Kaisa Henttonen

THE EFFECTS OF SOCIAL NETWORKS ON WORK-TEAM EFFECTIVENESS

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ABSTRACT

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This is a study of team social networks, their antecedents and outcomes. In focusing attention on the structural configuration of the team this research contributes to a new wave of thinking concerning group social capital. The research site was a random sample of Finnish work organisations. The data consisted of 499 employees in 76 teams representing 48 different organisations. A systematic literature review and quantitative methods were used in conducting the research: the former primarily to establish the current theoretical position on the relationships among the variables and the latter to test these relationships. Social network analysis was the primary method used in identifying the social-network relations among the work-team members. The *first* and key contribution of this study is that it relates the structural-network properties of work teams to behavioural outcomes, attitudinal outcomes and, ultimately, team performance. Moreover, it shows that addressing attitudinal outcomes is also important in terms of team performance; attitudinal outcomes (team identity) mediated the relationship between the team's performance and its social network. The *second* contribution is that it examines the possible antecedents of the social structure. It is thus one response to Salancik's (1995) call for a network theory in that it explains why certain network characteristics exist. It demonstrates that irrespective of whether or not a team is heterogeneous in terms of age or gender, educational diversity may protect it from centralisation. However, heterogeneity in terms of gender turned out to have a negative impact on density. *Thirdly,* given the observation that the benefits of (team) networks are typically theorised and modelled without reference to the nature of the relationships comprising the structure, the study directly tested whether team knowledge mediated the effects of instrumental and expressive network relationships on team performance. Furthermore, with its focus on expressive networks that link the workplace to a more informal world, which have been rather neglected in previous research, it enhances knowledge of teams and networks. The results indicate that knowledge sharing fully mediates the influence of complementarities between dense and fragmented instrumental network relationships, thus providing empirical validation of the implicit understanding that networks transfer knowledge. *Fourthly,* the study findings suggest that an optimal configuration of the work-team social-network structure combines both bridging and bonding social relationships.

Keywords: social network, team, effectiveness, knowledge sharing, identity, performance
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Lappeenranta November 2009

Kaisa Henttonen

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2. Henttonen, K., Janhonen, M., Johanson, J-E. & Puumalainen, K. (2009). The demographic antecedents and performance consequences of the social-network structure in work-teams, *EURAM 2009, Renaissance and Renewal in Management Studies*, 11-14 May 2009, Liverpool (under review for the Journal of Team Performance Management)

3. Henttonen, K., Janhonen, M., Johanson, J-E. & Puumalainen, K., (2009). Work-team network structure and performance: the impact of instrumental and expressive social relationships, *Workshop on Information and Organisation Design*, 20-21 April 2009, Brussels (submitted for review)

4. Henttonen, K., Johansson, J-E. & Nikkilä, R. (2009). Work-team social network structure and attitudinal outcomes & performance: the impact of bonding and bridging social relationships, *EBRF 2009, Research Forum to Understand Business in Knowledge Society*, "Emergent drivers of shared business models in globalizing ecosystems", 23-25 September 2009, Jyväskylä (submitted for a review)

The contribution of Kaisa Henttonen to the publications:

1. Sole author.

2. Formulated the research problem, conducted the analyses and wrote the paper. Other authors collected the data, and Professor Kaisu Puumalainen advised on statistics issues.

3. Had the idea for the paper, developed the conceptual framework, conducted the analyses and wrote the discussion and conclusions. Other authors collected the data, and Professor Kaisu Puumalainen gave statistical advice.

4. Formulated the research questions, built and tested the hypotheses, and interpreted the empirical results. Other authors collected the data. I would also like to acknowledge Professor's Kaisu Puumalainen's contribution in giving statistical advice related to this research paper.

PART I: OVERVIEW OF THE DISSERTATION

1. INTRODUCTION

1.1. Background and motivation

Of all the phenomena that have recently affected the business world, few have had as big an impact as networks. They have even been seen as reshaping the global business architecture. (Parkhe et al., 2006) A classical example of a network and also in focus in this study is the informal organisation (Thompson et al., 1998). More specifically, this is a study of informal team-level networks, also termed social networks. The key argument is that structural social capital is an important vehicle for pursuing effectiveness in one of the basic organisational microstructures, namely work teams.

Interest in this topic arose in the context of organising for "business as usual". A lot has been written about the changes that are redefining the environment and forcing companies to examine their organisational design. Public and private organisations are facing challenges on account of discontinuities created by the interdependent global economy, hypercompetition, demassification in some sectors in parallel with enormous growth in others, and knowledge-based competition (Fenton and Pettigrew, 2000). The trend appears to be moving away from the paradigm according to which organisations strive for mass-production efficiencies and rigid compartmentalism in the form of hierarchies and functions (ibid.). On the macro-level the multidivisional organisation (M-form) has come into being as a response to the increasing scale and complexity of enterprises. There is also an emphasis on managing business processes instead of functional departments. (Stewart, 1992) This type of horizontal integration enables organisations to "tear down" their hierarchy and functional structure. They have, for example, responded by using teams as a standard mode of organising duties in an effort to decentralise decision-making and respond more flexibly to their environments (Manz & Sims, 1993; Mohrman et al., 1995). Teams represent the division of labour on the micro-level, and also more emergent design features. Typical of this more emergent design is that work tasks are not arranged in detail beforehand, which has traditionally been considered a fundamental organisational function. Furthermore, duties are not assigned permanently, and carrying out team tasks

requires the acquisition and application of various types of specialised knowledge and skills. (Giddens, 1984; Ranson et al., 1980)

In these types of arrangements the formal organisation thus seems to be present mainly as an institutional skeleton and is not so crucial in determining activities or capabilities (Fenton and Pettigrew, 2000). It is rather the emergent, informal organisation that functions as the central nervous system driving the collective thought processes, actions and reactions, especially when unexpected problems arise. With more emergent organisational design it is thus the analysis of the interaction patterns that determines it (see also Lincoln, 1982). In the firm context these interaction patterns are also termed informal or social-network structures. This study addresses some unanswered questions concerning the different types of team social-network structures, their antecedents and (positive) outcomes.

This study is part of a growing body of research connecting the fields of social capital and social networks. More specifically, the meta-construct of group social capital (Oh et al., 2006) is applied as a promising way of bridging the theoretical divide between the structure of networks and the content of social capital (see also Moody et al. 2009). The model of group social capital was introduced in order to examine in greater depth how a group member's in-group and out-group social-network relationships are related to the group's effectiveness. The model as a whole is not tested in this study, but it is used as a way of investigating the direct effects of social networks and the resources that are made available to work teams through external and internal social-network relationships. To date, relatively little research has been done in the area of group social capital (see e.g., Kratzer et al. 2005; Balkundi et al., 2007; Kratzer et al., 2008 for exceptions); there have been investigations of the direct effects of in-group social-network structures, but the study of out-group network relationships is still in its infancy (see e.g., Oh et al., 2004; Wong, 2008). The primary focus in this work, therefore, is on the direct effects of social-network relations on work-team effectiveness.

The divergent and sometimes conflicting empirical results on the direct effects of social networks on team effectiveness prompted me to ask the question whether there are any mediators between a team's social networks and its effectiveness. One of the

underlying arguments of Adler and Kwon (2002) is that an individual's social-network relationships create opportunities for social-capital transactions. However, the mere existence of a relationship does not guarantee social-capital (positive) outcomes. There have been some recent empirical studies on the mediators between dimensions of social networks and team processes such as knowledge sharing (Hansen, 1999; Wong, 2008). Although some studies have significantly increased understanding of the social-network – team-effectiveness relationship through exploration of the mediators, we still know fairly little about their role. It is proposed in this study that knowledge sharing and team identity could be mediators that translate the (positive) outcomes of social networks into concrete team-effectiveness enhancement.

Furthermore, one issue that has not attracted much attention is how different structural positions are derived (Balkundi et al., 2007), in other words the antecedents of the social structure. Gerald Salancik (1995) also called for a network theory that would explain why certain network characteristics exist: as he states: "much of [organisational theory's] promise has yet to be realised, in that social network analysis has been used mainly for analysing data about organizations rather than for understanding organizations per se" (1995, 345 cf. Parkhe et al., 2006). A further aim of this study is to contribute to this discussion on the team level through examination of the effects of the antecedents on team social networks in terms of team composition.

In order to investigate the research questions concerning 1) the antecedents of social networks, 2) the mediators and 3) the (positive) outcomes of different types of social networks I studied 76 work teams comprising 499 employees representing 48 different organisations from private and public sectors. I decided on team-level analysis because economic behaviour in both the private and the public sectors is often confined to small groups of people interacting with each other (Sonnemans et al., 2006). Thus, one straightforward reason for learning more about small groups, such as teams, is that they permeate organisations, partially determine their effectiveness and affect the lives of their members (see Goodman et al., 1987). Furthermore, previous investigations seem to have concentrated on teams or groups in laboratory settings engaged in non-standard duties (e.g., innovation activities), or on

non-work-related contexts (e.g., student teams). Only a few studies have concentrated on the effectiveness of networks in the standard-duty context, as in this study (see research paper 1).

1.2. Clarification of the key constructs

I will now briefly clarify the concepts that are used throughout the study (see Figure 1 below).

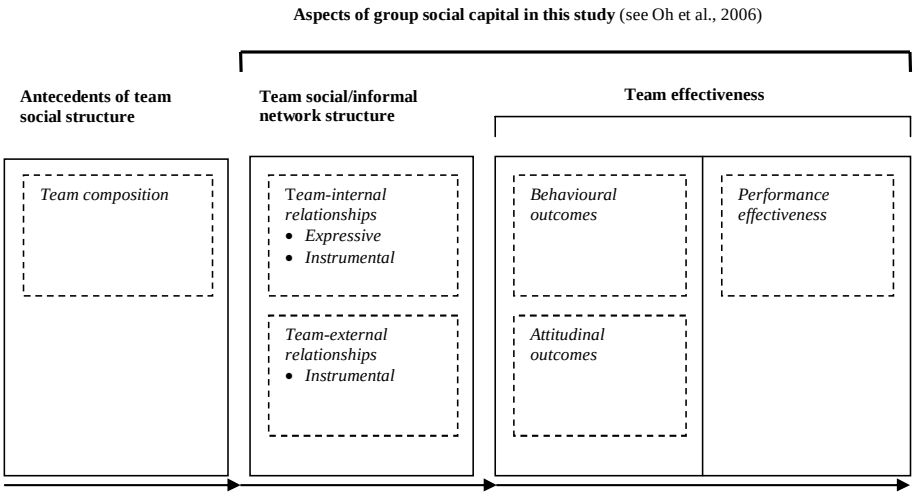

Figure 1. The key concepts of this study

There are various definitions of *teams*. As Guzzo and Dickinson (1996) recommend, I decided to adopt the one put forward by Alderfer (1977) and Hackman (1987). In this study, therefore, a team comprises individuals who consider themselves and others a social entity. Furthermore, these individuals are interdependent on account of the tasks they carry out as a team. Teams are also embedded in one or several larger social systems, and thus are also assumed to carry out tasks that affect third parties such as team-external organisational members. As in most of the literature on organisations, (small) "group" and "team" are treated synonymously (see also Cohen and Bailey, 1997). These two concepts of "team" and "group" are discussed in greater detail in the first research paper. In addition, this study concerns work teams, which

generally have a stable membership and are well defined (Cohen and Bailey, 1997; see also Cohen, 1991, for more on definitions of various types of teams).

The distinction between *formal* and *informal organisational structures* has attracted quite a lot of attention in academic literature (see e.g., Watson and Weaver, 2003; Allen et al., 2007; Gulati and Puranam, 2009). Scientists and academics largely agree that organisational actors use both formal and informal structures in parallel in order to achieve their goals. The formal organisational structure incorporates the prescribed and forcibly generated management systems and structures that are often driven by the corporate strategy and mission (Chandler, 1962). More specifically therefore, it encompasses the processes by which individuals communicate on issues directly laid down and governed by management (Allen et al., 2007). It is assumed in this study that informal social-network structures overlap with formal structures (Granovetter, 1985), and that they are emergent, unsanctioned and un-governed organic structures (Mintzberg, 1973; Tichy, 1981 cf. Allen et al., 2007). As in previous studies (see e.g., Allen et al., 2007), here, too, the terms informal organisational structures/relationships and social-network structures/relationships are used interchangeably. In the firm context the informal social-network structures include working relationships, which are not found in formal organisational structures but result from the personal initiative of employees (Cross and Parker, 2004 cf. Allen et al., 2007).

Informal social-network relationships fall into two broad and overlapping types of relationship, *expressive* and *instrumental* (Ibarra, 1995; Polodny and Baron, 1997), which in this study reflect the diverse positive relationships between the members of the team. The two types of network relationship chosen for this study represent both of these broad categories. Instrumental relationships such as work-related-advice relationships therefore include those through which individuals share work-related resources such as information, assistance and guidance (see also e.g., Sparrowe et al., 2001). I decided to focus on advice networks because they may be strong indicators of current or recent interaction within the work team. Assessing these types of instrumental relationships is worthwhile because they indicate how the work is being done in the teams (see also Cross and Parker, 2004). Individuals interact for many reasons that are not always instrumental (Portes, 1998). Social-support networks, on the other hand, consist of relationships that reflect affection and camaraderie (Baldwin

et al., 1997), and represent expressive networks in this study (see research paper 4). Expressive, i.e. social-support networks were chosen as an object of study because they may be good indicators of the atmosphere in the work team. The dimensions of social support are therefore likely to matter in relation to the quality of working life and information or knowledge flows within the teams (see also Cross and Parker, 2004).

The concept of "*group social capital"* (Oh et al., 2006) is a meta-construct and it is used here as a way of studying the direct effects of the social-network structure and the resources that are made available to work teams through social-network relationships within and outside them, in other words *the team social network*. A network in general is seen here as a set of team members connected to each other by a set of social-network relationships (Borgatti and Foster, 2003). The team social-network structure consists of member-to-member relationships that are aggregated to the team level. The aim in focusing on these *team-internal social-network relationships* is to capture what are also called *bonding social relationships***,** which have been described as consisting of "inward looking [networks that] tend to reinforce exclusive identities and homogenous groups" (Putnam, 2000, 22). Additionally, the team social-network structure in this study comprises team-member relations with other members within the organisation in which the team is embedded. *Team-external social-network relationships* are investigated with a view to capturing *bridging social relations***,** which in turn are considered "outward looking and [to] encompass people across diverse cleavages" (Putnam, 2000, 22). Bonding and bridging social relationships are considered important in this study because they concretise group social capital in describing *what* is the most optimal social-network structure for a work team to achieve effectiveness.

The antecedents of the team social network in this study refer to *team composition*, which basically means the characteristics of the individual members (Stewart, 2006, 30). The research on team composition therefore requires individual differences to emerge into a team-level construct (Stewart, 2006, 32). In line with previous research this was done in this study by means of calculating the coefficient of variation (see e.g., Cummings and Cross, 2003). Furthermore, team composition includes demographic factors and is considered a causal factor (see Levine and Moreland, 1990

for more on treating demographic factors as contextual or consequential[1]) that is expected to affect team effectiveness or the social-network structures within the team. The antecedents of team social networks under examination consist of the members' age, education and gender aggregated to the team level.

There is no single, uniform measure of *team effectiveness*. It is defined in this study according to the dimensions introduced by Cohen and Bailey (1997): 1) performance effectiveness, 2) member attitudes and 3) behavioural outcomes. Team performance effectiveness further includes: a) *team performance,* which is dealt with in this study, and (b) team members' attitudes towards the quality of work life and c) withdrawal behaviours, which are not addressed for design reasons. Team performance is therefore considered to represent *performance effectiveness*.

This study concerns both attitudinal and behavioural outcomes in addition to team performance effectiveness. *Team identity* (see research paper 4) is considered an *attitudinal outcome*. Identification with the team is especially important because it signals the extent to which team members have internalised the identity of the group (here work team). To be more exact, team identity is a team-level construct representing the collective level of identification across all team members (Lembke and Wilson, 1998). It was included here because it is one potent indicator of team functioning. For example, it has been found in previous research that a shared team identity is an important factor in enhancing team performance in that it gives the members a common point of reference and thereby helps to avoid social loafing, which may decrease productivity (Haslam, 2001). Finally, *knowledge sharing* is addressed in this study as a *behavioural outcome* (see research paper 3*)*. It was chosen for examination because it is widely regarded as one of the key benefits of social capital (see e.g., Adler and Kwon, 2002; Burt, 1997; Coleman, 1988; Uzzi, 1997). Previous research has also found that it positively affects team performance (see e.g., Wong, 2008).

[1] Composition as a context means treating it as a social context in which other phenomena are at work. It thus moderates phenomena rather than causing them directly. On the other hand, composition as a consequence is considered a product of other factors. (Levine and Moreland, 1990)

1.3. Research objectives

The overall objective of this study is to explore the effect of social networks on work-team effectiveness. A pertinent question is whether we can predict the conditions under which teams are likely to perform successfully and understand why this is the case. Accordingly, the main research question is:

What is the role of team social networks in predicting work-team effectiveness?

In addressing this question a systematic and critical review of prior research on team social networks and team effectiveness was conducted in order to find out the current state of the research. More specific objectives were to assess the theoretical approaches, research contexts, study designs and operationalisations. Analysis of substantial findings in relation to various types of teams revealed the research gaps. The key question in this respect was to find out what types of social-network structures had been found to facilitate team effectiveness. Thus, the first sub-question was:

1. *What do we already know about social networks and their effects on effectiveness at the team level?* (research paper 1)

The second research question concerned the antecedents of the team's social-network structure, and whether they are more appropriate in predicting team effectiveness than the actual structure. The reasons for pursuing this question were twofold. Firstly, a team's members are its most important resource, and what happens in the team is often reflected in the people who belong to it. Secondly, managers in particular should benefit in that a team's composition has often been considered a "device" that is more easily controlled than the social network within the team. Thus the second sub-question addressed in this study is:

2. *What is the role of team composition in determining the social-network structure and the effectiveness of work teams?* (research paper 2)

According to the literature review (first research paper), there seems to be no consensus as yet on the effects of team social networks on team effectiveness. This may be due to the relatively low number of studies that have been conducted. The review also revealed a research gap that this study could help to fill by examining the direct effects of the team-internal social-network structure. The third sub-question is thus:

3. *What are the effects of various types of team-internal social-network structures on team effectiveness?* (research papers 2, 3 and 4)

Furthermore, it is apparent that most studies on (team) social networks have examined two of the three sets of variables – the social-network structure, and mediators and effectiveness – and treated the third, unmeasured set as implicit (for exceptions see Hansen, 1999 with its implicit assertion about the effects on performance, and Wong, 2008). The entire nomology of social-network structures to mediators to effectiveness (attitudinal, behavioural outcomes and performance effectiveness) has attracted little direct attention. Therefore, rather than focusing purely on the direct effects of the network structure on team performance, this study also examined the mediating role of behavioural (here knowledge sharing) and attitudinal (here team identity) outcomes. This area of inquiry is summarised in the fourth research sub-question as follows:

4. *What are the effects of the social-network structure on team performance mediated by attitudinal and behavioural outcomes* (research papers 3 and 4)?

The research model as a whole is summarised in Figure 2. The figure also summarises the research papers and how they complement each other. Research paper 1 is a review and the aim is to integrate the findings of studies on team social networks and effectiveness in order to identify where the conclusions converge and diverge. The idea is to enhance understanding of team-level social networks, and thus to enable us to channel future research more effectively. Research paper 2 concerns the antecedents of work-team social networks, posing the questions of where the different types of network structures derive from, and what are their direct effects on performance effectiveness (here team performance). The main focus in paper 3, on the

other hand, is on whether knowledge sharing (as a behavioural outcome) mediates the relationship between the different types of team-internal social networks (instrumental and expressive) and team performance. Finally, paper four deals with team-internal and team-external social-network structures, or alternatively bonding and bridging social-network relationships, the question being whether they can predict performance effectiveness (team performance) and attitudinal (team identity) outcomes in work teams. The key variables represented in Figure 1 and their definitions are discussed in more detail in Chapter 1.2. above: "Clarification of the key constructs".

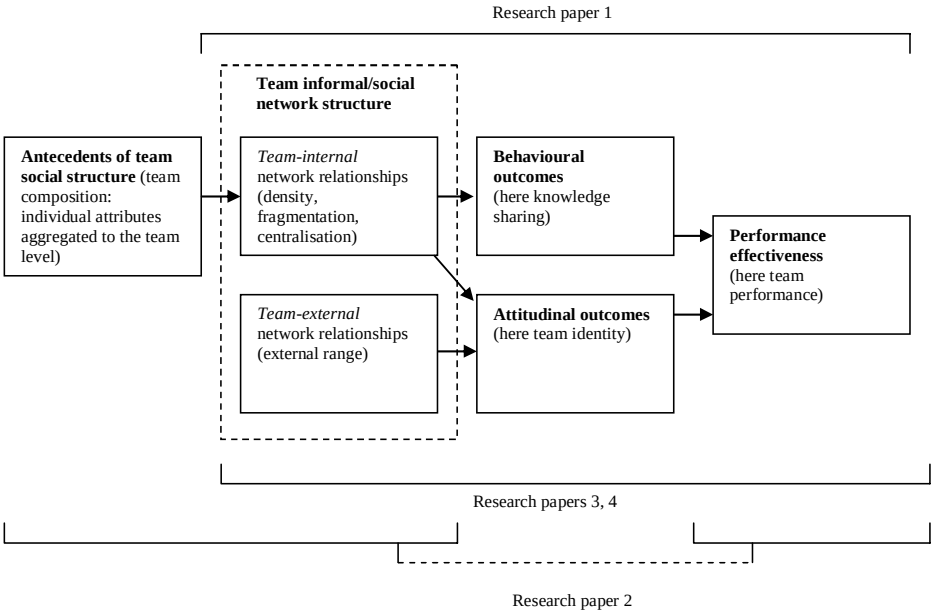

Figure 2. The research model and the research papers

1.4. Scope and limitations of the study

There are some deliberate limitations to this study. Social networks exist within and between organisations. I decided to concentrate on social networks within the firm and, more specifically, on those that exist 1) within teams and 2) between teams and other actors within the focal organisation. Thus, the focus here is on internal

networks, which is crucial in terms of fostering external networks with other organisations (see also Miles et al., 2006).

Social network analysis also facilitates investigation of various types of informal i.e. social-network relationships in a workplace. The ability to map networks of relationships is almost limitless (Cross and Parker, 2004). Generally, however, one should study social networks that are meaningful in terms of revealing the internal workings of a team (Cross and Parker, 2004). In addition to studying instrumental (advice) and expressive (social-support) networks I could have investigated network relationships with the potential for information/knowledge sharing, such as knowledge-awareness or access networks, as well as social-network relationships revealing network rigidity. Analysis of these types of relationships could, more specifically, have identified possible constraints within the work team, such as bottlenecks indicating overdependence on the decision maker (Cross and Parker, 2004).

Furthermore, most of the previous research on team social networks has focused on positive or neutral networks (Sparrowe et al., 2001). This study could have addressed *negative* social-network relationships, which may reveal a structure that potentially impedes work-team effectiveness. This would no doubt have been beneficial given the lack of such studies and the fact that researchers often face the challenge of obtaining valid data in field settings (Sparrowe et al., 2001). Social-network researchers have also distinguished between strong and weak relationships. This categorisation may be based on reciprocity, intensity or affect, for example (see e.g., Reagans et al., 2004)., No distinction between strong and weak relationships is made in this study for reasons to do with its design.

Understanding effectiveness has been a key issue in team research in general, and several models have been created in order to identify a variety of factors (Kirkman et al., 2001). This study dealt with all dimensions of team effectiveness: performance effectiveness (team performance), attitudinal (team identity) and behavioural (knowledge sharing). The choices of measures and why they were chosen are discussed in more detail in Chapter 1.2. "Clarification of the key constructs".

However, it is apparent that other measures of team effectiveness could also have been addressed. Previous studies on team social networks have mainly succeeded in explaining the variance in objective and subjective performance effectiveness, and only to some extent in attitudinal and behavioural outcomes (see research paper 1 for more details). Objective measures in these studies are specific to the task and type of team, such as the number of models produced (Jehn and Shaw, 1997), the number of published position papers, project proposals and scientific/technical articles (Reagans and Zuckerman 2001), and patents (Reagans and Zuckerman, 2001, Mote 2005). Subjective measures have been collected through survey questions focused on perceptions of overall team effectiveness among team members (see e.g., Kratzer et al., 2005; Leenders et al., 2003), managers (see e.g., Oh et al., 2004; Reagans and Zuckerman, 2001), or both (e.g., Cummings and Cross, 2003). Work quality (Oh et al., 2004; Cummings and Cross, 2003; Wong, 2008) in terms of the group's initiative, its ability to respond quickly to problems (Oh et al., 2004), innovativeness (Wong, 2008), creativity (Kratzer et al., 2008), meeting objectives (Lucius and Kuhnert, 1997), and cooperation with other groups (Oh et al., 2004) are examples of subjective measures. Some attitudinal (commitment; Jehn and Shaw, 1997 and satisfaction; Lucius and Kuhnert, 1997) and behavioural-outcome (knowledge sharing; Wong, 2008) variables have also been assessed in a few previous studies. The latter are addressed in this study.

1.5. Outline of the study

This thesis comprises two parts. The first part gives an overview of the whole study, and the second part consists of four research publications. The outline of the study is depicted in Figure 3.

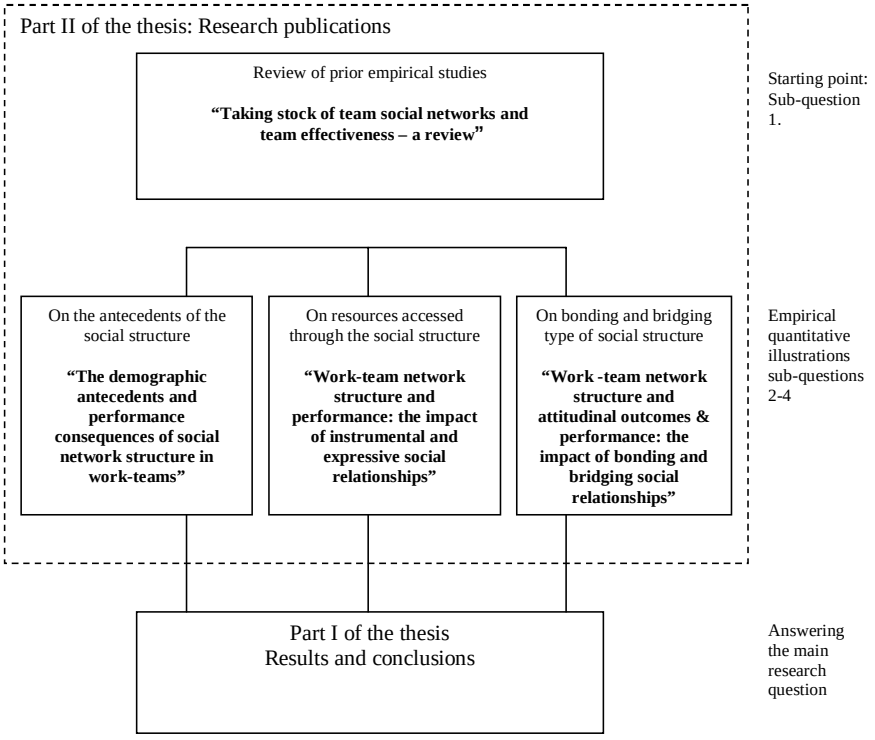

Figure 3. The outline of the study

The first part of the dissertation comprises six chapters. The first one, the introduction, deals with the background, motivation, objectives, scope and outline of the study. The second chapter discusses the theoretical background. Chapter three describes the research strategy and methodology, and Chapter 4 discusses the research findings. The fifth chapter presents the contributions of the study, offers suggestions for further research and discusses the limitations. Finally, Chapter six gives the conclusions.

Part II consists of four research publications. The first one reviews the previous research in order to identify what we already know about the research topic, and the other three adopt various perspectives on the relationship between the team social-network structure and team effectiveness. The second paper concerns the antecedents of the network structure and its impact on performance effectiveness, namely team performance. The third one discusses the moderating role of knowledge sharing

between the network structure and team performance. Finally, the fourth paper deals with internal and external team social networks and their impact on attitudinal (team identity) outcomes and, ultimately, on performance effectiveness (team performance).

2. THEORETICAL BACKGROUND

Within the "big picture" this study is linked to the question of how social life is coordinated. According to Thompson et al. (1998), networks, in addition to markets and hierarchies, are genuine "models" of coordination that can be both characterised abstractly and used as an analytical framework in order to understand how social life in general is organised. In comparison to hierarchy and market coordination, however, network coordination is less formal and more cooperative and egalitarian. (Thompson, 1998) Miles and Snow (1993) see the network form as part of the continuing evolution of the capitalist enterprise from the functional organisation of the late nineteenth century to the divisionalised form and, further, to the matrix form.

A network is often seen as a "flat" organisational form. It highlights the informal, i.e. social relationships between generally equal social agents and agencies, and is mainly shaped via the structures of interpersonal interaction. A classic example of a network, which is also in focus in this study, is the informal, collegiate organisation. (Thompson, 1998) It is from this type of relational perspective, which again is adopted in this study, that the real work of a human organisation goes on within the space of interaction between its members (Bradbury and Bergmann Lichtenstein, 2000, 551). This also means accepting the basic idea of the network perspective, which highlights the fact that actor-to-actor relationships are most likely to be influenced by the overall set of relationships (Mitchell, 1969): a social system comprises a variety of people who act as "reference points" in one another's decisions (Knoke and Kuklinski, 1998). Thus, the focus here is on the structures of the entire social network of the team rather than on the characteristics of the teams that comprise it. This type of approach comes from the social-network perspective. In accordance with the alternative, atomistic perspective typically assumed in economics team members are considered to make choices and to act without taking the behaviour of other actors into account (Knoke and Kuklinski, 1982, 9).

2.1. The social network perspective

This study is based on the idea of networks as a perspective, which originates in social-network analysis and aims at capturing relational embeddedness in organisational action. Sociology, and especially economic sociology, has played a central role in introducing the social-network concept to the field of organisational design. Network analysis as such, and social-network analysis in particular, offer alternative conceptualisations and techniques for analysis. (Fenton and Pettigrew, 2000)

If network analysis were limited to the conceptual framework for analysing how actors are linked together it would not have aroused much interest. However, the approach has explicit premises of great consequence: the structure of relations among actors and the location of individual actors in the network have significant behavioural, perceptual and attitudinal consequences both for the individual units and for the system as a whole. (Knoke and Kuklinski, 1998) It is apparent that the networks in which people and teams are embedded affect the success and failure of their undertakings (see also Ibarra et al., 2005). One of the reasons for the lack of studies in this particular area may be that previous results were not very well suited to policy domains, and the data collection was both expensive and too time-consuming. Given the time and risk involved in collecting whole-network data as in this study, scholars have tended to avoid embarking upon studies in which the scores and the variation in the dependent variable are known very late in the research process (see also Raab and Kennis, 2009). However, organisations have become more and more interested in results that can be gained through social-network analysis as they have become more and more aware that they can actually change their design and thus adapt and adjust to the environment (Lawrence and Lorsch, 1967; Woodward, 1965; Baligh et al., 1990). There is also evidence that altering the design may improve performance (see Burton and Obel, 1984; Lawrence and Lorsch, 1967).

There is no general official definition of the social-network perspective. However, there are some underlying ideas on which scholars agree. Wellman (1988) identified the core principles that create the “underlying intellectual unity” of network research

(see also Katz et al., 2004) First, people's behaviour is best determined by the social network in which they are embedded and not by their intrinsic attributes, such as demographic characteristics. This follows the embeddedness argument, postulated by Granovetter (1985), which suggests more specifically that economic action is structurally embedded in social networks. Secondly, the focus of social-network analysis lies in the social relationships among individuals and not in the intrinsic attributes of the network members. Thus, according to Scott (2003), social-network data is relational (e.g., density, centralisation) and not attribute-related (e.g., gender, age). Thirdly, typical of social-network analysis is the focus on the pattern of relationships in the whole network and not only on the dyadic relationships between individuals. This implies that a person's behaviour is influenced not only by his/her interaction with another party in a dyadic relationship, but also by the relationship between him/her and every other member in the network as well his/her position within it. Fourthly, the boundaries of groups are blurred rather than sharp, and organisations are considered to consist of overlapping networks rather than discrete groups: in this study group/team is considered to be an exogenously determined boundary around a set of people (Katz et al., 2004). Finally, the data analysis must not depend on the traditional assumption of independence, the reason being that the sample is determined relationally rather than categorically. There is thus an underlying assumption of interdependence between units. In addition to its special theoretical characteristics the social-network approach is also characterised by its special methodology and techniques for data collection and statistical analysis, which is known as social network analysis and it is applied in this study. It is discussed in more detail in the methodology section (Chapter 3).

The question of whether the social-network tradition is based on any real theory or theoretical approach has created a great deal of debate among researchers. Some see it rather as an "orientation towards the social world" and "a collection of methods" (Scott, 2003, 27), whereas others (Degenne and Force, 1999, 12) believe that there is "as theory of social structures" to be found in the approach (Kilduff and Tsai, 2007). In this research and in this respect I follow the latter view. Social-network theory[2] is

[2] Of course, it can be questioned whether there is a social-network theory at all. This leads to the question of what a theory is in the first place. It is too large an issue to be settled here, and I thus refer to the ideas presented by Kilduff and Tsai in their 2007 book "Social networks and organizations"

not a single entity but rather a collection of theories under one umbrella. (Kilduff and Tsai, 2007) The key idea idea behind social-network theory is rather simple: it questions whether the social networks in which people are embedded affect their behaviour. More specifically, people's behaviour depends on their interaction with one another and their relationships with the overall network. Furthermore, it is not just individuals whose success and/or failure depend on the social-network structure in which they are embedded, but also e.g. teams, as in this study.

2.2. The concepts of social capital and group social capital

As discussed above, scholars have generally agreed on the key principles of the social-network perspective, but there are different explanations as to *why* people invest in relationships (Katz et al., 2004). This study adopts the social-capital explanation, which is dealt with next. The notions of homophily and heterophily are also used as a basis for investigating the antecedents of the social structure in work teams.

Network researchers also represent other approaches such as theories of mutual interest and collective action (e.g., Marwell and Oliver, 1993; Fulk et al., 1996; Monge et al., 1998), social exchange and dependency (e.g., Homans, 1950; Emerson 1972a; Emerson, 1972b cf. Katz et al., 2004), and various cognitive theories (e.g., Hollingshead, 1998; Moreland, 1999; Heider, 1958). According to Katz et al., (2004), theories of mutual interest and collective action generally aim at explaining why group members contribute to the collective good so that everyone in the group is able to enjoy it. One of the most highly developed examples of this type of theory is that of the public good (Samuelson, 1954), the key premise being that no member of the group can be excluded from enjoying the public good. In the context of team research these types of phenomena have been examined as part of the "free rider" problem. Cognitive theories focus on cognition from different perspectives: transactive memory

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Their general argument is that theory, in order to be a social-network theory, needs to fulfill certain requirements. First, it needs to address the formation, evolution or dissolution of network relationships. It also has to inform us about the antecedents and outcomes of structural positions in networks. Pure descriptions of the structure cannot therefore be considered a theory.

concerns what team members think others know, whereas cognitive consistency is more a matter of whom team members think other members like, for example. Theories of social exchange and dependency, on the other hand, imply that individuals are motivated to create network relationships because they aim to decrease dependence on those from who they need resources and maximise their dependency on those who need resources from them. Thus, the main interest among individuals is not in maximising their personal interest, as in the social-capital approach.

Social capital is one way of conceptualising returns on investment in relationships. Nahapiet and Ghoshal (1998) transferred the concept to organisational theory by building on Moran and Ghoshal's (1996) idea of value creation through the combination and exchange of resources. Nahapiet and Ghoshal (1998) transferred the concept to organisational theory by building on Moran and Ghoshal's (1996) idea of value creation through the combination and exchange of resources. Nahapiet and Ghoshal (1998) developed a social-capital-based rationale for the existence of a firm as an alternative to the classic approach of Williamson (1975; 1981) concerning monitoring and opportunism. It offers a more socially oriented perspective and is in line with the more recent theories of the firm positing that its principal purpose and source of competitive advantage is the creation and dissemination of firm-specific knowledge (Kogut and Zander, 1996). Thus, a major component of this competitive advantage is seen to reside in an organisation's social capital. Nahapiet and Ghoshal (1998) argue that an organisation should be seen as a social community. Its advantage accrues from a range of factors, such as having a group of individuals with functional expertise who communicate, coordinate, cooperate and exchange information. Relationships are created through exchanges between team members, and the resulting network structures are the basis of social capital (Nahapiet and Ghoshal, 1998).

It is acknowledged here that social capital exists in different forms (Coleman, 1988) or dimensions (Nahapiet and Ghoshal, 1998; Koka and Prescott, 2002), and that despite the large amount of theoretical and empirical work carried out there is still no consensus on the concept or on the processes that affect its acquisition (Nahapiet and Ghoshal, 1998). Nahapiet and Ghoshal (1998) provide a useful framework, however. They distinguish three dimensions of social capital, the structural, the cognitive and

the relational. The structural dimension refers to the network relationships, the network configuration and appropriate organisation. The cognitive dimension focuses on shared codes, language and narratives, and the relative dimension concerns norms, obligations and identification. The main interest in this study is on the structural dimension. The social-network approach is usually adopted in studies on structural social capital (Brass and Burkhardt, 1992), as it is here.

Given that the ultimate value of a specific form of social capital also depends on contextual factors, it is suggested that the following four levels of analysis are appropriate in the organisational context: individual, group, organisational and inter-organisational (Gabbay and Leenders, 1999). The analysis in this study focuses on the group level. More specifically, the study focuses on one of the fairly unexplored aspects of social capital - the question of whether team social capital (also termed "group social capital"; Oh et al., 2006) determines group effectiveness.

Group social capital

Group social capital is defined in this study as in Oh et al., (2006): "*The set of resources made available to a group through group members' social relationships within the social structure of the group itself, as well as in the broader formal and informal structure of the organization*", although the formal structure is not examined here. It could be considered a meta-construct that includes the set of resources flowing through the relationships and also the structure and configuration of the relationships themselves (Seibert et al., 2001).

All in all, the key argument is that group social capital promotes group effectiveness. The primary emphasis in this study is therefore on the benefits that the work team can achieve by participating in social networks. According to Locke (1999), however, this "more is better" perspective does not take into account the loss of objectivity that may occur if actors are deeply embedded in an existing network, thereby excluding potentially beneficial actors or ideas. He also points out that the notion of social capital ignores the role of individual discovery: knowledge is not only created through social interaction, it is also an intellectual process. Furthermore, Adler and Kwon (2002) offer a framework questioning the "more is better" logic, pointing out that social capital brings both benefits and risks. They suggest that risks accrue for three

main reasons: firstly, actors may become over-committed to specific relationships; secondly, cliques may produce exclusionary effects in the organisation; and thirdly, the solidarity benefits of social capital may also restrict the flow of new ideas if an actor becomes too tightly embedded in a certain relationship. It is hereby acknowledged that the focal study also suffers from the limitations of this one-sided perspective.

According to Oh et al., (2006), group social capital has some special characteristics not identified in previous discussion on social capital. The prime source comprises the existing ties within the team. Thus, the group itself could be considered to have a social structure. It should therefore be examined as a whole and also as the sum of its parts. Accordingly, groups can be divided into sub-groups and the members may vary in terms of their hierarchical position. Secondly, groups should be considered in a broader context (e.g., Firebaugh, 1980; Gladstein, 1984 cf. Oh et al., 2006). A group member may gain social capital by belonging to certain sub-groups within or outside of the team. Hence, the notion of group social capital is also linked to the work on group interface management and effectiveness (see e.g., Ancona, 1993; Ancona and Caldwell, 1992), which has shown that effective group interface management is important in that it improves access to political and informational resources.

The definition of group social capital in Oh et al. (2006) also takes resources more broadly into account than the previous definitions, which have limited the discussion to resources such as information and referrals (Burt, 1992). The relationships group members have with other members of their organisation may provide them with various types of resources when they need them. These resources could be broadly categorised as instrumental or expressive. Instrumental benefits include access to political support (see Ancona and Caldwell, 1992) or information/knowledge (see also Wong, 2008), which is also examined in this study (see research paper 3). Examples of expressive benefits include emotional support (Ibarra, 1993; Wellman, 1992) and team identity (Somech et al., 2008; Bezrukova et al., 2009), both of which are considered in this study, too (see research paper 4).

Previous research has identified two main types of relationship through which social capital flows: 1) bonding social relationships and 2) bridging relationships, both of

which are addressed in this study. The focus here, in comparison with the dimensions of social capital (see e.g., Nahapiet and Ghoshal, 1998), is on the actors who are utilising it. The notion of bonding and bridging social relationships has largely developed around two distinct research streams, each with different conceptualisations of what social capital represents and how it is measured.

Bonding social relationships mean the relationships among individuals within the focal group, i.e. the work team (see Sandefur and Lauman, 1998). Also termed bonding social capital, this stream is largely based on the work of Coleman (1988) and Putnam (1993, 1995). Social capital is seen as a feature of social organisations based on networks of interaction in which, for example, norms of reciprocity enhance coordination and cooperation for mutual benefit (Smith, 2005 cif. Smith, 2006). In this form it is based on dense networks of social interaction. It is considered to reduce incentives for opportunism and to change the individual's sense of self from "I" to "we", thus enhancing the appeal of mutual benefit (Putnam, 1993; Johnson et al., 2000).

Bridging social relationships refer in this study to the external relationships of individuals within groups, i.e. work teams (see Burt, 1992; Putnam, 2000). This stream of research, also termed bridging social capital, is often related to the work of Burt (1992), and focuses on the "private goods" aspect of social capital (see Leana and Van Buren, 1999). Burt (1992) defines it in terms of the information and control benefits that come to individuals who are able to find gaps between non-redundant contacts in the network. (Burt, 1992) The next sub-chapter discusses in more detail the findings reported in the literature on the benefits of both bridging and bonding relationships in teams.

2.2.1. Outcomes of group social capital

It is suggested in the research on networks that social actors gain benefits through social capital based on the bonding type of social relationship (Portes and Sensenbrenner, 1993). On the team level, previous research has assessed the effects of team social networks on outcomes such as creativity (Kratzer et al., 2008), and a

combination of grades (Baldwin et al., 1997), position papers, project proposals and published scientific/technical articles (Reagans and Zuckerman, 2001), patents (Reagans et al., 2001; Mote 2005) and patent applications (Reagans and Zuckerman, 2001).

However, other researchers have suggested that actors connected by bonding, redundant relations might suffer from constrained flexibility and authority (Burt, 1992). Accordingly, the ability to gather resources and ideas from diverse groups is important to success (Polodny and Baron, 1997). Previous research has established that bridging types of social-network relationships in teams have a positive impact on aspects such as the ability to complete work on time, the quantity (Oh et al., 2004) and quality (Oh et al., 2004; Wong, 2008) of work done, and the team's initiative and ability to respond quickly to problems (Oh et al., 2004).

However, recent studies have found that both redundant and non-redundant relationships (relationship-portfolio thinking) are necessary in order to achieve optimal performance (see e.g., Reagans and Zuckerman, 2001; Reagans and McEvily, 2003; Wong, 2008). According to Reagans and Zuckerman (2001), these opposing views represent two different types of social relationship, namely bonding and bridging relationships. They argue that both types may be important in teams (especially in the R&D context). The former facilitates coordination and collective action within the team, whereas the latter functions as a basis for information transfer and learning. This could be seen as a small stream of research recognising that optimal network configurations combine seemingly conflicting elements, such as density and external range (Reagans and Zuckerman, 2001; Reagans and McEvily, 2003).

There also appears to be a lack of studies on behavioural outcomes in the literature on group social capital. Studies focusing on social networks and teams usually explore only two of the three variables comprising relationship characteristics, mediators and effectiveness, and the third unmeasured variable is often considered implicit. An exception to this is the study carried out by Wong (2008) investigating the relation between bonding and bridging social-network relationships, knowledge processes and group effectiveness. He found that breadth of knowledge (meaning a wide range of

knowledge) mediated the relationship between bridging social relationships and group effectiveness. Finally, there is little research on the attitudinal outcomes of social networks on the team level. The assumption that more bonding relationships lead to better job satisfaction has been supported (Lucius and Kuhnert, 1997), for example.

2.2.2. Antecedents of group social capital

The concepts of homophily (Festinger, 1954) and heterophily (Simmel, 1950 cf. Kilduff and Tsai, 2007) are used in this study as another explanation of why people engage in social-network relationships. More specifically, they provide the basis for an exploration of the antecedents of structural social capital in work teams, representing two conflicting views on team heterogeneity.

According to the principle of homophily, social networks in teams are more likely to form among members who are similar than among those who are dissimilar (see McPherson et al., 2001). It was noted in early structural analyses that both the probability of the existence of a network relationship and its positive nature were related to similarity between the nodes (see Freeman, 1996 for a review), or team members in this study. Homophily also implies that differences in social characteristics may also affect the social-network structure: dissimilar members are not closely connected to each other (McPherson et al., 2001).

Two types of homophily have been distinguished, status homophily and value homophily (Lazarsfeld and Merton, 1954 cf. McPherson et al., 2001). Value homophily, which is not examined in this study, refers to the variety of attitudes, beliefs, abilities and aspirations that may shape the behaviour of an actor in the future. This study concentrates on status homophily, because it represents the major sociographic dimensions that categorise society. It includes characteristics that are based on informal, formal or ascribed status. These characteristics may be a) ascribed, such as race, gender and age, or b) acquired, such as education and occupation. The dimensions of status homophily included in this study are age, gender and education. They were chosen to represent both ascribed and acquired characteristics.

Thus, as people have a strong tendency to cluster together based on shared characteristics, it could be assumed that informal organisational networks are likely to fragment into separate groups that are not connected to each other at all, or only to some extent (Kilduff and Tsai, 2007). However, the reverse may be the case, according to the heterophily principle (Simmel, 1950 cf. Kilduff and Tsai, 2007): regardless of the propensity of individuals to interact with similar others, those in diverse groups have access to other individuals with different backgrounds, networks, information, skills and experiences.

This perspective lies behind concepts such as weak ties and structural holes, i.e. interpersonal gaps, in the network literature. The presence of structural holes in a team may, for example, prevent the restrictive enforcement of norms that occurs among mutual friends (Krackhardt, 1999). Routines may also turn into rigid rules in cohesive teams in the absence of structural holes (Barker, 1993). These examples illustrate how structural holes may function as vehicles that encourage a diversity of views and openness to new ideas within teams. The theory of weak ties (Granovetter, 1973) promotes similar ideas: distant and infrequent relationships, i.e. weak ties, facilitate knowledge sharing in opening access to novel information through the bridging of groups and individuals that may otherwise be unconnected.

The problem with both of these principles, however, is that they are not considered well-articulated theoretical perspectives, and often place emphasis on the preference to work with similar others or the value of diverse information, knowledge and perspectives (McPherson et al., 2001). It is also acknowledged here that the literature on teams, unlike that on networks, often discusses the notions of homophily and heterophily from the social-categorisation perspective on work-group heterogeneity and the information-and-decision-making perspective, respectively (see Mannix and Neale, 2005 and van Knippenberg and Schippers, 2007 for extensive reviews). It has been pointed out that neither of these two perspectives incorporates a clearly articulated theoretical framework (van Knippenberg and Schippers, 2007).

Social categorisation starts from the notion that similarities and differences create a basis for categorising oneself and others into groups. More specifically, this means distinguishing between in-group members, who are similar, and out-group members,

who are dissimilar. It may be that, as a result, homogenous work groups operate more smoothly than heterogeneous groups, and that members of similar groups may be more satisfied and attracted to the group because it comprises similar members (see e.g., Murningham and Conlon, 1991, in relation to higher performance).

The information/decision-making perspective, on the other hand, highlights the positive aspects of work-group heterogeneity. It is based on the idea that heterogeneous teams are likely to have more task-relevant skills, knowledge and abilities as well as members with different opinions and perspectives. They thus have larger pools of resources and may be especially effective in handling non-routine problems. Moreover, heterogeneity may stimulate thinking and prevent too early consensus on issues that need thorough consideration (van Knippenberg et al., 2004). Some previous studies have also found evidence of an association between higher heterogeneity and performance (Bantel and Jackson, 1989).

2.3. Summary of the theoretical foundations

In sum, this study bridges the literature on social capital and social networks (see Figure 4). The meta-construct of group social capital (Oh et al., 2006) is used as and considered a promising bridging mechanism for combining *the structure of networks* with *the content of social capital* (see also Moody et al. 2009) on the team level.

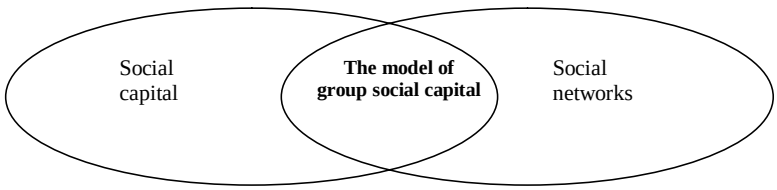

Figure 4. A summary of the key theoretical premises of this study

It is often posited in team-level studies on social capital that do not explicitly focus on social-network relationships that the system works through mechanisms such as

aggregated team-level communication (see Chen et al., 2008; van Emmerik and Brenninkmeijer, 2009) and does not depend directly on a particular network relationship. Additionally, social capital may also comprise, apart from social networks as socially meaningful feelings or values that are independent of the micro-network structure, in other words content without structure (Bollen and Hoyle, 1990 cf. Moody et al., 2009). On the other hand, research on social networks that does not take social capital into account often focuses on network relationships and structures, in other words on the social structure, and ignores the content. Network researchers adopting this approach have been called "formalists" (Wellman, 1988). For example, a formalist enquiry would be a study on the spreading of computer viruses through email address books: the virus will spread regardless of the type of relation (Moody et al. 2009).

It is argued in this study that implicit in the model of group social capital adopted (Oh et al., 2006) is the assumption that full specification of the theory in the team social-network field requires attention to content. The study therefore leans on the self-interest paradigm that is based on the work of Coleman (1988). Coleman (1988) demonstrated how two-actor interactions, with both of the actors operating from self-interest, constitute the basis of a social system (i.e. a small group such as a work team). Each actor (here team member) is trying to maximise his/her own self-interest, being simultaneously embedded in and constrained by the interdependent relationships with the other actor (here, other team members). The relationships are thus considered both to limit actor (team member) behaviour and to give improved access to resources through other actors (other team members). (Katz et al., 2004)

Incorporating social capital into social networks has various potential benefits. The literature on social networks has traditionally focused on the "absence" or "presence" of network indicators. The concept of social capital may help researchers to identify which types of relationship are relevant in various social situations and thus to improve social-network indicators of a binary nature: this study concerns both instrumental and expressive networks, for instance. Research on social capital could also help in conceptualising network models in terms of highlighting how the context shapes social-network relationships. In accordance with the theory of group social capital, this study enhances understanding of team effectiveness in investigating how

work teams are embedded in the larger organisation. The importance of context is also evident in determining who is likely to create social-network relationships with whom, and whether this affects the team's network structure. The notions of homophily and heterophily offer alternative explanations for this type of enquiry. For example, from the heterophily perspective work-team heterogeneity in relation to age has been found to protect teams from fragmentation (Balkundi et al., 2007).

In short, in accordance with the model of group social capital (Oh et al., 2006), it is argued that in predicting work-team effectiveness we are well advised to integrate the insights gleaned from the literature on social capital and social networks. Furthermore, this represents the new wave of thinking to which this study is meant to contribute.

3. RESEARCH METHODOLOGY

The chosen research strategy, methodology and data-collection process are discussed in this chapter. It begins with a description of the systematic review, continues with a discussion on social network analysis as a research approach and introduces the quantitative study.

3.1. Review and analysis of prior studies

In response to the first research question the research process began with an extensive systematic literature review: the review of prior academic literature is an important feature of any academic project. In this case it was strictly focused on the team level. Given the nature of the research problem the emphasis was on empirical, quantitative studies. The aims were to find out what is known about team-level social networks and team effectiveness, and to identify and describe the gaps in the literature with a view to suggesting areas for further research.

Three specific criteria were used in selecting and assessing the potential studies for review.

1. They had to deal with social-network structures within the team and their effectiveness on the team level. I set this criterion because the key idea was to establish whether there is a reason for studying team or work-group social networks in terms of team and group effectiveness.
2. They should include an empirical study of any kind of team, such as groups and project teams in organisational, laboratory, military and university/school settings. I retained some theoretical and conceptual studies, however, because I wanted to investigate the possible effects of social networks in teams. These types of articles occasionally proved useful in enhancing understanding of the relationship between the team's structural social capital (Oh et al. 2006; Goyal and Akhilesh, 2007; Evans and Carson, 2005) and its effectiveness.
3. They had to have been published in a peer-reviewed journal. The focus was on journal articles because they are the primary means by which scholars seek to disseminate their results. Furthermore, limiting the review to journal papers was considered one means of ensuring the sample quality.

First, I conducted a search for journal articles within ABI/INFORM, ELSEVIER, EMERALD and EBSCO (academic search elite and business source elite). I used keywords such as "networks", "social networks", "informal networks", "social network analysis", "performance", "efficiency" and "outcomes", preceded by the term "team", "group", "project", or "virtual team". At this stage I did not restrict the subject area of the research, nor did I limit the time period, although I was aware of the recent surge of interest in this particular area of study. I then analysed the results in order to identify articles that were of relevance in the field of organisational studies. At this stage, therefore, I discarded studies dealing with computer or neural networks.

The next step was to read through the remaining article abstracts, which often gave enough information on the level of the study and the methods used. I was then able to eliminate studies focusing purely on the individual (e.g., Klein et al., 2004), organisational (e.g., Tsai and Ghoshal, 1998) or industry (e.g., Rowley et al., 2000) level, and also those focusing on the antecedents of team social networks such as personality, proximity and the organisational structure (see e.g., Klein et al., 2004; Hinds et al., 2000). Articles on team network structures in which the assessment only related to the impact on organisational performance (e.g., Harrington, 2001) were not

included either: I found that the majority of the research in the organisational context concerned dyads. I further eliminated studies focusing on overall communication among team members (Shah and Jehn, 1993), on how much the members spoke (Brown and Miller, 2000) and what each member said (Larson et al., 1996). I acknowledge the rich body of research on work groups since Mayo (1933), but I decided not to include it or more recent studies on the relationship between teamwork and project success (e.g., Hoegl and Gemuenden, 2001; Hoegl et al., 2003; Hoegl and Parboteeah, 2007). The results of this later research nevertheless complemented the reviewed studies in highlighting the performance effects of collaborative relationships and communication as one of the key components of teamwork quality.

Having identified relevant and potentially relevant articles I read them in detail in order to make sure that they suited the requirements of the research. I also used the ISI Web of Knowledge citation index in order to trace all citations of the relevant studies I had identified, and thus to find out if there were any I had missed. As a further check I conducted searches within specific journals such as the Journal of Engineering and Technology Management, Social Networks, Management Science, the Journal of Organisational Behavior and Administrative Science Quarterly in order to ensure that the initial searches were as thorough and as comprehensive as possible. I chose these specific journals for further search because they seemed to concentrate on the types of study in which I was interested . The final sample included 32 studies altogether.

Thereafter, following Provan et al., (2007), I summarised each article that suited the purposes of the study in Microsoft Word tables that included, for each one, the reference, the theoretical framework used for the conceptual development of the analysis, the research focus, the nature of the teams examined, the methodological approach (including the data collection, the sample size, the usable response rate, the key informants and the analytical approach), and the key conclusions. These article summaries provided easily identifiable markers for comparison with the research being conducted in the field.

3.2. The quantitative study

The aim in the quantitative phase of this study was to find answers to the sub-questions dealing with the antecedents and the mediators of social networks, and the effect of social networks on team effectiveness. At this phase, in autumn 2008, several social-network professionals - Senior Lecturer Jan-Erik Johanson from the University of Helsinki and researchers Minna Janhonen and Riku Nikkilä from the Finnish Institute for Occupational Health - gave me access to the team-level social-network data they had collected, and agreed that I could write based on it within certain limitations in order to avoid excessive overlapping with their studies. The questionnaire was thus developed and realised in collaboration with the Faculty of Political Sciences at the University of Helsinki and the Finnish Institute of Occupational Health. I used social-network analysis to study the network structures within work teams. The discussion therefore turns next to social network analysis as a research approach, and then to the measures applied and the analyses conducted.

3.2.1. Social network analysis as a research approach

Social network analysis was used in this study for one main reason: it complies with the main aim of the research in that it has been used to study social-network relationships between actors. Given the research aim to identify the outcomes of social-network structures in work teams it was potentially useful in this respect, too: it helps in tracing not only the absence and presence of such relations but also their structure.

More specifically, social network analysis was also selected on account of the special benefits it provides (Katz et al., 2004). First, it makes it possible to explore various features of small-group interaction, such as the existence of isolates and the importance of hierarchy (e.g., through centralisation measures). Secondly, its focus on team structural social capital allows examination of the embeddedness of a small group (i.e. team) in its external environment (see also Katz et al., 2004): the literature on teams has typically focused on team-internal dynamics, but no team is an island.

Furthermore and thirdly, the approach yields more information on the interaction between a team's internal functioning and the external environment. For example, Baldwin et al. (1997) found that student teams with a higher-than-average number of (friendly) external contacts were less successful (in terms of team effectiveness) than those that were less expansive.

Other potential methods for investigating the relationship between team social networks and team effectiveness include laboratory experiments (see e.g., Bavelas, 1950; Leavitt, 1951). Early studies on small-group networks from the 1950s and 1960s involved manipulating the pattern of interaction among members of small groups. The researchers controlled who could send messages to whom, and then measured the impact of the various patterns of interaction on group functioning and effectiveness. This approach was rejected for this study, however, because I questioned whether the essentials of a relationship could really be captured in an artificial laboratory setting. For example, studies in laboratory settings have suggested that certain types of network structures are more beneficial than others for diffusing information in small groups. Generalising the results may be risky, however, because in real life the problems in natural work settings may be unclear whereas laboratory teams often work on a problem generated by the researcher. Additionally, the researcher may determine the optimal information flow in laboratory settings, but in natural work settings the information flow is likely to be more emergent and to depend on various contextual factors such as the personal characteristics (e.g., expertise) of the team members. Furthermore, information diffusion may be facilitated by different network structures than information exchange, for example (see also Cummings and Cross, 2003).

Another approach would have been to follow traditional team thinking and concentrate on aggregated levels of communication (e.g., Shah and Jehn, 1993), in terms of asking how much each team member speaks or who says what. It would also have been feasible to study the extent of the presence of social network relationships at an aggregated level[3] (see e.g., Tiwana, 2008, Chen et al., 2008). However, this

[3] Tiwana (2008, 272), network items: Members of this team a) vary widely in their areas of expertise, b) have a wide variety of different backgrounds and experiences, c) have skills and abilities that complemented each other'.

would have left me without information on the actual distribution and the structure of network relationships, which are also of importance in understanding the outcomes of the social-network structure at the team level. I therefore decided against the traditional approach.

Furthermore, I did not adopt a qualitative approach because it could not have answered the research question on the impact of the social-network structure on team effectiveness. However, I could have used interviews to complement the survey: they would probably have enabled me to dig deeper into the mediators of team social networks (see e.g., Coviello, 2005). However, this type of approach was not feasible for reasons to do with the study design: I did not have further access to the teams concerned.

3.2.2. Data collection

The data I used for the current study was collected in Finnish companies during the year 2005. A mail survey was distributed and a total of 595 individual responses were received. The sample of teams was based on information provided by the Maintenance Work Ability (MWA) barometer: MWA data was gathered from a random sample of Finnish work organisations with at least two members, including approximately 900 organisations altogether.

Sampling the organisations

The 900 organisations in the original MWA data were selected by stratified random sampling. Personnel (dummy variable), industry sector (private, community, state) and location (as a dummy variable: Southern Finland, Western Finland, other parts of Finland) were used as a stratum. In more simple terms, the sample includes 1) work organisations of different sizes 2) from different industry sectors and 3) from each location in proportion to the number of employees at the time of the sampling. This

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Chen et al. (2008, 27), network items: Team members build networks with marketing and other project teams in order to exchange ideas and information about new product development; Team members collaborate in order to get information about customer needs; Team members connect with other projects within the organization in order to generate a new product idea; Team members seek top-management support in terms of resources (e.g., finance, human capital and facilities).

strategy was chosen to ensure that the data well represents employed people, i.e. the working population. If the sampling had been done directly in proportion to all business locations, small and medium-sized enterprises would have been over-represented and the data would not have represented the working population very well. Private enterprises with no employed personnel were excluded. The sampling frame was the Business Register and Register of Public Corporations of Statistics Finland, which includes 140,000 office locations in which there is at least one salaried person (Peltomäki et al., 2001). The Maintenance Work Ability barometer survey in question was carried out by the Finnish Institute of Occupational Health in early 2004.

Sampling the teams

In order to provide a basis for further inquiry on the team level the respondents to the Maintenance Work Ability survey were asked about the teams in their organisations. The questions covered, among other things, the functioning of teams at their work place. They also included open questions on issues such as what kinds of teams they had and what kinds of tasks they carried out. The organisations for further study were chosen from the Maintenance Work Ability survey based on two criteria: they had teams and the respondents had expressed their willingness to take part in the team survey (Taittonen et al., 2008). At this phase 99 organisations agreed to be contacted again. Thus, of the 900 organisations there were teams in at least 99 of them.

The data-collection process

First, an invitation letter was sent to the contact persons, mainly HR or operations managers, who had taken part in the MWA survey and agreed to be contacted again (see Appendix 1). The representatives of the potential organisations were then contacted by telephone. Although 77 of the contact persons had agreed to take part in the team survey, during the phoning stage 22 representatives refused to do so, mostly saying that they were too busy. Another reason was that they could not force their subordinates to complete the survey outside working hours. After a further reminder to the contact persons respondent names were finally received from 56 organisations. (Taittonen et al., 2008)

The contact persons were also asked to name the teams that would participate, one high-performing team and the other with lower performance (Taittonen et al., 2008).

The reason for doing this was to ensure as high a response rate regarding the work-team-network data as possible. Another alternative would have been to ask the representatives to list all the teams in their organisations and the researchers could have made the selection based on the list. However, this might have reduced the response rate. Moreover, if the representatives of the organisations had been asked to name two teams they might have chosen two excellent teams and there would have been even less variation.

All of the questionnaires were sent to the contact persons (see Appendix 2), who delivered them to the actual respondents (see Appendix 3). Instructions and a stamped envelope were included. The respondents were asked to return their questionnaires to the Finnish Institute of Occupational Health within three weeks. If they had not been returned after three weeks new ones were sent. The final survey response rate was 75 per cent, and a total of 101 teams responded. Because network analysis requires a high response rate (Wasserman and Faust, 1994) teams with less than 80-per-cent participation were excluded. Teams with less than three members were also excluded because calculating the network measures is not meaningful for teams of two. The final sample therefore comprised 76 teams and 499 people. Survey responses were gathered from both team members and team leaders.

A potential limitation of this study is that participation was totally voluntary, and it may be that those who were most interested in the research area took part in the survey. This, in turn, could mean that the sample does not represent the population very well. However, if those who were most interested in the research area were the ones who took part, they may have taken the survey more seriously and answered the questions more carefully, thus increasing the external validity of the study. Moreover, the results are in line with those of previous research, which further increases the external validity.

The types of teams

The teams conducted various types of tasks from education, administration, social services and health care to retail trade. From now on the work-team tasks are characterised as only more standard-type in comparison with non-standard, new-product-development tasks, which require even more innovativeness in the effective

coordination and integration of ideas as well as more information processing. All the work teams conducted stationary tasks. On account of their different, temporary nature in comparison to the other teams in this study no project teams were included.

Projects could be characterised as temporary organisations as opposed to stationary organisations (Lundin and Söderholm, 1995; Modig, 2007). This categorisation is based on expected lifespan: projects are expected to end but stationary organisations are expected to exist at least for the near future. Consequently, the tasks of stationary and temporary organisations are likely to differ. It has been suggested, for example, that temporary organisations are more suited to complex exploratory tasks (see e.g., Davies and Brady, 2000) whereas stationary organisations conduct more standard duties, as do the work teams included in the sample of this study (Browne et al., 1996). It has also been established in previous research that there are time implications in the research areas under study. For example, the effects of diversity may change over time as groups gain more experience of working with each other (Harrison et al., 1998, 2002; Pelled et al., 1999; Chatman and Flynn, 2001). Furthermore, through group interaction the group members gradually become more familiar with each other, thus the impact of the group structure on group performance may also vary over time (Adler and Kwon, 2002; Earley and Mosakowski, 2000; Abrahamson and Rosenkopf, 1997).

The inclusion of several different types of standard duties in the present data might, however, appear to lend itself to analysis of how the effects of network variables vary by task type. More detailed analysis is left for future studies. However, a control variable (expert task and others) was included in the current analyses to reflect the possibility that some teams are more dependent on information sharing and others on diverse information. However, it would seem that given the full range of possible work tasks, all the task types included in this study involve roughly similar issues. This reflects the approach used by Oh et al. (2004) in their fairly recent article in the Academy of Management Journal: their work groups were from various functions, including accounting, sales, human resources and research and development. They did not control the tasks, but generally treated these teams as process teams.

The average team size turned out to be seven members: 57.9 per cent of the teams had six or fewer. The average time elapsed since the team formation was four years, and the average age of the respondents was 42 years. The average organisational tenure was 10.23 years and, finally, 55 per cent of the work teams represented the public sector and 45 per cent the private sector. Furthermore, a typical work team had existed for about four years. Approximately 60 per cent of the respondents were from the public sector and 40 per cent from the private sector. Because of the personal nature of the questionnaire questions (personal networks), the ethical aspects of the research were considered very carefully. The company names are disguised and not reported anywhere. The responses of specific teams are not revealed either.

3.2.3. Measures and analyses

This work is a whole-network study and not an egocentric (personal) network study, in which the network is defined from the perspective of a focal individual. The aim is to investigate how the relationship structure including the relationships of all the members of the population (here the work team), affects the behaviour or attitudes (here effectiveness) of its members. (Wellman, 1988)

Measures of the social-network structure

Four types of network measures are used in this study: density, fragmentation, centralisation and external range. The first three deal with the work-team-internal network and were selected because they reflect, respectively, the three main properties of a network: density, connectivity and hierarchy (Nahapiet and Ghoshal, 1998). In particular, density was chosen to illustrate the intensity of relations (see also Wong, 2008). However, a highly dense team-internal network may be inefficient because it may return less diverse information (Nahapiet and Ghoshal, 1998), thus fragmentation was included to capture more sparse, maybe even cliquish, network structures. Finally, centralisation was included to allow investigation of the status ordering in a work team (see also Wong, 2008).

External range, on the other hand, was included to reflect the importance of work-team surroundings, thereby contributing to the theory of teams as complex adaptive

systems. The implication is that research on small groups (including studies on teams) has been limited by the conceptual and methodological paradigms that previously advanced it. A great deal of the research during the past century has been carried out in accordance with a strongly positivist paradigm, which has meant an emphasis on laboratory experimentation as a research strategy. There have also been field studies, but they, too, have treated groups as isolated entities. One limitation of the research is that groups have been studied as if isolated from the context in which they are embedded (McGrath et al., 2000). However, no small group, such as a team, functions in a vacuum.

More specifically, the network measures used in this study were defined and calculated as follows:

- *Density*. The denser the team's social network is, the more likely are all the members to interact with each other frequently (Reagans and Zuckerman, 2001). Density was measured as the ratio of the actual to the possible number of advice-seeking relationships/social-support relationships among the members of the team (see e.g., Lucius and Kuhnert, 1997, Sparrowe et al., 2001 and Wong, 2008 for a similar measurement approach).
- *Fragmentation.* The fragmentation measure was included in order to establish the extent to which the teams were divided into subgroups. The fragmentation index ranges between zero and one, and the measurement is based on the analysis of (strong) components. A subset of actors in a network is called a strongly connected component if (taking directions of lines into account) from every node we can reach every other node in the same subset. This index represents the proportion of people that cannot be reached by others in the network according to the strong-component criterion. If all members are reachable, fragmentation will be zero and if no actor can be reached it will be one. (Scott, 2000)
- *Centralisation.* Centralisation measures the variation in interaction among the network members: the more centralised the network is, the less the members vary in their participation. Internal network centralisation was measured in line with Wasserman and Faust's (1994) measure of in-degree network

centralisation, which calculates the dispersion of or variance in an individual actor's in-degree centrality indices across the team. The in-degree centrality of a team member in the internal advice/social-support network represents the total number of members who turn to the focal member for advice/social support.

- *External range.* External range reflects one of the major characteristics of a team, the extent of social-network relationships with organisational members who are external to it. The external social network of each team was created by means of extracting the respondents' advice relationships with non-team members in their organisation. As long as one member had a relation to an individual in the focal organisation the whole team was considered to have that certain external-social-network relation. The external network range of a team was measured in accordance with the number of distinct external individuals upon which it relied (see e.g., Wong, 2008 and Oh et al. 2004 for a similar measurement approach)

The antecedents of team social networks

Team composition was investigated as an antecedent of the social-network structure in order to assess the diversity of the team members.

- *Team composition.* In line with previous research, the coefficient of variation was calculated for all measures indicating heterogeneity in demographic background (more specifically age, gender and education: see e.g., Cummings and Cross, 2003).

Effectiveness measures

Finally, the effectiveness measures were the following:

- *Behavioural outcomes.* In accordance with Nonaka and Takeuchi/Bennet (2001), in order to measure knowledge sharing within work teams the team leaders and members were asked to assess it on a five-point scale ranging from "I totally disagree" to "I totally agree", comprising the following items: old members give advice to new members; team members like to share information; team members discuss the workplace rules and procedures; there is frequent face-to-face communication (alpha=0.69).

- *Attitudinal outcomes.* Identification with the team (alpha=0.74) is one potential indicator of how the group is functioning. It was measured following the example of Mael and Asford (1992). The items were: "When someone criticises our work team it feels like a personal insult"; "I am very interested in what others think about our work team"; "When I talk about our work team I usually say 'we' rather than 'they'; "The work team's success is my success"; "When someone praises our work team, it feels like a personal compliment" and "My membership of this work team reflects what I am personally".
- *Performance effectiveness.* Team performance was assessed by work-team members and leaders on the following three items: "The team works effectively", "The team works fluently", "The team works better than other teams" (alpha=0.824). The use of objective indicators was problematic in this study: the sample included both public and private organisations, and public organisations do not always have objective indicators available. Moreover, the different types of organisations involved would have made comparison of objective outcomes a challenge, and if there had been objective data the characteristics of the teams would have made comparison difficult (see also Campion et al., 1993). Here, therefore, as in many previous studies, subjective outcome measures were used (Kirkman et al., 2001).

The research questions and the variables discussed above are summarised in Table 1 below.

Table 1. Summary of the research questions addressed and the variables used in the research papers

Research paper	Research question	Dependent variables	Independent variables
Research paper 1. "Taking stock of team social networks and their team-level outcomes – a review"	The main objective is to establish what we know about the impact of social networks on various types of teams.	-	-
Research paper 2. "The demographic antecedents and performance consequences of the social -network structure in work teams"	Where do the different types of social networks derive from? What are the consequences of the different types of social-network structure on team performance?	Team performance (performance efffectiveness)	Instrumental (advice) network density Instrumental (advice) network fragmentation Instrumental (advice) network centralisation
Research paper 3. "Work-team network structure and performance: the impact of instrumental and expressive social relationships"	What types of work-team-internal social networks (instrumental or expressive) are associated with enhanced team performance? Does knowledge sharing mediate the relationship between the different types of team-internal social networks and team performance?	Team performance (performance effectiveness)	Expressive (support) network density Expressive (support) network fragmentation Instrumental (advice) network density Instrumental (advice) network fragmentation
Research paper 4. "Work-team network structure and attitudinal outcomes & performance: the impact bonding and bridging social relationships"	Do bonding and bridging social relationships predict attitudinal outcomes (team identity) and team performance in work teams?	Team performance (performance effectiveness) Team identity (attitudinal outcome)	Instrumental (advice) network density Instrumental (advice) network External range Team identity (mediator)

The reliability and validity of the measures

Reliability (can the results be reproduced) and validity (are we measuring what we intend to measure) are the most important measurement criteria in quantitative research. Reliability is concerned with the degree of consistency between multiple measures of the variable. (Hair et al., 1998, 117), and could be described in terms of stability, uniformity, predictability and accuracy (Kerlinger, 1981). Team composition in this study was based on demographic information, the reliability of which can be checked in the organisation's archives (Podsakoff and Organ, 1986), for example. The reliability of the social-network measures, on the other hand, was ensured by including only the kinds of network relationships identified by both respondents within it. The respondents' answers were therefore used for the purposes of mutual confirmation. Additionally, as many responses as possible were elicited from each

team in order to increase the reliability of these measures, which were aggregates of all the answers given by the members. Only teams with a response rate of 80 per cent or more were included in the analyses. All the respondents were assured of total confidentiality with regard to their answers, and that neither they nor their team or organisation would be identifiable in the research reports. This may have increased the reliability of the information, especially given its delicate nature (e.g., with whom the respondents socialised), and the special concerns associated with social network analysis: for example, anonymity cannot be guaranteed during the data-collection phase because the researchers need to know who the respondents are in order to be able to link them individually to those with whom they claim to have relationships. Moreover, non-participation does not mean total exclusion from the study because other respondents might name the non-participants (see Borgatti and Molina, 2003 for more details).

Cronbach's alpha was used to test the reliability of the team effectiveness measure (attitudinal outcomes, behavioural outcomes and performance effectiveness) in terms of internal consistency. The alphas are given in Table 1 above, in brackets after each measure. All in all, the reliability coefficients were higher than the 0.60 threshold commonly specified in the literature as the acceptable minimum (Nunnally and Bernstein, 1994). They are thus also assumed to support the internal consistency in that the individual items correlate and are therefore likely to measure the same construct (Hair et al., 1998).

Validity, on the other hand, means the extent to which the scale or the measures represent the construct in question, and is typically broken down into content, construct and criterion validity (Hair et al., 1998, 118). The assessment was limited to content validity in this study. In terms of social-network measures the method used was the typical one of presenting each team member with a list of the other members and asking them to mark those with whom they were in contact (see e.g., Cross and Parker, 2004). This decreases the likelihood of the respondents forgetting about one or more of their fellow team members and thereby increases the validity of the social-network measure. The validity was further strengthened in that at least 80 per cent of the respondents within each team answered the relevant questions. Furthermore, single-informant bias (see e.g., Phillips, 1981) was avoided. The use of measures that

have been applied in previous studies further enhanced the content validity. Also factor analyses were conducted.

In addition, the unit of analysis was escalated in order to avoid potential problems due to the lack of objectivity in self-estimation (see Podsakoff and Organ, 1986): the aim, again, was to increase the validity of the measures. The survey items were written with a view to identifying the attributes of the team as a whole, not of the individual members. It was therefore considered better to capture its collective sense and its ability to accomplish its tasks rather than first to ask the members to respond to individual-level questions and then aggregate them to the team level (see also Tesluk et al., 1997; Podsakoff and Organ, 1986).

Finally, self-report measures were used to assess team effectiveness. The challenge with such measures is that they are not, in most cases, verifiable by other means (Podsakoff and Organ, 1986). This may lead to problems of common method variance, i.e. potential bias arising from social desirability and negative affectivity, which could artificially inflate the relationships (Cambell & Fiske, 1959; Fiske, 1982 cf. Podsakoff and Organ, 1986). Such problems were avoided in this study, however, because regardless of the self-report nature of the team-effectiveness measures, the social-network measures could be considered fairly objective: they did not lean on the perceptions of the team members.

Analyses

First, all of the measures were tested for normality by investigating the normal probability plot, skewness and kurtosis values, as well as by means of the Kolmogorov-Smirnov test that calculates the level of significance if different from a normal distribution. Thereafter, data transformations were made following the guidelines set by Hair et al. (1998), if necessary. The hypotheses in this study were tested by means of linear regression analysis with the help of SPSS software. The variables were added to the model according to the Enter method. The Mediated Regression Technique was used in testing for mediation according to the guidelines set by both Baron and Kenny (1986), whose mediation test has been widely used in management research, and Pierce et al., (2004), who formed three regression models

in order to test for mediation and linkages. The progress of each quantitative analysis is presented in more detail in the three relevant research papers.

Given the quantitative nature of the study, causal explanatory logic was used. It is acknowledged that overcoming one of the key challenges in social network analysis in general requires being clear about the position of the network in the causal chain. The underlying causal assumption in this study is that social-network relationships enable team members to access resources that are beneficial for team outcomes. It has been found, however, that a reputation for high performance may positively affect the centrality of an individual within a network, which thus gives it a more integrative role (Hinds et al., 2000). Regardless of these findings it would nevertheless be unlikely that information on team-level effectiveness would make any member approach another member for work-related advice or support, for example. Thus, it is assumed in this study that networks precede effectiveness, and that this effect direction is more potent.

4. SUMMARIES OF THE PUBLICATIONS AND A REVIEW OF THE RESULTS

This chapter presents the overall objectives and main contributions of each research paper. The first study is a review of prior research related to the effect of social networks on team effectiveness. The rest of the papers all deal with work-team social networks, their antecedents, mediators and effectiveness. The last section of this chapter summarises the main results reported in the research papers.

4.1. Taking stock of team social networks and their consequences – a review

4.1.1. Overall objective

There is a vast amount of research on intra-organisational networks. However, there seems to have been large-scale neglect of teams regardless of the fact that, as

Kozlovski and Ilgen (2006) state, there has been a decade-and-a-half evolution of change in the design of work, and a shift from individual jobs in functionalised structures to teams embedded more in complex workflow systems (Devine et al., 1999; Lawler et al., 1992; 1995, Mathieu et al., 2001). In parallel and also surprisingly, there is also a lack of social-network studies in the literature on teams. The main purpose of this study was thus to integrate the findings on team social networks in order to identify where the conclusions converge and diverge. The aim was to enhance understanding of team-level social networks, and to facilitate the more efficient channelling of future research. More specifically, suggestions are given based on what has been learned from the modest number of studies that have been conducted, and potential future directions are identified. The review therefore covered the findings of the previous studies in terms of content, the research contexts, conceptualisations and operationalisations, and measurement issues. On a more detailed level I discuss four types of team: laboratory teams, student teams, innovation and R&D teams and other organisational teams. I also review the research findings for each type.

4.1.2. Results and main contribution

The findings reported in the first publication reveal that, despite the extensive knowledge about the determinants of team effectiveness, academic understanding of one potentially critical set of determinants, social networks on the team level, is limited. (see e.g. Marks et al., 2001; Marks et al., 2000; Cannon-Bowers et al., 1995; Salas et al., 2005; Smith-Jentsch et al., 1998; Stevens and Campion, 1994; Fleishman and Zaccaro, 1992; Dickinson and McIntyre, 1997) To be more precise, fairly few connections have been made between the literature on small groups (i.e. teams) and on social networks, and team-level findings therefore leave a variety of questions unanswered. The first finding from the review was that scholars studying team social networks do not agree on what variables should be considered social-network variables. They also give different names to the same variables. This makes synthesising the literature somewhat of a challenge.

Nevertheless, previous research seems to have concentrated on three general questions of substance concerning the team-level effectiveness of 1) the “individual”, i.e. the position of a particular individual within the team, 2) the “internal”, i.e. the internal network structure of a particular team and 3) the “external”, i.e. the position of the team in the overarching network. Furthermore, it was generally established that the direct impact of team social networks on team effectiveness are not unequivocal, and therefore the results of existing studies should be replicated in various contexts in order to improve their validity and generalisability. Moreover, it seems that the emphasis is more often on non-standard duties (e.g., innovation and R&D) than teams carrying out more standard tasks. It thus seems clear that social networks in teams affect team effectiveness. However, there is not yet enough information to allow the drawing up of specific criteria for deciding on the type and social-network structures that are beneficial or detrimental, such as whether the existing network needs improvement, or what the optimal structure is. Team density attracted the most attention in all of the different kinds of teams investigated in the review. Density has been found to affect team performance positively, especially among student teams. There have been fewer studies on the relationship between team density and performance in the other types of teams, and the investigations have produced contradictory results. Some of these results may be at least potentially attributable to the different types of networks addressed.

Thus, the main contribution of this research paper lies in the systematic analysis and assessment of the previous research and the suggestions for further study. Furthermore, comparison of the different types of teams could provide a starting point for categorising how teams vary in type in relation to social networks and their effects on team effectiveness.

4.2. The demographic antecedents and performance consequences of the social-network structure in work teams

4.2.1. Overall objective

The discussion in the literature on organisations has tended to focus on individual actors' positions in social networks and the outcomes for those occupying one type of position rather than another. The aim in this paper is therefore to redirect attention from individual patterns of relations to social relations within work teams. It is not a question of how individuals structure their networks to their individual advantage, but rather of how their interactions affect work-team performance. Furthermore, as businesses strive to reach multiple markets and remain competitive by taking advantage of teams whose members vary along various dimensions, the question of whether heterogeneity enhances or decreases team performance assumes relevance for both managers and researchers (Jackson et al., 2003; Mannix and Neale, 2005). The research paper links these two discussions, and examines demographic heterogeneity and social-network structure (see Mannix and Neale, 2005) in work teams.

Given the team as the unit of analysis the paper addresses two questions. First, *where do the different types of social-network structures derive from and does demographic heterogeneity directly influence team performance*? The investigation covers whether team members network in certain ways consistent with particular demographic characteristics, i.e. if the team will split into sub-groups based on the members' demographic characteristics. Secondly, *what are the consequences of the different types of social-network structures on team performance?* The study addresses all three properties of network structure described in Nahapiet and Ghoshal (1998): density (measured by density), connectivity (measured by fragmentation) and hierarchy (measured by centralisation). The hypothesised model is presented in Figure 5.

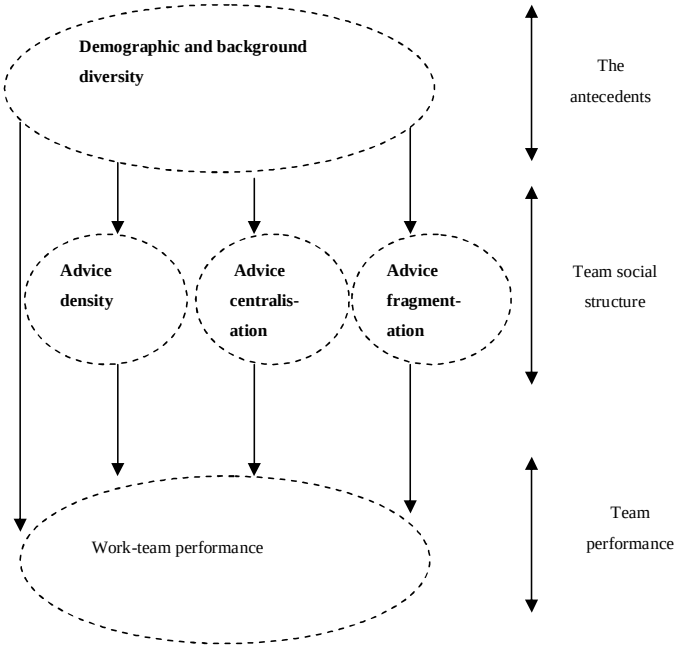


Figure 5. The hypothesised model (research paper 2)

4.2.2. Results and main contribution

The study investigated the effects of network density, centralisation and fragmentation on team performance with a view to identifying possible antecedents of such social-network structures in work teams. It contributes to the literature in investigating the antecedents of social networks: it highlights the structural consequences of having people with different backgrounds in the same work team, which is a fairly neglected area in the literature. Secondly, it provides an empirical link between the structural properties of a network and the performance of that collective, i.e. work team. There are only a few studies of this type (see the first research paper for a review).

Hence, the main contribution of this study is twofold. Firstly, irrespective of whether or not a team is diverse in terms of age or gender, it seems that educational heterogeneity may protect it from uneven member influence measured in terms of centralisation. However, heterogeneity in terms of gender was found to decrease

density. Secondly, it thus seems that the creation of clusters of team members (fragmentation) is not detrimental if there are also alternative "routings" (density) within the team enabling access to the desired resources. Fragmentation may be required in order to promote coordination and cooperation, and density to promote creativity and innovation, for example. Furthermore, it seems that some "hierarchy" is beneficial in that a cluster of team members acts as the core group (centralisation).

4.3. Work-team network structure and performance: the impact of instrumental and expressive social relationships

4.3.1. Overall objective

This research was undertaken in order to fill two main gaps identified in the literature on team social networks. First, there are only a few studies focusing on how social-network relationships affect team performance, and an even smaller number addressing both expressive and instrumental relationships. Instrumental relationships provide cognitive resources through information sharing and advice giving, and give access to the necessary resources for accomplishing a task (Umphress et al., 2003), such as the advice relationships that were examined in this paper. On the other hand, an individual enmeshed in a network of expressive, non-work-related relationships is likely to maximise his/her access to a variety of resources that may be of significance in many areas (Baldwin et al., 1997). Secondly, studies on social networks and teams have usually explored only two of the three variables characterising social-network relationships, namely mediators and performance, and the third unmeasured variable has remained implicit. This study focuses on knowledge sharing as a mediator between the team network structure and team performance. Knowledge, in particular, has been considered one of the key resources that can be accessed through social-network relationships (Coleman, 1990; Nahapiet and Ghoshal, 1998).

Thus, the first research question addressed in the study was: 1) *What types of work-team-internal social networks (instrumental or expressive) are associated with enhanced team performance?* Furthermore, with regard to teams there are only a few

empirical inquiries into the mediators between social-network structures and performance: this gave rise to the supplementary question: *1a) Does knowledge sharing mediate the relationship between the different types of team-internal social networks and team performance?* Knowledge sharing refers in this paper to the sharing of work-related and task-related information and know-how among the work-team members. Thus, a further aim was to assess the likelihood that social-network effects would materialise. The hypothesised model is presented in Figure 6.

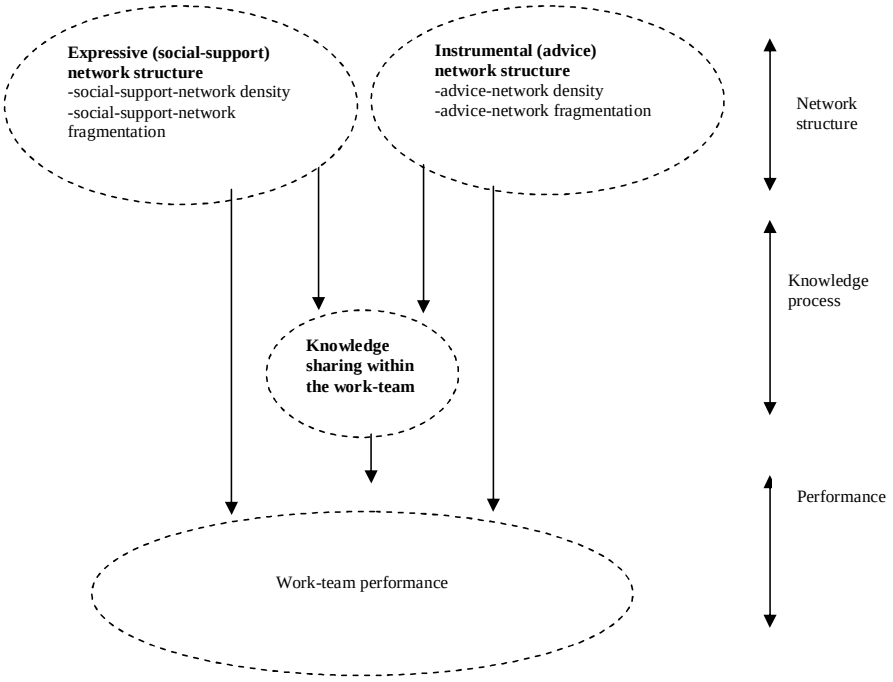


Figure 6. The hypothesised model (research paper 3)

4.3.2. Results and main contribution

First, in examining the social structure of different types of relationships, both instrumental and expressive, this study responds to the growing call in organisational theory for research into the social content underlying social networks (Harrington, 2002). As in Luo (2005), it was found that instrumental relationships are related to knowledge sharing whereas expressive relationships are not. It is not surprising that

instrumental relationships are important in exchanging work-related knowledge of standard types of tasks. However, a more surprising finding is that expressive relationships (off-duty types of relationship) do not improve team performance when it comes to knowledge sharing. This is in line with previous research findings suggesting that friendship relationships are more strongly related to emotional support or informal influence (see e.g., Luo, 2005; Krackhardt and Hanson, 1993).

Secondly, this research paper makes a contribution by directly testing whether team knowledge mediates the effects of advice-network structures on team performance. The results showed that knowledge sharing fully mediated the influence of complementarities between dense and fragmented network structures, thus providing empirical validation of the implicit understanding that networks transfer knowledge. More specifically, they offer a theoretical explanation of how instrumental social-network structures influence team performance. However, the expressive network, or more specifically fragmentation within it, had a notable performance effect. It is thus suggested that dense expressive relations are important in that they create teams in which members give each other approval, for example, and this further affirms their individual standing within the team (see e.g., Homans, 1974). This is likely to motivate them to complete their tasks more effectively and, at best, the team performance as a whole improves.

The main contribution of this study lies in directly testing whether knowledge sharing mediates the effects of instrumental (advice) and expressive (social-support) network structures on work-team performance. It thus implies that researchers should focus not only on the structure but also on the content of networks. The results also indicate that knowledge sharing mediates the relationship between advice-network structures and work-team performance.

4.4. Work-team network structure and attitudinal outcomes & performance: the impact of bonding and bridging social relationships

4.4.1. Overall objective

Previous research has identified two distinct social-network relationships: bonding and bridging. The kinds of benefits social capital brings and the types of network relationships that influence it have been a major focus of previous studies on the subject. This debate between the two views has not been settled, and researchers in search of a solution have started to focus on the tensions and complementarities between the different types of social-network structures. However, few studies have focused directly on these types of tensions, and even the ones that do seem to have concentrated on the purely performance effectiveness of these various types of social capital, often in a non-standard-duty context. This study therefore considered performance effectiveness in terms of team performance, and attitudinal outcomes in terms of team identity. Furthermore, in addressing team identity it also analysed whether there was a link with team performance: this type of attitudinal outcome of "teamness", even if it is a good estimate of team functioning, would not as such arouse much interest. More specifically, the study examined *whether bonding and bridging social relationships predicted attitudinal (team identity outcomes and performance in work teams.* The hypothesised model is presented in Figure 7.

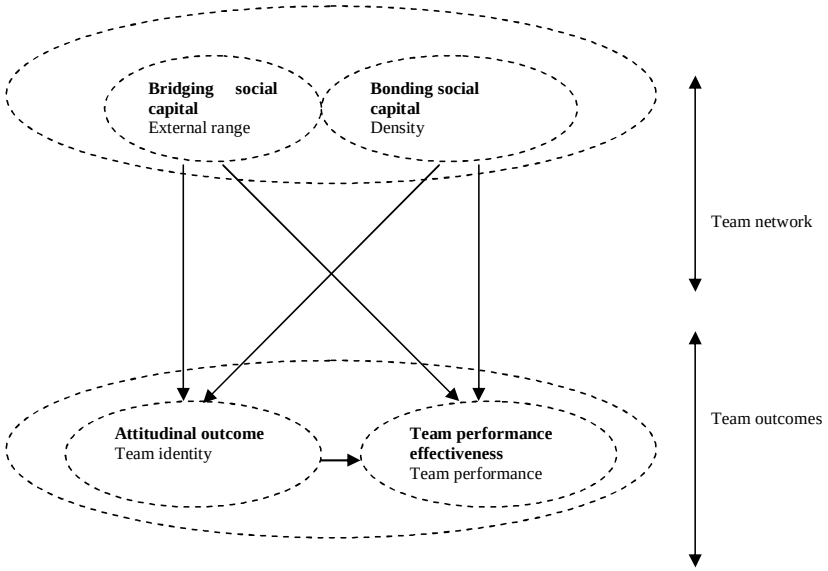


Figure 7. The hypothesised model (research paper 4)

4.4.2. Results and main contribution

First, it was found that the bonding and bridging types of team social networks impact team performance. Secondly, both bridging and bonding types of social networks were also related to attitudinal outcomes - here, team identity. Support was also found for the role of team identity in mediating the relationship between team social structure and team performance. Thus and thirdly, the study contributes to the increasing body of research on social identity in teams (see e.g., Somech et al., 2008; Bezrukova et al., 2009). Fourthly, it provides information about work-team processes that mediate the effect of the social-network structure on team performance. On a more general level, it is essential to understand what mediates small-group performance (here team performance) in order to determine how group dynamics and social-network structures lead to differing performance levels. Fifthly, it seems that work teams simultaneously need both bonding and bridging social networks in order to achieve positive attitudinal outcomes and team performance. The study therefore offers further research evidence (see also Reagans and McEvily, 2003; Reagans and Zuckerman 2001) that the optimal configuration of team social-network relationships may combine seemingly conflicting elements such as density and range, and thereby

contributes to the growing body of literature emphasising the need to pay attention to and manage tensions and paradoxes (see e.g., Gibson and Birkinshaw, 2004).

The study makes three main contributions. Firstly, it shows that both bridging and bonding types of social-network relationships affect attitudinal (team identity) outcomes and team performance. Secondly, it introduces team identity into the nomology, and shows that it fully mediates the influence of bonding and bridging social relationships. Thirdly, it highlights the paradoxical tension between bridging and bonding social relationships in providing empirical evidence that work teams need both.

The main research question and the results reported in each publication are again summarised in Table 2 below.

Table 2. A summary of the research questions and contributions of each study

	Research paper 1	Research paper 2	Research paper 3	Research paper 4
Title	Taking stock of team social networks and their consequences – a review	The demographic antecedents and performance consequences of the social-network structure in work teams	Work-team network structure and performance: the impact of instrumental and expressive social relationships	Work-team network structure and attitudinal outcomes & performance: the impact of bonding and bridging social relationships
Main goal	• to integrate the findings of studies on team social networks in order to identify where the conclusions converge and diverge • to enhance understanding of team-level social networks, in order to better channel future research.	• where do the different types of social networks derive from and does diversity directly influence work-team performance? • what are the consequences of the different types of social-network structure on team performance?	• what types of work-team-internal social networks (instrumental or expressive) are associated with enhanced team performance? • does knowledge sharing mediate the relation between the different types of team-internal social networks and team performance?	• do bonding and bridging social relationships predict team performance and attitudinal outcomes (team identity) in work teams?
Main results	• systematic analysis and assessment of the previous research • suggestions for further research • comparison between the different types of teams that could provide a starting point for categorising how teams vary in type in relation to social networks	• educational heterogeneity may protect the team from uneven member influence measured in terms of centralisation whereas homogeneity in terms of gender enhances density • the creation of cluster of team members (fragmentation) thus does not appear to be detrimental if there are alternative "routings" (density) through which to gain access to the desired resources • it seems that work teams benefit from some kind of "hierarchy", in other words a cluster of team members acting as the core team (centralisation).	• instrumental relationships are related to knowledge sharing whereas expressive relationships are not • team performance cannot be improved by expressive and instrumental relationships • knowledge sharing mediates the relationship between advice network structures and work-team performance	• team social structure has implications for both attitudinal (team identity) and team performance outcomes. • team attitudinal outcomes mediate the relationship between the social network structure and team performance • the optimal configuration of relationships combines both bonding and bridging social relationships in the work-team context

5. DISCUSSION AND IMPLICATIONS

5.1. Answering the research questions

The overall objective of this study was to explore the effects of social networks on effectiveness in work teams. In pursuance of this objective four sub-questions were addressed. The first of these was: *What do we already know about social networks and their effects on effectiveness at the team level?* (Research paper 1) It was found that academic understanding is limited. To be more precise, the team-level findings

leave a variety of questions unanswered, although it is clear from the review that social networks in teams have consequences regarding team effectiveness. Nevertheless, there is not yet enough information to draw up exact criteria for deciding on the type and patterns of relational structures that are beneficial or detrimental – such as whether the existing network needs improvement or what the optimal form is.

Neglected issues in the literature on teams include the antecedents of social-network structures. Hence the second sub-question: *What is the role of team composition in determining the social-network structure and the effectiveness of work teams?* (Research paper 2) This research highlights the thus far neglected structural consequences of including people with heterogeneous educational backgrounds in the same work team. The results imply that educational heterogeneity may protect it from uneven member influence measured in terms of centralisation. However, heterogeneity in terms of gender was found to decrease density. It was also found that background (gender) and demographic (age) heterogeneity had an impact on the performance of the work teams under examination.

The focus in the third sub-question shifted from background and demographic heterogeneity to the social-network structure (Mannix and Neale, 2005), in other words whether the structure matters in predicting work-team performance: *What are the effects of various types of team-internal social-network structures on team effectiveness?* (Research papers 2, 3 and 4) All three structural dimensions – density, connectivity and hierarchy (Nahapiet and Ghoshal, 1998) – were investigated in terms of density, fragmentation and centralisation, respectively. It was found that the creation of clusters of team members (fragmentation) was not detrimental if there were alternative "routings" (density) within the team allowing access to the desired resources. Fragmentation may facilitate coordination and cooperation, whereas density promotes creativity and innovation, for example. Furthermore, it seems to be beneficial to have some kind of "hierarchy", in other words a cluster of team members acting as the core group (centralisation). Thus, the implication is that a core team could enhance the functioning of the work team in terms of driving the collective actions within it.

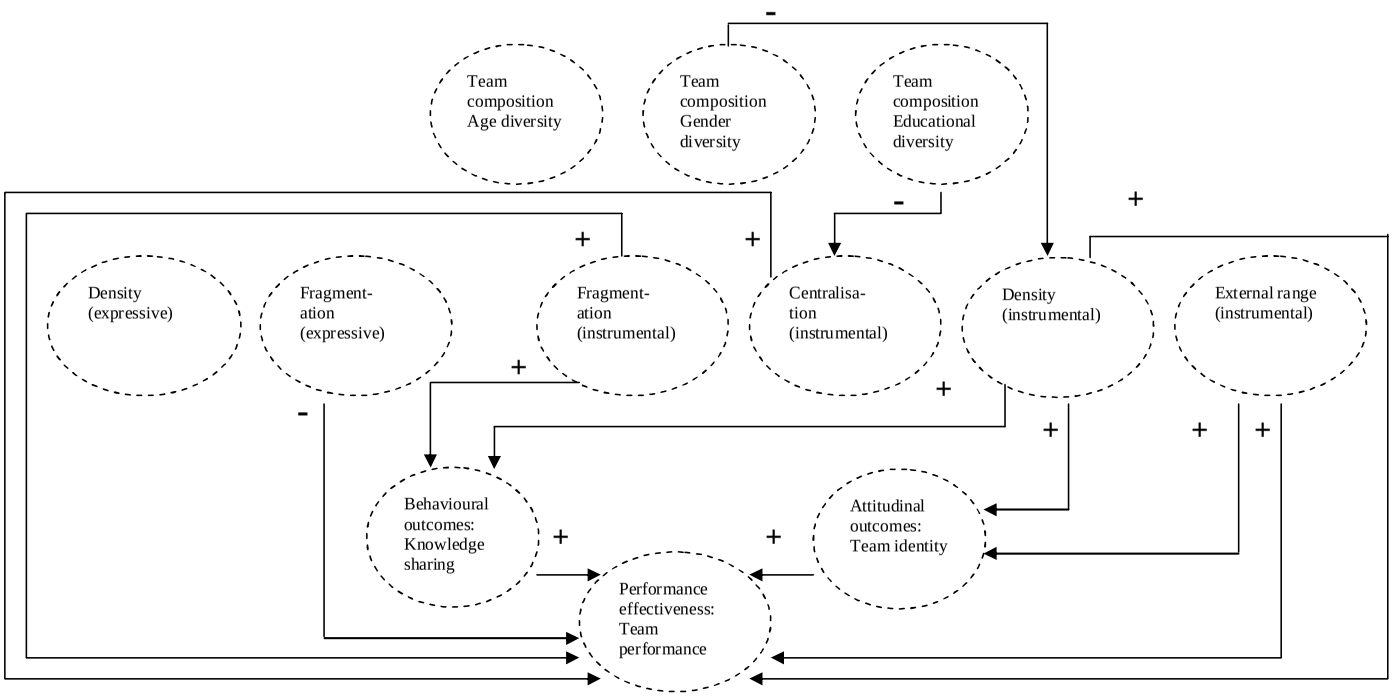
The fourth sub-question was: *What are the effects of the social-network structure on team performance mediated by attitudinal and behavioural outcomes?* (Research papers 3 and 4) In terms of behavioural outcomes (paper 3) it was found that only instrumental (advice-network) relationships were related to knowledge sharing. It is not surprising that advice networks turned out to be helpful in exchanging work-related knowledge, although it confirms the implicit understanding that networks transfer knowledge. However, with regard to expressive relationships it seems that off-duty social activities do not significantly enhance knowledge sharing. Thus the study supports previous findings suggesting that expressive relationships are more likely bring resources such as emotional support and informal influence (Krackhard and Hanson, 1993, Krackhardt, 1992, Krackhardt and Porter, 1985).

In terms of attitudinal outcomes (paper 4) the results reveal that both bonding and bridging types of social relationships predict both attitudinal (here, team identity) and team performance. It was also found that the former have an impact on the latter, and that team identity mediates the relationship between the social-network structure (measured in terms of bonding and bridging relationships) and team performance. Thus, team identity is important not only in terms of input (as a mediator) but also as an outcome that measures group functioning. Finally, the study supports findings from previous studies acknowledging that the optimal configuration of team social-network relationships may combine seemingly conflicting elements such as bridging and bonding social relationships. It thereby adds to the growing body of research emphasising the need to recognise and manage tensions and paradoxes (see e.g., Gibson and Birkinshaw, 2004).

The four sub-questions yielded results that address the main research question of this study: *What is the role of team social networks in predicting work-team effectiveness?* The key finding is that such networks have behavioural, attitudinal and, ultimately, economic implications. This study integrates insights from the literature on social capital and networks, and complements the emerging line of research on group social capital (Oh et al., 2006) in several ways. Having revealed the gaps in the literature it offers four key contributions: first, it provides more information on the direct effects of social-network structures on team effectiveness; secondly, it sheds light on the mediators between team social structure and team performance; thirdly, it advances

research on the optimal configuration of team-social-network relationships; and fourthly, it enhances knowledge of the antecedents of team-social-network structures. Figure 8 summarises the results of the entire study. The + symbol indicates a positive relationship between the variables, whereas the – symbol indicates a negative relationship.

Figure 8. The combined results of the entire study



5.2. Theoretical contribution and managerial implications

5.2.1. Exploring the direct effects of social-network structures in work teams

The key contribution of the study is to relate the structural properties of work teams to attitudinal outcomes, behavioural outcomes and, further (acknowledging the limitations), to team performance. It also focused on one team type that is largely neglected in the literature on group social capital, namely work teams carrying out standard duties, thereby complementing the contingency model of the relationship between the team's social-network structure and its effectiveness. Its primary implications therefore concern this emerging stream of research on group social capital (see Oh et al., 2006; Goyal and Akhilesh, 2007; Evans and Carson, 2005).

Additionally, given the observation that the effectiveness of a team's network structure is typically theorised and modelled without reference to the character of its constituent relationships, special efforts were made to link the research streams on social networks and social capital. This was done in the interests of theory development with regard to the structural-network effects that account for the character of such relationships. Moreover, with its focus on expressive relationships it contributes to the research on group social capital in taking into account social-support relationships, which have been neglected and unappreciated even though they link the workplace to a more informal world. A further contribution is to the research on group social capital in terms of distinguishing between the *types* of team social-network relationships that are studied. Kratzer et al. (2005) point out the need for a stronger focus on different types of studies with a view to explaining why some previous research findings are contradictory. They suggest that this type of approach could also refine results concerning the relation between the social-network structure and team effectiveness. This study confirms the findings of previous research (see Luo, 2005).

5.2.2. Studying the mediators between the team's social-network structure and its effectiveness

The study also directly tested whether team knowledge sharing mediated the effects of instrumental and expressive network structures on work-team performance. The results showed that knowledge sharing fully mediated the influence of complementarities between dense and fragmented instrumental network relationships, thus providing empirical validation for the implicit understanding that networks transfer knowledge. Moreover, the findings revealed the importance of attitudinal outcomes in terms of performance: team identity mediated the relationship between team performance and the social-network structure. The assumption was not merely that a variety of resources (e.g., information and knowledge, team identity) flow through relationships and improve work-team performance, but a more resource-based view on social capital was pursued than in the vast majority of previous studies in the area. The study further contributes to the literature on group social capital (Oh et al., 2006) in concentrating on all of the three sets of variables, namely the social-network structure, a mediator and team performance, and not leaving the third one implicit. It thus represents one effort to open up the "black box" by measuring the knowledge resources that presumably flow through social relationships, and the team identity that is created.

5.2.3. Shedding light on the optimal configuration of social-network relationships

Thirdly, on the basis of the findings I would suggest that an optimal configuration of team-internal relationships combines elements of both density and fragmentation. The potential team-composition effects were controlled in the analyses of the optimal network-configuration structure of the work teams in question (see especially research paper 2). Moreover, it was shown that these teams need both density (bonding social relationship) and external range (bridging social relationship) simultaneously in order to achieve attitudinal outcomes and team performance. The study therefore contributes to the emerging stream of research showing that optimal network configurations may combine seemingly conflicting elements such as density and range (Reagans and McEvily, 2003), and density and demographic heterogeneity, i.e.

bonding and bridging social relationships, respectively (Reagans and Zuckerman, 2001).

5.2.4. Investigating the antecedents of the team social structure

The fourth contribution of this study is that it enhances understanding of the possible antecedents of the social-network structure in teams. Unlike previous research, which focuses mainly on the effectiveness of social networks, the emphasis here is on the antecedents: regardless of whether or not a team is heterogeneous in terms of age or gender, educational heterogeneity may protect it from centralisation. However, mixing people with dissimilar genders produced a negative effect on team density. It was also shown that heterogeneity (age, gender) in team composition also predicted performance to some extent. The study contributes in responding to Salancik's (1995) call for a network theory explaining why certain network characteristics exist.

5.2.5. Managerial implications

The key criterion in academic work, concerning team social networks and their effectiveness for example, is to establish at an early stage that there is a reason for conducting such studies given the various potential (beneficial) consequences for teams and, thereby, organisations. It is obvious that there are not, as yet, strong criteria determining whether the existing social network needs improvement, and what types of social-network relationships and structure are beneficial or detrimental. As shown in first paper comprising this study (research paper 1), the empirical evidence linking team networks to effectiveness is fairly scarce.

Some suggestions can be made, however. First, team composition is something managers are able to control more easily. If they are looking for less fragmented teams, then mixing together people with different educational backgrounds might help. They could also confer different expert roles on each member so as to encourage advice seeking among more members and thus foster a less centralised structure. The results of the study also indicate that stimulating both expressive and instrumental

relationships is beneficial, but in different ways. It was found, for example, that off-duty social activities do not improve network relations in knowledge sharing. On the other hand, a fragmented expressive network structure within the team is likely to be detrimental to team performance. This indicates that emotional support and informal influence also matter. Furthermore, work teams were found to benefit from both team-internal and team-external relationships. In order to enhance networking team managers could appoint members to liaise with different external teams so that the team as a whole will have a wider external network. As a way of encouraging the development of bridging relationships common spare-time and social activities could be organised to facilitate their formation. Various computer-based social-networking systems (e.g., Facebook, LinkedIn) could also enhance the development of bridging relations. Furthermore, when work teams are formed members' opinions on their composition could be elicited: for example, potential team leaders or members who are known to have very good relationships with various employee groups within the organisation could be crucial in maximising the team's potential.

In terms of managerial implications I would call for more management-related research investigating how managers could facilitate the desired team social-network structures. For example, previous research has shown that networks can be manipulated to a certain extent. After World War II military sociologists found that the smallest battle crews in the German army had a great fighting spirit, and this was not because of their fanatic thinking but because of the high level of team interaction and closeness. Their commanders had deliberately kept the teams together no matter what. (Janowitz and Shils, 1948; cf. Kratzer, 2001) This is an extreme example of the use of relational structures in special circumstances that led to the desired results, i.e. a high fighting spirit.

5.3. Limitations and suggestions for future research

Despite its contributions, this study has several evident limitations. One of these is related to the subjective evaluation of work-team performance. Previous studies have mainly relied on the evaluation of the team leader, who is also involved in the daily

activities of the team. Hence, the question remains whether one involved team leader could give a better and less subjective evaluation of performance than the mean value of the evaluations given by himself/herself and the other members (varying between three and 15 individuals in this study). Moreover, the case organisations were from both the private and the public sectors. It is frequently the case in the public sector that performance records do not exist, and for this reason subjective evaluation was used. Still, future studies could focus on collecting objective measures in order to obtain more accurate assessments of team performance. It would also be worth investigating both behavioural and attitudinal outcomes rather than concentrating on purely team performance. This study took one step in this direction in considering, in addition, both behavioural and attitudinal outcomes in the form of knowledge sharing and team identity.

Although the sample of teams (n=76) in this study is fairly large in comparison with the average of 60 (Cohen and Bailey, 1997), it is not feasible to suggest implications concerning the dynamic effect because the data was collected at one point in time. There is thus a need for research on how work-team social-network relationships evolve over time. Furthermore, the work teams included this study were not pre-designed in terms of structure (Gersick, 1988), and the results were therefore drawn from the natural evolution process. As a result, questions of how environmental characteristics such as formal authority structures and informal social-network relationships interact and affect work-team processes remain unexplored. Further research in this area would be beneficial. In addition, the work teams' tasks were only used as control variables. Taking these tasks more fully into account by using slope adjustments (see Reagans and Zuckerman, 2001) would yield more information on task contingency. There is thus also a need for more research in this respect. The limitations of the study are discussed in more detail in each research paper.

6. CONCLUSIONS

Data covering 499 employees in 76 teams representing 48 different Finnish work organisations was used to explore some unanswered questions regarding two different types of social-network relationships, bonding and bridging, and their impact on

work-team effectiveness. The key argument is that structural social capital is an important vehicle for pursuing effectiveness in one of the basic organisational microstructures, namely work teams.

This study was conducted from the network perspective. Within it there are various "schools of thought" (Monge and Contractor, 2003) explaining why people create, maintain, dissolve and possibly recreate network relationships with each other, and who is likely to form relationships with whom (Katz et al., 2004). In theoretical terms it contributes to the growing interest in social capital as a distinctive competitive resource in focusing on its content and on the structure of social networks. In particular, this dissertation is based on the meta-construct and model of group social capital (Oh et al., 2006), which was introduced as one way of examining, in greater depth, how a group member's social-network relationships inside and outside of the group are related to group effectiveness. It therefore enhances understanding of what group social capital entails (Oh et al., 2006). This type of study is fairly rare: researchers have concentrated on the factors that influence team effectiveness in numerous cases (see Cohen and Bailey, 1997; Kozlowski and Ilgen, 2006; Salas et al., 2007), but social networks are not often included in the critical set of determinants.

This study applied social network analysis and quantitative methods. In the former case the aim was to discover the social-network relations among work-team members, and quantitative methods were used to test the theoretical arguments. Many prior studies concerning social networks have struggled with generalisability due to a lack of access to sufficiently numerous or diverse organisations. Thus, the size and diversity of the sample are the main methodological strengths of the present study. The sample covered several different types of organisation from public to private, thus facilitating the study of work-team social networks in a variety of organisational contexts. In addition, 76 work teams were surveyed, which is more than in the average (60) study on teams (Cohen and Bailey, 1997). Furthermore, the sample consisted of employee members of real teams in organisations and not student teams, thus enabling generalisability in real-life settings.

In order to complement previous research this study focused on social networks in work teams, which it shows are related to team effectiveness and, more specifically,

to behavioural, attitudinal and, ultimately, team performance. This finding is interesting as it shows that social networks have various types of consequences for work teams. In addition to illustrating the direct effects on team effectiveness and a more outcome-focused approach, the study provides further insight into how social networks influence team performance through the investigation of possible mediators. According to the results, team identity fully mediates the influence of bonding and bridging social networks on work-team performance. Studies on social networks have often focused on two of the three variables - relationship characteristics, mediators and effectiveness - and considered the third implicit. The present finding is therefore interesting because it sheds light on the processes that mediate team performance, which in turn are essential in enhancing understanding of how team dynamics lead to differing performance levels. These types of investigation also open up the "black box" and show what types of resources flow through social networks in teams. The study also highlights the importance of types of social networks, bonding and bridging relationships, in creating team identity. This is interesting because it indicates that individuals identify with the team through the social networks they have both with the other team members and with those outside. Team identity, as an attitudinal outcome, is a significant feature because the results show that those who identify more with their work teams tend to perform better.

A further aim was to refine current knowledge by distinguishing between two kinds of social-network relationships, instrumental (advice) and expressive (social support), and investigating what kinds of structures influence team performance. The findings showed that only instrumental network structures transfer knowledge, but that non-fragmented expressive networks are important in terms of performance. This is of interest because it provides empirical validation of the implicit understanding that instrumental networks transfer knowledge. It also provides a more nuanced understanding of how different types of social networks and knowledge sharing affect work-team performance. Another question that was addressed was whether there was an optimal configuration of a work-team social network, and it was found that such a configuration combines elements of both bridging and bonding social relationships. This is of interest because it indicates that the optimal configuration of a team's social-network relationships combines seemingly conflicting elements, which in turn points to a need to consider and manage tensions and paradoxes (see e.g., Gibson and

Birkinshaw, 2004). The implication is that notions such as density (bonding social relationships) and external range (bridging social relationships), which appear to be in conflict when viewed independently, can indeed beneficially coexist. Finally, this study also investigated the antecedents of the work-team social-network structure in response to Gerald Salancik's (1995) call for a network theory explaining why certain characteristics exist (see also Parkhe et al., 2006). Educational diversity was found to have an impact: it prevents the work team from becoming hierarchical. Moreover, mixing people with dissimilar genders had a negative effect on team density. This, again, is of interest because it enhances understanding of the reasons why social networks form. There is as yet a lack of information on the question of where social networks in teams derive from (see Balkundi et al., 2007 for an exception).

These findings also generate insights that might help in predicting the conditions under which teams are likely to perform successfully, and in understanding why this is the case. The managerial implications set out in the research papers identify a variety of alternative network strategies that companies can adopt, ranging from performance-management and reward systems to encourage team-oriented behaviour to sponsoring informal groups engaging in common hobbies and other social activities. All in all, the complexity of the current work environment is forcing us to recognise that it is no longer economically viable to go about the present challenges relying exclusively on individual employees.

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Appendix 1: Cover letter

Arvoisa vastaanottaja

Työterveyslaitoksen Työterveyshuolto-osasto toteuttaa yhteistyössä Helsingin yliopiston Yleisen valtio-opin laitoksen kanssa postikyselytutkimuksen **tiimien toimivuudesta suomalaisilla työpaikoilla**. *Sosiaalinen pääoma ja hyvinvointi työorganisaatioissa – sosiaalisen pääoman ekspressiiviset ja instrumentaaliset ulottuvuudet* on osa Suomen Akatemian Sosiaalisen pääoman tutkimusohjelmaa, ja sen tarkoituksena on selvittää tiimien kommunikaatioon, työn sujuvuuteen ja työntekijöiden hyvinvointiin liittyviä asioita.

Keräämme nyt tietoa *kahdesta* työpaikallanne toimivasta tiimistä. Tutkimusta varten pyydämme Teitä itse valitsemaan toimipaikaltanne yhden sellaisen tiimin, joka toimii hyvin ja yhden sellaisen, jonka toiminnassa olisi kehittämisen varaa. Pyydämme näiden tiimien kaikkia jäseniä täyttämään kyselylomakkeen. Tietoja käsitellään luottamuksellisesti siten, etteivät yksittäisten tiimin jäsenten vastaukset tai työpaikkanne käy ilmi tutkimuksen tuloksissa. Tuotamme tutkimukseen osallistuneille toimipaikoille yhteenvetoraportin, joka antaa uutta tietoa tiimityöstä suomalaisilla työpaikoilla.

Tutkimukseen osallistuminen on vapaaehtoista. Toivomme Teiltä myönteistä suhtautumista, kun tutkijamme **soittaa Teille toimipaikallenne** sopiakseen Teille helpoimmasta aineiston keruutavasta. Ensisijaisesti ehdotamme **postikyselyä suoraan tiimien jäsenille**, mutta voimme tarvittaessa sopia myös aineiston keruusta työpaikallanne. Lomakkeeseen vastaamiseen kuluu arviolta 20-30 minuuttia. Aineiston keruuta varten pyydämme Teitä puhelun jälkeen nimeämään tutkittavien tiimien jäsenet.

Tiimitutkimuksen perusteella valitsemme edelleen kaksi toimipaikkaa tutkimukseen, jonka kohteena on koko organisaation toiminta. Tiimitutkimuksen jatko-osaan osallistuneille organisaatioille tarjoamme tutkimuksen jälkeen myös palautetta työpaikan toiminnasta. Tutkijamme kysyy halukkuutta osallistua myös tähän tiimitutkimuksen jatko-osioon yhteydenoton aikana.

Tiimitutkimuksen onnistumisen kannalta on tärkeää, että jokainen tiimin jäsen vastaa kyselyyn.

Mahdollisiin tutkimusta koskeviin kysymyksiin vastaa tutkija Maria Taittonen sähköpostitse maria.taittonen@helsinki.fi tai puhelimitse (09) 191 249 60.

Yhteistyöterveisin

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p. (09) 191 248 23

Transcript of the above text

Dear recipient,

The Department of Occupational Health Care at The Finnish Institute of Occupational Health is carrying out a mail survey in collaboration with The University of Helsinki and the Department of Political Sciences. The survey concerns **teams and their operations in Finnish work places.** *Social capital and well-being in work organisations – the expressive and instrumental dimensions of social capital* (*Sosiaalinen pääoma ja hyvinvointi työorganisaatioissa – sosiaalisen pääoman ekspressiiviset ja instrumentaaliset ulottuvuudet*) is part of the Academy of Finland's Social Capital research programme, the main aim of which is to explore issues related to team communication, team functioning and worker well-being.

We are now collecting information on *two* teams in your work place. For the purposes of this research we ask you to choose one team that works well and one that would need to improve. We will ask all the members of these two teams to answer the survey questions. The information will remain strictly confidential. Neither the

responses of the team members nor the identity of the organisations will be revealed in the research results. We will also send a report to all the organisations participating in the study offering new information on teamwork at Finnish work places**.**

Participation in this survey is voluntary. We hope for a positive response when our researcher telephones **you at work** to discuss the most appropriate means of data collection for you. As the primary alternative we suggest **a survey mailed directly to the team members,** but data collection at the work place could also be arranged if you prefer. It will take about 20-30 minutes to complete the survey. During the phone call and for data-collection purposes we will ask you to name the team members taking part in this research.

On the basis of the results of the team survey we will select two organisations to participate in research concerning the functioning of the whole organisation. We will provide those who do so with feedback on the results. Our researcher will ask if you are willing to participate in this part of the team research during the telephone call.

For the research to be successful it is very important that all team members respond to the survey.

If you have any questions please contact researcher Maria Taittonen via email (maria.taittonen@helsinki.fi) or by telephone: (09) 191 249 60.

We are looking forward to collaborating with you. Yours faithfully,

Appendix 2: Cover letter to the supervisors

Arvoisa vastaanottaja

Kiitämme teitä lupautumisesta Työterveyslaitoksen Työterveyshuolto-osaston ja Helsingin yliopiston Yleisen valtio-opin laitoksen **tiimien toimivuutta** kartoittavaan postikysely-tutkimukseen. *Sosiaalinen pääoma ja hyvinvointi työorganisaatioissa – sosiaalisen pääoman ekspressiiviset ja instrumentaaliset ulottuvuudet* on osa Suomen Akatemian Sosiaalisen pääoman tutkimusohjelmaa, ja sen tarkoituksena on selvittää tiimien kommunikaatioon, työn sujuvuuteen ja työntekijöiden hyvinvointiin liittyviä asioita.

Tutkijamme on soittanut toimipaikallenne ja sopinut aineiston keruusta. Lähetämme ohessa tiimien jäsenille osoitetut kysymyslomakkeet. Pyydämme Teitä toimittamaan kirjekuoret suljettuina tutkimukseen osallistuville työntekijöille. Kirjekuoret sisältävät kyselylomakkeen vastausohjeineen sekä valmiin vastauskuoren. Pyydämme Teitä ohjeistamaan tutkimukseen osallistuvat työntekijät vastaamaan lomakkeeseen ja toimittamaan sen suljetussa vastauskuoressa mahdollisimman pian – **kuitenkin viimeistään 30.6.2005 mennessä** – suoraan Työterveyslaitokselle kuoressa mainittuun osoitteeseen. Vastauskuoren postimaksu on maksettu puolestanne.

Tietoja käsitellään luottamuksellisesti siten, etteivät yksittäisten tiimin jäsenten vastaukset tai työpaikkanne käy ilmi tutkimuksen tuloksissa. Tuotamme tutkimukseen osallistuneille toimipaikoille yhteenvetoraportin, joka antaa uutta tietoa tiimityöstä suomalaisilla työpaikoilla.

Tiimitutkimuksen onnistumisen kannalta on tärkeää, että jokainen tiimin jäsen vastaa kyselyyn.

Mahdollisiin tutkimusta koskeviin kysymyksiin vastaa tutkija Maria Taittonen sähköpostitse maria.taittonen@helsinki.fi tai puhelimitse (09) 191 249 60.

Yhteistyöterveisin

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p. (09) 191 248 23

Transcript of the above text:
Dear recipient,

We thank you for promising to take part in the survey research being carried out by the Department of Occupational Health Care at The Finnish Institute of Occupational Health and the Department of Political Sciences at The University of Helsinki. *Social capital and well-being in work organisations – the expressive and instrumental dimensions of social capital* (*Sosiaalinen pääoma ja hyvinvointi työorganisaatioissa – sosiaalisen pääoman ekspressiiviset ja instrumentaaliset ulottuvuudet*) is part of the Academy of Finland's Social Capital research programme, the main aim of which is to explore issues related to team communication, team functioning and worker well-being.

Our researcher has contacted your organisation and an agreement has been made concerning the data collection. We wish to distribute the enclosed survey questionnaires to the team members. We would be grateful if you could deliver the sealed envelopes to the participating employees. The envelopes contain the survey questionnaire, instructions and a return envelope. We would ask you to encourage the employees to answer the survey questionnaire and to return it in the sealed envelope as soon as possible **– at the latest by 30.6.2005 -** to The Finnish Institute of Occupational Health at the address given on the envelope. The postage is pre-paid.

The information will be kept strictly confidential. Neither the responses of the team members nor the identity of the organisations will be revealed in the research results. We will also send a report to all the participating organisations, which will offer new information on teamwork in Finnish work places**.**

For the research to be successful it is very important that all team members complete the survey.

If you have any questions please contact researcher Maria Taittonen via email (maria.taittonen@helsinki.fi) or by telephone: (09) 191 249 60.

We are looking forward to collaborating with you. Yours faithfully,

Appendix 3: Cover letter to the team members

Arvoisa tiimin jäsen

Työterveyslaitoksen Työterveyshuolto-osasto toteuttaa yhteistyössä Helsingin yliopiston Yleisen valtio-opin laitoksen kanssa postikyselytutkimuksen **tiimien toimivuudesta suomalaisilla työpaikoilla**. *Sosiaalinen pääoma ja hyvinvointi työorganisaatioissa – sosiaalisen pääoman ekspressiiviset ja instrumentaaliset ulottuvuudet* on osa Suomen Akatemian Sosiaalisen pääoman tutkimusohjelmaa, ja sen tarkoituksena on selvittää tiimien kommunikaatioon, työn sujuvuuteen ja työntekijöiden hyvinvointiin liittyviä asioita.

Tutkimuksen onnistumiseksi pyydämme Teitä ystävällisesti vastaamaan oheiseen kysymyslomakkeeseen seuraamalla lomakkeessa annettuja ohjeita. Vastaamisen jälkeen pyydämme Teitä postittamaan lomakkeen oheisessa vastauskuoressa mahdollisimman pian – kuitenkin viimeistään 30.6.2005 mennessä – suoraan Työterveyslaitokselle kuoressa mainittuun osoitteeseen. Lomakkeeseen vastaamiseen kuluu arviolta 20-30 minuuttia. Vastauskuoren postimaksu on maksettu puolestanne.

Antamianne tietoja käytetään luottamuksellisesti ja ainoastaan tutkimustarkoituksiin eivätkä vastauksenne tule tutkimuksen missään vaiheessa työnantajanne tietoon. Myöskään työpaikkanne ei käy ilmi tutkimuksen tuloksissa.

Tiimitutkimuksen onnistumisen kannalta on tärkeää, että jokainen tiimin jäsen vastaa kyselyyn.

Mahdollisiin tutkimusta koskeviin kysymyksiin vastaa tutkija Maria Taittonen sähköpostitse maria.taittonen@helsinki.fi tai puhelimitse (09) 191 249 60.

Yhteistyöterveisin

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Transcript of the above text:

Dear team member,

The Department of Occupational Health Care at The Finnish Institute of Occupational Health is carrying out a mail survey in collaboration with The University of Helsinki and the Department of Political Sciences. *Social capital and well-being in work organisations – the expressive and instrumental dimensions of social capital* (*Sosiaalinen pääoma ja hyvinvointi työorganisaatioissa – sosiaalisen pääoman ekspressiiviset ja instrumentaaliset ulottuvuudet*) is part of the Academy of Finland's Social Capital research programme, the main aim of which is to explore issues related to team communication, team functioning and worker well-being.

We are attaching the survey questionnaire and ask you kindly to complete it in accordance with the instructions given. It will take about 20-30 minutes. When you have completed the questionnaire would you please return it directly to The Finnish Institute of Occupational Health in the pre-paid and addressed envelope provided - as soon as possible but at the latest by 30.6.2005.

The information you provide will be treated in the strictest confidence and will be used only for research purposes. Your responses will not be revealed to your employer at any stage of the research, nor will your organisation be identifiable from the results.

For the research to be successful it is very important that all team members respond to the survey.

If you have any questions please contact researcher Maria Taittonen via email maria.taittonen@helsinki.fi or by phone (09) 191 249 60.

We are looking forward to collaborating with you. Yours sincerely,

Appendix 4: Selected questionnaire item sets

I WORK-TEAM MEMBERS AND WORK-TEAM BACKGROUND INFORMATION

Circle the number describing the most suitable response or give your answer in the space provided.

1. What is your position?
   1. Upper management
   2. Middle management/manager/superior
   3. Expert
   4. Administration personnel (e.g., secretary, IT support)
   5. Worker
   6. Other, what?
      _____

2. ---

3. ---

4. What are your educational qualifications?
   1. No professional qualification
   2. Vocational course/courses at the work place
   3. Vocational school
   4. College-level degree (e.g., commercial college)
   5. University/institution of higher learning

5. ---

9. ---

10. Your position in the work team
    1. Work-team leader
    2. Work-team member

11. Type of work team
    1. Work-team engaged in tasks of a permanent nature
    2. Project team
    3. Inter-departmental work team
    4. Management team
    5. Other

12. ---

13. Your gender
    1. Male
    2. Female

14. Your age _____ years

15. ---

6. How many years have you worked in *this organisation*? _____ years 7. How many years have you worked *in your current work team*? _____ years 8. ---	16. --- 17. --- 18. ---

III WORK-TEAM-INTERNAL COMMUNICATION

There is more communication in some work teams than in others. Please assess your communication with other work-team members during the existence of the work team as a whole.

C. Asking for advice. Who do you turn to when you need advice or support related to your work? Please mark those persons with an X.

D. Emotional support. Are there people in your work team who provide you with emotional support that is not directly work-related? Please mark those persons with an X.

Name of the work-team member	C. Asking for advice	D. Emotional support
1.		
2.		
3.		
4.		
5.		

III WORK-TEAM-EXTERNAL COMMUNICATION

Your work assignments require maintaining contacts with people who are external to the work team and the organisation. Please estimate how often you are in contact with different employee groups and other parties outside your organisation. Circle the number representing the most suitable alternative.

Employee group	Frequency of communication				
	Daily	Weekly	Monthly	A few times a year	Not at all
1. Middle management	4	3	2	1	0
2. Other teams	4	3	2	1	0
3. Other employees	4	3	2	1	0

IV THE CHARACTERISTICS OF THE WORK TEAM

V KNOWLEDGE CREATION AND SHARING IN THE WORK TEAM

Ways of creating and sharing knowledge differ depending on the work team or organisation. The aim in this section is to find out how your work team creates and shares knowledge. Please circle the number that best describes how, in your opinion, knowledge is shared in your team.

	I totally agree	I partially agree	I do not know	I partially disagree	I totally disagree
4. Old members give advice to new members.	1	2	3	4	5
5. Team members do not like to share information [reversed].	1	2	3	4	5
11. Team members discuss the workplace rules and procedures.	1	2	3	4	5
15. There is frequent face-to-face communication.	1	2	3	4	5

VI KNOWLEDGE SHARING IN THE WORKPLACE

VII DECISION-MAKING AND THE ASSESSMENT OF MANAGERIAL WORK

VIII THE FEATURES OF MY WORK

IX ATMOSPHERE IN THE WORK-TEAM AND AT THE WORKPLACE

This section concerns the atmosphere in your work team and in the organisation in general. The work-team atmosphere may differ from the organisational atmosphere. Therefore, some of the questions concern both your work team and your organisation. The first items deal with your work team. Please circle the number representing the most suitable response.

	I totally disagree	I partially disagree	I do not know	I partially agree	I totally agree
1. When someone criticises our work team it feels like a personal insult.	1	2	3	4	5
2. I am very interested in what others think about our work team.	1	2	3	4	5
3. When I talk about our work team I usually say ‘we’ rather than ‘they’.	1	2	3	4	5
4. The work team’s success is my success.	1	2	3	4	5
5. When someone praises our work team, it feels like a personal compliment.	1	2	3	4	5
6. My membership of this work team reflects what I am personally.	1	2	3	4	5

III STRESS AND EXPECTATIONS

XI HOW THE WORK-TEAM MEMBERS THINK

Thank you for your cooperation!