational modeling (Rogers and Menjivar, Chapter 12). They also make use of other types of designs, such as the sequential exploratory design (Rogers and Menjivar, Chapter 12) and conversion designs (Verd and Lozares, Chapter 10; Hollstein and Wagemann, Chapter 9).

In order to illustrate the wide spectrum of possible uses of mixed methods designs in investigating social networks and, at the same time, encourage the discussion of – the partially similar – methodical problems across different subjects, the book comprises studies from diverse areas of application. The empirical studies thus represent various fields of network research, such as organizational and innovation research; socialization and life-course research; family and migration research; and research on intercultural relations, cultural change, and modernization processes. To complete the picture, the studies focus on different kinds of social networks, including egocentric and whole networks, social networks within and between organizations, informal and formal networks, as well as personal networks (cf. Table 1.1). The substantive chapters all follow the same outline: They start with a set of empirical questions and then argue why using mixed methods is a promising way of addressing these questions. This is followed by a review of the literature on the subject, a description of the data and methods, and then the results of the research. The conclusion summarizes what the study contributes to our understanding of the topic in question and reflects on the research design and choice of methods, including their advantages and limitations.

The Contributions

The first part of the book discusses general issues relevant to mixed methods network research. It starts out with an introduction by Betina Hollstein, followed by an overview of social network analysis by Peter

Table 1.1. *Overview of the book*

Part	I. General issues			II. Mixed methods applications	
Authors	*Carrington*	*Wald*	*Häussling*	*Bernardi et al.*	*Maya-Jariego/ Dominguez*
Focus/MM design	**Social network analysis**	**MM methodological issues (triangulation, validity)**	**Theoretical concepts**	**Parallel design** MM sampling, data collection	**Sequential explanatory design**
NW aspects	NW descript. NW effects	NW effects NW dynam.	NW effects	NW effects (NW dynam.)	NW descript.
Topic	Various	Innovation/ cooperat.	Innovation/ cooperat.	Life-course/ fertility	Migration/ acculturat.
NW type	Various	Organizational NW	Organizational NW	Pers. NW	Pers. NW
	Various	Ego NW	Whole NW	Ego NW	Ego NW
Samples		Same	Same	Same	Different
Data					
Observations		-	x	-	x
Survey		x	x	x	x
Interviews		x	x	x	x
Documents		x	x	-	-
NW chart		x	x	x	x
NW grid		x	-	x	-
Strategies of Analysis					
Descriptive NW measures		x	x	x	x
Ethnography		-	-	-	x
Qual. text anal./ thematic coding		x	x	x	x
Quant. content analysis		-	-	-	-
Quantitizing strategy		x	-	x	x
Visualization		x	x	-	-
Other				Grounded Theory	Psychometric scales

	III. New methodological approaches used in MM designs				
Avenarius/ Johnson	*Gluesing et al.*	*Hollstein/ Wagemann*	*Verd/ Lozares*	*Molina et al.*	*Rogers/ Menjivar*
Fully inte-grated design	**Embedded design**	**Fuzzy set QCA** (Conversion /integrated design)	**Semantic net-work analysis** (Conversion design)	**Visualization** (Parallel design)	**Simulation** (Sequential explor-atory design)
NW effects	NW dynam. NW effects	NW effects	NW descript.	NW descript.	NW dynam.
Moderniz./ culture	Innovation/ cooperat.	Life-course	Life-course	Migration/ acculturat.	Migration
Pers. NW/ local comm.	Organizational NW	Pers. NW	Pers. NW	Pers. NW	Pers. NW
Ego/Whole NW	Whole NW	Ego NW	Ego NW	Ego NW	Ego NW
overlap	Multi-level	Same	Same	Same	-
x	x	-	-	-	x
x	-	-	-	x	-
x	x	x	x	x	x
-	E-mail	-	-	-	-
-	-	x	-	x	-
-	-	-	-	x	-
x	x	x	x	x	x
x	x	-	-	-	x
x	x	x	x	x	x
x	x	-	-	-	-
x	-	x	x	-	-
x	x	-	x	x	x
Cultural con-sensus analysis	Quant. Semantic network analys. Triad census	QCA	Qual. Semantic network analys. Component analysis	Clustered graphs	Simulation Agent-based modeling

J. Carrington (Chapter 2). Carrington introduces the reader to social network research, its origins, principal concepts, and contributions to the different fields of research. He outlines the historical development of social network analysis and introduces the reader to the main concepts, such as graphs, ego-centered and socio-centered networks, concepts of social cohesion, social status and roles as applied in network research, and centrality. Research questions and major contributions of social network research are illustrated using examples of how it is applied in various fields of study.

Chapter 3, by Andreas Wald, connects the general introduction to social networks with mixed methods: Wald discusses triangulation as a methodological concept at the heart of mixed methods research and outlines its potential for network research. He argues that triangulating quantitative and qualitative methods in data collection and analysis can enhance the validity of network data and the explanatory power of network studies. Based on a study concerned with networks of research groups, Wald demonstrates how triangulation can be applied systematically in collecting and analyzing network data. Finally, he presents a set of criteria to assist in deciding whether to employ a single method or a mixed methods design.

In the fourth chapter devoted to general issues, Roger Häussling addresses theoretical strands to guide mixed methods network research. He distinguishes four different theoretical levels for capturing and interpreting the socially multidimensional nature of human interaction. These different and – as he shows – complementary levels of social interaction are (a) the context of interaction (cultural symbols, norms, and established roles), (b) the network of interlaced interactions, (c) the interventions of the actors involved, and (d) the expression of emotions accompanying the transformation of relationships. Based on a case study of the social network and the processes of communication and knowledge transfer in the sales department of an auto manufacturer, he demonstrates how this theoretical concept can be applied and the kinds of results it can be expected to yield.

The chapters in Part II illustrate applications of different mixed methods research designs for studying social networks of various sorts: In Chapter 5 Laura Bernardi, Sylvia Keim, and Andreas Klärner employ a *mixed methods parallel design* to investigate how network effects and social influence affect the fertility behavior of young adults in West and East Germany. The chapter shows how qualitative interviews and standardized methods of collecting network data (using network charts, network grids, and a network questionnaire) are applied simultaneously to the same sample. The mixed methods analysis then allows identifying relevant (influential) relationships as well as analyzing their structural

characteristics and how the social influence may vary in networks with different structural characteristics.

In Chapter 6 Isidro Maya-Jariego and Silvia Domínguez describe a *mixed methods sequential explanatory design* to assess the acculturation of host individuals based on ethnographic and psychometric research of Latina immigrants in Boston (US) and Latin American immigrants in Andalucía (Spain). Assuming a contingent relationship between the kind of acculturation experience and the type of personal network, data on the structure of personal networks are used to identify individuals (screening) and are then combined in an iterative process with data from interviews, participant observation, and surveys using psychometric scales. This design allows understanding the complexity of the acculturation process while taking into account both the topology of the intergroup situation and the interactive nature of the intercultural contact.

Applying a *fully integrated mixed methods design*, in Chapter 7 Christine Avenarius and Jeffrey C. Johnson investigate the adaptation to new legal procedures in rural China; the complex relationship between social networks, beliefs, and perceptions of Chinese citizens regarding notions of justice and fairness; and preferred conflict resolution strategies. Despite efforts by the Chinese government to establish the rule of law and construct a new legal system, the rule of relationships continues to influence the daily reality of Chinese citizens. Integrating qualitative data from the peasants' narratives about justice and fairness as well as the preferred means of dispute resolution – analyzed by cultural consensus analysis – with quantitative data depicting their personal network structures and their structural position within the village network helps us to understand why some peasants prefer to take a case to court rather than just settle outside of court instead.

In Chapter 8 Julia Gluesing, Kenneth Riopelle, and James A. Danowski use an *embedded design* to study innovation networks in global organizations. In analyzing tens of thousands of e-mails, the authors show how social network analysis techniques that tap into the flow of electronic communication reveal much about how innovation networks are structured, how they evolve, and what kinds of messages flow through the communication networks. Supplementary ethnographic research (interviews, participant observation) was conducted to validate the quantitative measures of network dynamics and help uncover emerging roles, the different meanings of a particular innovation within the global networks, and the different patterns of collaboration. For instance, the interviews testify to different patterns of e-mail use in Europe and in the United States. (In the primary European location, managers did not engage in e-mail exchange with

those whose offices were nearby; interpersonal communication was the norm instead.)

Part III presents new methodological approaches to mixed methods social network research. In Chapter 9 Betina Hollstein and Claudius Wagemann demonstrate how *fuzzy set analysis*, a new variant of Qualitative Comparative Analysis (QCA; Ragin 2000, 2008), can be employed to investigate the impact of personal networks on the successful entry into the labor market. Since it integrates qualitative and quantitative steps of analysis, fuzzy set analysis itself can be seen as a mixed method. Drawing on set-theoretical considerations, fuzzy set QCA facilitates systematically comparing cases and developing typologies from individual case analyses. This allows enhancing the explanatory power of studies based on medium-sized samples. Because qualitative data on network relations are transformed into numerical data (fuzzy sets of individual attributes), the chapter also provides a good illustration of a *conversion mixed design*.

An increasingly important issue in social network research is the extraction of data on network structures from qualitative text sources based on, for example, narrative data or digital communication – a procedure referred to as data mining (cf. Gluesing et al., this volume). In Chapter 10, Joan Miquel Verd and Carlos Lozares review various methods aimed at transforming textual data into relational and network data (so-called *quantitizing strategy of data conversion*). As opposed to procedures using automated coding, Verd and Lozares present an approach that analyzes textual data and *extracts network information using interpretive strategies of analysis*. Interpretive strategies allow analyzing texts with an eye to semantic structures, social meaning, and context. The procedure is applied to the analysis of narrative biographical interviews on education and employment careers.

In the subsequent Chapter 11, José Luis Molina, Isidro Maya-Jariego, and Christopher McCarty evaluate the potential of personal *network visualizations* as a tool in conducting and analyzing interviews. Network visualization is not only an important instrument in presenting data; it can also be a valuable tool in exploring and analyzing data. Moreover, visualizing networks in the form of diagrams, charts, or maps is a technique frequently used in collecting network data (e.g., Häussling; Bernardi et al.; Hollstein and Wagemann, this volume). Molina et al. show how the combination of computer-assisted visualizations of personal networks and qualitative interviews based on those visualizations allows researchers to obtain a special kind of information about the social world of informants (social circles, social support, etc.). The particular strength of visualizations lies in their ability to trigger cognitive responses that are difficult to obtain

by other means. The chapter draws on methods of data collection and analysis utilized in two research projects targeting immigrants in Spain and the United States.

As computer technology evolves, this creates growing opportunities for the use of computer simulations in analyzing complex social phenomena. This is particularly interesting with regard to social networks. Using agent-based modeling, Bruce Rogers and Cecilia Menjívar simulate a social network in a poor economic environment and analyze the effects of reciprocal exchange on the network structure in Chapter 12. A qualitative ethnographic study on poor and legally marginal Salvadoran immigrants living in the San Francisco area serves as input for creating a computational model (sequential exploratory mixed methods design). In the ethnographic part of the study, Menjívar identifies the mechanism of expected reciprocity to explain the weakening and dissolution of social relationships. In the following simulation, the notion is formalized in such a way as to allow for a wide range of different individual behaviors. Using computer simulations allows one to carefully track network evolution and to study the dynamic behavior of social networks.

Table 1.1 provides an overview of the chapters; their methodological focus; and the topics, network aspects, and network types investigated in the studies. The table provides a summary for readers who are interested in a particular approach to the combination of data, of strategies of analysis, or a particular type of mixed methods design. It intends to help identify the chapter to read if one wants to learn more about a particular kind of design.

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