INTEGRATING INDIVIDUAL PSYCHOLOGY AND SOCIAL NETWORKS

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DECLARATION OF AUTHORSHIP

I, Laura Weis, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Signature:

04/10/2017

ABSTRACT

Using a wide range of methodological and theoretical frameworks this thesis aims to integrate the social network approach with psychological research. Chapter 1 provides an overview of the network perspective and the wide range of theories, concepts and applications. Further, a novel structural framework is offered, integrating the most important measures of network-positioning. Chapter 2 contains four studies examining how an individual's personality and motivation relates to their perception of, and actual social network positioning. Study 1 shows that personality influences how people perceive themselves in social networks and that this perception moderates the well-researched relationship between personality and subjective wellbeing. The second study demonstrates that (similarity on) the Big Five personality factors affect the likelihood of selecting and attracting social network ties. Yet, effects are small and somewhat inconsistent with previous literature. Results of Study 3 did not support our hypothesis that differences in motivation are associated with the occupation of different social network positions, in an organizational setting. Lastly, study 4 shows how an individual's political skill relates to his/her preferred and perceived personal networks, and their joint effect on job attitudes. Chapter 3 links SNA with Social Cognition research. Study 1 demonstrates that high self-monitors are perceived as more similar to the self, and that this (partly) accounts for the well-known effect of self-monitoring on popularity in friendship networks. Study 2 examines if, and concludes that perceptions of high popularity negatively affects the quality of a friendship relations. Lastly, Study 3 demonstrates that an individual's sense of power negatively impacts perceptual accuracy of dyadic relations in a friendship network. Chapter 4 emphasizes qualitative aspects of social network relations. Study 1 suggests that average frequency of tie "activation" as well as advice ties that co-occur with more personal ties, lead to increased levels of employee engagement. Study 2 demonstrates that costs of giving and benefits of receiving

advice are more pronounced in informal, compared to formal work networks. Overall, it

is concluded that the social network approach provides a powerful research tool for

psychologists, yet being fraught with both methodological as well as theoretical

challenges.

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CHAPTER 1: GENERAL INTRODUCTION

This chapter was written in collaboration with

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1.1 Scope of the thesis

Today's world is characterized by complex communication and transportation technologies, embedding individuals in local and global communities, with each of us only a few 'links' away from one another. Consequently, there is an increasing awareness of social life interdependencies and one of the most compelling thoughts in the contemporary social science literature is the notion that people are embedded or situated in the social context (e.g., Borgatti, Mehra, Brass, & Labianca, 2009). From this viewpoint, individuals are seen as intimately linked to how they are embedded or integrated in their social context. This social context is defined by different social formations (relationships) consisting of normative expectations and needs directly influencing the individuals identity, cognition, attitudes and behaviours. Importantly, individuals can be embedded in social formations that either constrain or create opportunities. For example, being embedded in traditional kinship relations, can serve as opportunities or constraints to social and physical mobility. Similarly, in an organisational setting, social contacts can mean better information/advice and more career opportunity but may also entail increased social pressure and obligations. In the words of Granovetter (1985): "Actors do not behave or decide as atoms outside a social context, nor do they adhere slavishly to a script written for them by the particular intersection of social categories that they happen to occupy. Their attempts at purposive action are instead embedded in concrete, ongoing systems of social relations (p.487)".

Using a broad range of methodological and theoretical frameworks, the present thesis aims to address this notion by integrating *Social Network Analysis* (SNA)

techniques with prominent psychological areas, including *Personality and Individual Differences* (Chapter 2), *Social Cognition* (Chapter 3) and *Organizational Psychology* (Chapter 4). Figure 1 below graphically illustrates the thesis structure.
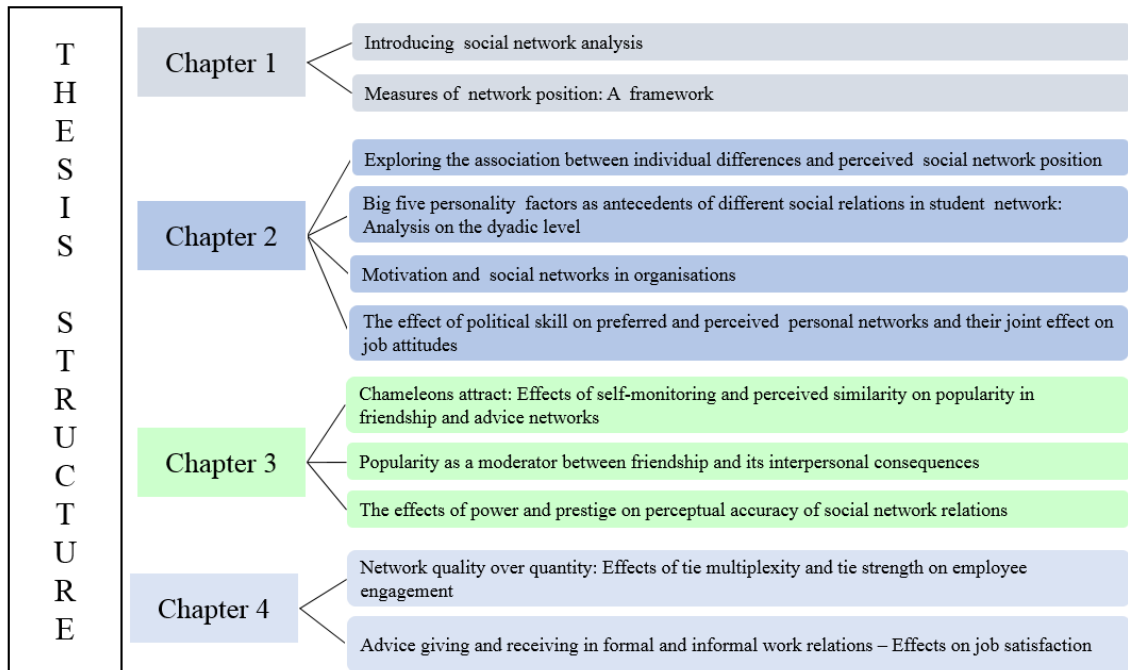
Figure 1. Thesis structure.

The **first chapter** provides a brief overview of the wide range of theories, concepts, terminology and applications that comprise the social network perspective. The origins will be described and how the social network approach offers a distinct focus on social interactions. Important concepts and ideas will be discussed and an introduction to network (social) cognition and use of social networks in organizational settings will be offered. Since the notion of defining an individual's network position is key to social network theory, a novel, three level structural framework is presented, integrating the most imperative measures of structural positioning.

The **second chapter** contains four studies attending to how individual differences in personality and motivation relate to the perception of, and actual social network positioning. *Study 1a* and *1b* will investigate the relation of the Big Five

personality dimensions, Self-esteem and Regulatory Focus with an individual's perception of higher-order network properties.

Using a student sample, *Study 2* is concerned with the question of how the Big Five personality traits influence the likelihood of selecting and attracting social network connections/ties. Furthermore, using the dyadic level of analysis, this study will consider potential personality homophily effects: if two individuals are similar in personality, are they more likely to approach each other for advice, become friends and trust each other?

Given the relative absence of previous work considering how a person's motivations enact different network characteristics, *Study 3* will explore the question of whether differences in motivation explain the extent to which individuals take advantage of social network opportunities, in an organizational setting.

Lastly, *Study 4* investigates the effects of an individual's political skill on preferred and perceived personal networks and their joint effect on job attitudes.

The **third chapter** comprises three studies, linking SNA with social cognition research. *Study 1* examines effects of self-monitoring and perceived similarity on popularity in friendship and advice networks. Previous research has demonstrated stable effects of self-monitoring personality in attracting social ties; however, little is known about the mechanism underlying this relationship. Using a three-wave longitudinal social network study, we will test if high self- monitoring scores are associated with higher levels of perceived similarity, as reported by others. It is hypothesised that it is this perception of similarity that increases the likelihood of receiving ties.

Prior research demonstrates that individuals vary in their perceptual accuracy of social relationships. *Study 2* sets out to investigate how perceptions of popularity affect the relationship between friendship and interpersonal outcomes including advice seeking, trust and perceptions of competence. Following prior work, we anticipate that friendship

will be positively associated with these beneficial interpersonal outcomes. However, we expect that those positive effects associated with friendship, are reduced when the target is considered highly popular. In other words, the relationship between friendship and interpersonal outcomes, is expected to be weaker if perceived popularity is high.

Lastly, *Study 3* is based on literature in the field of social cognition examining how power influences social information processing. Specifically, the study explores the influence of an individual's power and social prestige on their perceptual accuracy of dyadic relations in a friendship network. Predictions will be tested using Cognitive Social Structure (CSS) network data collected from three different student groups.

Chapter 4 aims to go beyond the popular "more connections are better" philosophy. Specifically, we highlight the importance of considering qualitative aspects of social networks – next to their size – to gain a more comprehensive understanding of how social network characteristics affect organizational outcomes.

Study 1 investigates effects of tie multiplexity and strength on employee engagement. The study objective is to test effects of simplex (only one type of relation, e.g., advice seeking) and multiplex (multiple types of social relations, e.g., advice seeking together with friendship) social relations as well as average frequency of activation of those relations on employee work engagement.

Study 2 of chapter four sets out to examine advice giving and receiving in formal and informal work relations and their effects on job satisfaction. Prior studies considering effects of advice giving and receiving have yielded somewhat inconsistent conclusions, yet generally it appears that it is better to receive than to give. In this study, we propose that the strength of this effect depends on the *formality of ties*, i.e., whether individuals are formally required to work with each other. Assuming that advice ties, occurring in and outside the formal workflow are qualitatively different, we expect that

the difference between the costs associated with advice giving and the benefits of receiving advice are exaggerated if connections take place outside the formal workflow.

1.2 Introducing social network analysis

1.2.1 What is social network analysis?

Social Network Analysis (SNA) is an increasingly popular technique used in the social and behavioural sciences, as well as in fields such as finance, advertising, architecture and industrial engineering. The social network perspective puts a strong emphasis on relationships among social actors, such as interactions among group members, financial transactions between organizations, and trade or treaties among countries (Wasserman & Faust, 1994). SNA allows representation of the social environment as relational patterns among interacting social entities. This focus on social relationships is an important addition to more traditional social and behavioural research, which is mostly concerned with actor specific attributes. In the last fifty years the amount of scientific literature on social networks has grown exponentially (Brass, Galaskiewicz, Greve, & Tsai, 2004) and researchers from different fields have started to acknowledge that the network perspective allows addressing established social and behavioural science questions, by offering a tool to precisely define and mathematically measure structural aspects of the social environment.

1.2.2 History, theory and methodology

The development and application of SNA is not a clear, linear process, making it difficult to write a simple history of its evolution (e.g., Pell, 2012). In particular, due to the multitude of academic fields applying, interpreting and developing SNA in various different ways, the ontological and epistemological foundations remain somewhat unclear (Wellman, 1983). In general, SNA can be seen as emerging from a number of diverse research domains including sociometry, psychology, anthropology and mathematics (see

Freeman, 2004 for a review). Sociometry is the study of social relations and is rooted in the work of psychiatrist Jacob Moreno, who first examined how the social relations of an individual influence their psychological development and wellbeing (Scott, 2000). From a sociometry perspective, society should be studied by investigating causes and consequences of social relations, instead of studying individuals in isolation. In so called "sociograms" people are graphically represented as points (i.e., nodes) and social connections are represented as lines (i.e., ties) between points. In subsequent years, the visual appeal of theses sociograms became more formalized with the introduction of graph theory and mathematics (Cartwright & Harary, 1956) offering a terminology for defining and describing networks as well as a collection of axioms and theorems, which can be adopted to understand structural patterns in social networks (Scott, 2000).

In addition to the sociometric and graph theoretical roots, modern network analysis is also based on psychological and anthropological work (Scott, 2000). First, during the 1930s, social and cognitive psychologists working under the *Gestalt* paradigm examined social group structure and information flow among its members. Second, researchers at Harvard University advanced work by A.R. Radcliffe-Brown focusing on interpersonal relationship emergence and subgroup formation within social networks. Third, scholars from the University of Manchester studied tribal societies to further refine network theory and the study of social communities. Those researchers were also primarily influenced by Radcliffe-Brown's research, yet, they tended to focus on conflict and change rather than cohesion, which was the main emphasis for the Harvard group (Scott, 2000). Together, these streams of research, serve as the theoretical and methodological groundwork of social network research.

Today, SNA can be traced to many disciplines, including anthropology (Barnes, 1954; Levi-Strauss, 1969; Mitchell, 1974; Radcliffe-Brown, 1948), linguistics (Levi-Strauss, 1951; Milroy& Milroy, 1985; Wiklund, 2002), primate research (Haslam,

1997), industrial economics (Madhavan, Koka, & Prescott, 1998), entrepreneurship (Burt, Jannotta & Mahoney, 1998; Gattiker & Ulhøi, 2000; Greve & Salaff, 2003), health (Hendryx, Ahern, Lovrich & McCurdy, 2002; Smith & Christakis, 2008) and, of course, social media (Huberman, Romero, & Wu, 2008; Lewis et al., 2008).

While – as outlined above - most theoretical foundations of SNA are found in the field of sociology (e.g., Burt, 1987; Coleman, 1988; Simmel & Hughes, 1949), and social psychology (e.g., Festinger, Back, & Schachter, 1950; Freeman, 1992; Katz & Lazarsfeld, 1955; Moreno, 1937; Travers & Milgram, 1969), methodologically, SNA has been profoundly shaped by mathematics and statistics (Wasserman & Faust, 1994) and one of the oldest, and still prevailing, criticisms of social network research is that it lacks an intuitive theoretical grounding and it is merely descriptive or methodological (e.g., Borgatti et al., 2009). As put by Krackhardt (1995):

"Network research is frequently characterized as an amalgam of mathematical (read boring) techniques and a-theoretical data crunching" (p.353).

Indeed, some early researchers such as Mitchell (1969) or Barnes (1972) view network analysis as nothing more than an eclectic bag of techniques:

"There is no such thing as a theory of social networks; perhaps there never will be. The basic idea behind the metaphorical and the analytic uses of social networks-that the configuration of cross-cutting interpersonal bonds is in some unspecified way causally connected with the actions of these persons and with the social institutions of their society-this remains a basic idea and nothing more. It constitutes what Homans calls an 'orienting statement' rather than a theory with propositions that can be tested" (Barnes, 1972, p. 2).

Yet, today scholars widely agree that the network perspective is not merely a methodological extension to traditional research. As White, Boorman and Breiger (1976) stated:

"The presently existing, largely categorical descriptions of social structure have no solid theoretical grounding; furthermore, network concepts may provide the only way to construct a theory of social structure"(p.5).

This is in line with Barry Wellman (1983), founder of the *International Network Society of Social Network Analysts* (INSNA, in 1978) statement that:

"The power of network analysis resides in its fundamental approach to the study of social structure" (p. 156).

Similarly, Scott (2000) claims that SNA is:

"An orientation toward the social world that inheres in a particular set of methods. It is not a specific body of formal or substantive social theory" (p.5).

In general, there appears to be widespread consensus that SNA is more than a method. It is an approach towards understanding human behaviour, emphasizing the importance of social relations as well as offering a set of methodological tools enabling the study of those social relations and their consequences. While many (scientific) methods carry various *data specific* assumptions, the network method also holds *theoretical* assumptions about the social environment an individual is part of. Most importantly, it is assumed that individuals tend to be embedded in social systems containing other actors who act as point of reference for behaviour, and secondly, there are systematic structural patterns to these relationships (Knoke & Kuklinski, 1982).

In summary, SNA provides the method to define social structure and concepts, offering a theoretical alternative to the prevailing assumption of independent entities and

a framework for empirically testing research questions related to the role of the social structure. Consequently, SNA today is widely considered as its own 'paradigm' with its own unique methodological, analytical and theoretical approaches.

1.2.3 The basic network anatomy

A social network can be defined as:

> "*A finite set or sets of actors and the relation or relations defined on them. The presence of relational information is a critical and defining feature of a social network*" (Wasserman & Faust, 1994, p. 17-21).

The different types of social networks are characterised by *network mode*. Network mode is defined by the number of entities on which structural variables are assessed. Most networks are defined as *one-mode* network with one set of nodes that are similar to each other (e.g.,individuals, groups, countries). Yet, some networks are *two-mode* networks (also called affiliation or bipartite networks) containing two dissimilar sets of nodes (e.g.,individuals and events) and ties only between nodes that belong to dissimilar sets (see Figure 2 below).
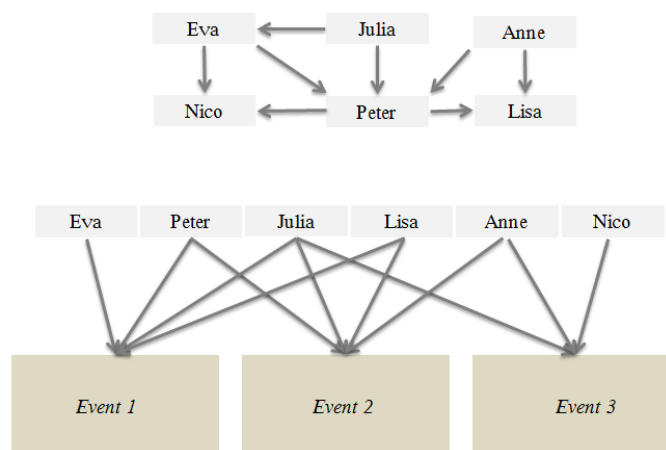
Figure 2. Example of *one-mode* (top) and *two-mode* networks (bottom).

Generally, a social network comprises a minimum of two social actors and some sort of link (tie) between them (i.e. a dyad). This can be represented as (or

abstracted to) a mathematical object termed graph with nodes (vertices, actors) and ties (edge, links, relation, connection). Figure 3 illustrates a social network with directed and weighted ties. Arrows depict tie direction (e.g.,resource flow direction, advice giving or seeking) while thickness depicts weight of a tie (e.g.,frequency, intensity of interaction).
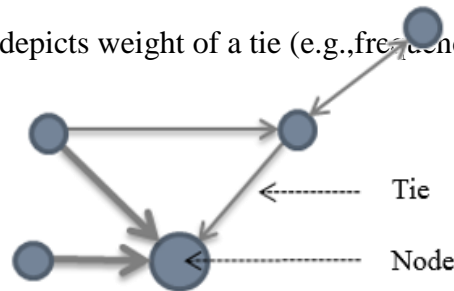
Figure 3. Visualization of example Social Network.

A central task of network science has been to devise graph-theoretic properties that describe (a) actor network positions, (b) dyadic properties between actors and characteristics defining (c) the whole network structure. At the *actor level* researchers tend to focus on the position of the actor in the overall network. One of the most popular actor level measures is centrality (e.g., degree, betweenness, closeness), which belongs to a family of concepts describing network positioning. A *dyadic level* analysis focuses on the properties of actor pairs. Examples are geodesic distance (i.e., the number of ties in the shortest path from one actor to another), reciprocity and structural equivalence (i.e., the extent to which a pair of actors has ties to the same third party). Whole *network level* analysis involves exploring properties such as *density* (i.e., the proportion of actual ties divided by the maximal number of possible ties) and *centralization* (i.e., how much the network 'is build' around a particular node).

Researchers typically differentiate among various types of dyadic connections both analytically and theoretically. Borgatti et al. (2009) split dyadic relations into four simple types: *similarities*, *social relations*, *interactions*, and *flows* (see Figure 4) and a

considerable amount of SNA research is concerned about how these different types of ties influence each other.

Similarities			Social Relations				Interactions	Flows
Location	*Membership*	*Attribute*	*Kinship*	*Other*	*Affective*	*Cognitive*		
e.g. Same spatial & temporal space	*e.g. Same clubs, same events etc.*	*e.g. Same gender, same attitudes etc.*	*e.g. Mother of, Sibling of*	*e.g. Friend of, Boss of, Enemy of*	*e.g. Likes, Hates, Loves*	*e.g. Knows, knows about, sees as popular*	*e.g. Sex with, talks to, goes to advice, harmed*	*e.g. Information, beliefs, norms*

Figure 4. A typology of ties studied in SNA (adapted from Borgatti et al., 2009)

Similarities may be investigated in terms of location (spatial and temporal proximity), membership (co-membership in social groups or events) and attributes (sharing socially significant attributes). Similarities may not be directly considered as ties, but as a condition that increases the probability of forming other kinds of ties, by creating opportunities for interaction, resulting in social relations. *Social relations* are the most popular type of tie. Conceptualized as stable properties, they differ from *interactions* which are distinct 'countable' events, often being facilitated by and occurring in the context of social relations. *Flows* constitute tangible and intangible properties spread through interactions (i.e., ideas through communication; viruses through physical contact) and are usually not directly assessed, but rather they are inferred from relational networks.

Each type of tie is typically seen as a distinct network, with a unique structure and different consequences for the actors involved. Typically, researchers then go on to explore how these unique networks relate to one another (e.g., how racial similarity affects the development of friendship networks; how friendship predicts professional advice quality etc.).

1.2.4 Key theoretical frameworks

Even though some network researcher adopt an inductive, method-driven approach, a deductive, theory-driven approach appears much more prevalent (Prell, 2012). In this approach the researcher has a clear idea of the study question or theory he/she aims to test. According to Prell (2012) there are five theories that are most commonly tested - in one way or another - in network research. These are summarized below:

Social Capital. Social capital broadly refers to the resources accumulated through the relationships among social actors (Coleman, 1988). More specifically it can be defined as:

"The sum of the resources, actual or virtual, that accrue to an individual or a group by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintance/ recognition" (Bourdieu & Wacquant, 1992, p. 14).

Network researchers investigating Social Capital, tend to link a certain structural network characteristics, such as centrality, brokerage, reciprocity or strength of tie, to some specific outcome of interest, for instance, in an organizational setting, wellbeing, job attitudes or performance.

Network exchange. Network exchange or Social exchange theory is a social psychological and sociological outlook explaining changes in social systems through processes of negotiated exchanges between social units.[1] This is based on the assumption that these relations are formed based on the comparison of several alternatives, to maximize benefit and minimize costs. As such, social exchange can be seen as "the reciprocal transfer of 'goods', both tangible and intangible, such as practical help, advice, information, or prestige" (Dijkstra, 2015, p.1). Social exchange theory is widely used to

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[1] See Emerson (1976) and Cook, Cheshire, Rice and Nakagawa (2013) for a comprehensive review.

explain behaviour across numerous domains, such as information technology adoption (Gefen & Keil, 1998) consumer behaviour (Shiau & Luo, 2012), information sharing (Hall, Widén, & Paterson, 2010) leadership (Liden, Sparrowe, & Wayne, 1997) and social power (Molm, Peterson, & Takahashi, 1999).

Biased net theory. One of the earliest methods to formally model social networks is random and biased net theory, introduced by Rapport and others in the 1950s (Skvoretz, Fararo, & Agneessens, 2004). According to this theory, ties are seen as deriving from influences that are both random and non-random (biases). For example, the *reciprocity* or *mutuality bias* is a **structural type** bias indicating probability of a tie from actor x to actor y is elevated if there is a tie from actor y to actor x. A **compositional type** bias, is concerned with an actor's attributes. For instance, the *inbreeding bias*, is demonstrated in a study by Fararo and Sunshine (1964) showing that delinquent schoolboys were more likely than chance to nominate other delinquent boys as friends than to nominate non-delinquent schoolboys.

Social influence and *Social Selection Network theory.* Theories around social influence consider how actors in a network influence one another's attitudes, emotions, opinions and behaviour. For example, connected individuals impact one another's perceptions, emotions and behaviours, over time leading to more similarity (Friedkin, 1998). Yet as noted by Robins, Elliott and Pattison (2001), it is challenging to determine which comes first, social selection or influence. That is, are we first attracted to similar or do we become more similar as a result of increased interaction over time? Most likely, these mechanisms are closely intertwined, mutually influencing one another (Robins et al., 2001).

Social networks and diffusion of innovation. Diffusion of innovation refers to the investigation of how, why, and at what rate new technology or idea is spread and

adopted (Rogers, 1995). The theory has its origins in sociology and anthropology (see Tarde, 1903) with some influence from epidemiology (Bailey, 1957). In the diffusion of innovation process, a few group members initially adopt an innovation, followed by others until most members have adopted the new idea (Rogers, 1995; Ryan & Gross, 1943; Valente, 1996). Past empirical research demonstrated that new ideas and practices spread through social networks through (informal) interpersonal contact within and between social units (Beal & Bohlen, 1955; Katz, Levine, & Hamilton, 1963; Ryan & Gross, 1943; Valente, 1996).

1.2.5 Integrating structuralist and individualist research traditions

A dominant characteristic of social network research has been the mere emphasis on structure, often entirely ignoring individual-level variables. As a result, the network literature has mainly focused on showing how an individual's social network structure has a substantial impact on some outcome of interest (Bernardes, 2010; Borgatti et al., 2009; Morton, Danity, Burns, Brookes, & Backhouse, 2006). Radical promoters of the social structural perspective, tend to view the study of individuals as "a dead end" (Mayhew, 1980, p. 335) which should be "substituted" by empirical examinations of social structures (also see Leinhardt, 1977; Wellman & Berkowitz, 1988; White, 1992). It has often been concluded that structural and individual approaches are separate scientific paradigms and are therefore incompatible (e.g.,Kilduff & Krackhardt, 1994; Landis, 2016).

"Structuralist and individualists are asking different questions. They are

attempting to explain different things....and no shared language and no line of

communication unites them in any common discourse" (Mayhew, 1980, p.339).

"To speak of personality and social structure in the same breath is as close as one can get to heresy against the established social network paradigm." (Kilduff & Tsai, 2003, p. 79).

Yet, viewing social network research as totally independent from an individual's psychology seems somewhat inconsistent, since traditionally the method is strongly relying on the psychology it appears to dismiss so harshly (Kilduff & Krackhardt, 1994). In fact, more recently researchers have started to acknowledge that rather than contradicting one another, psychology and the structuralist approaches can complement and inform one another (e.g.,Landis, 2016). Consequently, scholars have started to focus on an individual's perception of social network structures and how individual differences may influence the network position a person holds (Kilduff & Krackhardt, 2008). Individual differences can refer to observable characteristics such as gender, race or age or to emotions, attitudes or personality characteristics such as Extraversion, which may be especially predictive of an individual's network characteristics such as network size. In line with this, scholars in the field of social psychology as well as network analysis increasingly call for studies taking into consideration both individual as well social structural characteristics (Kilduff & Tsai, 2003) and an accumulating research base indicates that personality – in some way or another - affects the structure of social relations (e.g.,Buhrmester, Furman, Wittenberg, & Reis, 1988; Mund & Neyer, 2014; Reitz, Zimmermann, Hutteman, Specht, & Neyer, 2014).

"Given the persistence of the anti-categorical imperative among sociological researchers on the one hand and the neglect of networks by those studying social relations from a psychological perspective on the other hand, there is a pressing need for non-dogmatic research that explores issues concerning how individual differences in cognition and personality relate to the origins and formation of social networks" (Kilduff & Tsai, 2003, p. 85).

In a similar vein, there appears to be a general consensus that potential antecedents and outcomes of social networks, in particular psychological and motivation factors, remain understudied (Kalish & Robins, 2006; Kilduff & Tsai, 2003; Mehra, Kilduff, & Brass, 2001; Sasovova, Mehra, Borgatti, & Schippers, 2010). Research in this area might also, to a certain extent, satisfy longstanding calls for research in fields such as social and ecological psychology, by acknowledging the importance of the social context in understanding individuals and groups.

1.2.5.1 Individual differences and networks

The psychological area currently most integrated with SNA is individual differences, in particular personality (Casciaro et al., 2015). Especially the personality trait self-monitoring — "the active construction of public selves to achieve social ends to proactively behave in a manner suitable for a specific situation" (Gangestad & Snyder, 2000, p. 546) — has received much attention in the network literature (e.g.,Sasovova et al., 2010). For example, Mehra et al. (2001) obtained network structures of 116 employees of a small high-technology firm. Findings indicate that individuals, scoring high on self-monitoring, occupy more central network positions. Furthermore, self-monitoring and network centrality independently predicted individuals' workplace performance. Burt et al. (1998) were possibly the first to incorporate personality research in a SNA methodology. In their study they found that individuals embedded in entrepreneurial networks (open with numerous structural holes) tend to be proactive and risk taking individuals. On the other hand, people embedded in constrained networks tend to have more reactive and risk-averse personalities. These results were extended and replicated with a psychometrically more valid method by Kalish and Robins (2006) showing that individuals who are more individualistic, controlling and neurotic are inclined to occupy structural hole positions. Furthermore, their findings revealed that people who see themselves as vulnerable to external forces have a preference for closed

networks of weak positions. Austin, Soklofske and Egan (2005) established a positive link between Emotional Intelligence (EI) and social network size and quality and Klein, Lim, Saltz and Mayer (2004) used the Big Five factor Model (Goldberg, 1990) to predict network structures demonstrating that highly educated individuals with low Neuroticism scores tend to occupy central positions in advice and friendship networks. Furthermore, Openness was negatively related to friendship centrality and positively to adversarial network centrality. Similarly, Kanfer and Tanaka (1993) conducted a study with undergraduates concluding that students who were more extraverted, agreeable and emotionally stable were more integrated and thus better connected in the network. Totterdell, Holman and Hukin (2008) investigated individual differences in people's propensity to connect with others (PCO) and found that PCO may help individuals adjust and thrive in their social context. The authors found that managers and team leaders showed a greater inclination to connect with others compared to other employees in the organization. This implies that having this propensity may lead individuals to adopt or be adopted for certain social roles. Lastly, in a recent meta-analysis Fang et al., (2015) investigated (a) how personality impacts network position, (b) how network position in turn predicts work outcomes and (c) if the association between personality and work outcomes is mediated by network position. The 138 studies reviewed in the meta-analysis each include self-monitoring and the Big Five personality characteristics. Work outcomes examined included career success and performance. Network position was represented by *in-degree centrality* (number of incoming ties) and *brokerage* (bridging otherwise unconnected actors). Social relationships were considered in expressive (e.g., friendship) as well as instrumental (e.g., advice) networks. Results demonstrate that personality and network centrality both directly predict performance and career success. Yet, notably, personality is merely a modest predictor of in-degree centrality and brokerage (3% - 5%

of the variance), and network position only partially mediates the personality-performance association.

1.2.5.2 Network cognition

Though *network cognition* has been of enduring prominence in SNA research (e.g., Lewin, 1951; Newcomb, 1961), in the past 25 years there has been a renaissance of interest in how networks of relationships are perceived and cognitively represented (Brands, 2013). Traditionally, SNA methodology focuses on an actor's perception of their social networks, assuming that those perceptions accurately model actual interaction patterns (see Bernard, Killworth, & Sailer, 1979). The mental monitoring of social relations is a vital task for individuals and the ability to accurately perceive and process social information is important not only because it partly determines what makes us human, but it also impacts our success as individuals as we endeavour to get along and get ahead (e.g., Flynn, Reagans, Amanatullah, & Ames, 2006). Yet, humans are known to have major deficits when it comes to accurately perceiving social relations around them (e.g., Krackhardt & Kilduff, 1999; Janicik & Larrick, 2005). Studies on network learning show that individuals expect social relations to follow particular patterns. For example, there seems to be a general assumption of reciprocity in dyadic relations (De Soto, 1960). Crucially, these network cognition matter – arguably even more than objective realities. For instance, if a person x in a work setting perceives that some high-performing individual in the organization is friends with a person y, person x will think of person y also as a high performer regardless of this is true or not. Consequently, what seems to really matter, is the perception of the presence and absence of ties – regardless of whether this link really exists or not (e.g.,Kilduff & Krackhardt, 1994). In other words, it is our perceptions, not reality, that determine how we think, feel and act. This becomes important, if one aims to study consequences of social networks since network

perceptions (as opposed to actual network realities) should be particularly likely to predict subjective, personal outcomes (see Mehra et al., 2014).

The above raises the question if social networks reflect actual patterns of interactions or merely social structures which are cognitively represented (Burt, Kilduff, & Tasselli, 2013). Addressing this question, Cognitive Social Structure (CSS) research emphasizes the cognitive dimension of social networks by exploring biases that people have when perceiving social networks (see Brands, 2013 for a review). Thus, CSS research examines how individuals perceive, cognitively process and represent the social structure surrounding them. CSS studies tend to address two main questions (Brands, 2013): firstly, how do people perceive and cognitively represent their social network? And secondly, how does this perception than impact behaviour and outcome? In answering these questions, CSS research parallels a person's perception of their social network structures to others peoples' perceptions of the same relationship(s).

Methodologically, CSS not only measures an individual member's perceptions about their own direct ties, but requires participants to report what they suppose the relationship to be between other group members. With friendship networks, for instance, group members are not only asked to indicate who they consider a personal friend, but also who they believe are friends in the group. For example, one may ask "who would Karen Smith consider a personal friend?" and the other 20 members of the groups are listed as possible answer options below. This will then be repeated for all other members in the list with the answer list excluding the individual occurring in the question. This cognitive approach may help to better understand how individuals' outcomes are influenced by the social structure around them. From a network view an individual's cognition and behaviour is constrained as well as facilitated by their social environment (Coleman, 1988). In this perspective, actors may benefit from their surrounding relationships (social capital) due to the fact that they occupy beneficial network positions

(e.g., Mehra et al., 2001). Krackhardt (1990) for example showed that an accurate perception of advice taking relations, significantly predicted how powerful that person was perceived by others. CSS research therefore may extend these insights by emphasising the significance of actors' network *perceptions*. The underlying assumption here is that an actor cannot activate and make use of the social capital available unless they can correctly perceive it.

1.2.6 Social network analyses in the organizational context

1.2.6.1 Formal and informal networks

"…*no formal organization will operate effectively without an accompanying informal organization*" (Simon, 1976, p. 148-149).

For the vast majority of today's workforce, work is interaction. We receive information, process it, and transfer it as knowledge to other people. Thus, knowledge sharing has become a crucial organizational concern, not only due to the increased significance of knowledge work (Hansen, 2002; Reagans & McEvily, 2003), but also due to the recognition that tacit ''implicit'' knowledge is more valuable compared to explicit ''formal'' knowledge in innovation processes (Leonard & Sensiper, 1998). Consequently, in modern organizations, the organizational chart is often no longer a sufficient and accurate guide to how work gets done.

Social Network concepts relevant to the organizational context are flourishing (Kilduff & Tsai, 2003). As indicated above, organizational outcomes today are often the results of the effectiveness of cross functional practices (Rummler & Brache, 1995). Managers have to acknowledge the ambiguity of today's organizations (Park, Wasserman,

& Ralston, 2006). In particular, in knowledge-intensive organizations, people and information have to be coordinated and brought together in an adaptable and flexible manner (Cross & Parker, 2004). Consequently, the social networks employees are embedded in, are thought to strongly impact the achievement of short- and long-term success in an organization. From knowledge sharing (e.g., Tortoriello, Reagans, & McEvily, 2011) and creativeness (e.g., Burt, 2004) to individual/team performance (e.g., Mehra et al., 2001) and promotions (e.g., Brass, 1984), there are few areas of organizational behaviour, which are not affected by individuals' social network ties (Landis, 2016). As a result, a vast number of studies have demonstrated the importance of social networks in an organizational context including areas such as social power (Krackhardt, 1990; Brass & Burkhardt, 1992; Ibarra, 1993), employee and organizational performance (Granovetter, 1973; Brass & Labianca, 1999; Gabbay & Zuckerman, 1998; Hansen, 1999; Sparrowe, Liden, Wayne, & Kraimer, 2001), collaboration and teamwork (Lazega & van Duijn, 1997), and job attitudes (Soltis, Agneessens, Sasovova, & Labianca, 2013; Brass, 1981; Kilduff & Krackhardt, 1994).

1.2.6.2 Integrating psychology, network and organizational research

It has been suggested that "network and psychological studies of organizations are complementary and can synergistically improve our understanding of organizational phenomena" (Casciaro et al., 2015, p.1). As discussed before, the structuralist view underlying most organizational network research so far (Wellman & Berkowitz, 1988) ignores or even denies the importance of characteristics on the individual actor level. Though this strictly structuralist approach may be useful to examine neural, molecular or other mainly physical networks, organizational networks are "made of" individuals with affect, cognition, personality and motivations – human psychological factors (Cascario et al. 2015). Taking this into account, an increased interest has been directed towards integrating and jointly investigating the interplay of psychological and network factors (as

illustrated in Figure 5) to get a more holistic understanding of organizational phenomena (e.g.,Brands, Menges, & Kilduff, 2015; DeRue, Nahrgang, & Ashford, 2015 ; Fang et al. 2015;Vardaman, Taylor, Allen, Gondo, & Amis, 2015).
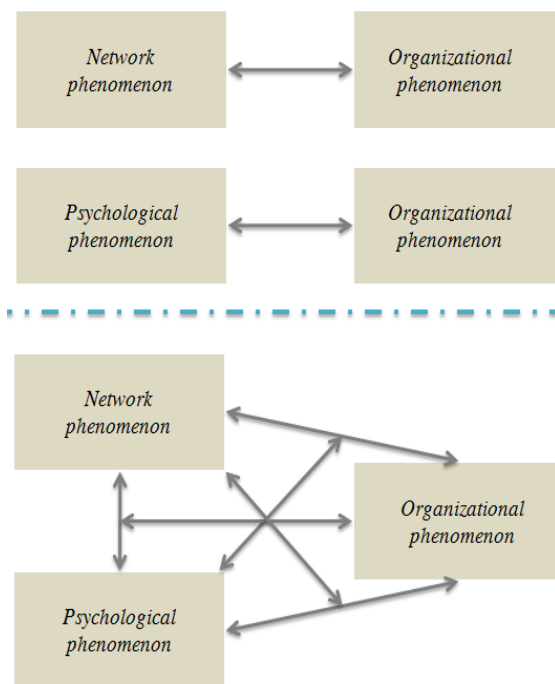
Figure 5. Disciplinary (top) and Interdisciplinary (bottom) Perspective on Organizational behavior. Adapted from Cascario et al. (2015).

1.2.7 Summary

SNA as a method is increasingly used to address questions originally articulated by social psychologists and sociologists. The method allows to quantitatively assess how and individual's social embeddedness is related to their personality, cognition, attitudes and behaviour. At this point in time, it seems that the potential of SNA for academic researchers is not being exploited to the full. Due to the eclectic nature of the SNA field,

current academic literature appears rather fragmented with individual disciplines using and developing it in isolation. This is astonishing since the synergy of psychological and behavioural research with social network research appears to have enormous theoretical and empirical value (e.g., Kilduff & Krackhardt, 2008).

1.3 Measures of network position: A framework

1.3.1 Introduction

The fundamental rationale of network methods is that social structures can be characterised not only in terms of individual characteristics, but also in terms of relations. Network structure is defined by the presence and absence of relational links between nodes, which can vary from *isolated network structures*, where none of the nodes are connected, to *fully connected structures*. Most actual network structures, lie somewhere between these two extremes. Assuming that different structural properties have different effects on individual level and network level outcomes, network scientists have extensively studied how to best measure these structural characteristics. Consequently, the notion of defining an actor's position is key to structural theory (Borgatti & Everett, 1992). Structural position is widely used as a dependent or independent variable in empirical as well as theoretical work. For instance, network position plays a key role in the study of wellbeing (e.g., Agneessens & Wittek, 2008; Gest, Graham-Bermann, & Hartup; 2001; Lubben & Gironda, 2003), mental health (Kadushin, 1982), bullying (Huitsing, Veenstra, Sainio, & Salmivalli, 2012), innovation (Burt, 1987; Tsai, 2001), job changes (Krackhardt & Porter, 1986), firm performance (Powell, Koput, Smith-Doerr, & Owen-Smith, 1999) organizational influence (Galaskiewicz & Krohn, 1984) and many others.

However, the term "position" does not refer to one single concept. A plethora of different frameworks, categorizations and definitions exist, and an even greater range

of applications (Borgatti & Everett, 1992). Importantly, these variants are based on different theoretical and methodological considerations, with strongly varying implications. As a consequence, there appears to be no general consensus about the terminology of network positions and how network positions are conceptually linked.

There are various different ways of conceiving an individual's network positioning (e.g., Borgatti, Jones, & Everett, 1998; Borgatti & Everett, 2006; Freeman, Roeder, & Mulholland, 1979;) including structural measures such as *degree* and *closeness* centrality, as well as measures considering actor and/or alter characteristics, such as measures of *homophily* (Agneessens, Borgatti, & Everett, 2016). While node-level measures such as *degree* and *closeness* centrality are commonly used to estimate an actor's access to information or other resources (Brass, 1984), measures that include attributes have been used to assess how similar an actor is to his/her alters (e.g., as a measure of social selection) and to capture diversity of alters (e.g., resource-richness of network). Moreover, measures can attend only to the *local* or direct contacts of an actor, or additionally include more *global*, indirect connections to others at a longer distance.

Due to the variety of network measures, it is important to carefully evaluate the specific research context and question, when deciding which measures of positon are suitable (e.g.,Borgatti et al, 1998; Borgatti & Everett, 2006; Marsden, 1990). Rather than a theoretical discussion highlighting the importance of these a priori considerations, we here offer a relatively straightforward three level structural framework that links and integrates different levels of network positioning. We perceive this to be an important first step for encouraging an awareness, discussion and empirical research embracing the idea that network measures are manifold and as such may be more or less suitable depending on the research context. Level 1 is concerned with, what we term "tie approach", focusing on number and direction of local and global relational links of a focal actor. Level 2 extends this by considering the presence or absence of relational links between an actors

alters (others connected to a focal actor). Lastly, Level 3 further takes into account actor and alter attributes (characteristics) introducing a new two-axis structural framework. For convenience, all examples in this paper concern un-weighted directed networks defined by a single relation.

1.3.2 Level 1: From local to global - tie approach

The notion of network centrality is one of the oldest in SNA (Freeman, 1978) and numerous measures of centrality have been offered (for a review see Borgatti & Everett, 2006). Identifying which node is more "central" than others, has been a fundamental concern for network scholars (Freeman, 1978; Bonacich, 1987; Borgatti, Carley, & Krackhardt, 2006). Often representing the importance of an actor in a group, centrality measures are designed to characterise an actor's position in the network, (Brandes, Kenis, & Wagner, 2003; Freeman, 1978). *Degree centrality* is the simplest centrality measure, only using the local structure around nodes. In an undirected network, the degree is simply the number of ties a node has. In a directed network, degree is divided into *in-degree* and *out-degree*, since a node may have a different number of outgoing and incoming ties. However, this local approach has important limitations. Degree centrality does not take into account the *global* network structure. This is important, because even though an actor might have many ties to others, he/she might be in a disadvantaged position to quickly reach others in the wider network (e.g., Borgatti, 2005; Brass, 1984). The concept of *closeness centrality* was introduced to address this issue. Focusing on the distance of a node to all others in the network, closeness centrality is defined as the inverse sum of shortest distances to all other nodes from a focal node. Brass (1984) for example, considered closeness centrality to assess how efficient an actor could access resources spread throughout the network. Efficiency is generally based on the length of the *shortest distance* to all others, (i.e., geodesic distance) with shorter

distances (high closeness centrality) considered to be more beneficial compared to longer distances (e.g., Freeman, 1978).

According to Agneessens et al. (2016) it is plausible to consider that more or less weight should be given to nodes at longer distances depending on attribute and network characteristics. Social Network research often simply assumes that indirect relations are vital to acquire resources (Borgatti & Halgin, 2011). For instance, Granovetter (1973) highlights the importance of weak ties in transmitting information about career opportunities among contacts people at longer distance. Being indirectly connected to many other nodes, may be particularly useful when considering easily transferrable information (e.g., the follow of factual information or explicit knowledge) demanding little energy from the network participants. Yet, sometimes direct degree might be more relevant, for instance, in the case of social support or friendship, when a certain level of trust is necessary. Furthermore, transferring complex or tacit (implicit) knowledge is timely and requires considerable energy; this information my not flow over longer distances (Agneessens et al., 2016). Along the same lines one may argue that *geodesics* (shortest distance) may be more relevant when examining the transfer of explicit information whereas *walks* (revisit nodes and links multiple times) may be more suitable for reinforcing information of more implicit character (e.g., persuasion, learning, attitude influence) (see Borgatti, 2005). Consequently, when trying to decide on a suitable measure to capture a person's centrality, it seems sensible to carefully consider whether the social structural impact is expected to be mainly on a local level, or whether the wider network matters, in which case one would need to consider more global measures.

1.3.2.1 In-degree/closeness: Incoming ties – receiving

Whereas *in-degree* is only assessing local connectivity, *in-closeness* also measures indirect global connectivity (e.g., Braha & Bar-Yam, 2004). While *in-degree*

centrality is simply a count of a number of node's incoming ties (e.g., incoming information), *in-closeness* centrality is measured as a function of the minimum geodesic distance from all other nodes towards a focal node. In other words in-closeness centrality measures the degree to which a node can be easily reached from other nodes (i.e. using edges coming in towards the node) where "easily" refers to shortest distance (see Figure 6).

1.3.2.2 Out-degree/closeness: Outgoing ties – sending

Out-degree centrality is calculated as a number of node's outgoing ties (e.g.,sending out information), while *Out-Closeness* centrality measures the degree to which a node can easily reach out to other nodes (i.e., using edges out from the node), and easily again means shortest distance. High out-closeness implies that an actor can reach others in few steps (see Figure 6).

1.3.2.3 Reciprocated degree/closeness

Reciprocated-degree is the number of reciprocated relations a node has – mutual exchange of information. *Reciprocated- closeness* is the minimum geodesic distance form a focal node to all other nodes, only considering reciprocated ties (see Figure 6).

1.3.2.4 Conductivity

1.3.2.4.1 Conductivity- transmitting

Conductivity describes a node with in- and out- going ties- receiving and sending information. This is important because two nodes which have the same degree centrality could have different numbers of in-degree and out-degree ties. As such, they have different roles, which can be either a receiver (mainly in-coming ties), sender (mainly out-going ties) or transmitter (both) (see Figure 6 and 7). This concept is related

to *ego-betweenness* (local level) and *Freeman's betweeness* (global level) where nodes

may be brokering or bridging between two or more others (who are not themselves

connected). This measure of centrality is less concerned with the amount of information a

focal actor receives or gives but with the amount of power resulting from occupying such

bridging position (Brass, 1984).

In-degree - *Local*

RECEIVING
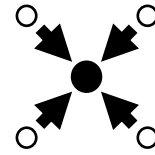
In-closeness - *Global*
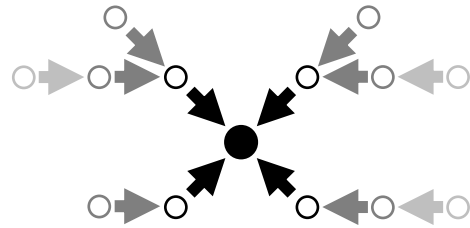
Out-degree - *Local*

SENDING
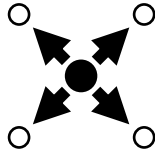
Out-closeness - *Global*
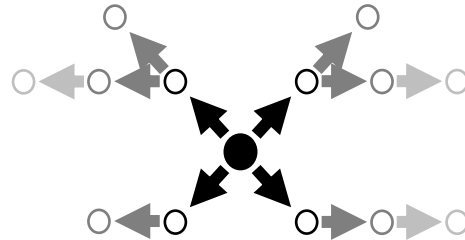
Reciprocated-degree - *Local*
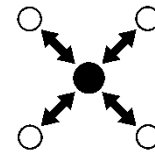
Reciprocated-closeness - *Global*
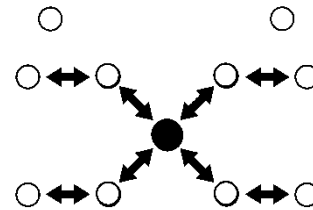
In-Out-degree - *Local*

TRANSMITTING
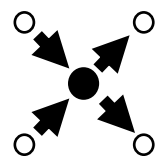
In-Out-closeness - *Global*
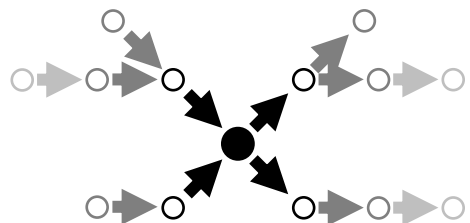
Figure 6. Graphical depiction of local and global network structures.

1.3.2.4.1 Conductivity - In/Out Ratio

        The number of in and out going connections can be plotted as a two dimensional graph. As can be seen in Figure 7 below, a *source* is a node that passes on information (high out-degree) but does not receive information from others (no in-degree). A *sink*, on the other hand is a node who receives information (high in-degree) but does not pass this information on to others (no out-degree). A *spreader*, receives little information (low in-degree) but passes the information to many others (high out-degree). A *low transmitter* has both low in-degree and low out-degree centrality (e.g., someone who receives information from one person and passes it onto one other person). A node is referred to as *hub* if it is high on both in-degree and out-degree centrality, who receives a lot of different information while also effective at spreading these information. A *bottleneck i*s one who has many in-coming ties, representing high amount of information reception, but passes it on to few people (low out-degree). An *isolate* is a node with neither in-degree nor out-degree ties.
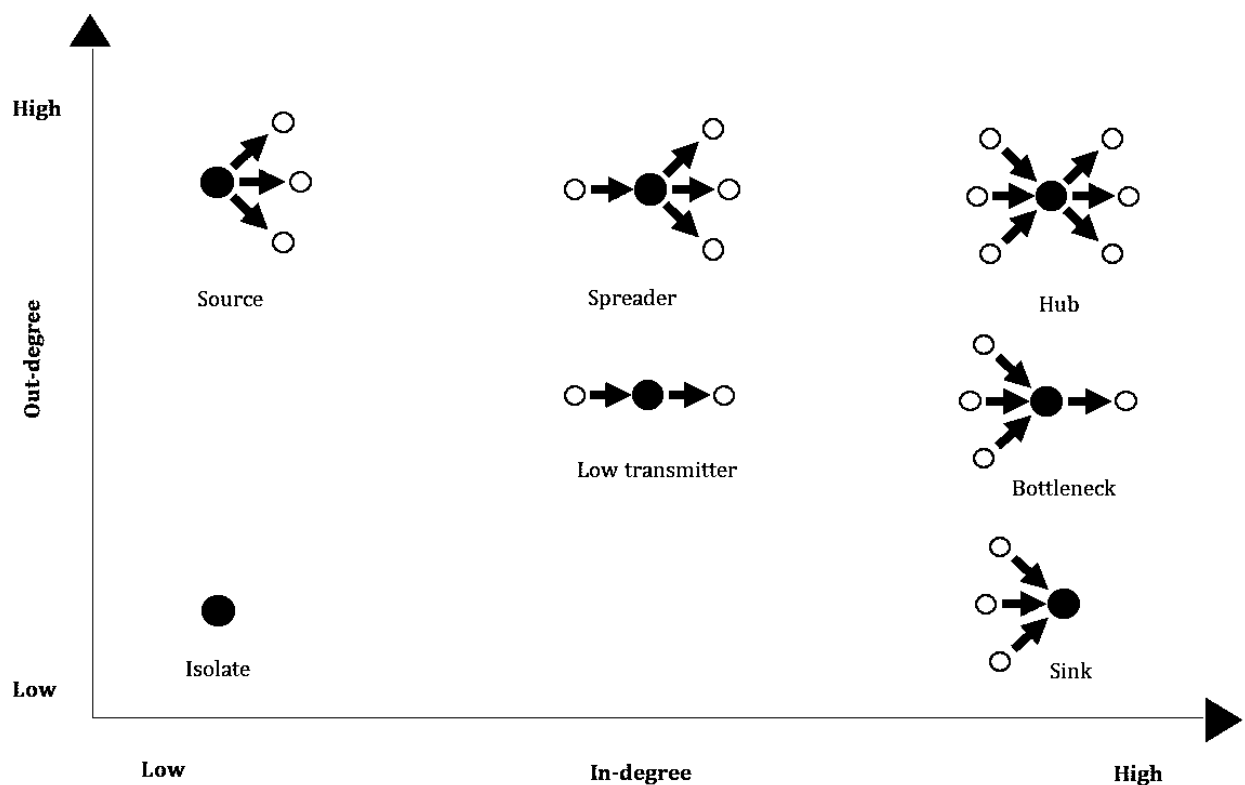
Figure 7. Graphical depiction of in- and out-degree network constellations.

1.3.3 Excurse- What are bottlenecks?

Bottlenecks is a concept much talked about. They are central nodes that offer the only connection between different parts of a social network. Not every bottleneck identified equally impacts network efficiency and effectiveness. This excurse briefly points out the conditions under which a focal node is *not* what is traditionally considered to be a bottleneck. We aim to motivate researchers to take on a more discriminate view on the popular concept. Measurement does not necessarily need to be adjusted, but careful considerations with respect to the research contexts (e.g., tie content, (formal) role of actor) are encouraged before drawing conclusions.

CASE 1– Redundant

Assumption: All sources have the *same* simple factual information (e.g., Trump is US president) and recipients receive that information. The blue field indicates redundant information giver. Given the type of information further information givers do not add value (see Figure 8).
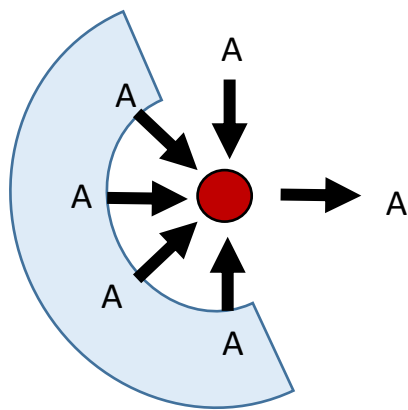
Figure 8. Graphical depiction: Redundant information

CASE 2– **Enforcer**

Assumption: All sources have the *same* (subjectively) loaded information (e.g., Trump is a bad US president) and recipients receive that information. Other than purely factual information, subjective, opinion based (e.g., emotional) information can add up to reinforce (see Figure 9).
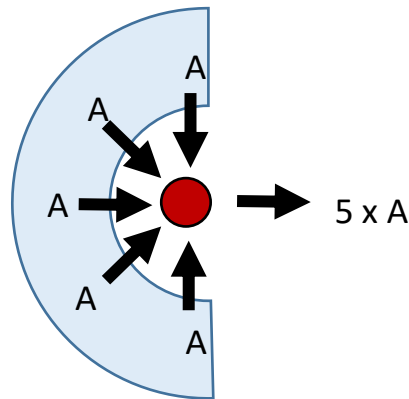
Figure 9. Graphical depiction: Enforcer

CASE 3 – **Bundler**

Assumption: All sources (A-E) have unique information and recipients receive all the unique information (A, B, C, D, and E). *Bundlers* receive unique information and recipients receive all that information in its original, unaltered manner. This is especially important if one intents to identify individuals who are effective at collecting and bundling (simple, factual information) from various different sources and forwarding it its original form (see Figure 10).
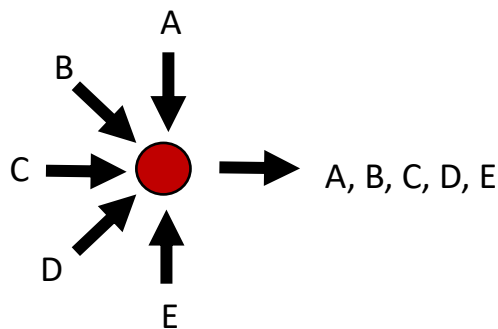
Figure 10. Graphical depiction: Bundler

CASE 4 – Merger

Assumption: All sources (A-E) have unique information and recipients receive all the *unique* information (A, B, C, D, and E). *Mergers* receive unique information and recipients receive a product all the unique information in an integrated fashion. They act as mergers, creating something new (F) based on others input. This is especially important if one is interested in identifying individuals that are capable to act creatively/innovative and solve problems (see Figure 11).
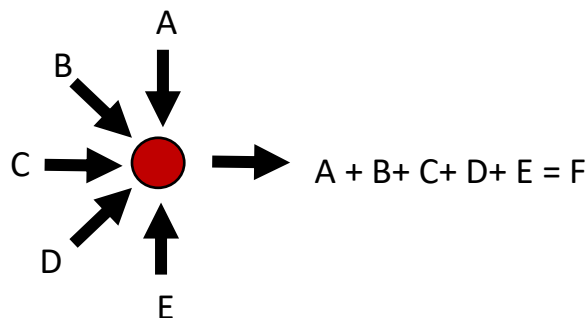
Figure 11. Graphical depiction: Merger.

CASE 4 – Bottleneck

Assumption: All sources (A-E) have unique information. All the information is relevant to the receiver, but is not, or only partially transferred (see Figure 12).
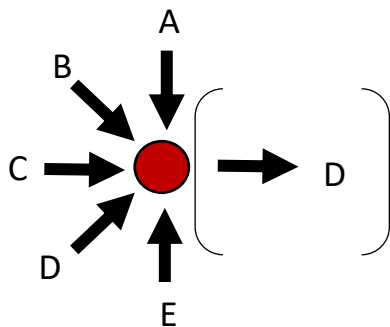
Figure 12. Graphical depiction: Bottleneck.

Additional note: *It could be that a bottleneck is proportional, meaning if receiver receives double the amount of input he/she is likely to transfer double the amount. So if the above would be extended to F, G, H, I, J and K sending (10 unites of information are given) it may be that instead of one unit (D) two units are transferred (e.g.,D, C). Yet this is unlikely in reality since getting more units of information will not come about with an increase in time/ability to transfer more information.*

1.3.4 Level 2: From dyad to triad - structural approach

Social network configurations, can be relatively sparse (open) or cohesive (close), which can be both disadvantageous and advantageous. According to Coleman (1988) cohesive social ties facilitate trust and cooperation since they enable the development of group norms. Being central in a cohesive network leads to more bonding relationships and thus more social capital. In line with this, Obstfeld (2005) showed that individuals with *cohesive networks are more* likely to show innovative behaviour. Conversely, proponents of the structural-hole theory suggest that open networks - connecting other otherwise disconnected parties – offer "structural diversity" and information control, resulting in higher performance, quicker promotion, more career mobility, and the ability to efficiently adapt to change (Burt, 1992, 2004; Cross, Thomas, & Light, 2008; Hargadon & Sutton, 1997). Others argue for a combination where internally cohesive and externally open networks are thought to be advantageous (Adler & Kwon, 2009; Gudmundsson & Lechner 2006; Kadushin, 2002). Again, rather than discussing this issue on a theoretical level, though undoubtedly a useful enterprise, a purely structural framework is offered, illustrating how network positions can be conceptualized to capture different forms of closure (see Figure 13). Interestingly, most research, when discussing benefits of open and closed networks, neglect the fact that it may be relevant to consider whether information is received, sent out, or transferred. Network theory suggests that effects of closure, for example, may be more disadvantageous when receiving information, rather than sending it to two connected actors. We propose that these are critical considerations, which should be reflected in the network positional measure used in a specific research study.
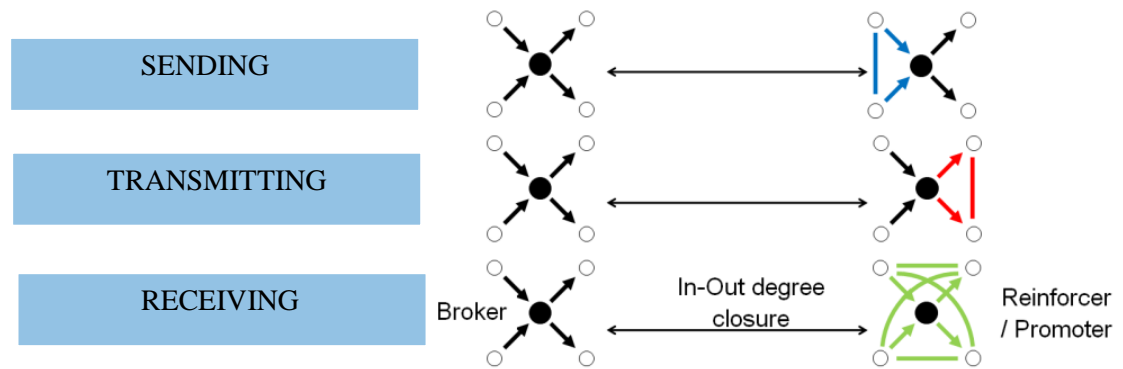
Figure 13. Open and closed networks.

1.3.5 Level 3: Boundary/attribute approach

Level three extends the above by considering attributional characteristics of the actors involved. Next to strictly structural measures, node-level characteristics of actor and alter can be taken into account, to capture idea that some connections are more or less important for an actor (Agneessens et al., 2016). For reasons of simplicity we include configurations that involve two actors and one intermediate receiver, sender or transmitter. The concepts discussed, thus only include local configurations with path length two. Nevertheless, following the previously discussed logic, one could easily extend this to more global variants, where contacts at longer distance are also taken into account – if the social structural impact under investigation is expected to occur in the wider network. Level three is similar to the approach proposed by Gould and Fernandez (1989), however extends their work by not only considering brokerage configurations (actor with in and outgoing tie; transmitting) but also consider receiving (actor with two incoming ties) and sending configurations (actor with two outgoing ties) and placing them on a two dimensional graph (homophily and diversity). As already stated, the framework offered is based on the assumption that differentiating between these different configurations is theoretically important. For instance, from a social capital - /diversity of resource perspective, it is important to consider various *receiving configurations* and

where they fall on the continuum of homophily and diversity. Furthermore, from an influence perspective, it appears useful to consider *various sending configuration,* to determine the impact of an actor in terms of how many groups he/she reaches. From a social identity and leadership perspective, considering overlap in group membership (see configuration 5 in Figure 14) appears conceptually and theoretically important. [2]

Differentiating receiving, sending and transmitting intermediates

If one allows three actors involved in a relation to belong to different parties or groups; various different types of intermediation are possible in digraphs (Figure 14).

1. All three actors are from the same group

2. The intermediate actor is from a different group

3. The intermediate and one of the other actors are from the same group

4. All three actors are from different groups

5. Alters belong to different groups and intermediate is part of both
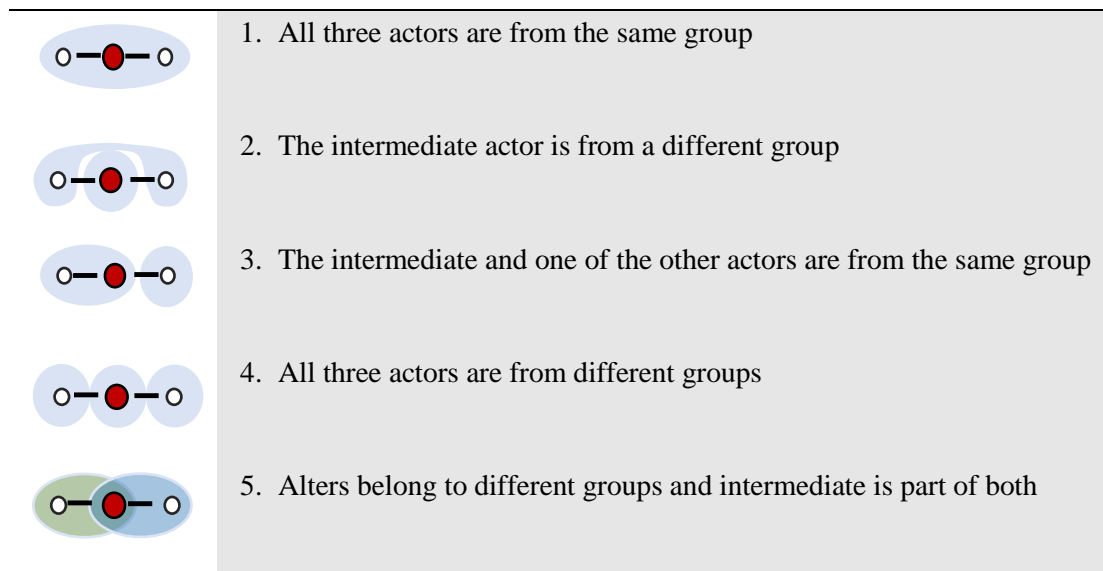
Figure 14. Different intermediation configurations.

These types of intermediation can be categorized along two dimensions (see Figure 15 and 16):

I. *(Alter) Diversity*: Similarity of alters (e.g., measured by Index of Qualitative Variation; IQV)

II. *Homophily*: Similarity actor to alters (e.g., measured by External-Internal Index, EI)

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[2] Gould and Fernandez (1989) introduced the concept of brokerage typology, dividing brokerage into five types based on the direction of resource flow in the network. Furthermore actors are divided into mutually exclusive groups. As such, they do not consider cases where group membership might be overlapping.
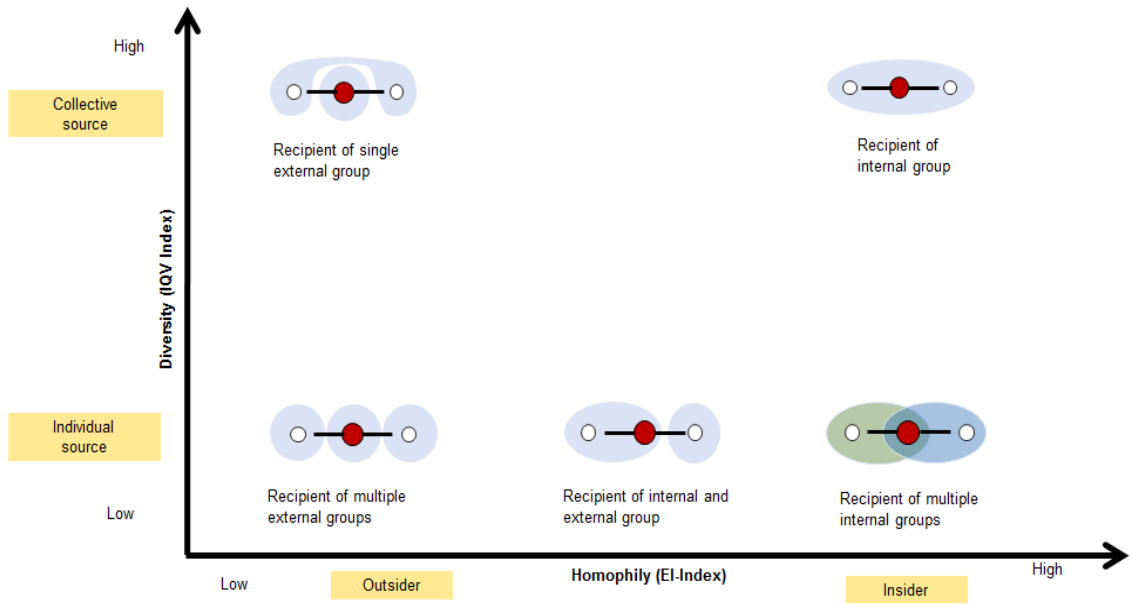
Figure 15. In- and Out-degree digraph.
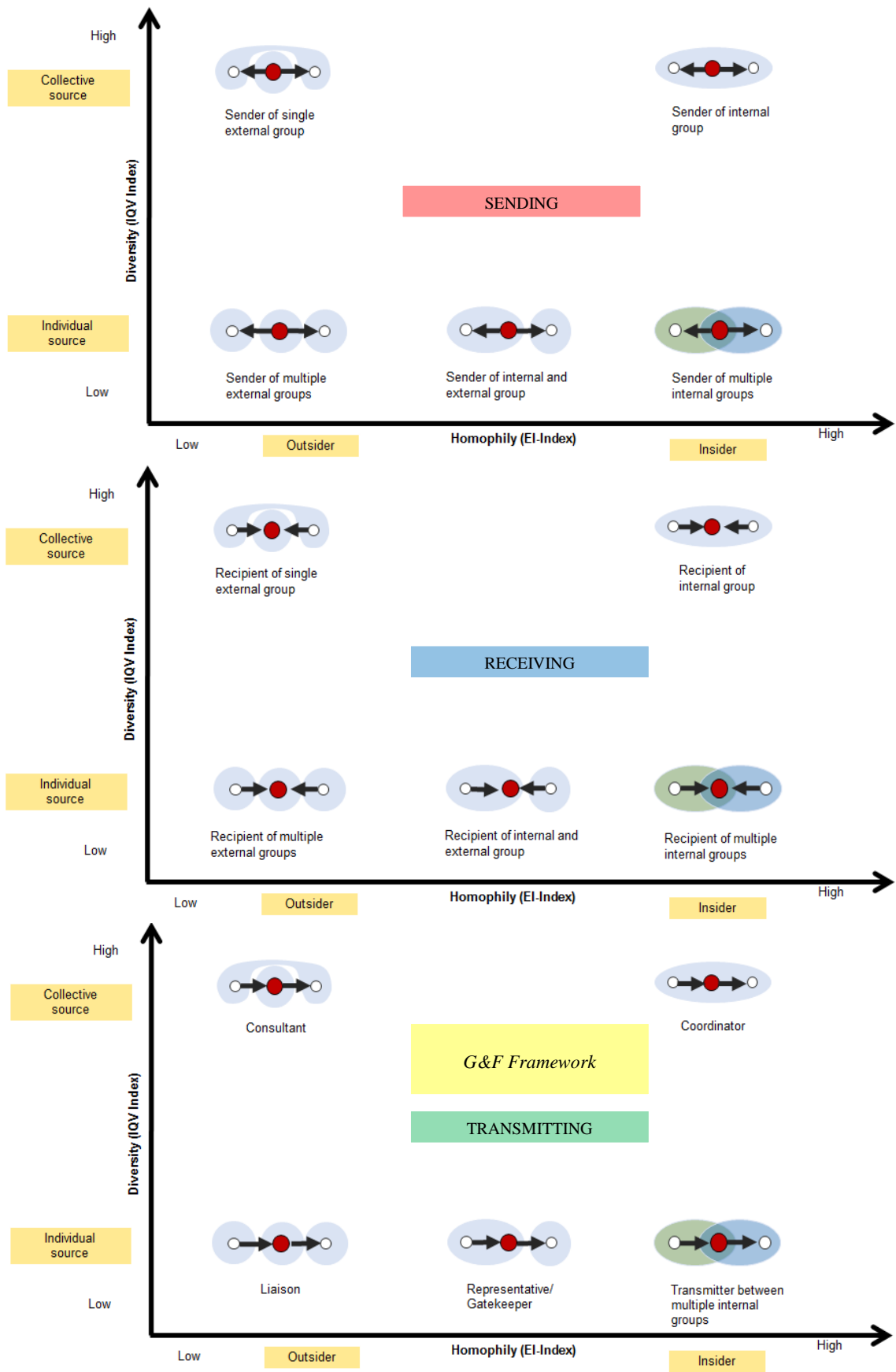
Figure 16. In- and Out-degree digraph variations.

Figure 17 below, combines tie direction, alter attributes and cohesiveness.
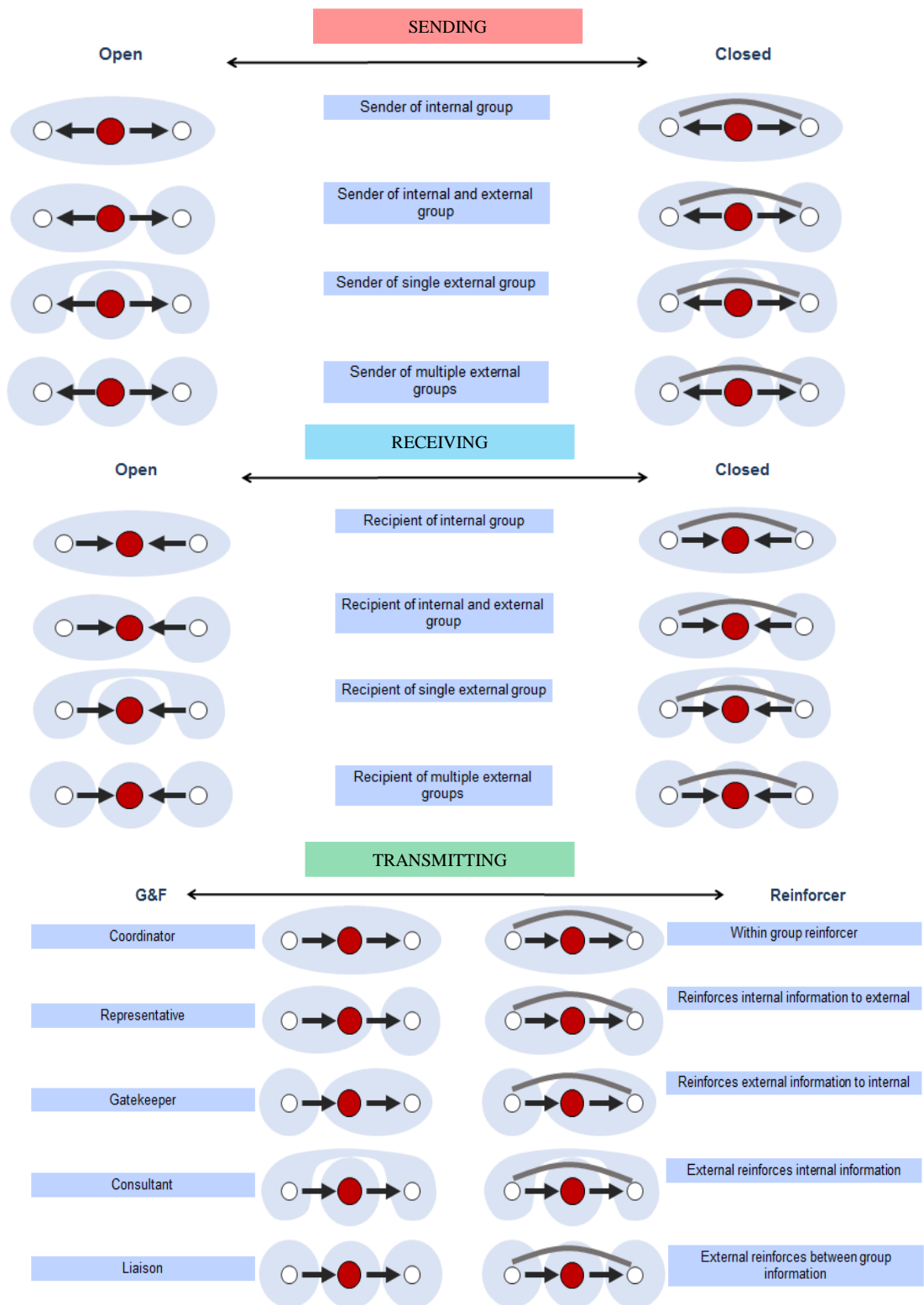
Figure 17. In- and Out-degree, open and closed digraph variations.

1.3.6 Conclusion

A key notion in network theory is that an individual's network position determines the quality and quantity of social resources that individual possesses. Various measures have been proposed, reaching from purely local or direct (e.g., degree) to more global or indirect measures (e.g., closeness). While those measures are purely topological, some measures additionally take into account actor attributes (e.g., diversity and homophily). One of the main problems with SNA is that the analytical tools are more precise than social reality. Some social network researchers fall prey to the illusion of accuracy and construct complicated statistical models that, in the end, make no sense at all for real people. It's what happens in economics. Economists fall in love with mathematics and forget the real thing, which is far from mathematical. Yet, on the other hand, it appears that numerous researchers considering network positioning and its consequences, tend to use rather crude measurement methods that are often lacking theoretical rational, making structural comparisons a difficult task. Selected measures are often not carefully adjusted to the specific context and research question under investigation. For progress in the field, it thus appears desirable to bring some logical framework to the measurement of network position. The three-level-approach proposed, was constructed to provide this framework, enabling step-by-step, content-related considerations to arrive at a theory-fitting measure of social network positions. A logical extension of this paper would be to undertake research exploring how various local and global measures within the proposed framework contribute to outcomes of interest. This would help to develop a more profound understanding under which conditions direct or indirect, close or open, diverse or similar and homophilous or heterophilous networks are more or less important.

CHAPTER 2: ACTUAL & PERCEIVED NETWORK

POSITITION **-** the role of individual differences

2.1 Introduction and overview

2.1.1 Introduction: Personality and social networks

Until very recently, social network researchers have rarely considered potential effects of psychological predispositions on how individuals are positioned in a social network (e.g., Kalish & Robins, 2006; Mehra et al., 2001). Network research traditionally tends to move "away from individualist, essentialist and atomistic explanations toward more relational, contextual and systemic understandings" (Borgatti & Foster, 2003, p. 991). As a result, the vast majority of present-day social network research is concerned with outcomes that are thought to be a consequence of particular network characteristics.

Whereas the outcomes of social network positioning have been well studied, the question of what characteristics may act as antecedents, helping individuals to effectively embed themselves within these networks, has received much less attention (Kilduff & Brass, 2010).[3] The existence of a gap in the literature between the

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[3] At this point it is worth pointing out that there has long been awareness among scholars that social relationships change over time and that the dynamics of social phenomena are a result of continuous time-processes. Yet, to date, the SNA methodology mostly captures a single observation at discrete time point and therefore research tends to focus on the consequences of network properties, i.e. outcomes rather than antecedents. In other words, most SNA research – including the current thesis work - captures 'snap shots in time' and as such involves static assumptions - e.g. that centrality scores are fixed at a moment in time –ignoring the fact that actors may seek out new ties, or dissolve them, over time (Borgatti, Brass & Halgin., 2014). Consequently - as will be discussed in more detail later on in the thesis - capturing time remains one of the key challenges in network research.

structuralist (i.e., the analysis of social ties; SNA) and the individualist approach (i.e.
individual difference psychology) has been widely acknowledged (e.g., Burt et al.,
2013; Fang et al., 2015; Kilduff & Krackhardt, 2008; Kilduff & Tsai, 2003; Landis,
2015). While *individual difference theories* postulate that personal outcomes are
primarily determined by characteristics inherent in the individual (e.g., their personality
or personal motivations), *structuralist/social network theories* stress that individuals
benefit from occupying certain structurally advantageous network positions, offering
access to valuable information, knowledge or social support (e.g., Brass 1984; Burt,
1992; Seibert, Kraimer, & Liden, 2001). Yet, importantly, individual attributes appear
to influence how social networks are developed and used (Burt, 2005; Burt et al., 1998)
and empirical evidence suggests that individual attributes such as self-monitoring
(Mehra et al., 2001), the Big Five personality traits (Fang et al., 2015), and proactive
personality (Thompson, 2005) are associated with building and maintaining effective
personal networks.

More recently scholars have started to bring together these two approaches
(e.g., Fang et al., 2015; Kilduff & Krackhardt, 1994; Kilduff & Tsai, 2003). As
mentioned before, of particular interest has been the role that personality variables may
play in predicting social network structures. As a consequence, in the last years,
substantial progress has been made, and research (by and large) suggests that
psychological predispositions act as antecedents of individual's occupation of network
positions (e.g., Asendorpf & Wilpers, 1998; Casciaro, 1998; Clifton et al., 2009; Fang
& Shaw, 2009 ; Kalish & Robins, 2006; Kalish, 2008; Klein et al., 2004; Lee, Yang et
al., 2010; Sasovova et al., 2010; Tasselli, Kilduff, & Menges, 2015). Self-monitoring
personality, in particular, has been the focus of much attention, due to its emphasis on
the way individuals interact (Snyder, 1987). Fang and colleagues (2015) conducted a
meta-analysis of personality, network positions and work outcomes in organizations

using data from 138 independent samples. Focusing on self-monitoring (Snyder, 1974) and the Big Five personality traits, Fang et al. (2015) provide meta-analytic evidence for the relationship between personality and actual network positions. Specifically, their research demonstrated that high self-monitors garner more in-degree connections in expressive (e.g., friendship) as well as instrumental (e.g., professional advice) networks and tend to hold brokerage positions, bridging disconnected actors. In relation to the Big Five traits, the review indicated that extraverts are inclined to occupy brokerage positions in instrumental network, but not in expressive networks. Those with high Openness to Experience appeared to have smaller friendship networks, but also higher tendency to act as a broker between disconnected friends. Unsurprisingly, individuals high in Conscientiousness are more popular for work-related advice and information; they also tend to fill structural holes in the flow of work-related information. Finally, those with high Neuroticism scores are less attractive for friendship and advice.

In summary, there appears to be compelling evidence that personality and individual difference psychology offer important insights for understanding the social network position an individual occupies. This chapter aims to extend the current literature by considering effects of individual differences on personal (ego) network perception (study 1 & 4) and actual social tie formation in a student (study 2) and organizational context (study 3).

2.1.2 Chapter overview

In **Study 1** we use a recently developed method (*Visual Network Scales*, VNS) by Mehra and colleagues (2014), to examine antecedents and consequences of what has been termed "cognitive social network structures". In two studies we explore how individual differences including personality (the Big Five personality traits), Self-esteem and Regulatory Focus are associated with an individual's perceptions of higher-

order network properties. Furthermore, we examine how these perceived network characteristics interact with personality traits to predict an individual's subjective wellbeing.

Previous research has suggested that personality traits impact the development of actual (not just perceived) social networks. Additionally, similarity in certain personality traits has been shown to make the existence of social relations more likely. Using the relational dyad as unit of analysis, **Study 2** examines the effects of the Big Five personality traits on the existence of different social relationships amongst university students. Attempting to validate and replicate previous literature, we investigate whether personality traits influence the likelihood of selecting and attracting network ties. Furthermore, homophily effects are considered: if two individuals are similar in personality, are they more likely to approach each other for advice, become friends and trust each other?

Study 3 is concerned with the question of whether differences in motivation explain the extent to which individuals take advantage of social network opportunities in an organizational setting. Specifically, we explore how social needs that motivate employees — affiliation, dominance, autonomy, or achievement—are associated with in degree centrality and brokerage, the most well-known structurally beneficial positions in organizational social networks.

The final study, **study 4**, of this chapter examines how individuals with high levels of political skill may differ in their social networking style in organizations. The research examines how an individual's political skill is associated with perceived and preferred network position and how this, in turn, relates to their job attitudes. We explore the possible mechanism underlying the previously established relation between political skill and job attitude (e.g., satisfaction). It is anticipated that politically skilled

individuals are more likely to be, and also perceive themselves, in more central organizational network positions and that this perception of increased social embeddedness has a positive effect on their job attitude. In part two of this study, we experimentally test the idea that highly politically skilled individuals have a preference to occupy bridging positions, by actively maintaining the separation between their network contacts.

2.2 Study 1: Exploring the association between individual differences and perceived social network position.

2.2.1 Introduction

2.2.1.1 Social networks as cognitive (re)constructions

"Social networks are not just patterns of interaction and sentiment in the real world; they are also cognitive (re)constructions of social relations, some real, some imagined"

(Mehra et al., 2014, p. 315).

In SNA, researchers tend to create networks by asking participants to report their relations with other members. Yet, people are relatively poor at accurately recalling their actual interpersonal interactions (Bernard et al., 1984). From a theoretical perspective, this may raise doubts about the general validity of subjective reports as a data collecting method for "real world" networks (e.g., Mehra et al., 2014).

The current work directly attends to antecedents and consequences of social networks conceptualized as cognitive (re)constructions. Specifically, we examine how personality characteristics relate to an individual's perception of their personal social network, using Visual Network Scales (VNSs, Mehra et al., 2014). Additionally, in study 1a we explore how perceptions of degree centrality (network size) may impact the well-

established *personality – subjective wellbeing* relationship (see Richard & Diener, 2009 for a review). Study 1b extends this by considering potential differences between general personal network perceptions – as in study one – and perceptions in a setting were boundaries are specified (i.e., a work group environment). We deem this to be important because specifying network boundaries is a fundamental challenge in network research, since it appears to have a significant impact on how variables under investigation may or may not relate to one another.

2.2.1.2 Visual network scales (VNSs).

Mehra et al. (2014) have recently introduced a pictorially based method making it possible to gather quantifiable data about individuals' perceptions of their social environment. Respondents are asked to judge the extent to which their perceptions of the structure of their social world match these stylized networks (see Figure 18). Two insights primarily prompted this approach:

Firstly, the ease of comprehension of social networks using pictorial representations. Graphical representations of relationships are one of the key features of modern SNA (Freeman, 2004), however researchers hardly ever use pictorial representations to gather data (e.g., Hogan, Carrasco, & Wellman, 2007). According to Mehra et al. (2014) these pictures have not only become meaningful, but they may have become a new way of constructing a social identity.

Secondly, the VNS method allows for the direct probing of a particular network phenomena, rather than soliciting responses at the level of dyadic ties and then subsequently inferring the network characteristic of interest.
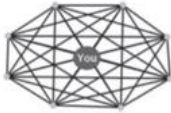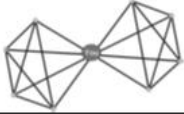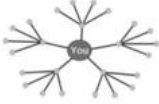
Figure 18. VNSs examples

2.2.1.3 Perceived social networks

To the best of our knowledge, no published research so far has attempted to explore whether individual difference variables not only relate to actual network position but also – and potentially even more so – to an individual's perception of their position in the social structure. The underlying idea of this is that it is not so much our actual network position, impacting attitudes and behaviour, but the position we perceive ourselves to be in. Similarly, it may be argued that it is not people's actual network position which may be indicative of influence and power, rather it is the position in which other people perceive an individual to be in. Consequently, it is crucial to understand how things are perceived and cognitively processed, since perceptions, not reality, tend to influence attitudes and behaviour (Thomas, 1928). The main aim of the present research is to explore the association between personality and these perceived network positions.

2.2.1.4 Effects of perceived social network size on the personality – subjective wellbeing relation

An individual's personality has been repeatedly linked to their subjective wellbeing (e.g., Bostic & Ptacek, 2001; Diener & Lucas, 1999; Emmons & Diener, 1985; Emmons, 1986; Richard & Diener, 2009; Schmutte & Ryff, 1997; Schimmack, Diener, & Oishi, 2002; Schimmack, Radhakrishnan, Oishi, Dzokoto, & Ahadi, 2002; Vittersø, 2001). In study 1a we further explore how perceptions of social network size (degree centrality) in friendship networks influence this association. To do so, we consider additive, mediation and moderation models (see Figure 19 below).
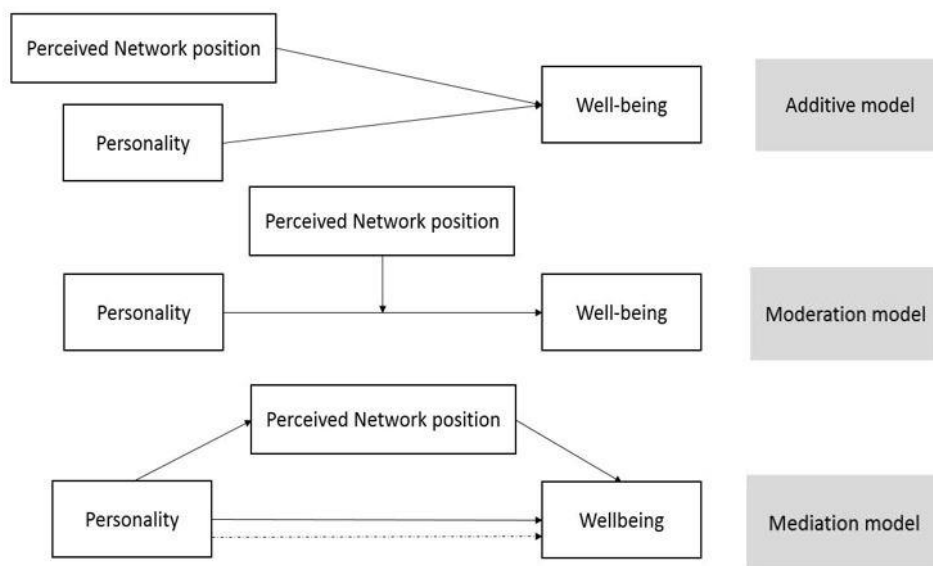
Figure 19. General models of the relationship between personality, social network position and subjective wellbeing.

Firstly, the additive model implies that the two factors may influence subjective wellbeing independently of one another. This means that being high or low in one dimension would not impact the wellbeing benefits of the other. Secondly, a moderation model is tested. For example, Neuroticism might be more detrimental for those who think of themselves as outsiders (having few social connections). Consequently, it appears plausible that individuals' perceptions of their social network size might moderate the relationship between personality and outcomes. In other words, individual differences

may matter for personal wellbeing, but only under particular social circumstances. Lastly, the mediation model suggest that personality is the driving force to perceived network position which then relates to individual wellbeing. For example, Zhu, Woo, Porter and Brzezinski (2013) suggest that actual network size and proportion of new contacts may act as a mediating mechanism connecting Big Five personality traits to perceptions of social support and subjective wellbeing.

Given the established links between personality variables and subjective wellbeing, the three models above are tested and the best fitting model is reported and discussed. We limit our analysis to the three most prevalent personality traits predicting subjective wellbeing: Extraversion, Neuroticism (e.g., Costa &McCrae, 1980; Diener, 2000; Hotard, McFatter, McWhirter, & Stegall, 1989) and Self-esteem (e.g., Diener & Diener, 2009; Mellor, Stokes, Firth, Hayashi, & Cummins, 2008). In terms of network measures, we focus on whole network position (in terms of periphery and centrality; degree centrality), since this is thought to be the most prevalent, predictive and intuitive network metric (e.g.,Fang et al., 2015).

In short, study 1a has two main objectives: a) explore the association between personality and perceived network position (in friendship networks) and b) investigate how these personality and perceived network centrality (vs. periphery; corresponding to degree centrality) interact to predict subjective wellbeing.

2.2.2 Study 1a

2.2.2.1 Method

2.2.2.1.1 Participants

In total, 211 participants (131 male) took part via web-based recruiting. The mean age was 35.1 (*StD* = 11.0). 58.3% of the participants were Asian, 36.5% White,

2.4% Black and 2.8% identified themselves as "other". All participants received debriefing information at the end of the online survey.

2.2.2.1.2 Measures

Perception of networks. We assessed participants' network perception using various Visual Network Scales (VNS) adapted from Mehra et al. (2014). Participants were familiarised with the general idea that social networks can be depicted in two-dimensions using nodes to represent people and lines to denote relations (in this case friendship). Subsequently, they were asked to indicate their perception of their personal close friendship network. We included three VNSs from Mehra et al. (2014) presented in Figure 18. Additionally, we have also designed a new VNS Whole Network (WN) *centrality* (measuring periphery/centrality in the friendship network; see Figure 20)
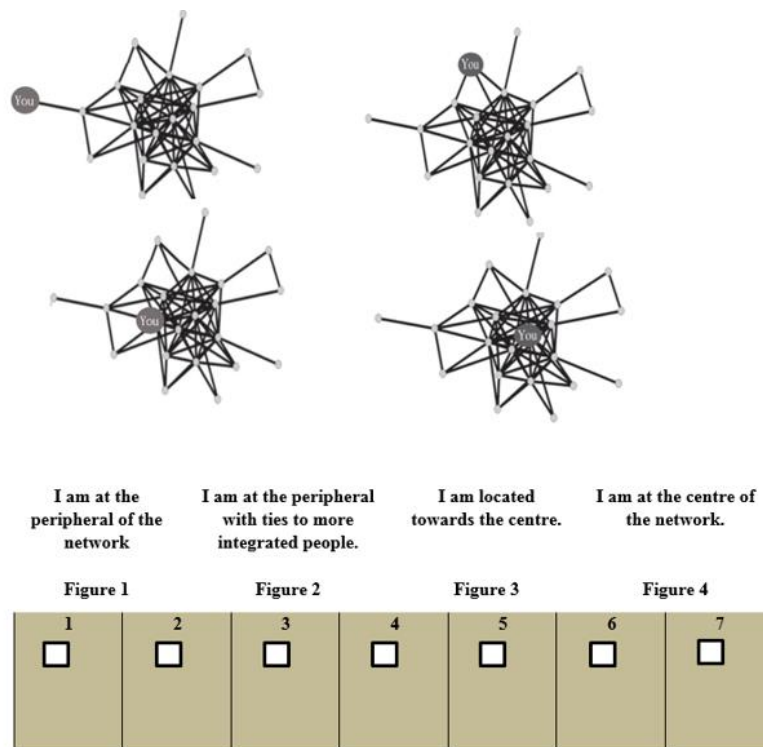
Figure 20. WN *centrality* to assess perceived whole network position in terms of periphery and centrality in the friendship network.

Personality. The Big Five personality traits were assessed by the Mini International Personality Item Pool (Mini-IPIP) scale (Donnellan, Oswald, Baird, & Lucas, 2006). The Mini-IPIP is a 20-item short form of the 50-item International Personality Item Pool – Five-Factor Model measure (Goldberg, 1999). Reliabilities in the current study were found to be adequate (Extraversion, $\alpha = .70$; Agreeableness, $\alpha = .72$; Conscientiousness, $\alpha = .60$; Neuroticism, $\alpha = .59$; Intellect, $\alpha = .68$).

Subjective wellbeing. Subjective wellbeing was measured with the *Satisfaction with Life Scale* (SWLS; Diener, Emmons, Larsen, & Griffin, 1985), answered on a 7-point Likert-type scale anchored at 1 (*disagree strongly*) and 7 (*agree strongly*) with a neutral midpoint at 4 (*neither agree nor disagree*). Cronbach alpha's value of .90 indicates good internal consistency.

Self-esteem. Rosenberg Self-esteem Scale (RSES; Rosenberg, 1965) was used to assess participants' global Self-esteem, defined as one's overall sense of worthiness as a person (Baumeister, 1993). The Cronbach alpha was .62.

Demographic information. We asked participants to answer a set of questions regarding their demographics, including age, gender and ethnicity.

2.2.2.1.2 Procedure

Participants were recruited via the online recruitment *Amazon Mechanical Turk (Mturk)*. Data from MTurk have been found to surpass student samples in diversity and are comparable in quality (e.g., Buhrmester, Kwang, & Gosling, 2011; Paolacci, Chandler, & Ipeirotis, 2010).

2.2.2.2 Results

2.2.2.2.1 Preliminary analyses

An independent-samples *t*-test showed no significant difference in all variables of interest between men and women ($p > .20$). An analysis of variance showed significant differences between ethnic groups in ego network density ($F\,(2, 208) = 3.36$, $p = .04$, $\eta_p^2 = .02$). Yet, the effect size was considered very small (Cohen, 1992). A Pearson's correlation revealed that age is significantly and negatively correlated with ego network density, ego network bridging, whole network centrality (rs = |.03| - |.24|). The effect sizes were in the medium range (Cohen, 1992). Consequently, we controlled for age in all subsequent analyses.

2.2.2.2.2 Descriptive statistics and correlations

Partial correlation coefficients between variables are reported in Table 1. Self-esteem was found to positively correlate with Ego Perceived Network (EPN) *density, EPN reach* and perceived WN *centrality.* Extraversion was significantly and positively correlated with all network metrics except EPN *reach.* Agreeableness was correlated positively with EPN *density* and *reach.* Conscientiousness correlated positively and Neuroticism negatively with EPN *reach.* Lastly, Openness to Experience was significantly negatively associated with EPN *bridging* and positively with EPN *reach.*

Table 1

Partial correlation matrix between variables

	M	StD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) EPN *density*	3.32	1.06	-	.38***	.25***	.32***	.19**	.18**	.15*	.01	-.10	.06
(2) EPN *bridging*	3.21	1.24		-	.14*	.45***	.11	.29***	.07	-.08	.02	-.17*
(3) EPN *reach*	2.46	.60			-	.12	.23***	.13	.21**	.17*	-.19**	.14*
(4) WN *centrality*	2.76	.87				-	.18*	.37***	.09	-.00	.00	.01
(5) SE	28.98	4.11					-	.35***	.47***	.43***	-.60***	.47***
(6) EX	15.64	5.10						-	.34***	.12	-.18**	.20**
(7) AG	19.93	4.55							-	.44***	-.42***	.54***
(8) CO	19.16	4.14								-	-.42***	.44***
(9) NE	3.62	1.26									-	-.43***
(10) OP	18.85	5.04										-

Note. *p < .05; **p < .01; ***p < .001. SE = Self-esteem; EX = Extraversion; AG = Agreeableness; CO = Conscientiousness; NE = Neuroticism; OP = Openness to experience.

2.2.2.2.3 Regression analyses

We considered all three possible models mentioned above. We did not find convincing evidence for the mediation model, yet the proposed moderation model, yielded consistent results. We tested this using the proposed procedures by Baron and Kenny (1986). Firstly, the independent variable (s) and moderators were centred and the interaction term was created. Subsequently, we performed eight (separate) three-step regressions. Age was entered in a first step. Subsequently, the independent variable was entered in a second step together with the moderator. Finally, the interaction was entered in a third step. Results are presented in Tables 2.

Table 2

Regression testing the moderating effect WN centrality on the relationship between (a) Self-esteem (b) Extraversion (c) Neuroticism & subjective wellbeing.

		(a)		(b)		(c)	
		β	t	β	t	β	t
Step 1:	Age	-.14	-2.00	-.14	-2.00	-.14	-2.00
Step 2:	Age	-.15*	-2.40	-.05	-.81	-.11	-1.60
	WN *centrality*	.22***	3.62	.18**	2.61	.30***	4.57
	Self-esteem	.43***	7.16				
	Extraversion			.32***	4.74		
	Neuroticism					-.22***	-3.39
Step 3:	Age	-.14*	-2.44	-.03	-.43	-.10	-1.56
	WN *centrality*	.18*	2.96	.16*	2.42	.22***	3.35
	Self-esteem	.37***	6.02				
	Extraversion			.28***	4.04		
	Neuroticism					-.14*	-2.08
	Interaction	-.21***	-3.31	-.18**	-2.81	.26***	3.81
Step 1:	$F(1, 209)$	4.03		4.03		4.03	
	Adj R^2	.01		.01		.01	
Step 2:	$F(3, 207)$	27.07		16.33		12.27	
	Adj R^2	.27		.18		.14	
Step 3:	$F(4, 206)$	24.01		14.62		13.44	
	Adj R^2	.31		.21		.19	

Note. *$p < .05$; **$p < .01$; ***$p < .001$

2.2.2.3 Discussion

We found that Self-esteem was positively associated with personal network *density and reach* as well as whole network *centrality*. Leary and MacDonald (2003) stated that trait Self-esteem is an indicator of people's relational value "in the long run" (p. 404). This long-term expectancy is primarily a function of an individual's history of social inclusion and exclusion. Thus, in line with our results, it has been suggested that changes in people's levels of social inclusion (spending time with close others) is robustly associated with higher levels of Self-esteem (Leary, 2003). Correspondingly, in the social network literature, Balkundi, Kilduff and Harrison (2011) stated that individuals with high levels of Self-esteem tend to have good charisma and therefore are likely to occupy central network positions.

Compared to introverts, extraverts typically are more outgoing, cheerful, sociable and gregarious (Kalish & Robbins, 2006), tend to have better social skills (Lieberman & Rosenthal, 2001) and have "a tendency to behave in ways that attract or hold social attention and also to enjoy these behaviours" (Ashton, Lee, & Paunonen, 2002, p. 24). Results of the present research suggest that extraverts perceive their network to be denser and think of themselves as being generally more central. This is in line with previous findings showing that individuals who are seen as charismatic and gregarious are more likely to occupy central network positions (Balkundi et al., 2011). Similarly, previous network research has suggested that extraversion positively influences social network size (e.g., Asendorpf & Wilpers, 1998; Fang et al. 2015; Klein et al., 2004; Pollet, Roberts, & Dunbar, 2011). For example, Klein et al., (2004) linked an individual's level of Extraversion to higher socializing tendencies and thus friendship network centrality. Furthermore, our results suggest that extraverts see themselves as occupying more bridging positions. This corresponds to other studies investigating actual social networks

establishing an association between structural holes (brokerage) and Extraversion (Burt et al., 1998; Kalish & Robbins, 2006). Here it is worth noting that theory concerning the association between Extraversion and brokerage is somewhat incongruent (Fang et al., 2015). Extraverts have also been shown to have a desire to bring their various contacts together (Kalish & Robins, 2006), leading to dense, transitive networks (no bridging). It may be, that this effect occurs due to the fact that extraverts tend to build relatively large networks and brokerage may increase merely because the number of missing links among contacts is likely to be relatively high (e.g.,Bossard, 1945).

Agreeableness captures the extent to which a person is cooperative, friendly, helpful, compliant, empathetic and trusting to develop positive relations with others (Barrick, Stewart, & Piotrowski, 2002; Klein et al., 2004; Nettle, 2006). Given this, combined with the fact that Agreeableness is associated with a desire for intimacy and close relationships (Graziano, Jensen-Campbell, & Hair, 1996), it is reasonable that Agreeableness is associated with centrality and relatively large and dense networks. We only found evidence for increased perceived *density* and *reach.* Since agreeable people do not usually actively strive to be central they may not see themselves as being central in a general friendship network.

Conscientiousness describes the tendency of a person to be structured, dutiful and determined (McCrae & John, 1992). Previous literature has failed to find an association between popularity (centrality) and Conscientiousness in affective and instrumental networks (Klein et al., 2004). Yet, these people are likely to occupy bridging positions, since they tend to be approached from very different parties to get advice or help (Fang et al., 2015). We only found evidence that conscientious people perceive their network to have higher levels of *reach.* This may be because they tend to be informed about the various social relations around them and thus they might comprehend and

appreciate their wider network – more clearly noticing friends-of-friends (due to more deliberate cognitive processing) and thus perceiving their network to be larger in terms of reach.

Neurotic individuals typically are emotionally unstable, anxious, unconfident, antagonistic, and irritable (McCrae & John, 1992) often feeling uneasy and nervous (Fleeson & Gallagher, 2009). They tend to be seen as rather difficult and are thus likely to be avoided (low in-degree centrality) (Klein et al., 2004). We did not find evidence that neurotic individuals see themselves as less central, yet they perceive their network reach to be limited. In comparison to conscientious individuals these people may fixate on few direct relations, rather than taking a big picture approach to their social network. Low perceived network reach may also simply result from the lack of active social interaction leading to a lack of information about the social relation around them.

Openness to Experience refers to the extent to which people are open-minded, resourceful, imaginative and knowledgeable (McCrae & John, 1992). These individuals typically are not particularly sociable since they may, rather selectively, seek connections with others who are perceived to be unconventional (McCrae, 1996), possibly reducing their general popularity (i.e., in degree centrality) (Klein et al., 2004). However, we found a negative correlation between Openness and perceived network bridging. This is surprising, since previous literature has found that high Openness to Experience predicts the extent to which individuals have open networks in which their friends tend to be disconnected from each other (Lönnqvist, Itkonen, Verkasalo, & Poutvaara, 2014). We theorize that this may be because we consider perceived, rather than actual network positions. Specifically, it may be, that they see themselves as being not only open to experience but also as tolerant to diversity (McCrae, 1996), being open to various different cultures and lifestyles. Hence, they may not view themselves as occupying

bridging positions (which may separate those different groups) but rather as reaching out to – and integrating - many different people (see the positive relationship between Openness and EPN *reach*). Lastly, brokerage is often linked to social responsibility. Since Openness is closely related to self-direction, stimulation and intuitive behaviour (Auhagen & Bierhoff, 2001), it may also be that individuals high in Openness to Experience simply do not want to see themselves in such a role.

As expected, our findings reveal positive associations between perceived centrality (vs. being peripheral) *in friendship networks* with subjective wellbeing. This is in line with evidence showing that social network embeddedness can influence subjective wellbeing by promoting positive perceptions of social support (e.g.,Zhu et al., 2013). Further, Cacioppo and Hawkley (2009) revealed that perceived social isolation is a risk factor for more negativity and depressive cognition, heightened sensitivity to social threats and a confirmatory bias in social cognition that is self-protective and paradoxically self-defeating.

The moderating role of perceived network *centrality* on the relationship between personality and subjective wellbeing was significant across all three personality facets considered. Interestingly, the positive relationship between Self-esteem and subjective wellbeing as well as Extraversion and subjective wellbeing was weaker if individuals perceive themselves as being central in their friendship network. In other words, the more central individuals view themselves to be, the less personality (i.e. Self-esteem and extraversion) is predictive of their well-being. This could also be interpreted as lower levels of Self-esteem and extraversion being less detrimental if individuals perceive themselves as well integrated (being central). Further, and less intuitively, the negative relationship between Neuroticism and subjective wellbeing appeared to be stronger if individuals perceive themselves to be central in their friendship network. It

may be that perceived social responsibilities and constrains present in large networks represent additional stressors and a burden that intensify the negative effect of neuroticism on subjective well-being.

2.2.3 Study 1b

The aim of 1b was to replicate and extend the findings of the previous study in two ways. Firstly, we extend our individual difference measures by including Regulatory Focus (Higgins, 1997; Higgins et al., 2001). We included Regulatory Focus, because effective self-regulation is ultimately about the successful use of various psychological as well as social resources (e.g., Zou, Ingram, & Higgins, 2015). Individuals may adopt two distinct orientations when pursuing goals (Higgins, 1997, 1999). *Promotion focused* individuals tend to pursue future aspirations, and are motivated to maximize gains. On the other hand, individuals high on *prevention focus* attempt to manage their immediate responsibilities, trying to prevent potential losses. Secondly, we suggest that depending on the *type* of network, personality may be associated in different ways to network metrics (Fang et al., 2015). Consequently, we not only consider general networks (i.e., whole personal network) - as in study 1a -but also ask participants to report their friendship networks in a specified instrumental social setting (a work group). Considering potential differences between these network types appears important, as whole network studies are usually constrained by previously specified boundaries. Specifically, we propose that the presence of absence of these boundaries influences how variables under investigation may or may not be related to one another. Additionally, some network characteristics may be either too abstract or simply not typical when considering general social networks without specified boundaries. Brokerage, for example offers control and strategic advantages (Obstfeld, 2005) which may be relevant in a work-related context but to a less extend in a leisure or family context. Consequently, the current study seeks to investigate

potential differences in participants' reports of perceived network positions, when boundaries are specified (i.e., work group) or unspecified (i.e., whole personal network).

2.2.3.1 Method

2.2.3.1.1 Participants

Eighty participants (31 male) with a mean age of 20.3 (*StD* = .91, range of 19 to 24) recruited from an educational work group at a London University. 55.0% were British (*N* = 44) and 45.0% (*N* = 36) were International students.

2.2.3.1.2 Measures

Personality. (Mini- IPIP-20; Donnellan et al., 2006). In this sample, each subscale had good internal consistency (Extraversion, α = .79; Agreeableness, α = .67; Conscientiousness, α = .75; Neuroticism, α = .76; Openness, α = .72).

Self-esteem. RSES (Rosenberg, 1965; α = .91)

Regulatory Focus. Eleven items of the Regulatory Focus Questionnaire (RFQ) were used assess participants' subjective histories of success or failure in promotion and prevention self-regulation (Higgins et al., 2001). Each item was answered on a 5-point response scale ranging from 1 (*Never or seldom / certainly false*) to 5 (*Very often / certainly true*) with a neutral midpoint of 3 (*Sometimes*). Six items (e.g., "I feel like I have made progress toward being successful in my life") measured Promotion Focus (α = .61); six items (e.g.,"Not being careful enough has gotten me into trouble at times") assessed prevention focus (α = .78).

2.2.3.1.3 Procedure

The recruitment of an educational work group ensured that the participants referred to the same network when answering questions regarding their perceptions on

the networks within the course. The participants gave verbal consent prior to receiving a paper questionnaire. They were debriefed collectively upon completion of the questionnaire.

2.2.3.2 Results

2.2.3.2.1 Preliminary analyses

A Pearson's correlation indicated no significant effect of age in all variables. We ran two independent-samples t-test to check for group differences (gender and nationality). There was no significant difference in all variables between men and women ($p > .20$). There was a slight, but insignificant, difference in WG bridging between British ($M = 2.25$, $StD = 1.01$) and Internationals ($M = 2.03$, $StD = .88$), t (78) $= 1.04$, $p = .06$, $d = .24$. However, the effect size is small (Cohen, 1992). For the sake of model parsimony, we will pool the data as a whole in the subsequent analyses.

2.2.3.2.2 Descriptive statistics and correlations

Correlations between variables are reported in Table 3. As in study 1a, Extraversion was significantly and positively associated with EPN *density* but only in the general network (without specified boundaries). Furthermore, Extraversion was positively associated with EPN *bridging* and WN *centrality* in both contexts.

Divergent from study 1a there was no significant correlation between Agreeableness and EPN *density* and *reach* (yet, the effects were in the right direction). Yet, Agreeableness was associated with EPN *bridging*, and WN *centrality* but only in the general network. Again, different from study 1a, there was no significant association between Conscientiousness and EPN *reach*. Yet, we found a significant correlation with WG EPN *bridging*. Self-esteem was found to relate positively with WG EPN *bridging* but not with EPN *density* and WN *centrality*. Lastly, Promotion Focus was positively

associated with WG EPN *bridging* and prevention focus was negatively related to both

WG and WN *centrality*. Additionally, we explored the varying combinations of

promotion and prevention focus.

We first used a median to split the sample into four clusters (Idson, Liberman,

& Higgins, 2000; Markovits, 2012), labelled according to taxonomy provided by

Markovits (2012): high promotion/ low prevention focus (Achievers); high promotion/

high prevention (Rationalists); low promotion/ low prevention (Indifferents); and low

promotion/ high prevention focus (Conservatives). A series of ANOVAs was run on all

network metrics, revealing a significant difference in WG EPN *bridging*, $F (4, 71) =$

4.20, $p = .01$, $\eta_p^2 = .15$. Games-Howell post-hoc tests showed that the difference

between Achievers (*M* = 2.81, *StD* = .91) and Indifferents (*M* = 1.74, *StD* = .93) was

significant, $p = .01$.

Table 3

Correlation matrix between variables

	M	StD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) WG EPN *density*	3.24	.85	-	.07	.08	.00	.22*	.11	.21	-.13	-.05	.12	.11	.05	-.05	.08	.10	.10
(2) GE EPN *density*	2.81	.81		-	.05	.35**	.03	.08	.15	.33**	.31**	.21	-.03	.00	.08	.03	.00	-.10
(3) WG EPN *bridging*	2.15	.96			-	.09	-.10	.14	.39***	.25*	.33**	.13	.30**	-.10	.15	.23*	.39***	-.06
(4) GE EPN *bridging*	3.05	1.06				-	-.16	.09	.20	.51***	.44***	.24*	-.17	.00	.09	.17	.13	-.17
(5) WG EPN *reach*	2.23	.66					-	.18	-.13	-.15	.04	.01	.04	-.06	.02	.17	-.16	.11
(6) GE EPN *reach*	2.46	.59						-	.23*	.08	.12	.06	.08	.02	.04	.10	.02	-.12
(7) WG WN *centrality*	3.39	1.20							-	.35**	.38***	.19	.15	-.08	.20	.10	.18	-.28*
(8) GE WN *centrality*	4.25	1.33								-	.50***	.27*	-.12	-.03	.11	.15	.08	-.28*
(9) EX	13.45	2.34									-	.25*	-.01	-.19	.13	.23*	.20	-.15
(10) AG	20.89	1.99										-	.08	.06	.11	.09	.15	-.09
(11) CO	18.23	3.29											-	-.03	-.12	.06	.30**	.27*
(12) NE	16.09	3.29												-	-.01	-.42***	-.33**	-.28*
(13) OP	24.25	2.70													-	-.02	.07	-.24*
(14) SE	49.91	10.0														-	.59***	.13
(15) Promotion Focus	21.27	3.02															-	.17
(16) Prevention Focus	17.62	4.02																-

Note. *p < .05; **p < .01; ***p < .001. WG = Work Group; GE = General, EPN = ego perceived network

2.2.3.2.2 Comparison analyses

Paired-samples *t*-tests were run to assess within-sample differences between WG and general network metrics. The results (see Table 4) indicate significant differences in all network metrics. EPN density was considered to be higher in the specified network. Yet, participants reported significantly higher levels of EPN *bridging* and *reach* when considering their general network. Furthermore, participants saw themselves significantly more central in their general network.

Table 4

Paired-samples t-tests for WG and general network metrics

	Work group		General		N	95% CI for mean difference		d	t
	M	StD	M	StD					
EPN *density*	3.24	.85	2.81	.81	80	.17	.68	.52	3.35***
EPN *bridging*	2.15	.96	3.05	1.06	80	1.20	-.59	.89	-5.86***
EPN *reach*	2.23	.66	2.46	.59	80	-.42	-.06	.37	-2.66**
WN *centrality*	3.39	1.20	4.25	1.33	80	-1.18	-.54	.68	-5.33***

Note. *$p < .05$; **$p < .01$; ***$p < .001$.

2.2.3.3 Discussion

When WG and general network metrics were compared, differences were found among all network metrics. These results suggest that some personality traits are equally important in predicting network metrics in both contexts, while the effects of some are only apparent in one context, but not the other. Even though people appear to see more bridging in their general network we found that personality traits tend to be more predictive of bridging in specified work contexts.

Self-esteem was found to positively relate to EPN *bridging* in specified networks. Thus, individuals with high levels of Self-esteem see themselves as a bridging 'link' between two otherwise unconnected individuals or groups. Due to their central

position between others, brokers have been found to be influential members of networks (Fernandez & Gould, 1994), to exhibit high levels of control and to be seen as powerful by others (Freeman et al., 1980). Since high levels of Self-esteem have been linked to increased personal sense of power (Anderson, John, & Keltner, 2012) it is not surprising that individuals with high Self-esteem perceive themselves to occupy brokerage roles. Similar to study 1a, we found positive relation between Self-esteem and EPN *density* and WN *centrality,* yet this relationship did not achieve significance.

Replicating most results found in study 1a, Extraversion was significantly associated with three of the general network metrics (again not with EPN *reach*). Interestingly, Agreeableness was only significantly associated with general network metrics, but not network characteristics in the workgroup. It may be that Agreeableness is a personality trait that is more important in general social networks, but may be less useful in a work context. It is also possible that agreeable people focus less on their professional environment, but more on their personal social environment. Agreeableness, as in study 1a, was positively related to GE EPN *density*. Furthermore, agreeableness was positively and significantly related to GE EPN *bridging* and GE WN *centrality*. The association between agreeableness and GE EPN bridging is somewhat surprising, since agreeable individuals should generally prefer closed/dense networks. One possible explanation may be that agreeable people have the tendency to help to integrate conflicting partners' opinions and requirements, thus often acting as mediators (Jensen-Campbell, Gleason, Adams, & Malcolm, 2003), consequently finding themselves occupying brokerage positions.

Differing from study 1a, the influence of Conscientiousness is only apparent in specified networks, but not general network; yet effects go in the same direction concerning the positive relation to EPN *reach*. In line with previous literature, we found

that Conscientiousness was positively related to EPN *bridging*, but only in the specified work context set-up. This is in accordance with previous findings, suggesting high importance of Conscientiousness as a predictor in work-related instrumental networks since it produces the targeted behavior in work-related settings (McCrae & John, 1992).

Different to study1a, Neuroticism and Openness to Experience were not significantly related to any of the network metrics (even though effect were mostly in the expected direction). Potential reasons will be discoursed in the general discussion.

High Promotion Focus was related to individuals perceiving themselves as occupying more bridging positions in the specified work network; whereas high prevention focus is related to individuals perceiving themselves as occupying less central positions in both networks. In essence, Promotion Focus is related to the sensitivity towards positive outcomes, while prevention focus is related to the sensitivity towards negative outcomes. Hence, high Promotion Focus may motivate individuals to occupy more bridging positions in the specified network through a heightened sensitivity towards the positive outcomes associated with brokerage. On the other hand, high prevention focus is linked to a person's focus on maintaining security. Therefore these individuals tend to "play it safe" by possibly being overly cautious in evaluating and pursing potential social opportunities to avoid mistakes that may undermine their safety (Higgins, 1997; Molden, 2012). This is in line with recent finding by Pollack, Forster, Johnson, Coy and Molden (2015) demonstrating that a general tendency towards growth and advancement (Promotion Focus) is predictive of in-degree centrality, whereas prevention focus (emphasize on safety and security) can be linked to a decline in out-degree centrality.

We conducted further analyses to disentangle the interaction of promotion and prevention focus in their associations with network metrics. Interestingly, Achievers (high promotion/ low prevention focus) tend to perceive themselves as occupying more

bridging positions in the specified network, followed by Rationalists (high promotion/ high prevention focus) and Conservatives (low promotion/ high prevention focus), with the least being the Indifferent (low promotion/ low prevention focus). There was a statistically significant difference between Achievers and the Indifferent. Achievers may be motivated by the positive outcomes associated with occupying more bridging positions and therefore act in a way consistent to that motivation; while the "Indifferents", as described by Markovits (2012), may prefer to be on the periphery of the network.

2.2.4 General discussion and conclusion

Social networks are real world interaction patterns as well as cognitively constructed mental maps. Most social network research has focus on the former rather than the latter. This appears to be mainly due to two reasons. Firstly, the fact that one is intuitively more interested in what is "really" going on rather than what is going on in people's minds. Secondly, previous research has struggled with the methodological burden of systematically investigating people's social network perceptions. Here we used VNSs to directly focus on individuals' perceptions of higher order network properties.

Results from study 1b only partially replicated findings of study 1a. Yet, associations not replicated at least went in the right direction and may not have reached statistical significance due to the smaller sample size. Nevertheless there was some consistency: Results from both studies showed a stable positive association between Extraversion and perceived network *density*, *bridging* and *centrality*. Furthermore, Agreeableness appears to be positively related to perceived network *density* and *reach*. Work-related traits including Conscientiousness, Self-esteem and Promotion Focus were strongly positively related to perceived *bridging* in a work setting but not in the general personal friend setting. Effects of Neuroticism and Openness were weak and partially inconsistent.

It is also worth noting that in some cases the direction of connection may be important in determining certain outcomes. For example one may be interested in the question of whether a person is more satisfied because he/she thinks he/she has a lot of out-going ties (e.g.,asks a lot for advice) or because other people approach him/her frequently (e.g.,many incoming ties)? To answer this question, it appears important to construct scales which also take into consideration the direction of ties.

The value of VNS appears to lie in the fact that it directly measures individual's perceptions about the social context they are situated in. Thus, it appears especially likely to be predictive of subjective outcomes such as emotions, attitudes and behaviours. If one, for example, plans to conduct network interventions in an organizational context in order to improve job attitudes, it seems important to not only consider the actual network but also the way it is depicted in people's heads.

In conclusion, we deem the use of VNS a practical and efficient tool to compliment studies considering how individual differences impact subjective and objective outcomes.

Additional Analysis

Study 1a

Table a)

Regressions predicting EPN density, EPN bridging, EPN reach and PWN position.

		EPN *density*		EPN *bridging*		EPN *reach*		PWN *position*	
		β	t	β	t	β	t	β	t
Step 1	Age	-.19**	-2.79	-.18*	-2.57	-.03	-.40	-.19**	-2.82
Step 2	Age	-.17*	-2.40	-.12	-1.76	-.06	-.76	-.12	·1.74
	Extraversion	.14*	1.98	.30***	4.36	.07	.94	.38***	5.55
	Agreeableness	.12	1.35	.14†	1.70	.12	1.33	.01	.09
	Conscientiousness	-.08	-1.01	-.06	-.76	.07	.84	-.02	-.22
	Neuroticism	-.07	-.92	-.02	-.22	-.11	-1.38	.05	.70
	Openness	-.03	-.30	-.28***	-3.55	-.01	-.14	-.03	-.43
Step 3	Age	-.18*	-2.53	-.13†	-1.92	-.06	-.87	-.13†	·1.91
	Extraversion	.11	1.49	.26***	3.73	.05	.59	.35***	4.88
	Agreeableness	.10	1.17	.12	1.49	.11	1.19	-.01	-.12
	Conscientiousness	-.10	-1.26	-.08	-1.04	.05	.64	-.04	-.51
	Neuroticism	-.01	-.10	.05	.65	-.06	-.71	.12	1.49
	Openness	-.05	-.54	-.31***	-3.82	-.03	-.32	-.06	-.72
	Self-esteem	.16	1.65	.17†	1.92	.12	1.21	.18*	1.97
Step 1		$F(1,209) = 7.78**$, Adj $R^2 = .03$		$F(1,209) = 6.59**$, Adj $R^2 = .03$		$F(1,209) = .16$, Adj $R^2 = -.00$		$F(1,209) = 7.97**$, Adj $R^2 = .03$	
Step 2		$F(6,204) = 3.10**$, Adj $R^2 = .06$		$F(6,204) = 7.20***$, Adj $R^2 = .15$		$F(6,204) = 2.36*$, adj $R^2 = .04$		$F(6,204) = 7.11***$, Adj $R^2 = .15$	
Step 3		$F(7,203) = 3.07**$, Adj $R^2 = .07$		$F(7,203) = 6.78***$, Adj $R^2 = .16$		$F(7,203) = 2.24*$, Adj $R^2 = .04$		$F(7,203) = 6.73***$, Adj $R^2 = .16$	

Note. †$p < .10$, *$p < .05$; **$p < .01$; ***$p < .001$.

Note. *Differences to correlation analysis*

1. Self-esteem no longer significantly predicts EPN density/ reach
2. Self-esteem became a marginally significant predictor of EPN bridging (from non-significant)
3. Extraversion no longer significantly predicted EPN density after SE was added.
4. Agreeableness no longer significantly predicted EPN density and EPN reach.
5. Conscientiousness no longer significantly predicted EPN reach.
6. Neuroticism no longer significantly predicted EPN reach.
7. Openness no longer significantly predicted EPN reach.

Study 1b

Table b)

Regressions predicting general EPN density, EPN bridging, EPN reach and PWN position.

		EPN *density*		EPN *bridging*		EPN *reach*		PWN *position*	
		β	t	β	t	β	t	β	t
Step 1	Extraversion	.23†	1.82	.42***	3.58	-.05	-.39	.47***	4.28
	Agreeableness	.22†	1.80	.14	1.25	-.05	-.37	.26*	2.43
	Conscientiousness	-.06	-.48	-.20†	-1.82	.06	.49	-.15	-1.42
	Neuroticism	.00	.03	.05	.43	.09	.65	-.00	-.04
	Openness	-.03	-.22	-.02	-.19	.03	.24	.01	.12
Step 2	Extraversion	.23	1.68	.39**	3.15	-.12	-.88	.44***	3.80
	Agreeableness	.25†	1.94	.11	.91	-.07	-.53	.27*	2.44
	Conscientiousness	.01	.05	-.24†	-1.92	.09	.66	-.09	-.80
	Neuroticism	-.05	-.33	.13	.96	.09	.57	-.06	-.44
	Openness	-.02	-.15	-.03	-.22	.00	.00	-.00	-.01
	Self-esteem	.08	.52	.16	1.09	.19	1.13	.08	.55
	Promotion Focus	-.18	-1.06	.10	.65	.02	.10	-.08	-.58
	Prevention focus	-.06	-.41	-.04	-.30	-.20	-1.31	-.13	-1.09
Step 1		$F(5,62) = .1.81$, Adj $R^2 = .06$		$F(5,62) = 4.35**$, Adj $R^2 = .20$		$F(5,62) = .23$, Adj $R^2 = -.06$		$F(5,62) = 7.17***$, Adj $R^2 = .32$	
Step 2		$F(8,59) = 1.27$, Adj $R^2 = .03$		$F(8,59) = 3.09**$, Adj $R^2 = .20$		$F(8,59) = .61$, Adj $R^2 = -.05$		$F(8,59) = 4.60***$, Adj $R^2 = .30$	

Note. †$p < .10$, *$p < .05$; **$p < .01$; ***$p < .001$.

Note. *Differences to correlation analysis*

1. Extraversion no longer significantly predicted EPN density.
2. Agreeableness: became marginally significant predicting EPN density.
3. Agreeableness no longer significantly predicted EPN bridging.
4. Conscientiousness became marginally significant predicting EPN bridging.
5. Prevention no longer significantly predicted WN centrality.

Additional Research

In an additional piece of research we aimed to assess how much EPN metrics correspond to *actual network metrics* and *perceived network metrics* (based on sociometric data) assessed by Cognitive Social Structures (CSS, Krackhardt, 1990; see study 3 in chapter three for a detailed description of the CSS methodology).

Most previous studies interested in cognitive (re)constructions (perceptions) of social relations have employed Krackhardt's (1990) CSS (e.g.,Kilduff & Krackhardt, 1994; Casciaro, 1998; Krackhardt & Kilduff, 1999). The method typically associated with CSS research is the CSS roster (Brands, 2013). The CSS roster asks individuals not only about their own connections but also about the connections between all other members of the group of interest. Thus, participants are not only asked: "Who would you consider a close personal friend" but also "Who would John Smith consider a close personal friend?" This is then repeated for every person in the network. The result is a number of *n* matrixes (one matrix per participant) representing their perception of dyadic relations in the network.

We have recruited 29 participants who were a cohort of students from an American university who were visiting Europe on an exchange programme (mean age was 20.7, *StD* = 2.02). We asked each participant about his or her perceptions concerning every other person's friendship network connection. Each participant responded to the following question "Would A (row) consider B (column) a close friend?" by placing a check in the box representing the outward relationship between A and B. This resulted in 29 so-called slices (matrices), representing the network of relations as perceived by each participant (their cognitive map). Additionally, visual network scales were used to assess participants' EPN *density*, *bridging*, *reach* and *position*.

<div align="center">Perceived network (PN)</div>

1) **VNS**

2) **CSS**, deriving perceived personal network by assessing who an individual considers a friend and who an individual thinks would consider them a friend.

<div align="center">Actual network (AN)</div>

3) **Directed**[4]

　　We derived the directed actual network from the individual CSS slices. From person's A slice we took person A's row where he/she indicated who he/she considers a close friend. We did this for every single participant and added rows together to derive at a classical self-report network matrix (containing information about who considers who a friend).

4) **Reciprocated**

　　We subsequently symmetrized the actual friendship network matrix applying the intersection rule: in order for there to be a reciprocated tie between person i and j, person i has to report a tie to j and person j has to report a tie to i.

　　Results are summarized in Table c. VNS measures of ego network *density, bridging* and *reach* did not significantly correlate with CSS measures. Furthermore, we could not find an association between VNS *density, bridging* and *reach* measures and measures based on the actual and the reciprocated network. VNS measures of perceived whole network *position* were positively related to CSS and actual network out-degree and CSS in-degree (ego perception of popularity) and degree centrality based on the

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[4] Since visual scales are undirected we considered both in and out-degree centrality. For both the CSS and the actual network, out-degree centrality is identical. Yet, for in-degree, CSS in-degree specifies how popular a person thinks he/she is (based on his/her judgement) while for the actual network in-degree indicates how popular a person really is (based on the judgement of others).

reciprocated network. However, there was no significant relation between VNS centrality measure and in-degree centrality in the actual network (actual popularity). Deviating from Mehra et al.'s preliminary results, our study did not find convincing evidence that perceived social network characteristics, as measured by VNSs, are related to traditional sociometric measures. Further, VNS measures of density, bridging and reach did not significantly correlate with CSS measures of density, bridging and reach. This additional piece of research lends support to the idea that CSS and the VNS do not capture the same cognitions: "...whereas CSS asks questions at the level of dyads (trees) and infers the structural characteristics of interest (the forest), the visual network scale approach asks directly about the structural characteristic of interest" (Mehra et al. 2014, p. 324).

Table c)

Associations between different network measures.

Ego network density

	M	SD	(1)	(2)	(3)	(4)
(1) PN (VNS)	3.41	.87	-	.09	.23	.16
(2) PN (CSS)	0.53	.33		-	.51***	.85***
(3) AN (directed)	0.59	.28			-	.67***
(4) AN (reciprocated)	0.66	.34				-

Ego network bridging

	M	SD	(1)	(2)	(3)	(4)
(1) PN (VNS)	2.83	1.19	-	.05	.04	.08
(2) PN (CSS)	8.72	11.03		-	.69***	.92***
(3) AN (directed)	11.12	12.33			-	.66**
(4) AN (reciprocated)	2.88	3.95				-

Ego network reach

	M	SD	(1)	(2)	(3)	(4)
(1) PN (VNS)	2.10	0.77	-	.13	-.05	.02
(2) PN (CSS)	9.72	7.21		-	.60***	.84***
(3) AN (directed)	15.86	6.74			-	.67***
(4) AN (reciprocated)	6.97	3.99				-

Ego network position (degree centrality)

	M	SD	(1)	(2)	(3)	(4)	(5)
(1) VNS	3.59	1.45	-	.56**	.64**	.33	.71***
(2) PN/AN (out-degree)	4.96	3.40		-	.92***	.55**	.83***
(3) PN (CSS, in-degree)	4.75	3.14			-	.58**	.91**
(4) AN (in-degree)	4.96	2.28				-	.61***
(5) AN (reciprocated)	3.41	1.97					-

2.3 Study 2: Big five personality factors as antecedents of different social relations in student network: Analysis on the dyadic level

2.3.1. Introduction

Although, as described before, scholars have started to bridge social network research with personality psychology, there are still relatively limited empirical studies linking personality traits to the structural network position of individuals, and the few studies published have yielded inconclusive evidence for effects of personality traits on social network positioning. Nevertheless, most published studies so far, suggest that an individual's personality – in some way or another - influences the structure of social networks (e.g.,Asendorpf & Denissen, 2006; Branje et al., 2004; Klein et al., 2004; Mehra et al. 2001; Neyer et al., 1999; Oh & Kilduff, 2008, Pollet et al. 2011; Sasovova et al., 2010). Next to individual effects of certain personality traits, similarity in personality has been demonstrated to play an important role in predicting relational ties (Acitelli, Kenny, & Weiner, 2001; Duck & Craig, 1978; Hamm, 2000; Luo & Klohnen, 2005; McPherson, Smith-Lovin, & Cook, 2001; Montoya, Horton, & Kirchner, 2008; Russell & Wells, 1991; Selfhout, Branje, Raaijmakers, & Meeus, 2010). Yet, once again, the few existing studies provide inconclusive (i.e. weak and often non-replicable) evidence for effects of personality similarity on network characteristics. While some researchers conclude that personality similarity has a positive effect on the formation of social relations (Selfhout, Burk, Branje, Denissen, Van Aken, & Meeus, 2010) others did not (Montoya et al., 2008; Selfhout, Denissen, Branje, & Meeus, 2009).

In general, personality factors might affect the existence of social network ties in at least three ways. Firstly, the number of connections individuals selects or chooses may be influenced by personality characteristics (**selection**). Secondly, personality might affect the extent to which individuals are socially attractive – i.e., how

many people select them (**attraction**). Lastly, (dis) similarity in personality may influence selection (**similarity**).

Exploring student network relations, the purpose of the current study is to address those questions, using the level of relational dyads as unit of analysis. Expressive as well as instrumental networks are considered, as those networks are thought to differ in terms of their antecedents as well as their theoretical and practical implications (e.g., Fang et al., 2015; Henttonen, Janhonen, &, Johanson, 2013; Ibarra & Andrews, 1993).

2.3.1.1 The Big Five personality traits and social network relations

Trait theory (Allport, 1966) proposes that individuals have underlying stable characteristics or *personality facets*, of biological origin, influencing human cognition and behaviour. Among the best-developed and most widely accepted taxonomies of personality traits is the Big Five personality model (Digman, 1990; McCrae & Costa, 1994; Judge, Bono, Ilies, & Gerhardt, 2002). The model suggests that five universal traits can be used to define the most relevant personality aspects, and that these traits are largely heritable (Jang, McCrae, Angleitner, Rieman, & Livesley, 1998), independent from external circumstances (Asendorpf & Wilpers, 1998), and are relatively stable throughout an individual's lifetime (McCrae & Costa, 1990). Below it is outlined how, based on prior research evidence, the Big Five traits are expected to influence the presence or absence of network ties. As mentioned before, depending on the network type (i.e. expressive or instrumental) personality may differently affects network positioning. Therefore, we will take into account possible differences in how personality might affect the existence of network ties, depending on the type of network. Specifically, one instrumental (academic advice) and two expressive networks (friendship and trust) are considered. Predictions are summarized in Table 5.

2.3.1.2 The Big Five: Selecting and attracting ties

Extraversion. The relatively intuitive positive relationship between Extraversion and network size has been evident in previous work on offline (Asendorf & Wilpers, 1998; Cascario, 1998; Kalish & Robbins, 2006; Neubert & Taggar, 2004; Pollet et al., 2011) and online social networks (Amichai-Hamburger & Vinitzky, 2010; Markovikj, Gievska, Kosinski, & Stillwell, 2013; Shen, Brdiczka & Liu, 2015). Individuals high on Extraversion tend to be outgoing, warm, vigorous, sociable, assertive, active, enthusiastic, excitement seeking and optimistic (McAdams, 2006; McCrae & John, 1992). They actively look for stimulation and tend to participate in numerous social activities (De Pascalis, Arwari, Matteucci, & Mazzocco, 2005). Consistent with this, in general, it appears that extraverts have larger social circles (Asendorpf & Wilpers 1998; Pollet et al. 2011) and a recent meta-analytic summary shows that in instrumental as well as expressive networks, Extraversion is positively related to actor popularity (Fang et al., 2015). As such, in general, empirical findings of previous studies lead to the expectation of <u>a positive association between Extraversion and the likelihood to send and receive ties in all three networks</u>.

Agreeableness. Agreeable individuals are known to be "courteous, flexible, trusting, good-natured, cooperative, forgiving, soft-hearted, and tolerant" (Barrick & Mount, 1991, p. 4). They tend to be helpful, generous, altruistic and cooperative (Denissen & Penke, 2008; McAdams, 2006; McCrae & John, 1992) striving to build positive relationships with others (Barrick et al., 2002). Mooradian, Renzl and Matzler (2006) demonstrated that highly agreeable people are more willing to share information, indicating higher levels of trust which is likely to lead to higher trust ratings from others. Due to their pro-social behaviour, they should also be attractive social interaction partners (Klein et al. 2004; Selfhout et al. 2010).

However, Fang et al. (2015) only found evidence for this association when considering expressive, but not instrumental networks. In instrumental networks, the prosocial/empathic behaviour associated with high Agreeableness appears to be less relevant. Based on this, we expect positive effects of Agreeableness with regards to selecting and attracting other in friendship and trust networks. No effects in instrumental advice networks are expected.

Conscientiousness. Conscientious individuals are organized, self-disciplined, diligent, dutiful, well- prepared, attentive and insistent (McAdams, 2006; McCrae & John, 1992), which is likely to lead to task-relevant proficiency and knowledge (Klein et al., 2004). Individuals are most likely to seek advice from people they consider disciplined, experts and hard workers (e.g.,Borgatti & Cross, 2003). Based on this, one would expect Conscientiousness to be positively related to centrality in academic advice networks. Consistent with this, Conscientiousness has been shown to be related to centrality in advice (Liu & Ipe, 2010) as well as in friendship networks (Lee, Yang, Wan, & Chen, 2010). Yet, Fang et al. (2015) only found Conscientiousness to be related to popularity in instrumental networks, and some other authors (e.g.,Klein et al. 2004) found it to be entirely unrelated to popularity in both networks. Based on this, we expect attraction effects of Conscientiousness, if any, only to be apparent in instrumental advice networks. Conscientious individuals tend to find it difficult to trust others, due to concerns about accuracy, reliability and honesty (e.g.,Jacques, Garger, Brown, & Deale, 2009). Based on this - although, effects of tie selection are somewhat unclear - it can at least be presumed that Conscientiousness is negatively related to initiating advice, friendship and trust ties.

Openness. Openness to experience refers to the extent to which a person is creative, open-minded and intellectual with a variety of different interests, an attraction to "the unconventional" and a positive attitude toward challenging learning experiences

(Barrick & Mount, 1991; McCrae & John, 1992). Due to this natural curiosity and their strong predisposition to socialize (Wehrli, 2008), it is plausible that individuals high on Openness ask more for advice, trust more and nominate more people as their friends. With regards to the likelihood to receive ties, prior research offers conflicting evidence. Kashdan, Afram, Brown, Birnbeck and Drvoshanov (2011) suggest that individuals that are more curious are more attractive interaction partners and thus should attract more people. Similarly, Neubert and Taggar (2004) found that Openness was positively associated with centrality in advice networks. Contrasting this, Klein et al. (2004) demonstrated that individuals with high Openness to experience tend to have smaller friendship networks and are disliked in groups, potentially because they challenge established norms and procedures and are therefore considered as being irritating. Consistent with this, Fang et al. (2015) proposed that due to their eccentricity they should be less attractive in social networks. Using meta-analytic evidence, those authors conclude that Openness had a negative effect on the likelihood of attracting ties, but only in expressive networks. Then again, others do not find any association between Openness and propensity to connect to others (Totterdell et al., 2008). Due to the lack and/or inconsistence of empirical evidence and a variety of theoretical arguments, <u>no specific predictions are made with regards to effects of Openness.</u>

   Neuroticism. Individuals high on Neuroticism tend to be anxious, apprehensive, un-easy, impulsive, hostile and short-tempered (McAdams, 2006; McCrae & John, 1992). Highly neurotic individuals may respond to advice requests with disregard, irritation, or insecurity, imposing higher tie maintenance costs. These negative emotions are expected to reduce the popularity of neurotic individuals. Consistent with this, previous research has shown that Neuroticism is negatively related to popularity in advice, as well as friendship networks (Anderson, John, Keltner, & Kring, 2001; Fang et al. 2015; Klein et al. 2004). Consequently, <u>Neuroticism is</u>

expected to be negatively associated with the likelihood of receiving an advice, friendship or trust tie. Tan and Sutherland (2004) suggest that Neuroticism is negatively associated with propensity to trust, since neurotic people are more likely to show anxiety and vulnerability, resulting in a lack of interpersonal trust to other people and situations. Further, it may be that worry and anxiety associated with Neuroticism lowers self-confidence, increasing the reliance upon advice of others. Therefore, it is plausible, that even though Neuroticism reduces the likelihood of initiating friendship and trust ties, it could positively affect academic advice seeking.

Table 5
Summary of study predictions

	Advice		**Friendship**		**Trust**	
	Selection	Attraction	Selection	Attraction	Selection	Attraction
Extraversion	+	+	+	+	+	+
Agreeableness	/	/	+	+	+	+
Conscientiousness	-	+	-	/	-	/
Openness	/	/	/	/	/	/
Neuroticism	+	-	-	-	-	-

Note. + = positive effect; - = negative effect; / = no effect or direction of effect unclear

2.3.1.3 Personality homophily

The similarity-attraction paradigm (Byrne, 1971; Clore & Byrne, 1974) suggests that individuals tend to establish relationships with similar others. There is abundant evidence for the existence of homophily (attractiveness and connectivity with similar others) with respect to age, gender, race, education, status, social class, tenancy, religion and occupation (Brass, 1985; McPherson & Smith-Lovin, 1987; McPherson et al., 2001; Ibarra, 1992, 1993). With regards to network structure, homophily implies

that individuals that are alike, cluster together. As such, social networks are known to develop on the basis of homophily, where individuals with similar characteristics are more likely to connect (McPherson et al., 2001). Correspondingly, similar friends are likely to remain friends; while, dissimilar friends are more prone to dissolve their friendship (Aboud, Mendelson, & Purdy, 2003; Cohen, 1977; Ellis & Zarbatany, 2007). The reinforcement-affect theory suggests that similarity in characteristics makes behaviour more predictable, reinforcing individuals' opinion and views, consequently increasing trust and social attraction through similar emotional states when interacting (Clore & Byrne, 1974). Furthermore, Berger and Cabrese (1975) suggest that similarity leads to interpersonal confidence, which reduces uncertainty, allowing people to interact more easily.

An important, but often overlooked aspect is similarity in personality traits. This is surprising, since previous research of adolescents and adults, identify personality homogeneity as a key criterion for attraction and attachment among friends and romantic couples (Botwin, Buss, & Shackelford, 1997; Byrne, Griffitt, & Stefaniak, 1967; Izard, 1960). Here it is suggested that homophily may also exist with regards to personality. While numerous studies provide evidence for the hypothesis that social groups tend to be homogenous with respect to some individual difference measure, most researchers have considered various lower order, behavioural responses associated with - personality cooperates, likes to socialise, is shy, nervous or withdrawn - (e.g.,Haselager, Hartup, Lieshout, & Riksen-Walraven, 1998; Kupersmidt, DeRosier, & Patterson, 1995; Massen & Koski, 2014; Poulin et al., 1997) instead of using the hierarchical structure of personality, such as the Big Five.

2.3.1.2.1 The Big Five: homophily effects

Homophily theories described above would predict that, across all Big Five traits, similarity in personality enhances the likelihood of social ties. Indeed, there is empirical evidence of personality homophily in online social networks: Individuals, high on Extraversion, Agreeableness and Openness have been shown to have a preference to interact with similar others (Balmaceda, Schiaffino, & Godoy, 2014). Interestingly, results of a study conducted by Selfhout et al. in 2010, found the same personality traits to be homophilous, in offline friendship networks. In both studies, no homophily effects of Neuroticism or Conscientiousness were reported. This is in accordance with prior social network and communication research demonstrating that similarity in Conscientiousness does not appear to trigger homophily processes (Amichai-Hamburger & Vinitzky, 2010; Balmaceda et al., 2014; Ross et al., 2009) and neither does similarity in Neuroticism (Jokela et al., 2015). Consequently, it appears reasonable that similarity matters when considering Extraversion, Agreeableness and Openness. Extraverts are particularly talkative and outgoing, whereas introverts tend to be more shy and inhibited during social interaction. It might be that an extravert enjoys conversation with another extravert more, since the interaction is more easy and predictable than with an introvert. Similarly, introverts may find the interaction style of an extrovert overwhelming, intense and unpredictable, and consequently unenjoyable. This lack of enjoyment and predictability is likely to result in a lack of attraction between individuals (Berger & Calabrese, 1975).

Agreeableness is primarily expressed through prosocial, altruistic behaviour (Denissen & Penke, 2008). Evolutionary game theory (e.g.,Maynard Smith, 1984) suggests similarity in Agreeableness positively affects tie formation, since one person's altruism can only be useful on a dyadic level, if the interaction partner is also altruistic.

If one of the dyadic partners involved acts in an egoistic fashion, the altruistic individual has more to lose than to win. Consequently, similarity in agreeableness is expected to result in more beneficial outcomes than dissimilarity.

Lastly, prior research on personality and friendships has demonstrate that friends are likely to have comparable levels of Openness to experience (Lee, Ashton, Ogunfowora, Bourdage, & Shin, 2010; Lönnqvist & Itkonen, 2016) and that similarity levels predict friendship (Selfhout et al., 2010). Openness, an intrapsychic trait, refers to individual differences in the structure and functioning of the mind (McCrae, 1996; McCrae & Costa, 1994). Therefore, its importance to social relationships may not be immediately obvious. Open individuals are likely to have similar interests (McCrae, 1996) and values (Cheng, Bond, & Chan, 1995) and be engaged in similar vocations (Holland, Johnston, Hughey, & Asama, 1991). Similarity in interests and values are assumed to increase social interaction (Byrne & Nelson, 1965; Clore & Byrne, 1974). As such, homophily here is not due to selection or induction/social influence (e.g.,De Klepper, Sleebos, Van de Bunt, & Agneessens, 2010) but is thought to be caused by a common exposure to something. Consistent with this, Cheng et al. (1995) show that an adolescent's ideal best friend had similar Openness levels. Lastly, a recent study found that individuals high on Openness were the happiest when their local neighbours were also high on Openness (Noë et al., 2016). In summary, it appears plausible that similar levels of Openness make the existence of social ties more likely.

It is worth noting, that some authors (e.g.,Aboud & Mendelson, 1996) have argued that individuals prefer to be associated with others who possess "ideal personality traits", rather than with others sharing "similar personality traits". In the current study we therefore control for incoming (receiver effect) and outgoing (sender effect) links, when considering effects of similarity.

2.3.2 Method

2.3.2.1 Participants

We collected our data at a London University Masters course. Out of 67 students, 65 took part in the study (97%). The average age of respondents was 27.26 (StD= 7.39), and 73% were female. The majority of participants self-reported as White (46.2 %) or Asian (44.6%), 5% Hispanic and 4.2 % as African American. Data was collected using an online survey administered through *Qualtrics*. On average, the survey took 15 minutes to complete.

2.3.2.2 Measures

Sociometric questions. Since the names of the students on the course were known in advance, the roster method was used during the data collection. Participants were presented with the list of names of all students on their course and asked to answer questions like "How often do you talk to this person?" by providing a response on a scale for each of the individuals presented. This method was better than participants generating names by themselves as it prevented participants not including names due to forgetting (Borgatti, Everett, & Johnson, 2013). Answers were recorded on a Likert scale reaching from 0 (never) to 5 (always).

Friendship. The friendship network was measured by asking participants to answer the following statement by selecting the names of their classmates "I consider the following people to be my personal friends. I socialise with them and spend non-work related time with them".

Trust. Similarly, trust network was assessed on the same Likert scale with the statement "Please indicate the people in the group you would trust to keep you best interest in mind. The people you think you can count on".

Advice. Advice network was measured with response to the statement "If I have questions or problems, related to my course, I ask the following people for help or advice".

Personality. We used the mini International Personality Item Pool (IPIP) scale (Donnellan et al., 2006) to measure the Big Five Personality traits (Extraversion, Agreeableness, Conscientiousness, Neuroticism and Intellect). The 20-item of Mini-IPIP is the short form of the 50-item International Personality Item Pool – Five-Factor Model measure (Goldberg, 1999). All items were answered using a 7-point Likert-type scale anchored at 1 (*very inaccurate*) and 7 (*very accurate*). The Mini-IPIP shows very good test-retest reliability, convergent, discriminant, and criterion-related validity, which is comparable to the NEO and other measures of the Big Five (Donnellan et al., 2006). Cronbach's alpha coefficient for each scale indicate good reliability (Extraversion, α =.82; Agreeableness, α =.62; Conscientiousness, α =.68; Neuroticism, α =.73; Intellect, α =.69).

Demographic information. Participants provided information about their age, gender and ethnicity.

2.3.2.3 Procedure

Course members have worked together for about ten months. Students responded by means of an online questionnaire distributed through the survey platform *Qualtrics*. The survey took on average eleven minutes to complete.

2.3.3. Results

2.3.3.1 Descriptive statistics and QAP correlations

Table 6 displays descriptive statistics. Standard statistical tests cannot be used to analyse SNA dyadic data, due to the auto-correlation of the error terms within rows

and columns. Therefore, intercorrelations were calculated based on Quadratic Assignment Procedure (QAP) method taking place in in two steps: Firstly, a Pearson correlation coefficient is generated between the cells of two variable matrices. Secondly, the significance levels are calculated by permuting one of the matrices several times (Table 7).

Two steps are involved in QAP correlation. Firstly, the program computes Pearson's correlation coefficients for corresponding cells in the two matrices. Subsequently rows and columns of one matrix are permuted and correlations between the matrices are calculated. This step is repeated 5000 times. Each time, the correlation derived from step 1 is compared with the correlation from step 2 to assess how often the randomly generated correlation generated by is larger or equal to the one from step 1. In order to test hypotheses, using multiple regression QAP analysis (MRQAP) the dependent variable matrices regressed on the independent and control variable matrices. Similar to the correlation analysis the program runs standard multiple regression across corresponding cells of the matrices (Borgatti et al., 2002). Subsequently, all rows and columns from the dependent variable matrix are randomly permuted and the regression coefficient is recalculated. Again, this step is repeated 5000 times. The coefficients computed in step 2 are compared to the coefficient produced in the first step. Subsequently, the number of random permutations needed in step 2 to achieve results similar to those of step 1 is calculated. A significant relationship is shown if the proportion of similar results found in step 2 is low compared with those from step 1 (Raider & Krackhardt, 2001). There are some crucial differences between the described QAP regression and standard ordinary least square method (OLS). Since QAP rests on permutation-based hypothesis testing degrees of freedom, statistical power, or effect sizes is not possible (Ferrin, Dirks, & Shah, 2006). Furthermore, equivalent correlations and beta values might not have equal significance levels because

the structure of network data limits the possible number of correlations. This means that a correlation coefficient of .06 may be significant between two variables, but not between two other variables. Therefore the primary statistic of interest is the p-value (Gibbons, 2004). A p-value of .01 means that 1% of the permutations achieved a larger correlation coefficient than what was observed (Gibbons, 2004).

Table 6

Descriptive statistics (N= 65)

	M	StD		M	StD
Age	27.26	7.39	Ex	4.53	1.25
Gender*	1.26	.44	Ag	5.77	.71
Race	-	-	Con	5.07	1.00
Advice	1.05	.42	Op	5.35	.98
Friendship	1.25	.73	Neu	3.40	1.08
Trust	1.65	.83			

*Female (1)/Male (2)

Table 7

QAP intercorrelations between all variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1 Age	1.00																			
2 Gender	.00	1.00																		
3 Race	.00	.00	1.00																	
4 Ex (s)	-.08*	.01	.07	1.00																
5 Ex (r)	.08*	.01	.07	-.02	1.00															
6 Ag (s)	.16***	-.02	.00	.23***	.00	1.00														
7 Ag (r)	-.16***	-.02	.00	.00	.23***	-.02	1.00													
8 Con (s)	.16***	-.07	.01	-.02	.00	.51***	-.01	1.00												
9 Con (r)	-.16***	-.07	.01	.00	-.02	-.01	.51***	-.02	1.00											
10 Op (s)	.05	-.11**	.00	.42***	-.01	.43***	-.01	.24***	.00	1.00										
11 Op (r)	-.05	-.11**	.00	-.01	.42	-.01	.43***	.00	.24***	-.02	1.00									
12 Neu (s)	-.07	.00	-.01	-.11**	.00	-.03	.00	-.18***	.00	.00	.00	1.00								
13 Neu (r)	.07	.00	-.01	.00	-.11**	.00	-.03	.00	-.18***	.00	.00	-.02	1.00							
14 Ex (dsi)	.00	-.04	.02	-.02	-.02	.02	.02	.02	.02	.01	.01	-.04	-.04	1.00						
15 Ag (dsi)	.00	.06	-.03	-.08	-.08*	-.15***	-.15***	-.09*	-.09*	-.10**	-.10**	-.05	-.05	.11**	1.00					
16 Con (dsi)	.00	.06	-.04	-.07	-.07	-.05	-.05	-.20***	-.20***	.01	.01	-.04	-.04	.07	.24***	1.00				
17 Op (dsi)	.00	.00	-.01	-.15***	-.15***	-.16***	-.16***	-.09*	-.09*	-.22***	-.22***	-.06	-.06	.20***	.24***	.04	1.00			
18 Neu (dsi)	.00	-.08*	-.08*	-.03	-.03	.01	.01	.09*	.09*	.10**	.10**	-.02	-.02	.01	-.05	.02	.07	1.00		
19 Advice	-.01	-.03	.11**	.04	.06	-.02	.00	-.08*	.01	.00	.05	.03	-.02	-.06	-.02	-.02	-.06	-.05	1.00	
20 Friend	-.02	-.03	.11**	.11**	.06	.02	-.01	-.03	-.01	.07	.04	.02	-.02	-.07	-.06	-.06	-.09*	-.06	.78***	1.00
21 Trust	-.04	-.03	.13***	.10**	.03	.02	.00	-.03	.00	.04	.03	-.04	-.02	-.03	-.01	-.03	-.04	-.04	.77***	.78***

Note. *p < .05; **p < .01; ***p < .001. N = 4,624 dyads among 68 individuals; Significance tests based on correlation quadratic assignment procedure tests using 2,000 permutation; sender (s), receiver (r), dissimilarity (dsim)

2.3.3.1 Regression analysis (QAP)

Results from a multiple regression analysis demonstrate that extroverts nominate more friends (see Table 9) and are likely to trust more people (see Table 10), while conscientious individual trust others less (see Table 10) and tend to seek advice less frequently (see Table 8). With regards to personality homophily, similarity in Extraversion was positively related to the presence of advice and friendship ties (see Table 11). Additionally, similarity in Openness positively predicted the presence of ties in advice networks, while similarity in Neuroticism appears to make friendship ties more likely (see Table 11). Consistent with previous literature racial similarity is consistently related to the existence of social network connections.

Table 8

Results of hypotheses tests using QAP regression predicting advice ties

	Model 1	Model 2
	Unstandardized coefficient (st. error)/standardized coefficient	
Control Variables		
Age	-.00(-.01)/.00	-.00(-.00)/.00
Gender	-.07(-.03)/.05	-.07(-.04)/.05
Race	.22(.11)/.05**	.21(.10)/.05**
Personality Variables		
Ex (s)		.02(.02)/.04
Ex (r)		.04(.05)/.03
Ag (s)		.04(.03)/.08
Ag (r)		-.04(-.03)/.05
Con (s)		-.10(-.10)/.05**
Con (r)		.01(.01)/.03
Op (s)		-.00(-.00)/.05
Op (r)		.04(.04)/.03
Neu (s)		.01(.01)/.04
Neu (r)		-.01(-.01)/.03
Adj. R-Square	.01***	.03***

Note. *$p < .05$; **$p < .01$; ***$p < .001$. N = 4,624 dyads among 68 individuals; Multiple Regression Quadratic Assignment procedure tests using 2,000 permutations; sender (s), receiver (r).

Table 9

Results of hypotheses tests using QAP regression predicting friendship ties

	Model 1	Model 2
	Unstandardized coefficient (st. error)/standardized coefficient	
Control Variables		
Age	-.00(-.00)/.00	-.00(-.00)/.00
Gender	-.06(-.03)/.06	-.06(-.03)/.06
Race	.24(.11)/.06**	.22(.10)/.06**
Personality Variables		
Ex (s)		.08(.09)/.04*
Ex (r)		.05(.05)/.03
Ag (s)		-.00(-.00)/.09
Ag (r)		-.05(-.03)/.05
Con (s)		-.03(-.02)/.06
Con (r)		-.01(-.01)/.04
Op (s)		.04(.03)/.06
Op (r)		.03(.03)/.03
Neu (s)		.03(.03)/.05
Neu (r)		-.02(-.02)/.03
Adj. R-Square	.01***	.03***

Note. *$p < .05$; **$p < .01$; ***$p < .001$. N = 4,624 dyads among 68 individuals; Multiple Regression Quadratic Assignment procedure tests using 2,000 permutations; sender (s), receiver (r)

Table 10

Results of hypotheses tests using QAP regression predicting trust ties

	Model 1	Model 2
	Unstandardized coefficient (st. error)/standardized coefficient	
Control Variables		
Age	-.00(-.04)/.00	-.00(-.00)/.00
Gender	-.08(-.03)/.06	-.08(-.04)/.06
Race	.33(.13)/.07**	.32(.10)/.07**
Personality Variables		
Ex (s)		.08(.08)/.05*
Ex (r)		.02(.02)/.03
Ag (s)		.04(.02)/.09
Ag (r)		-.03(-.02)/.05
Con (s)		-.05(-.04)/.06*
Con (r)		-.01(-.01)/.04
Op (s)		.00(.01)/.06
Op (r)		.03(.03)/.04
Neu (s)		-.04(-.03)/.05
Neu (r)		-.02(-.01)/.03
Adj. R-Square	.02***	.03***

Note. *p* < .05; **p* < .01; ***p* < .001. N = 4,624 dyads among 68 individuals; Multiple Regression Quadratic Assignment procedure tests using 2,000 permutations; sender (s), receiver (r)

Table 11

Results of hypotheses tests using QAP regression predicting advice ties

	Advice	Friendship	Trust
	Unstandardized coefficient (st. error)/standardized coefficient		
Control Variables			
Age	-.00(-.00)/.00	-.00(-.02)/.00	-.00(-.02)/.00
Gender	-.08(-.04)/.04*	-.07(-.03)/.06	-.07(-.03)/.06
Race	.20(.10)/.05**	.21(.09)/.06**	.32(.13)/.06**
Personality Variables			
Ex (s)	.01(.01)/.04	.07(.08)/.04*	.07(.08)/.04*
Ex (r)	.03(.04)/.03	.03(.04)/.03	.01(.01)/.02
Ag (s)	.04(.03)/.07	-.01(-.01)/.03	-.05(-.03)/.10
Ag (r)	-.05(-.04)/.05	-.06(-.04)/.08	-.03(-.01)/.05
Con (s)	-.10(-.10)/05**	-.04(-.04)/05	-.06(-.05)/07*
Con (r)	.00(.00)/.03	-.02(.02)/.06	-.02(-.02)/.04
Op (s)	-.00(-.00)/.05	.04(.04)/.04	.02(.01)/.07
Op (r)	.04(.04)/.04	.03(.03)/.05	.04(.03)/.04
Neu (s)	.00(.00)/.04	.01(.01)/.04	-.05(-.04)/.05
Neu (r)	-.02(-.02)/.02	-.03(-.03)/.05	-.02(-.02)/.03
Ex (dsim)	-.05(-.05)/.02*	-.06(-.05)/.03*	-.04(-.03)/.03
Ag (dsim)	.01(.00)/.04	-.05(-.03)/05	.03(.02)/05
Con (dsim)	-.04(-.03)/.03	-.05(-.04)/.04	-.05(-.04)/.04
Op (dsim)	-.05(-.05)/.03*	-.05(-.04)/.04	-.02(-.02)/.04
Neu (dsim)	-.03(-.03)/.02	-.06(-.05)/.03*	-.03(-.02)/.02
Adj. R-Square	.03***	.04 ***	.03 ***

N = dyads among 68 individuals; *** p < .001; ** p < .01; * p < .05; Multiple Regression Quadratic Assignment procedure tests using 2,000 permutations; sender (s), receiver (r), dissimilarity (dsim).

2.3.4 Discussion

Following a purely structural approach social network scholars tend to consider consequences for individuals based on their personal social network characteristics (Borgatti & Foster, 2003). Yet, as outlined before, personality traits associated with the acquisition of those network characteristics have been less researched. Findings of the currently study add to the still relatively limited, yet increasing, evidence that a person's personality influences the presence or absence of social network relations. While most prior studies have indicated a relationship between personality and network position, various other studies suggest otherwise. Results of the current research are similarly inconclusive. We only found – significant, but very weak - support for approximately 20 percent (4) of our predictions. Therefore, although the individual differences in personality do appear to matter in determining selection and attraction of social ties, they evidently do not tell the whole story.

Nevertheless, the study makes various valuable contributions to existing literature. We confirm the importance of distinguishing network types dependent on tie content, when relating them with different network antecedents. Results suggest that extraverts select more friends and have a higher propensity to trust, but are not more likely to seek advice. Additionally, the expected negative sender effects of Conscientiousness were non- significant for friendship, weak for trust but relatively strong in the advice network.

By and large, we failed to replicate previous research (Amichai-Hamburger & Vinitzky, 2010; Asendorf & Wilpers, 1998; Cascario, 1998; Kalish & Robbins, 2006; Markovikj et al., 2013; Neubert & Taggar, 2004; Pollet et al., 2011; Shen et al., 2015) providing evidence for the hypothesis that Extraverts attract more ties in instrumental and expressive networks. Instead, our results are in line with scholars suggesting that

that Extraversion is either no significant predictor of centrality (Klein et al., 2004) or over time, the social attraction of extroverts is "fading away" (Bendersky & Shah, 2013; Selfhout et al., 2010). In other words, it may be that effects of Extraversion are dependent on network specific factors such as relationship length.

Similarly diverging from prior empirical findings (e.g., Fang et al., 2015), agreeable individuals, in the current study, do not seem to select or attract more peers in expressive networks. Seevers, Johnson and Darnold (2015) found Agreeableness to be related with increased tie quantity, but not quality (strength). Since our "tie measure" was on a scale from 0 (no tie) to 5 (strong tie), we technically consider tie strength (quality) rather than quantity. Although post-hoc analysis using dichotomized data at various different cut-off points (resulting in binary – tie/no tie – data) did not change the patterns of results in this study, future research should consider the possibility of differing effects of personality on tie quality versus quantity.

Additionally, different from what was expected and previous findings (Fang et al., 2015; Liu & Ipe, 2010), conscientious individuals were not found to be more popular sources of advice. This finding resembles results from Klein et al.'s (2004) study showing no significant effect of Conscientiousness on advice in-degree centrality. It could be that conscientious individuals appear less approachable and possibly intimidating, since they tend to be highly achievement oriented, hardworking and demanding (Barrick & Mount, 1993).

Different to what was hypothesized, Neuroticism had no negative impact on selecting or attracting ties in neither of the three networks considered. This stands in contrast to various research showing that Neuroticism relates negatively to centrality (e.g.,Anderson et al., 2001; Fang et al., 2015; Klein et al., 2004). It appear possible, that in the setting of the current study, Neuroticism may not be visible or expressed, or

potentially covered up by impression management or self-monitoring processes (e.g.,Snyder, 1974).

As anticipated, similarity in Extraversion was positively related to the presence of advice and friendship ties, yet it did not predict the existence of trust ties. It may be that similarity attraction based on Extraversion occurs mainly on a behavioural, rather than attitudinal level. Seeking advice and friendship (as we conceptualized it – spending time outside of class) are mainly behavioural networks while trust is mainly attitudinal.

While similarity in Openness positively predicted the presence of advice seeking ties, homophily effects were weaker and did not reach significance when considering expressive networks. These findings at least partially support our prediction and previous research demonstrating positive effects of similarity in Openness on network formation (Lee et al., 2009; Lönnqvist & Itkonen, 2016; Selfhout et al., 2010).

Unexpectedly, results further suggest that similarity in Neuroticism appears to make friendship ties more likely. This corresponds to prior research showing that adolescents tend to select friends who possess similar levels of internalized distress, anxiety and depression (e.g., Hogue & Steinberg, 1995; Zalk et al., 2010)

2.3.4.1 Limitations and future research

Various improvements could be made for future replication efforts of the present research. A weakness of this investigation was the use of a cross-sectional design. Most social network studies, including the current, involve non-experimental and non-longitudinal data, making it impossible to clearly establish causality among the relationship between personality and network position. Yet, previous research on the biological basis of personality suggests that personality is likely to be an antecedent of social networks, since it is thought to be a relatively stable construct (e.g., McCrae &

Costa, 1994; Yamagata et al., 2006; Riemann, Angleitner, & Strelau, 1997). However, it should be noted that certain personality facets may change due to relational factors, or their expression may be more or less strong (e.g., Mund & Neyer, 2014; Snyder, 1974).

While the sample size for the current study is typical for studies in social networks research, it is relatively small and homogenous compared to other survey research studies. Consequently, we encourage caution when interpreting the results and applying them to different contexts. Furthermore, in this study we focus on the popular Big Five personality dimensions. Yet, it is plausible that other frameworks may be more suitable. For instance, it may be fruitful to give more attention to individual difference approaches related to affect (e.g.,emotion, positive/negative affect, happiness, loneliness), cognitive ability, core-self-evaluation, motivational traits and how these variables impact different types of networks.

Since this study used the dyad as level of analysis, we only focused on tie selection (sender effects) and attraction (receiver effects). Previous research has however suggested that personality may lead to structural advantages that go beyond the dyad (e.g.,transitivity and brokerage). Future research should consider the effect of personality using statistical models that take into account various triadic network configurations.

Lastly, as mentioned before, it could be that the perception of personality is more important than reality (actual/self-reported personality). In particular, when predicting the attractiveness of a social actor, peer perceptions of their personality might be much more important than their self-assessed personality (see research on personality consensus, e.g., Funder & West, 1993). Correspondingly, it may be that perceived similarity is more relevant than actual personality similarity, based on self-report, when predicting the existence of social ties, as individuals behave based on their perceptions (e.g., Strauss, Barrick, & Connerley, 2001). Montoya et al. (2008) carried out a meta-

analysis comparing effect sizes for perceived and actual similarity showing that perceived similarity, on average was a better predictor of interpersonal attraction compared to actual similarity. Accordingly, future research might benefit from taking into account perceived personality and perceived personality similarity, aiming for a better understanding of when actual or perceived personality is of importance.

2.3.4.2 Conclusion

Findings are similarly inconsistent with evidence from prior research. Results reveal that while extroverts select more people to be their friends and have a higher propensity to trust, conscientious individuals trust others less and tend to seek advice less frequently. Similarity in Extraversion was found to be positively related to the presence of advice and friendship ties. Additionally, similarity in Openness positively associated with the presence of advice ties, while similarity in Neuroticism appears to make friendship more likely.

Taken together, the current study suggests that the interplay between individual based and sociometric variables is more complex than previously assumed. It appears, that human behaviour is caused by a complex interaction between personality variables and environmental factors, mediated by perceptions, motivation and emotional responses. Additional research studies are needed to reach a better understanding of how the relationship between personality traits and social capital might be affected by cognitive, affective and motivational factors, as well as contextual and network specific factors such as size, formal constrains, personal importance, activation frequency and network history.

2.4 Study 3: Motivation and social networks in organizations

2.4.1 Introduction

2.4.1.1 Motivation and organizational social networks

Understanding and exploiting social networks at work is increasingly important for employees' success. This is demonstrated by the prominence of social network position as predictor of various work related outcomes including job acquisition (Granovetter, 1995; Ioannides & Loury, 2004; Montgomery, 1992; Wahba & Zenou, 2005), leader effectiveness (Balkundi & Kilduff, 2006; Balkundi, Barsness, & Michael, 2009), job attitudes (Mossholder, Settoon & Henagan, 2005; Soltis et al., 2013) and performance (Balkundi & Harrison, 2006).

Despite progress linking personality with social network position, the role that an individual's motivation may play remains little understood (Cascario et al., 2015). This is surprising since previous literature proposed that social networks emerge via either "serendipitous" or "goal-directed" behaviour (Kilduff & Tsai, 2003). To explain how networks are shaped via serendipitous behaviour, it is easy to imagine that a formal connection might evolve into an informal one over time. For example, a manager and an employee may become personal friends. Yet, explaining how networks are forming via 'goal-directed' behaviour is difficult, if motivation is not weaved into the conversation.

To explain this omission from the literature, Tasseli, Menges and Kilduff (2015) have suggested that one of the reasons why network scholars tend to omit the role an individual's motivation might play in shaping social network structure is that social network research has broadly treated motivation and opportunity as synonyms. For instance, Burt (1992) states: "I will treat motivation and opportunity as one and the

same . . . a network rich in entrepreneurial opportunity surrounds a player motivated to be entrepreneurial. At the other extreme, a player innocent of entrepreneurial motive lives in a network devoid of entrepreneurial opportunity" (p. 36). Importantly, this viewpoint goes beyond pure structuralism, implying prior individual motivation for strategic networking. In other words, Burt did not assume that individuals would simply benefit from structural advantageous; rather he suggested that people occupy these positions due to their motivation to exploit social resources and turn them into beneficial outcomes. Nonetheless, it appears that the agency element in Burt's famous argument was never as fully accepted and developed as the social structure element.

2.4.1.2 The four needs as antecedents of network position

Motivated behaviour, as per Murray's Need Theory (1938), and elaborated by McClelland, Atkinson, Clark and Lowell (1953), is a gauge of the strength of an individual's needs. These needs are part of somebody's personality construct and are widely considered to be stable individual characteristics, which emerge from psychological predispositions within a specific social context (Cattell, 1982). Building on foundational proposals around 'manifest needs' (Steers & Braunstein, 1976) and on various other motivational theories (e.g., Adler, 1939; Allport, 1955; Barrick, Mitchell, & Stewart, 2003; Baumeister & Leary,1995; Brunstein, Schultheiss, & Gräsmann, 1998; DeShon & Gillespie, 2005; Emmons & McAdams, 1991; Hogan, 1983; Kehr, 2004; Maslow, 1943; McClelland, Koestner, & Weinberger, 1998; Murray, 1938), Barrick et al. (2013) proposed that individual differences in workplace attitude and behaviour arise from two self-regulatory processes of striving towards *purposefulness* and *experienced meaningfulness*. The result of these processes fuel four fundamental 'Motivational Strivings' or social needs - *affiliation, dominance, autonomy* and *achievement* – which are thought to "comprehensively capture individual differences in intrinsic motivation

that determine purposefulness and meaningfulness…" (Barrick et al., 2013, p.8). The current research aims to understand how these differences in intrinsic motivation, affect how employees are embedded in their workplace social network. Based on previous literature in psychology and network science, we formulate several hypotheses (summarized in Table 12). Our predictions apply to both the affective and instrumental network unless otherwise specified. Affective networks provide socio-emotional support, while instrumental networks are useful for the advancement of career interests (Fombrun, 1983; Ibarra, 1993; Kram & Isabella, 1985). This study investigates effects on *in-degree centrality* (the number of incoming ties an individual receives from others) and *brokerage* (the extent to which an individual is connected to people or groups of people who are not themselves connected), the two network positional measures most commonly related to network structural advantages (Fang et al., 2015).

2.4.1.3 Predictions of the current study

Affiliation. Need for affiliation refers to the need to initiate and maintain friendly associations (Casciaro, 1998). People with a high need for affiliation are agreeable, accommodating and sympathetic to others (Koestner & McClelland, 1992) with a strong desire for social contact or belongingness (Veroff & Veroff, 1980). A strong need for affiliation is associated with the tendency to receive social rewards from a sense of communion with others (Murray, 1938). Those individuals strive for social support and aim to form meaningful interpersonal relationships (Baumeister & Leary, 1995). Within a work setting, they enjoy interdependence and cooperation (Yamaguchi, 2003). Unsurprisingly, popularity - defined as in-degree centrality - has been demonstrated to be an important factor in satisfying this need for relatedness (Agneessens & Wittek, 2012). In line with this, Park, Jin and Jin (2011) show that the need for affiliation relates positively to the number of relationships an individual has on

Facebook. Consequently, we predict affiliation striving to be positively related to network in-degree centrality in organizational networks, particularly in the affective network. With respect to brokerage a negative association is expected. The social forces arising from the need for affiliation are manifested in "clan-like" clique formation (e.g., Bar-Yam & Bar-Yam, 1987; Carron & Chelladurai, 1981). Cliques indicate high density and network closure (Wasserman & Faust, 1994) and therefore few structural holes. Moreover, need for affiliation is associated with high levels of Agreeableness (e.g., Barrick et al., 2013; Brutus & Greguras, 2008) and Agreeableness is known to lead to more closed networks (e.g., Fang et al., 2015).

Dominance. Those with a high need for dominance value power over sociability and are frequently disliked by their colleagues (Lucas, Diener, Grob, Suh, & Shao, 2000; McNeese-Smith, 1999). Previous literature has demonstrated that power is associated with less advice seeking (See, Morrison, Rothman, & Soll, 2011). This may be due to power resulting in overconfidence (See et al., 2011) or due to the belief that seeking advice may be damaging to one's status (Agneessens & Wittek, 2012). Along similar lines, a dominant person may not be willing to share their knowledge due to a fear of increasing their peer's power. Based on this we expect dominance striving to be negatively related to out- and in-degree centrality in organizational networks. Previous network literature has often associated brokerage with dominance. A need for power implies the internal desire to influence and control other people (McClelland, 1975). Being in bridging positions offers information and control benefits (Burt, 1992) greater power (Brass, 1984) and social influence (Fernandez & Gould 1994). Consequently, it is plausible that individuals with a high need for dominance may strategically endeavour to occupy brokerage positions, in order to gain power and dependants. Consistent with this, Barrick et al. (2013) state that the need for dominance relates to

Extraversion, which is also thought to predict brokerage (Fang et al., 2015). As such it is expected that dominance striving will relate positively to brokerage.

Autonomy. Autonomy describes an individual's desire to be in control of their behaviour and decisions. Those with a high need for autonomy do not want to be reliant on social relationships. Instead, they prefer fewer interactions and strive to work independently (e.g., Heckert et al., 1999; Kadushin, 2002). Consequently, it is predicted that autonomy striving will relate negatively to popularity in the network (in-degree centrality) in organizational networks. However, with regards to brokerage we expect a positive relationship, because open networks denote independence. Highly connected (closed) networks constrain a person's opportunity to freely decide, be creative or to deviate from standard behaviour (Kohler, Behrman, & Watkins, 2001). This is partly due to dense networks being associated with high visibility, consequently enforcing strict adherence to prevailing group norms (e.g., Burt, 1992). In order to create or maintain their autonomy, it is therefore expected that individuals with a high need for autonomy avoid being part of these dense network constellations. Once again, this is consistent with the need of autonomy being positively related to Extraversion (Barrick et al., 2013) making people more likely to have open personal networks (Fang et al., 2015).

Achievement. Those with a high need for achievement appreciate the extrinsic value of social connections to enhance their own career success (Tams & Arthur, 2010). They are cognisant of the benefits of receiving feedback during goal completion (Emmons & McAdams, 1991) and appreciate the prestige generated by publically giving advice and feedback (Agneessens & Wittek, 2012; Wright & Werther Jr, 1991). Therefore, it seems likely that achievement striving will relate positively to in-degree centrality in instrumental networks. Achievement striving is also expected to positively

affect brokerage tendencies, since workplace achievement and the occupation of structural holes are related (Burt, Kilduff & Tasselli, 2013). Consequently, it is plausible that individuals with a high need for achievement strategically situate themselves in brokerage positions to benefit from the structural advantageous these positions provide. This resonates with McClelland's (1967) argument that early formation of a need to achieve significantly predicts later entrepreneurial behaviour. Entrepreneurial behaviour, in turn, has been frequently associated with the occupation of bridging positions (e.g., Burt, 1992, 2000, 2004). In line with this, need for achievement is associated with high Conscientiousness (Barrick et al., 2013) and meta-analytic evidence demonstrated a positive effect of Conscientiousness on brokerage tendencies (Fang et al., 2015). However, achievement strikers may be viewed as over motivated, narcissistic or manipulative by others (e.g., Soyer, Rovenpor, & Kopelman, 1999). Hence, we do not expect higher centrality, neither degree nor brokerage, in the affective network.

Table 12

Summary of study predictions

Motivational Striving	Network Type	Degree Centrality		Brokerage
		Indegree	Outdegree	
Affiliation	Affective	+	+	-
	Instrumental	+	+	-
Dominance	Affective	-	-	+
	Instrumental	-	-	+
Autonomy	Affective	-	-	+
	Instrumental	-	-	+
Achievement	Affective	/	/	/
	Instrumental	+	/	+

Note. + = positive effect; - = negative effect; / = no effect or direction of effect unclear

2.4.2 Method

2.4.2.1 Participants

The study was performed as part of an internal consultancy program for a medium-sized company that specializing in risk management solutions. There were 143 employees across the organization with headquarters in London and three smaller locations. Hierarchically, the organization is relatively flat, with a collection of eight members of senior management, five of whom lead business units, see Figure 21. The units work both in silos and collaborate.
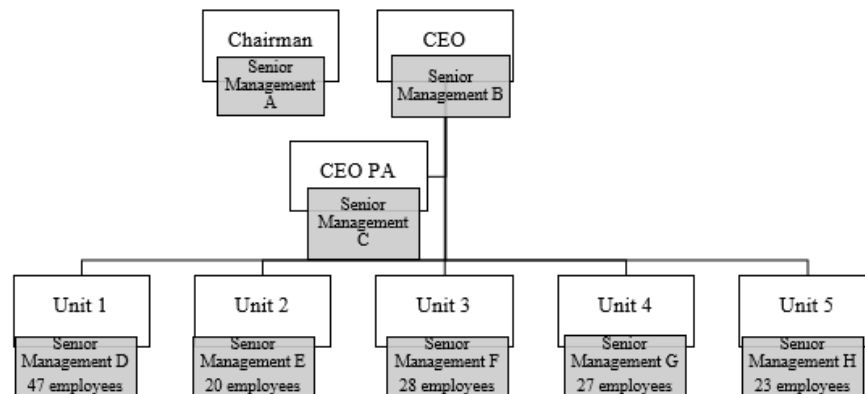
Figure 21. Organogram depicting the organizational structure.

2.4.2.2 Measures

Sociometric questions. The questionnaire presented respondents with a comprehensive list of employees – ordered by work unit (Wasserman & Faust, 1994). Previous literature suggests one-item network measures are largely reliable and the roster method of collecting network data facilitates recall and has been shown to be largely accurate (Marsden, 1990).

Instrumental advice network. To capture the *instrumental network* (advice), we posed the question: 'Please indicate the extent to which you have turned to each of the following people for information or knowledge on work-related topics'. Participants

were given a list of every name in the company and 5-point Likert scale: (1) never, (2) sometimes in 3 months, (3) sometimes in 1 month, (4) sometimes in 1 week and (5) daily. In the analysis, we choose to only consider connections which were activated more than once a month (tie strength 4 and 5).

Affective friendship network. This network was binary (0,1) and was conceptualized as friendship network. Participants were asked: 'Who are you close friends with? '

Motivation. The Needs Assessment Questionnaire (NAQ) developed by Heckert et al. (1999) includes 20 items that measure four psychological needs: achievement (nAch), affiliation (nAff), autonomy (nAut) and dominance (nDom). Participants answered on a 5 point Likert scale, from "total disagree" (1) to "totally agree" (5). Sample items include: "I try to perform my best at work" (nAch); "I spend a lot of time talking to other people" (nAff); "I would like to be my own boss" (nAut); "I seek an active role in the leadership of group" (nDom). Heckert et al. (1999) found these measures held internal consistency across four studies with both students and workers. Within our study, Achievement had a Cronbach's alpha of 0.82, Autonomy had a Cronbach's alpha of 0.76, Power had a Cronbach's alpha of 0.68 and Affiliation had a Cronbach's alpha of 0.46.

Demographics. Information was collected on age, gender, tenure and seniority because all of these attributes could potentially influence somebody's social network position (e.g., Brass, 1985; Mehra, Kilduff, & Brass, 1998). These measures were used as controls.

2.4.2.3 Procedure

Survey development and data collection took place during March and April 2016 using an online survey administered through *Qualtrics*. Initially a pilot survey was

conducted with five employees to validate the proposed measures and to receive

stakeholder approval to proceed. Making the survey accessible online allowed

employees to complete it at their own convenience during a two-week period. The

survey took no longer than 20 minutes to complete. To raise response rates, we travelled

to the various locations to talk to employees in person to address concerns and

encourage participation. The final sample included 143 out of 144 potential employees

for a response rate of 99.3%.

The data on network relations were arranged in a 143 x 143 binary adjacency

matrices. For example, in the advice network matrix, a value of 1 in the cell

x_{ij} corresponded to i going to j to advice. A value of 0 indicated no relation from i to j.

To calculate degree and brokerage measures, the network software program UCINET

VI, version 6.289 (Borgatti, Everett, & Freeman, 2002) was used. In-degree centralities

for the instrumental and affective network were computed following Freeman's (1979)

definition. *Direct* brokerage (considering only ego-network) was the preferred measure

of brokerage, because the benefits of brokerage are thought of as more intense between

immediate ties (Oh & Kilduff, 2008). Moreover, it has been proposed that brokerage

opportunities tend to be derived from direct contacts only, as opposed to those that are

indirect (Buechel & Buskens, 2013).

2.4.3 Results

2.4.3.1 Descriptive statistics and correlations

Table 13 presents means, standard deviations and correlations. Need for

affiliation was positively correlated with in and out-degree centrality in instrumental

networks and need for dominance was positively associated with out-degree and

brokerage in instrumental networks.

2.4.3.1 Regression analysis

There were no other correlations between independent and dependent variables. We used ordinary least squares (OLS) regression analyses to test our hypotheses. Our analyses included two models. Model 1 included all control variables and Model 2 the motivation variables. None of the motivation variables significantly predicted in-degree or brokerage, neither in instrumental (Table 14) nor in affective networks (Table 15). Figure 22 and 23 show the instrumental and affective network of the coloured by need for achievement and affiliation respectively. Colour intensity represents strength of need. Node size signifies in-degree-centrality.

Table 13

Means, standard deviations, and correlations

	Mean	StD	2	3	4	5	6	7	8	9	10	11	12
1. Gender	1.40	.49	-.04	-.19*	.12	.11	-.01	-.17	.27**	.18*	.13	.40***	.09
2. Age	36.60	11.21	1	.23**	.23**	.21*	-.01	-.11	-.16	-.07	-.07	.05	-.02
3. Seniority	.06	.23		1	.11	.16	-.03	.11	-.05	-.05	-.03	.07	.00
4. Tenure	3.63	1.85			1	.09	-.06	.01	-.00	.13	.11	.38***	.17
5. Affiliation	3.37	.48				1	-.26**	.18*	.09	.19*	.10	.05	.03
6. Autonomy	3.57	.58					1	.23*	.09	.03	-.09	-.03	-.04
7. Dominance	3.48	.55						1	.10	.16	-.03	-.02	.01
8. Achievement	4.59	.44							1	.18	.03	.08	.08
9. Instrumental (in-degree)	8.39	5.29								1	.06	.29***	.07
10. Instrumental (brokerage)	70.09	97.24										.14	.20*	.13
11. Affective (in-degree)	4.85	3.41											1	.37***
12. Affective (brokerage)	35.24	88.67												1

Note: *p < .05. **p < .01. ***p < .001

Table 14

Regression coefficients from analyses predicting instrumental network in-degree and brokerage

	In-degree				Brokerage			
	Model 1		Model 2		Model 1		Model 2	
	β	t	β	t	β	t	β	t
Demographics								
Gender	.22*	2.35	.20	2.02	.03	.30	.06	.58
Age	-.10	-1.01	-.09	-.90	.03	.34	.04	.38
Seniority	.05	.54	.01	.13	.09	.95	.06	.57
Tenure	.12	1.30	.12	1.25	.00	.00	-.01	-.09
Motivation								
Affiliation			.15	1.45			.12	1.12
Autonomy			.04	.37			.05	.53
Dominance			.14	1.36			.21	2.12
Achievement			.08	.88			-.04	-.43
Model F	2.2		2.05*		.31		1.21	
Total R^2 (adjusted R^2)	.07(.04)		.13 (.07)		.01(-.02)		.08(.01)	

Note.*p < .05. **p < .01. ***p < .001. Standardized coefficients are reported

Table 15

Regression coefficients from analyses predicting affective network in-degree and brokerage

	In-degree				Brokerage			
	Model 1		Model 2		Model 1		Model 2	
	β	t	β	t	β	t	β	t
Demographics								
Gender	.42***	5.15	.44***	5.03	.07	.76	.06	.58
Age	-.04	-.49	-.03	-.31	-.06	-.57	-.04	-.42
Seniority	.15	1.85	.16	1.84	.02	.17	.01	.12
Tenure	.32***	3.99	.32***	3.88	.18	1.84	.17	1.77
Motivation								
Affiliation			-.06	-.65			-.01	-.05
Autonomy			-.02	-.25			-.04	-.36
Dominance			.05	.58			.02	.15
Achievement			-.03	-.39			.06	.56
Model F	12.76***		6.29***		1.12		.60	
Total R^2 (adjusted R^2)	.31 (.29)		.32(.27)		.04(.00)		.04(-.03)	

Note.*p < .05. **p < .01. ***p < .001. Standardized coefficients are reported;

Figure 23. Instrumental (advice) network coloured by need for achievement.
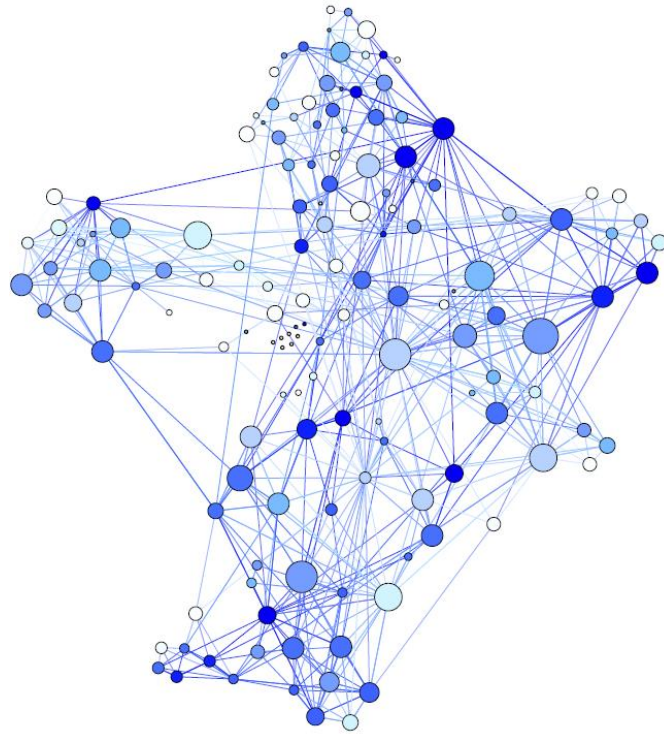
Figure 22. Affective (friendship) network coloured by need for affiliation.

2.4.4 Discussion

In general, psychological theory has assumed that seeking out others is a basic human motivation, since contact to others is necessary to satisfy basic human needs. The question is why people connect to others —what do they want from others, and what are the needs that connectivity with others satisfy? The current study aimed to address this question by considering how the social needs that motivate employees, are associated with in-degree centrality and brokerage in organizational networks. Unexpectedly, results provide no support for any of the hypothesized effects of the four motivational strivings on social network positioning.

Given the substantial literature relied upon to generate the research hypothesizes, the results lead to questions of limitations within the methodology. Below, we outline and discuss potential constraints and limitations of the existing study that may have contributed to our inability to find support for the study prediction. Additionally, some recommendations for future research directions are offered.

2.4.4.1 Limitations and future research

First, it is possible that the link between motivational needs and networks does exist, but may not manifest itself when only considering the work network of an individual. In the current study, only ties within the workplace were considered, entirely ignoring social connections that may exist outside of the organization (e.g.,family, spouses, non-work friends). This may have led to flawed results. For example, a person with high need for affiliation may have tight family bonds and a large friendship network outside, but not inside of work. This is particularly likely if people do not identify with their workplace due to uncertainties, conflict or other ambiguities. Notably, the organization that participated in the current study went through a rapid rate of growth, experiencing high rates of turnover, causing many employees to feel they

were in a survival/crisis mode. In light of this, it is plausible that employees satisfy their

social needs in networks that are outside of work, potentially contributing to the null

findings of the current study. Future studies, might benefit from taking into account

network ties and social characteristics (e.g., family status) that are outside the

workplace. For example, it may be that family status (i.e., having a family or not) may

moderate the relationship between need for affiliation and network in-degree and

closure at work.

The second potential limitation is concerned with our a priori assumption that

having certain needs enables individuals to position themselves in the network in a way

that is thought to satisfy this need. It is however plausible, that having a need does

necessarily lead to individuals being more skilled at building personal networks that

would, per theory, satisfy that need. In other words, motivation does not automatically

lead ability. For example, someone with a high need for dominance may not be capable

to effectively weave an open network that is rich of structural holes offering power

advantageous. In that case, they may try to gain control of the environment and

influence others by micromanaging, building strong ties and constraining networks.

This coercive power however is different from the more social power (e.g., expert,

referent; see French & Raven, 1959, for different power bases) obtainable by having

open networks.

In the current study, we adapted the view that needs are similar to

dispositional traits, and people differ to what extent they have a certain need. Put

simply, there are individual differences in motivation. Yet notably, some theorists

assume that all humans have similar basic needs. Those scholars typically investigate

the extent to which the satisfaction of those needs affect certain outcomes of interest.

Taking on this viewpoint, Deci and Ryan (1985) note that only focusing on the

dispositional level of motivation overlooks the context specific attitudes and objectives an individual may have motivating him/her to pursue an action/goal. Ryan and Deci's self-determination theory (2000), for example, suggests that this intrinsic motivation is essential to human functioning: "Perhaps no single phenomenon reflects the positive potential of human nature as much as intrinsic motivation, the inherent tendency to seek out novelty and challenges, to extend and exercise one's capacities, to explore, and to learn." (Ryan & Deci, 2000, p. 70). It is suggested there are three innate psychological needs that are relevant for intrinsic (and extrinsic) motivation to develop: competence, autonomy and relatedness. Note that these needs are very similar to the motivations considered in the current study, yet importantly, they are assumed to be universally inherent needs of every human, rather than constituting an individual difference trait. Using a longitudinal research design, future research may investigate how the social environment either supports or undermines the satisfaction of the three psychological needs. This would correspond with Lee, Mitchell, Sablynski, Burton and Holtom (2004), noting that the decision to perform should be associated with social network embeddedness, through motivational effects. It is proposed that being well connected in the workplace increases the motivation to perform since social embeddedness fosters feeling of higher fit and identification and lower turn-over intention.

Furthermore, it may be that motivation does not actually lead to a specific network positioning; rather certain motivations may be necessary in enabling individuals to successfully leverage the advantageous offered by a particular network position. From a structuralist perspective, social network positions offer people with achievement opportunities. Yet, it may be that only individuals that are highly motivated succeed to take advantage of these opportunities. For instance, Reinholt, Pedersen and Foss (2011) suggest that an individual's motivation may moderate the relation between network position and knowledge sharing. Employees may not explore

the network opportunities due to the "possible psychological and social costs associated with requesting help from a colleague" (Reinholt et al., 2011, p. 1280).

Lastly, there are some issues related to the measurements used. Confirmatory factor analysis did not support the four-factor structure of the NAQ (Heckert et al., 1999) used for assessing motivation. Chi-square, GFI and AGFI indicated that the data from the current study did not fit the model suggested by Heckert et al. (1999). Additionally, the data on motivation was positively skewed, violating the regression assumption of normality. Further analysis using a) the logarithmic transformation of these variable b) medians instead of means and quantile regression did however not change the patterns of results. These psychometric shortcomings casted some doubt on the validity of the measure used and invite further inspection on the validity of the instrument. Additionally, a common concern of self-report data is social desirability, referring to the bias in self-report data accounted for by respondents' desire to look good due to respondents' need for self-protection and social approval (Crowne & Marlowe, 1964). This bias may be particular problematic if (a) participants feel little or no threat of investigators verifying the answers (b) questions refer to the participant's ability (c) there is uncertainty about the survey context and implications (Dobbins, Farh, & Werbel, 1993). As mentioned before, due to financial difficulties, recent organizational restructuring and high turn-over the employees in the company where we draw our sample from, are likely to be experiencing relatively high levels of ambiguity, uncertainty and anxiety. Further, answering questions about their achievement need, dominance or autonomy needs may have made employees feel that this information could be held against them. In fact, subsequent interviews revealed that, this is plausible, since management has abused information provided in surveys in the past.

2.4.4 Conclusion

In conclusion, from an organizational behaviour perspective, employee's extent of motivation at any point in time depends on their psychological disposition and social context characteristics (Barrick et al., 2013). The current research aimed to investigate whether employees with different motivations or needs, enact different types of social networks. The pattern of inconsistent and non-significant empirical findings of the present research is thought to be, at least in part, caused by methodological rather than theoretical shortcomings. Therefore, caution is necessary in the interpretation of the results of the study, and replication, with careful consideration of methodological detail is encouraged. Nevertheless, our study constitutes a first step in investigating the interplay of individual motivation and network positioning. We hope to provide researchers with a starting point for future research, emphasizing the importance of moving away from static conceptions of structural positioning, towards understanding the processes responsible for the development and effects of social networks in organizations.

2.5 Study 4: The effect of political skill on preferred and perceived personal networks and their joint effect on job attitudes

2.5.1 Introduction

Organizations are inherently political (Mintzberg, 1985); individuals and groups compete with one another over scarce resources and status. To be effective, one must make use of the ability to persuade, influence and negotiate, which has been referred to as "political skill" (Mintzberg, 1983, 1985). Political skill or "savvy" is often thought to be the way to "get ahead "in the workplace (Mainiero, 1994; DeLuca, 1999; Pfeffer, 1981). Ferris and colleagues (2005) defined the concept as "the ability to effectively

understand others at work, and to use such knowledge to influence others to act in ways that enhance one's personal and/or organizational objectives" (p. 127).

Recent studies in the field have demonstrated a strong association between political skill and social reputation (Ammeter et al., 2002; Blass & Ferris, 2007; Blickle, Schneider, Liu, & Ferris, 2011; Zinko, Ferris, Humphrey, Meyer, & Aime, 2012), job performance (e.g., Munyon, Summers, Thompson, & Ferris, 2015), and job attitudes (Ferris, Rogers, Blass, & Hochwarter, 2009; Ferris et al., 2008; Harvey, Harris, Harris, & Wheeler, 2007). Yet, to-date, it is not clear *how* politically skilled employees achieve these favourable work outcomes, prompting calls for research investigating the intermediate relations between an individual's political skill and organizational outcomes (e.g., Ferris, Treadway, Brouer, & Munyon, 2012).

One intuitive explanation for this association, would be that politically skilled individuals are likely to hold particularly desirable social network positions (e.g., Bolander, Satornino, Hughes, & Ferris, 2015; Wei, Chiang, & Wu, 2012) and that political skill may increase one's ability to effectively make use of available social capital, which, as previously discussed, affects work outcomes.

Differing from existing studies investigating the link between political skill and work outcomes (e.g., Bolander et al., 2015; Wei et al., 2012), in the current study we focus on attitudinal rather than performance outcomes. Based on this, we consider network *perceptions* of position, rather than *actual* position, because job attitudes are likely to depend on a person's internal subjective representations and feelings rather than on external objective realities (see Brands et al., 2015; Mehra et al., 2014). In other words, it is not an individual's actual network position that influences employee attitude, rather, it is the position in which they perceive themselves to be in, that matters. Accordingly, the current study explores if politically skilled individuals are more likely to perceive themselves in strategically beneficial positions in their organization. Furthermore, we

examine if these perceptions of advantageous structural positioning in the work environment, may act as an intermediate link between employee political skill and job attitudes. Lastly, we experimentally explore whether individuals with high political skill show an intentional behavioural preference to maintain separation among their social network contacts, to increase their control and power.

2.5.1.1 Social networks and political skill

Political skill at work is positively associated with political behaviour (Treadway, Hochwarter, Kacmar, & Ferris, 2005). Ferris and his colleagues have stressed that "individuals with political skill are adept at identifying and developing diverse contacts and networks of people. The people in these networks tend to hold assets seen as valuable and necessary for successful personal and organizational gains" (Ferris et al., 2007, p. 292). This corresponds with the view that organizational social networks are potentially a source of considerable advantage: Employees benefit from occupying advantageous network positions, which provide access to valuable information and knowledge, career sponsorship, and social support (Brass, 1984; Seibert et al., 2001). Accordingly, Blickle et al. (2011) argued that politically skilled employees enjoy strong networking skills and are more likely to develop social capital, leading to higher job performance, due to the availability of social resources. Along the same lines, it has been argued that politically skilled individuals tend to have a sincere and authentic interpersonal style, reflecting a sense of self-confidence and efficiency (e.g., Bolander et al., 2015; Ferris et al., 2007). Consequently, they likely to be more popular (Cullen, Fan, & Liu, 2014), make friends more easily (Ferris et al., 2005), skilfully form coalitions (Bolander et al., 2015) and tend to have better reputations (Blickle et al., 2011; Liu et al., 2007). Lastly, Wei et al. (2012) demonstrated that subordinates' political skill is

positively related to the establishment of informal social ties with superiors, which in turn positively effects career development.

Based on the above, we predict that individuals with high levels of political skill should be more likely to perceive themselves to be popular and prestigious; to perceive themselves, as being central[5].

Hypothesis 1a: Political skill predicts employee's perceived social network centrality.

Brokerage or bridging, next to network centrality, is the most studied structurally advantageous position (Fang et al., 2015). Individuals strongly differ from each other in the extent to which they occupy network brokerage positions (Burt, 1992). Brokers connect units (e.g., groups or people) who are themselves unconnected, bridging interpersonal gaps or "structural holes" (Burt, 1992). These individuals tend to have higher information asymmetries, leading to influence and higher job performance ratings (Mehra et al., 2001) and early promotions (e.g., Burt, 1992).

In the current study, we suggest that politically skilled employees are more likely to occupy these bridging positions, since they have strong motives to engage in social interactions in a strategic fashion. Politically skilled individuals tend to be more goal -oriented (Ferris et al., 2005) and more astute observers of their social environment (Treadway et al., 2013) which is likely to increase their awareness of the informational benefits offered by occupying bridging positions. Furthermore, their influence abilities together with their delegation skills, suggest that they will effectively make use of the control aspects existing when occupying these positions. Lastly, Ferris et al. (2005) suggest that political skill is linked to the ability to build a diverse network across and

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[5] Note: In this article, we refer to network centrality as what is known as degree centrality or network size (i.e., the number of social ties that an individual has) in the Social Network literature.

outside of the organization. When connections are diverse, they are likely to be to various different social groups, making brokerage more likely (e.g.,Burt, 2005). As such politically skilled individuals should be more likely to act as a "go-betweener". Consequently, we expect politically skilled individuals to occupy more bridging positions, compared to individuals low on political skill. Therefore, we hypothesize:

Hypothesis 1b: Political skill predicts employee's perceived network bridging.

2.5.1.2 Job attitudes

An individual appraisal (perception) of contextual situations predicts how these situations are assessed, constituting attitudes (Petty, Wegener, & Fabrigar, 1997). Arguably, the two most important job attitudes are job satisfaction and organizational commitment, respectively referring to appraisals of one's general job situation (Weiss, 2002) and the level of attachment towards the organization (Tett & Meyer, 1993). Numerous scholars have examined direct effects of political skill on various organizational phenomenon, establishing a stable positive association with job attitudes (e.g., Harvey et al., 2007; Ferris et al., 2009; Ferris et al., 2008; Kimura, 2015). Ferris et al. (2008) demonstrated a direct impact of overall political skill composite and career satisfaction. Individuals with high levels of political skill are likely to view work as an opportunity for personal goal achievement (e.g., Ferris et al., 2005; Ferris et al., 2007), which is reflected in attitudinal evaluations of job satisfaction (Locke, 1970). Conforming to previous research, we expect political skill to be positively associated with general job attitudes (i.e., job satisfaction) and psychological attachment to the organization. (i.e., organizational commitment). Consequently, we propose:

Hypothesis 2a: Political skill is positively related to job satisfaction.

Hypothesis 2b: Political skill is positively related to organizational commitment.

Harris, Kacmar, Zivnuska and Shaw (2007) stated that political skill does not actually increase job performance; rather employees manage to give the impression of high performance by manipulation, impression management and specific social influence tactics (also see Kolodinsky, Treadway, & Ferris, 2007). Due to this, individuals high in political skill tend to be more popular and have more positive reputations, which has been suggested to be the explanatory mechanism for the association between political skill and career success (Blickle et al., 2011; Zinko, et al., 2012). In other words, political skill creates the impression (in others and the self) of social popularity and influence, which, in turn, leads to career success and positive job attitudes. Accordingly, we suggest that an individual's perceived network position is mediating the positive relationship between political skill and their job attitudes.

Hypothesis 3a: The relationship between political skill and job attitudes is mediated by perceived network centrality.

Hypothesis 3b: The relationship between political skill and job attitudes is mediated by perceived network brokerage.

This idea corresponds to findings of a recent meta-analysis, showing that network position partially mediates the effects of certain individual variables (i.e. personality characteristics) on work outcomes (Fang et al., 2015).

2.5.1.3 Intentional brokerage

As emphasized above, an individual's tendency to have an open network (a propensity towards brokerage), does not mean they are actually aware of it. Similarly, it cannot automatically be inferred that the individual prefers (intends to have) this kind of network. A person may have a preference for a personal network with dense connections and yet end up with a network that is sparsely connected for various contextual reasons, such as specific job characteristics. Yet, based on theoretical evidence described above,

we speculate that individuals with high levels of political skill deliberately manoeuvre themselves into those brokerage positions.

Hypothesis 4: Political skill is associated with a preference for occupying brokerage positions

To understand how the occupation of bridging positions may act as a function of people's political skill, we experimentally tested this idea by presenting respondents with stylized network diagrams (Mehra et al., 2014) and ask them how they have attempted to transform (or not) such situations in the past. Specifically, we predict that individuals with a high score on political skill report to be less likely to connect people who are themselves currently unconnected (to maintain their position of influence).

2.5.2 Method

2.5.2.1 Participants

Participants (N = *202, 77 males*) aged from 18 to 64 (mean=34.59; StD =10.95), were recruited from *Prolific Academic*, an online platform that allows individuals to complete academic surveys for monetary compensation. We limited participation to English speaking respondents from the U.K., who self-reported being in full-time or part-time employment at the time of recruitment, and who had an approval rating of 90% or higher.

2.5.2.2 Measures

Job satisfaction. Job satisfaction was measured using three items developed by Cammann, Fichman, Jenkins, and Klesh (1979; $\alpha = .91$). Responses were obtained using a 7-point likert-type scale ranging from (1) strongly disagree to (7) strongly agree.

Organizational commitment. Organizational commitment was assessed using the organizational commitment scale developed by Marsden, Kalleberg, and Cook (1993;

α = .79). Participants indicated their agreement on a 4-point Likert-type scale ranging from strongly disagree (1) to strongly agree (4).

Political skill. Political skill was assessed with the 18-item Political Skill Inventory (PSI) developed by Ferris et al. (2005). Ferris and colleagues have reported a substantial body of construct validity evidence for the political skill construct (e.g., Ferris et al., 1999; Perrewé et al., 2004) and the PSI measure (e.g., Ferris et al., 2005). A seven-point response format was used ranging from strongly disagree to strongly agree. Reliability analysis yielded a Cronbach's alpha of .93.

*Preference and perceived network position***.** Following Brands et al. (2015), we presented respondents with two visual scales adapted from Mehra et al. (2014). On a 7 point scale (strongly disagree to strongly agree), participants were asked to indicate how much they see themselves at the centre of the network and to what extent they occupy bringing positions. To assess preference for brokerage we showed participants a visual representation of a scenario where the participant acts as a "go-between position" connecting two others who do not know each other. Participants were asked to think of times when they found themselves in such a position. They subsequently had to indicate if they a) would *not* attempt to change things b) would try to arrange for the two people to meet or c) if they would drop the connection to one of the people. In the current sample, no one choose option "c" prompting us to treat the decision outcome as binary.

*Control variables***.** We controlled for tenure time and being employed by very small (< 10 employees) micro organizations, given that such small groups tend to have higher density and are therefore less likely to have structural holes**.** All analysis controlled for age and gender, since they are known to affect social network position and their outcomes (e.g., Burt, 1998).

2.5.2.3 Procedure

After providing informed consent, participants were directed to the measures described above, which were presented in an anonymous form and in random order via the randomization function with *Qualtrics*, which hosted the survey. In exchange for completing the survey, participants were paid £2.00. All participants received debriefing information at the end of the survey.

2.5.3 Results

2.5.3.1 Descriptive statistics and correlations

Table 16 presents the means, standard deviations and correlations among all variables considered. There were strong positive correlations between political skill and perceived centrality and brokerage, brokerage preference, job satisfaction and commitment.

Table 16

Means, Standard Deviations, and Correlations

	M	StD	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Age	34.59	10.95	.11	.36***	.09	-.04	-.10	.08	-.06	.01	.01
(2) Gender	-	-	-	-.06	.10	.13	.00	-.04	.03	-.02	.00
(3) Tenure (month)	58.82	110.40		-	.03	-.03	.02	.09	.12	.05	.00
(4) Micro size	-	-			-	-.08	-.10	.10	-.06	.03	.12
(5) Political skill	5.05	.92				-	.18**	.44***	.35***	.31***	.26***
(6) Brokerage pref.	1.69	.46					-	.16*	.51***	.09	.13
(7) Perc. Brokerage	2.75	1.18						-	.07	.33***	.34***
(8) Perc. Centrality	2.42	.78							-	.33***	.31***
(9) Job satisfaction	5.07	1.49								-	.72***
(10) Commitment	2.60	.54									-

Note: *$p < .05$, **$p < .01$, ***$p < .001$

2.5.3.2 Regression analysis

We expected that political skill would be positively related to perceived centrality as well as brokerage (hypothesis 1a and 1b). As can be seen in Table 17 (Model 2), there was a strongly significant relationship between political skill and perceived network centrality (β = 41, $p < .001$). Furthermore, as depicted in Table 18 (Model 2) political skill was strongly associated with perceived brokerage (β = .54, $p < .001$). This association remained stable (β = .40, $p < .001$), even after controlling for perceived centrality which, unsurprisingly had a strong positive effect on perceived brokerage (β = .36, $p < .001$; Table 19, Model 3). These findings lend support to hypothesis 1a and b.

Table 17

Summary of Regression Analyses Predicting Perceived Centrality

	Model 1		Model 2	
	β	**t**	**β**	**t**
Age	-.11	-1.49	-.09	-1.27
Gender	.05	.73	-.01	-.17
Tenure (month)	.16*	2.04	.15*	2.12
Micro size	-.09	-1.23	-.08	-1.17
Political skill			.41***	6.31
R-Square	.03		.20	
Adjusted *R*-square	.01		.18	

Note: *$p < .05$, **$p < .01$, ***$p < .001$

Table 18

Summary of Regression Analyses Predicting Perceived Brokerage

	Model 1		Model 2		Model 3	
	β	t	β	t	β	t
Age	.06	-.80	.09	1.45	.13	2.07
Gender	-.06	-.87	-.18	-2.39	-.14	-2.51
Tenure (month)	.05	.63	.04	.58	-.02	-.24
Micro size	.07	1.03	.09	1.47	.12*	2.06
Centrality (D)					.36***	5.73
Political skill			.54***	8.92	.40***	6.41
R-Square	.02		.30		.41	
Adjusted *R*-square	.00		.29		.39	

Note: *$p < .05$, **$p < .01$, ***$p < .001$

To test our next set of hypothesis, we employed a causal step approach, to identify if the variables satisfied the mediation criteria. A mediator variable (m) can account for all or some of the observed relationship between two variables (x and y). We suggested that political skill would predict job attitudes (job satisfaction and commitment), and that perceived network characteristics would mediate this relationship. As depicted in Table 19.1 (Step 1), political skill significantly predicted job satisfaction and organizational commitment giving support to hypothesis 2a and 2b. As endorsed by Preacher and Hayes (2008), bootstrapping analyses were conducted to assess the effects of mediators by constructing confidence intervals around the estimates. Four separate single mediation analyses combinations were performed to isolate the inter-relationships between variables. In all cases, the 95% confidence intervals derived from the bootstrapping test did not include zero and thus indicated significant mediation. These results, as well as the Sobel tests using

raw coefficients ($p < .05$ in all cases) are consistent with mediation -even though partial-, supporting hypothesis 3a and 3b (see Table 219.1 and 19.2).

Table 19.1

Mediation Analysis of Political Skill on Job Attitudes (Job Satisfaction and Commitment) via Network Perceived Brokerage

Mediator	Outcome	
Perceived brokerage	**Job satisfaction**	**Commitment**
Step 1. x variable predicts y – *path c*	$F(5, 194)= 5.87$; $p<.001$; adj. $R^2=.13$ $\beta = .62$, $t(194)= 5.37$; $p=<.001$	$F(5, 194)= 5.10$; $p<.001$; adj. $R^2=.12$ $\beta = .20$, $t(194)= 4.78$; $p=<.001$
Step 2. x variable predicts m – *path a*	$F(5, 194)= 16.90$; $p<.001$; adj. $R^2=.30$ $\beta = .73$, $t(194)= 8.93$; $p=<.001$	$F(5, 194)= 16.90$; $p<.001$; adj. $R^2=. 30$ $\beta = .73$, $t(195)= 8.93$; $p< .001$
Step 3. x and m together predict y	$F (6, 193) = 5.85$; $p<.001$; adj. $R^2=. 15$	$F (5, 193) = 5.49$; $p<.001$; adj. $R^2=. 15$
a) m predicts y – *path b*	$\beta = .23$, $t(193)= 2.26$; $p= 025$	$\beta = .10$, $t(193)= 2.62$; $p=<.01$
b) x variable no longer predicts y/ is lessened predicting y – *path c'*	$\beta = .45$, $t(193)= 3.45$; $p=.001$	$\beta = .13$, $t(193)= 2.67$; $p=<.01$
Sobel Test	$Z=2.18$; $p=.0296$	$Z=2.50$; $p=.0125$
95% confidence intervals	LB: .04; UB: .31	LB: .02; UB: .13

Note. x = Political skill, y= Job satisfaction / commitment

Table 19.2

Mediation Analysis of Political Skill on Job Attitudes (Job Satisfaction and Commitment) via Network and Centrality

Mediator	Outcome	
Perceived centrality	**Job satisfaction**	**Commitment**
Step 1. x variable predicts y – ***path c***	$F(5, 194) = 5.87$; $p<.001$; adj. $R^2=.13$ $\beta = .62$, $t(194)= 5.37$; $p=<.001$	$F(5, 194)= 5.10$; $p<.001$; adj. $R^2=.12$ $\beta = .20$, $t(194)= 4.78$; $p=<.001$
Step 2. x variable predicts m – ***path a***	$F(5, 194) = 9.55$; $p<.001$; adj. $R^2=20$ $\beta = .36$, $t(194)= 6.31$; $p=<.001$	$F(5, 194)= 9.55$; $p<.001$; adj. $R^2=.20$ $\beta = .36$, $t(194)= 6.31$, $p< .001$
Step 3. x and m together predict y	$F(6, 193) = 6.53$; $p<.001$; adj. $R^2=.17$	$F(6, 193) = 5.89$; $p<.001$; adj. $R^2=.15$
a) m predicts y – ***path b***	$\beta = .42$, $t(193)= 2.94$; $p=<.01$	$\beta = .16$, $t(193)= 3.00$; $p=<.01$
b) x variable no longer predicts y/ is lessened predicting y – ***path c'***	$\beta = .47$, $t(193)= 3.78$; $p=<.001$	$\beta = .15$, $t(193)= 3.20$; $p=<.01$
Sobel Test	$Z=2.64$; $p=.0083$	$Z=2.68$; $p=.0074$
95% confidence intervals	LB: .05; UB: .29	LB: .01; UB: .11

Note: x = Political skill, y= job satisfaction / commitment

A binary logistic regression was conducted to determine the impact of high levels of political skill on the likelihood that respondents would close the triad (closure, no bridging) or keep the two individuals apart (brokerage, bridging) (hypothesis 4). Table 20 shows that roughly 68% of the participants would "try not to change things", implying a preference for bridging. The full statistical model testing the effect of political skill on that

preference, was statistically significant, χ^2 (3, 197) = 9.562, p = .023, indicating that the model was able to distinguish between the two preferences. The total model explained between 5% (Cox and Snell R squared) and 7 % (Nagelkerke R squared) of the variance and correctly classified 68.2 % of cases. Whereas none of the control variables significantly contributed to the model, political skill achieved significance (see Table 21). Political skill was significantly predicting brokerage preference with an odds ratio of 1.64. This indicates that respondents with high levels of political skill were 1.64 times more likely to keep the two individuals apart compared to respondents with low levels of political skill. Results of the logistic regression, support our hypothesis that political skill is a significant predictor of whether a person prefers to close the triad or keep the individuals apart.

Table 20

Frequency of Brokerage Preference

	Frequency	Percent	Cumulative Percent
I tried to arrange for the two people to meet (B)	62	30.7	31.0
I did not attempt to change things (NB)	138	68.3	100.0
Total	200	99.0	

Table 21

Logistic Regression Predicting Brokerage Preference

	β	*SE*	*OR*	*95% CI*	*Wald Statistic*	*p*
Age	-.02	.01	.98	[0.954, 1.009]	1.82	.177
Gender	.10	.33	1.11	[0.581, 2.117]	.10	.753
Political Skill	.49	.19	1.64	[1.139, 2.358]	7.08	**.008**
Constant	-1.06	1.10	.35		.93	.335

Note. CI = confidence interval for odds ratio (OR)

2.5.4. Discussion

The current study highlights the importance of context specific network perceptions, when investigating the link between political skill and job attitudes. As reflected in our results, an individual's internal representations of social embeddedness appear to be particularly predictive of their personal attitudes towards their job. Additionally, we show that politically skilled individuals seem to proactively work to maintain separation between their social network contacts, leveraging the power/control advantage that comes with having disconnected contacts and preserving this separation. We draw three main conclusions from this research.

First, political skill predicts how people perceives themselves to be embedded in the social structure. Politically skilled individuals appear to occupy and, importantly, also view themselves to occupy central and bridging positions in organizational networks.

Second, results support the idea that perceptions of beneficial social embeddedness (social capital), constitute a mechanism through which political skill affects personal (e.g., confidence, self-efficacy) as well as organizational outcomes (e.g., job attitudes or performance). Specifically, results indicate that the relationship between political skill and job attitudes is partially mediated by perceived network position. As such, politically skilled individuals are more likely to perceive themselves to be in key network positions, which in turn has a positive effect on job satisfaction and organizational commitment. In other words, perceived access to research rich social networks appears to, at least partially, explain why politically skilled individuals experience more positive attitudes.

Third, political skill appears to influence an individual's networking strategy. Specifically, while politically skilled individuals appear to prefer disconnected contacts -

building networks rich of structural holes - individuals low on political skill seem to prefer denser, closed networks. As Burt (1992) argues, there are information and control benefits associated with occupying these bridging positions, and so-called *separation brokers* (Grosser, Obstfeldt, & Labianca, 2015) are concerned with preserving that disconnection.

2.5.4.1 Limitations and future research

This study has several methodological weaknesses. Since we decided to assess perceived - rather than actual network characteristics using a single questionnaire, our results could be inflated by common-method bias.[6]

Further, our study did not use fine-grained measures of (perceived) social networks, failing to capture the quality and/or intensity of connections. Thus, our measure of perceived social capital may be too crude, causing us to overlook important information. For example, it may be that politically skilled individuals prefer to build many weak ties (e.g., acquaintanceship), allowing them to maintain flexibility, whereas individuals with low political skills have a preference for few strong ties (e.g., friendship) choosing to belong to tight-knit cliques.

When moving away from subjective, personal outcomes such as job attitudes to more objective outcomes such as individual or team performance, it seems important to consider actual, next to perceived position. Network centrality and brokerage are structural network characteristics, yet perceptions of these characteristics may strongly differ from reality as demonstrated by past research showing that people lack accuracy in social network perception (e.g. Kilduff, Crossland, Tsai, & Krackhardt, 2008). We encourage research investigating how political skill may influence perceived as well as actual structural position

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[6] A post-hoc Harman one-factor test indicated that common method bias did not appear to have overly influenced the results.

and how these variables together affect work outcomes on an individual as well as group level.

Lastly, the current research utilizes cross-sectional data, limiting our ability to draw causal inferences between political skill and network preferences and perceptions. Even though there is considerable theoretical grounding for our causal assumption, it may in fact be that it is actually the perception of networks (or network opportunities) that result in (the expression of) political skill. Studies using longitudinal research designs may clarify how these variables affect each other over time.

3.5.4.2 Implications for practice

Though political skill is thought to have some dispositional antecedents, it can be learned, developed, and improved through practice (Ferris et al., 2007; Perrewé, Ferris, Frink, & Anthony, 2000; Perrewé & Nelson, 2004). Mentoring can enhance political skill and, as such, an employee's ability to understand the organizational social context, helping them to become better networkers (Blass, Brouer, Perrewé, & Ferris, 2007). Managers should actively encourage employees to learn and develop political skill through mentoring and training programs (Ferris, Perrewé, Anthony, & Gilmore, 2000), helping them to be, and view themselves as, better socially embedded. Furthermore, the fact that cognitive constructions (perceptions) of contextual factors are likely to be especially predicative of employee attitudes, it seems important to not only consider objective actualities in the work-place, but also how they are perceived. For example, even though employees have high political skill, they may not perceive themselves to be effectively integrated in the organisational network. Similarly it could be that individuals perceived themselves to be well integrated, but are actually not. These finding can be used as a basis for interventions aiming to make social resources more salient and accessible, facilitating the development and effective use of these valuable networks. Consequently, we encourage executives to not

only consider individual attributes, such as political skill, but to take into account (perceptions of) contextual factors. These insights will facilitate the development of targeted interventions and enable executives to gain a better understanding of their employee's perceptions of context specific barriers.

CHAPTER 3: NETWORK COGNITION

3.1 Overview

This chapter focuses on various forms of social network perceptions assuming that an individual's behaviour is influenced by both, objective network realities but also by internal subjective cognitive representations of the social context. Three studies aim to take this phenomena into account by studying how social networks and social perceptions/cognition relate and interact.

Various previous studies have documented the effects of self-monitoring personality in shaping social network structure; however, little is known about the mechanism underlying this relationship. **Study 1** is a three-wave social network study, aiming to show that high self-monitoring scores are associated with higher levels of perceived similarity, as reported by others. It is theorized that it is this perception of similarity, which increases the likelihood of being considered a friend and being asked for advice. As such, we expect perceived similarity to – at least partially- mediate the relationship between self-monitoring and popularity (in-degree centrality) in friendship and advice networks. Results are expected to help progress towards a more complete understanding of the complex relationship between personality and social network characteristics.

Study two investigates how perceived popularity affects the relationship between friendship and interpersonal outcomes including a) advice seeking, b) trust and c) perceptions of competence. Following previous research we anticipate that friendship will be positively associated with these positive interpersonal outcomes. However, we expect that those beneficial effects associated with friendship, are reduced when the target is considered highly popular. This is based on two assumptions. Firstly, perceived popularity might indicate, that the friendship is instrumental, rather than expressive.

Instrumental, due to individuals befriending these popular others primarily to enhance their own popularity ("basking in reflected glory"). Secondly, prior research has repeatedly related perceived popularity to dominance, aggression and distrust. Based on this, we hypothesize that the relationship between friendship and interpersonal outcomes, is weaker if perceived popularity is high.

The last study of this chapter, **study 3**, is concerned with the fact that individuals vary in their perceptual accuracy of the social world. Previous research in the field of social cognition demonstrates that (social) power affects how people perceive social relations. While some scholars suggest that powerful individuals tend to be lazy and imprecise with respect to their ability to process social information, others have found the opposite effect. Using cognitive social structure (CSS) network data collected from three different samples, we examine the influence of an individual's power and prestige on their perceptual accuracy of dyadic relations in a friendship network.

The three topics discussed in this chapter - perceived and actual popularity, self-monitoring and (social) power - are interconnected in a way that they all somehow relate to social influence, defined as a change in a person's cognition, affect, attitude, or behaviour as a consequence of social interaction. The first two studies focus on social influence by considering self-presentation as a form of social influence in which a person gains influence by somehow affecting how others see them. This assumes that individuals are in a better position to influence social interactions in a way suiting their purposes, if they are able to control how others view them. Study three brings in is the idea that being perceived, and perceiving the self in a certain way with respect to social influence, may also have implications for the focal individual's cognition and behaviour. Importantly, all three studies emphasizes the importance of social perceptions, assumptions and social cues next to objective social realities.

3.2 Study 1: Chameleons attract: Effects of self-monitoring and perceived similarity on popularity in friendship and advice networks

3.2.1 Introduction

Previous research suggests that individual differences in personality are associated with the structuring of interpersonal relationships (e.g., Fang et al., 2015; Klein et al., 2004; Oh & Kilduff, 2008). A particular emphasis has been given to the construct of self-monitoring personality, due to its focus on how social self-presentation impacts personal network structuring (Flynn et al., 2006; Mehra et al., 2001). Various authors established a relationship between levels of self-monitoring and network centrality, yet, to our best knowledge, no research exists investigating underlying mechanisms. Consequently, the current study seeks to explore the mechanisms that drive the greater social attractiveness of high self-monitors. Diverging from previous research, we take into account the reaction of the relational partner (alter). Bringing in the alter to understand network effects of self-monitoring seems important as Sasovova et al. (2010) state: "self-monitoring is primarily a theory of the impressions individuals create in the eyes of others" (p.650; also see Kilduff & Brass, 2010). The present research intends to examine how a person is perceived, depending on his or her levels of self-monitoring, and how this might relate to the previously observed social popularity of high self-monitors. Specifically, it is proposed that self-monitoring individuals are perceived as more similar to the self. Based on the well-researched principles of homophily ("birds of a feather flock together"; e.g., McPherson et al., 2001), this should lead to greater attraction and liking, making them particularity appealing for other's friendship and advice seeking.

3.2.1.1 Self-monitoring and network centrality

Past research has highlighted the role of self-monitoring personality (Kilduff & Day, 1994; Mehra et al., 2001; Oh & Kilduff, 2008; Sasovova et al., 2010) offering a theoretical basis to better understand the emergence of social relations. Accordingly, previous work has provided empirical evidence for a statistically significant association between levels of self-monitoring and network (in-degree and betweenness) centrality (e.g., Fang et al., 2015; Flynn et al., 2006; Mehra et al., 2001; Oh & Kilduff, 2008; Sasovova et al., 2010). Self-monitoring theory proposes that individuals differ in their ability to effectively pick up social cues, and the extent to which they have the expressive control needed to engage in appropriate self-presentations (Snyder, 1974; Turnley & Bolino, 2001). High self-monitors tend to readily adapt their behaviour in accordance with the social cues available (Snyder, 1979), promoting effective interactions with different groups of people (Ickes, Holloway, Stinson, & Hoodenpyle, 2006). This is, in part, due to their ability to effectively engage in different, and potentially contradicting, roles (Snyder, 1987). While high self-monitors attempt to generate emotions and behaviours appropriate to the specific situation, low self-monitors "rely less on social cues to direct behaviour and more on introspection" (Caldwell & O'Reilly, 1982, p. 125) and are therefore more "controlled from within by their affective states and attitudes" (Snyder, 1979, p. 89). The increased interpersonal attentiveness, apparent in high self-monitors, enables them to show great ease and excellent social skills when interacting with others (Furnham & Capon, 1983). Consequently, high self-monitors appear to be approachable and helpful (Sasovova et al., 2010; Toegel, Anand, & Kilduff, 2007), tend to talk more about the other person (Ickes, Reidhead, & Patterson, 1986), are able to accurately control emotions (Gangestad & Snyder, 2000; Riggio & Friedman, 1982) and use humour to engage and inspire (Turner, 1980). All this is likely to make high self-monitors desirable interaction

partners. In line with previous research, we therefore expect that high self-monitors are particularity attractive for others' friendship and advice seeking.

Hypothesis 1: A person's level of self-monitoring will be positively related to their in-degree centrality in friendship and advice networks.

3.2.1.2 The role of perceived similarity

The theoretical basis for the relationship between similarity and interpersonal attraction has emphasized the role of motivational factors underlying social interaction processes. Interpersonal attraction has previously been linked to attitudinal (Byrne et al., 1971), personality (Buss, 1984; Terman & Buttenwieser, 1935) and physical similarity (Berscheid, Dion, Walster, & Walster, 1971; Berscheid & Walster, 1974). Similarity is attractive, because it tends to be reinforcing: similar others are likely to verify one's own attitudes and beliefs (Byrne et al., 1971; Byrne et al., 1997; Byrne, Nelson, & Reeves, 1966). Furthermore, social uncertainty can be reduced by forming friendships with similar others (Harrison, Price, Gavin, & Florey, 2002). The matching hypothesis (Berscheid et al., 1971), the attraction-selection-attrition (or ASA) model (Schneider, 1987) or the genetic similarity theory (Rushton, 1990; Rushton, Russell, & Wells, 1984) all correspond to Byrne's position that similarity is related to attraction and liking. Accordingly, various research has shown that individuals prefer interacting with others they think they have something in common with. For example, people are more likely to assist someone who shares their name, birthday or has similar fingerprints, in particular, if the shared feature is perceived as uncommon (Burger, Messian, Patel, Del Prado, & Anderson, 2004; Oates & Wilson, 2002). This is also in accordance with the literature on *homophily* (e.g., McPherson et al., 2001), previously referred to as "a tendency for friendships to form between those who are alike in some designated respect" (Lazarsfeld & Merton, 1954, p. 23) demonstrating it to be an important predictor for

friendship formation (e.g., Allgeier & Byrne, 1973; Huston & Levinger, 1978; McPherson et al., 2001; Neimeyer & Mitchell, 1988; Rosenbaum, 1986; Tan & Singh, 1995). Interestingly, perceived, rather than actual similarity between interaction partners has been found to be more strongly associated with positive social relationship outcomes (e.g.,liking, marital satisfaction) compared to actual similarity (Acitelli, Douvan, & Veroff, 1993; Condon & Crano, 1988; Levinger & Breedlove, 1966; Murray, Holmes, Bellavia, Griffin, & Dolderman, 2002).

Hypothesis 2: Perceptions of similarity will be positively related to in-degree centrality in friendship and advice networks.

3.2.1.3 Self-monitoring and perceived similarity

As previously discussed, high self-monitors are skilled at processing information about others and consequently adapt their behaviour and self-presentation in a suitable way (Snyder, 1974; 1979). While low self-monitors are likely to ask themselves: "Who am I and how I can be me in this situation?" (Snyder, 1979), high self-monitors ask themselves: "Who does this situation want me to be and how can I be that person?" (Snyder, 1979). Hence they are frequently described as "chameleon-like" (Mehra et al., 2001, p. 121). Related to this, it has been suggested that the impact of self-monitoring creates feelings of similarity among interacting individuals (e.g., Bhardwaj, Qureshi, Konrad, & Lee, 2016). This idea is also reflected in items of the self-monitoring scale asking participants how easy they find it to imitate the behaviour of other people (e.g., Lennox & Wolfe, 1984; Snyder & Gangestad, 1986). In line with this, Brafman and Brafman (2010) note that high self-monitoring individuals are able to effectively form connections, since they are willing to control and modify their behavior and actions to meet others "where they are". High self-monitors find it easy to imitate

the behavior of people and as such are able to "naturally" mirror their interaction partner (Brafman & Brafman, 2010). Consequently, it is hypothesized:

Hypothesis 3: A person's level of self-monitoring will be positively related to alter rating of perceived similarity.

3.2.1.4 Self-monitoring, perceived similarity and network centrality

So far, we have outlined the role of self-monitoring in determining network centrality and subsequently highlighted the importance of (perceived) similarities for instant social connection. On top of this, we expect that raised perceptions of similarities will mediate the positive relationship between self-monitoring and popularity in friendship and advice networks. In other words, it is hypothesized, that perceived similarity (at least partially) accounts for the relation between self-monitoring and social network centrality.

Hypothesis 4: Perceived similarity, will mediate the relationship between self-monitoring and popularity in friendship and advice networks.

As predictions are focused on alter's reaction towards a person's (ego) level of self-monitoring, we use a dyadic level approach to capture if an ego's level of self-monitoring, influences whether an alter indicates a social relationship with him or her.

3.2.2 Method

3.2.2.1 Participants

Twenty-eight full time students were recruited as participants from a London University Masters course. There were six males, and twenty-two females and the average age was 27.18 (StD = 8.41). Thirteen participants indicated their ethnic group as 'White', fifteen as 'Asian'. The response rate was 100% at all three time points.

3.2.2.2 Measures

Sociometric questions. Participants were presented with an alphabetical list of their peers. Participants answered on a 5-point Likert scale ranging from (1 = 'Never', 5 = 'Often') if not otherwise indicated.

Friendship (FR). Since the term "friend" is ambiguous and may be used in a relatively unsystematic way (Fischer, 1982), we conceptualized friendship as interaction out-side of work. Participants were asked if they consider a focal individual to be their personal friend (how frequently they socialize with them and spend non-work related time with them).

General advice (GA). Students may ask each other for advice about academic topics, but may also ask general advice about things independent of the professional context. We wanted to preclude the possibility that students are asked for advice exclusively due to their academic expertise. As such, participants were asked to indicate whom they had taken general advice from (not necessarily course or academic related advice).

Perceived similarity (PS). Participants were asked how similar they consider each of their peers to be to themselves (7-point Likert scale; 1 = 'Not at all like me', 7 = 'Just like me').

Personality. Self-Monitoring was assessed using a brief eighteen item self-monitoring scale devised by Snyder and Gangestead (1986). Items were presented as statements such as 'I would probably make a good actor', to which participants indicated whether they believed the statement were true of themselves on a dichotomous scale of 'True' or 'False'. A Kuder-Richardson reliability analysis of dichotomous items showed that the scale can be considered reliable with a score of .62.

Control Variables. Gender (e.g., Brass, 1985; Ibarra, 1992) age and ethnicity has been shown to influence social network structure. Demographic similarity leads

individuals to have common interests and viewpoints that may foster friendship and general advice seeking (Shah, 1998). To account for alternative explanations, demographic variables, such as age, gender and race were collected. Control variables were transformed into matrices: Cell entry *Xij* in the gender and age was coded as 1 if actor *i* and actor *j* were in the same category, otherwise, *Xij* was coded as 0. The age measure was continuous. Therefore, the matrices contained difference scores between two actors on each variable. For example, if Jane is 28 and John is 21, the cell between Jane (row) and John (column) would show (28-21) 7, since Jane is 7 years older than John.

3.2.2.3 Procedure

Network and personality data was collected from all twenty-eight by means of an online questionnaire distributed through the survey platform *Qualtrics*. This was done at three time points over the course of their academic year of study, in roughly three month intervals.

3.2.3 Results

The data on the relations were arranged in 28 x 28 weighted adjacency matrices at Time 1 (T1), Time 2 (T2) and Time 3 (T3). The matrices contained 784 observations on all possible pairs of people at all three time points (2352 directed ties in total). To calculate the network indexes the network software program UCINET VI, version 6.226 (Borgatti et al., 2002) was used. The predicted variables are friendship and general advice (at T1, T2 and T3) and predictor variables are self-monitoring (T1) and perceived similarity (at T1, T2 and T3). Control variables are gender, age and race. While only 28 people took part in the research, the matrices each contain 784 observations on all possible pairs of people. As mentioned before, these observations are not independent. For example, the correlation between George and Tim is not

independent of the correlation between George and Julia since both observations have the same data from George. Thus we used Quadratic Assignment Procedure (QAP) which is able to deal with dyadic observations that are systematically interdependent (see Baker & Hubert, 1981; Dekker, Krackhardt & Snijders, 2007; Hubert & Golledge, 1981; Hubert & Schultz, 1976; Krackhardt,1987), to calculate correlation and multiple regressions. Dynamic longitudinal results were calculated by employing "stacked" quadratic assignment regression (Dekker et al., 2007) to link social ties at different time point to each other and to self-monitoring.

3.2.3.1 Descriptive statistics and correlations

QAP intercorrelations were calculated for all variables of interest. The tendency for people - to receive more social ties - was measured by the *receiver effect*. A positive receiver effect would mean that individuals with high levels of self-monitoring are more likely receive social ties (be nominated as network contact). As can be seen in Table 22, self-monitoring (SM receiver, SM rec) was significantly positively related to perceived similarity, friendship and general advice at all three time points. This means that high self-monitors receive more ties compared to low self-monitors. Furthermore, perceived similarity was strongly positively correlated with the existence of an advice or friendship tie.

3.2.3.2 Regression analysis (QAP)

A simple method to gauge the accumulation of social ties during the academic year entails the use of QAP regression to predict perceived similarity from self-monitoring (Table 22) and subsequently friendship and general advice from self-monitoring and perceived similarity *along with* relations for earlier time points (see Table 24 – 25). The Baron and Kenny (1986) three-step method of mediation analysis

was applied, to determine whether a relationship between two variables is mediated by a third variable (see Figure 24 below)
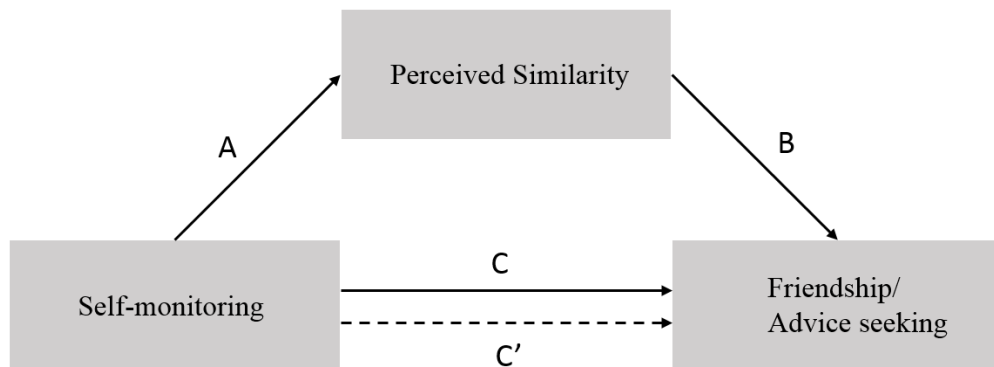
Figure 24. Mediation analysis.

First, relationships between self-monitoring and the mediator and outcome variables were established. As can be seen in Table 23, high levels of self-monitoring was significantly positively related to being perceived as similar at all three time points (Path A). In line with previous literature, Table 23 and 24 (step 1) show that self-monitoring was also positively related to being nominated as a friend and being asked for advice (Path C). Further, perceived similarity was a strong predictor or friendship and advice at all three time points (Table 24, 25; step 2; Path B). Finally, partial mediation could be determined, as indicated by a (predominantly) non-significant self-monitoring effect on friendship and advice in the same models, when perceived similarity was taken into account (i.e. Table 24, 25; step 2).

Table 22

QAP intercorrelations between all variables

	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Age	.00	.00	.05	-.05	-.14*	-.15**	-.13*	-.09	-05	-.05	-.10*	-.22***	-.23***
2. Gender	1	0.02	0.12	.12	.09	.06	-.03	.07	.01	-.04	.06	.04	-.10
3. Race		1	-.02	-.02	.17***	.19***	.18***	.21***	.28***	.25***	.14**	.21***	.26***
4. SM sender			1	-.04	.16**	.07	.04	.01	.02	.04	-.03	-.04	.06
5. SM receiver				1	.11*	.20***	.16**	.11*	0.15**	0.18**	.10*	.14**	.14**
6. PS T1					1	.58***	.56***	.47***	.46***	.35***	.59***	.46***	.43***
7. PS T2						1	.65***	.48***	.62***	.52***	.47***	.66***	.59***
8. PS T3							1	.37***	.48***	.57***	.43***	.47***	.68***
9. FR T1								1	.72***	.59***	.69***	.56***	.56***
10. FR T2									1	.73***	.61***	.65***	.63***
11. FR T3										1	.49***	.54***	.73***
12. GA T1											1	.64***	.59***
13. GA T2												1	.67***
14. GA T3													1

Note. *$p < .05$; **$p < .01$; ***$p < .001$. N = 784, dyads among 28 individuals; Significance tests based on correlation quadratic assignment procedure tests using 5,000 permutations

Table 23

Simple QAP for various time-points for Perceived Similarity

A) *Perceived Similarity T1*	β (Std)	*p*-Value
Age	-.14	.04
Gender	.06	.20
Race	.17	<.001
SM sender	.07	.09
SM receiver	.11	.03
Adj. R-Square	.09; p<0.001	
B) *Perceived Similarity T2*		
Age	-.14	.04
Gender	.02	.36
Race	.19	<.001
SM sender	.09	.19
SM receiver	.20	<.001
Adj. R-Square	.11; p<001	
C) *Perceived Similarity T3*		
Age	-.13	.05
Gender	-.06	.21
Race	.19	<.001
SM sender	.06	.30
SM receiver	.17	<.001
Adj. R-Square	.08; p<0.001	

Note.. N = 784 dyads among 28 individuals; Multiple Regression Quadratic Assignment procedure tests using 5,000 permutations

Table 24

Simple QAP for various time-points predicting friendship ties

	Step 1		Step 2	
A) *Friendship T1*	β (std)	*p*-Value	β (std)	*p*-Value
Age	-.09	.18	-.02	.40
Gender	.05	.24	.02	.38
Race	.21	<.001	.13	<.001
SM sender	.02	.43	-.06	.32
SM receiver	.10	.004	.05	.10
PS			.45	<.001
Adj. R-Square	.07; p<0.001		.25; p<0.001	
B) *Friendship T1*				
Age	.02	.33	.06	.09
Gender	-.06	.11	-.06	.08
Race	.14	<.001	.11	<.001
FR T1	.68	<.001	.54	<.001
SM sender	.03	.35	.00	.48
SM receiver	.09	<.001	.04	.06
PS T2			.35	<.001
Adj. R-Square	.54; p<001		.63; p<001	
C) *Friendship T1*				
Age	-.00	.47	.03	.33
Gender	-.07	.07	-.05	.90
Race	.06	.02	.04	.06
FR T1	.15	.01	.14	.01
FR T2	.59	<.001	.47	<.001
SM sender	.04	.28	.03	.34
SM receiver	.08	.01	.05	.03
PS T3			.28	<.001
Adj. R-Square	.55; p<001		.61, p <.001	

Note. N = 784 dyads among 28 individuals; Multiple Regression Quadratic Assignment procedure tests using 5,000 permutations

Table 25

Simple QAP for various time-points predicting General Advice seeking

	Step 1		Step 2	
A) *General Advice T1*	β (std)	*p*-Value	β (std)	*p*-Value
Age	-.10	.09	-.01	.42
Gender	.05	.24	.01	.42
Race	.14	<.001	.04	.12
SM sender	-.02	.42	-.12	.10
SM receiver	.10	.01	.03	.13
PS			.59	<.001
Adj. R-Square	.04; p<0.001		.36; p<0.001	
B) *General Advice T2*				
Age	-.16	<.001	-.11	.00
Gender	.00	.48	.00	.45
Race	.12	<.001	.07	.10
GA T1	.60	<.001	.41	<.001
SM sender	-.01	.43	-.05	.16
SM receiver	.08	.03	.01	.43
PS T2			.44	<.001
Adj. R-Square	.45; p<001		.59; p<001	
C) *General Advice T3*				
Age	-.10	.04	.08	.06
Gender	-.14	<.001	-.11	<.001
Race	.14	<.001	.10	<.001
FR T1	.28	<.001	.19	<.001
FR T2	.44	<.001	.31	<.001
SM sender	-.01	.48	-.04	.30
SM receiver	.06	.03	.02	.24
PS T3			.42	<.001
Adj. R-Square	.54; p<001		.67, p <.001	

Note. *p* < .05; **p* < .01; ***p* < .001. N = 784 dyads among 28 individuals; Multiple Regression Quadratic

Assignment procedure tests using 5,000 permutations

3.2.4. Discussion

Previous work examining the link between self-monitoring and network centrality has demonstrated consistent benefits for individuals with higher self-monitoring levels. Findings of the present research, identify one of the mechanism that appear to be underlying this relationship. At three different time points, high self-monitoring scores were related to increased levels of perceived similarity, as reported by others. Further it was demonstrated that these perceptions of similarity are associated with an increased likelihood of being considered a friend and being asked for advice. Consistently, over the three time-points considered, empirical results suggest that perceived similarity, partially mediates the relationship between self-monitoring and in-degree centrality in friendship and advice networks. Since we controlled for advice/friendship ties existing at previous time points, findings further imply that self-monitors keep attracting new social contacts over time. This is conforming to Sasovova et al. (2010), suggesting that levels of self-monitoring shape social network dynamics over time.

Traditionally, social network theory states that the benefits of social networks are social embeddedness (Burt, 1986; Wellman & Berkowitz, 1988) ignoring, or even rejecting (e.g., Mayhew, 1980) the role of human agency in social network structuring. Yet, scholars have increasingly called for research integrating the role of individual agency in social network patterning, to arrive at a more complete understanding of how social networks shape. Self-monitoring theory has proven to be particularly suitable in linking the individuals and social structural level, since self-monitoring personality has been linked to the occupation of structurally advantageous social network positions. On a broad level, the present study contributes to the theoretical integration of a purely structural approach and a more agent focused perspective. More specifically, the role of

agency in structuring ties appears to be bound by the reactions of relationship partners (alters) to the self-monitoring behaviour of the focal individual. Therefore, one important contribution of the present work is the integration of the alter's perception to better understand the association between self-monitoring personality and popularity in social networks. Results imply that alter reactions are key to understand the mechanisms underlying this association. It appears individuals feel more similar to high self-monitors, compared to low self-monitors, increasing the likelihood of interpersonal attraction and consequently advice seeking and friendship.

3.2.4.1 Limitations and future research

The current research has various limitations. In particular, the relatively small sample size (even though we achieved 100% response rate at all three points in time) call caution with respect to generalizing the results. Having said that, the dyadic level analysis (based on 748 observations), as well as the longitudinal design of the study are likely to somewhat counter-act this problem. Another limitation may be that only expressive networks were considered (non-work related). It could be that perceived similarity - resulting from high levels of self-monitoring - does not predict the development of more instrumental (work-related or expertise based) connections. If one seeks out for work-related information, it may be beneficial to approach people different to the self, to avoid redundancy and to gain a more diverse understanding and an informational benefit. In other words, two distinct motivations for social interaction may be more or less relevant dependent on the context. On the one hand individuals strive to form ties with similar other to reduce social uncertainty. On the other hand, individual may strive to develop connections to dissimilar others, due to their desire to benefit from receiving knowledge and information that is different from their own, reducing task uncertainty (e.g.,Mitteness, DeJordy, Ahuja, & Sudek, 2014).

Consequently, it is plausible that personality may have different effects, depending on tie content. This resonates with previous findings such as that extraverts (and to a weaker extent self-monitors) tend to have higher betweenness centrality in instrumental, compared to expressive networks (Fang et al., 2015).

Similar to null-findings by Kalish and Robins (2006), we could not replicate the results by Mehra et al. (2001) relating high self- monitoring with increased brokerage. While bridging between different university students may not require high levels of self-monitoring, bridging in organizational contexts may be facilitated by it. Therefore, future research should try to replicate findings in other settings, such as organizations. For example, it could investigate the high self-monitor's ability to appear more similar to alters, may not only account for social attraction, as shown in the current study, but also for the ability to better connect to various different social groups, resulting in higher levels of brokerage.

Lastly, since self-monitoring theory mainly focuses on the generation of social ties, the current research has deliberately emphasized tie development rather than dissolution. It could, for example be that ties to high self-monitors, that are initially based on perceived similarity, are less stable. Over time, the high self-monitor's "chameleon-like" behaviour, may come with perceptions of behavioural and attitudinal discrepancies and inconsistencies, potentially resulting in mistrust or ambiguity. This is likely to lead to reduced level of perceived similarity as well as doubts about the genuineness of the close personal relationships. Longitudinal studies exploring the effects of self-monitoring personality on both formation and dissolution of ties are encouraged.

3.2.4.2 Conclusion

Individual personality differences are important not just for individuals but also for understanding the structure of the social environments in which their interactions take place. The current study shows that high self-monitors appear to effectively mirror their interaction partners, consequently the partner perceives the high self-monitor as similar to the self. This similarity to the self, results in liking and consequently increased friendship and advice seeking. Taken together, the present study advances work in the area of social networks and personality research by identifying a possible mechanism explaining the, previously established, relationship between self-monitoring personality and the structuring of social networks.

3.3 Study 2: Popularity as a moderator between friendship and its interpersonal consequences

3.3.1. Introduction

"At the height of his wealth and success, the financier Baron de Rothschild was petitioned for a loan by an acquaintance. Reputedly, the great man replied: I won't give you a loan myself; but I will walk arm-in-arm with you across the floor of the Stock Exchange, and you will soon have willing lenders to spare" *(Cialdini, 1989, p. 45).*

The most important characteristic of friendship is social liking or affect (Brass, 1992). In addition to the inherent affective value of being part of a friendship network, friendship has been suggested to be instrumental in gaining important resources such as knowledge or information and can also serve as the basis of status and coalitions (Baldwin, Bedell, &, Johnson, 1997; Brass, 1992). This is consistent with *resource dependence theory,* suggesting that individuals strive to increase the accessibility of relevant resources by creating ties to potential resource providers

(Pfeffer & Salancik, 1978; Thompson & McEwen, 1958). Accordingly, previous literature identifies two distinct motivations for friendship, which have been defined as *expressive* and *instrumental* (Grayson, 2007; Price & Arnould, 1999; Wolf, 1966). Other researchers have referred to these constructs as *sentimental* and *instrumental* (Ingram & Roberts, 2000) or *intrinsic* and *extrinsic* social motivations to pursue friendship (Hawley, Little, & Pasupathi, 2002). In terms of the friendship dyad, expressive motivation reflects the degree to which individuals establish and maintain friendships for the inherent enjoyment of the close relationship - each satisfies some emotional need in the other. Here "it is the relation itself that is of greatest value" (Reohr, 1991, p. 21), they are "loved for them-selves alone" (Du Bois, 1974, p. 18) due to their "unique and irreplaceable qualities" (Silver, 1990, p. 1476). In contrast, instrumental friendship is not merely dependent on the relationship between the dyad involved, but it represents a potential link to other individuals, or resources outside of the dyad; in a way, each member acts as a sponsor for the other. For example, people tend to develop relationships with others because it may provide them with access to status, reputation or social connections (e.g., Dijkstra, Cillessen, Lindenberg, & Veenstra, 2010). If you are thought to be a friend of Baron Rothschild, you are likely to be seen in a certain way. In other words, people are known by the company they keep: *"It is our contention that people make known their …. connections with positive sources because they understand that observers to these connections tend to evaluate connected objects similarly"* (Cialdini et al., 1976, p. 374). In line with this, previous empirical (e.g., Dijkstra et al., 2010) as well as ethnographic studies (Adler & Adler, 1998; Eder, 1985; Short & Strodtbeck, 1963) show that the more strongly individuals are associated with popular others, the higher their own popularity. In the field of SNA, building from Heider's (1958) study on cognitive balance, research has shown that being perceived to have a popular friend, is positively associated with being perceived

as a good performer, whereas actually having such a friend has no effect (Kilduff &

Krackhardt, 1994). In summary, the popular have the ability to attract others and are

appealing to others who strive to be affiliated with them (Adler & Adler, 1998; Eder,

1985; Merten, 1997; Parkhurst & Hopmeyer, 1998) helping an individual to attain

social connections, status and other benefits (Cillessen & Rose, 2005; Jarvinen &

Nicholls, 1996; Lindenberg, 2001; Steverink & Lindenberg, 2006). Therefore, an

actor's perceived popularity is likely to motivate the people around them to build a

friendship tie with that actor, at least in part, for the purpose of increasing their own

popularity.

Despite these theoretical reasons to expect different motivation to impact

friendship formation and quality, effects of these friendship motivations have not been

researched. In the current study, we set out to examine how interpersonal benefits,

associated with friendship, including trust and advice exchange, are affected, when

friendship is accompanied by perceptions of high popularity. It is suggested that

friendships with people that are perceived to be popular, are qualitatively different from

friendships to people that are perceived to be less popular. Whereas relations to less

popular are likely to be "purely" intrinsically motivated, based on interpersonal

characteristics such as trust, relations to people that are perceived as popular are likely

to serve a more instrumental purpose.

3.3.1.1 Perceived popularity in friendship networks

Peer relationships comprise structured status systems (Coleman, 1961) and

peer status is determined by social popularity (Schwartz & Gorman, 2011). Acquiring

status or popularity, is a key aim, particularly for young adults (e.g., Ojanen, Grönroos,

& Salmivalli, 2005; Pellegrini & Long, 2002), associated with gaining a high social

"rank" within the peer network (e.g., Potocnjak, Berger, & Tomicic, 2011; Xie, Li,

Boucher, Hutchins, & Cairns, 2006). One way of assessing popularity in a friendship

network is what has been termed "sociometric popularity," which is a quantification of

the total degree to which an individual is liked, or considered to be a friend (e.g., Coie,

Dodge, & Coppotelli, 1982; Parkhurst & Hopmeyer, 1998). Most network research

takes on this unitary perspective of peer relations and focuses only on friendship

nominations, which are subsequently used to infer social or sociometric popularity

(Fujimoto & Valente, 2015). However, perceived popularity has been widely

recognized as a unique form of status, distinct from sociometric popularity (Borch,

Hyde, & Cillessens, 2011; Cillessen & Rose, 2005; LaFontana & Cillessen, 1999;

Lease, Kennedy, & Axelrod, 2002; Parkhurst & Hopmeyer, 1998). For example,

empirical research has shown that young adults do not necessarily like, or are friends

with, the same person whom they perceive popular or high status, suggesting that

sociometric and perceived popularity are different kinds of relationships. Lansu and

Cillessen (2012), for instance, show that there is a discrepancy when students are given

the opportunity to freely choose those they like most (sociometric popularity), and those

they see as being popular (perceived popularity). Whereas sociometric popularity

assesses how well liked (vs. disliked) an individual is, perceived popularity reflects

popularity (vs. unpopularity), status and dominance within the social hierarchy

(Parkhurst & Hopmeyer, 1998). Accordingly, sociometrically popular individuals are

known for their pro-social behaviour, interpersonal capabilities, and empathy for others

and their disposition to collaborate in a non-aggressive fashion (Borch et al., 2011).

Importantly, this is a very personal judgment, based on affect and individual preference

and is not usually shared within the group (Moody, Brynildsen, Osgood, Feinberg, &

Gest, 2011). On the other hand, perceived popularity in friendship networks describes

those, who are thought to be popular among their peers or colleagues. Different from

sociometric popularity, perceived popularity is often related to aggression and

supremacy and therefore not necessarily dependent on prosocial behavior. Accordingly, well-liked individuals are described mainly by prosocial characteristics, whereas perceived-popular individuals tend to show a hybrid of prosocial and aggressive traits (Parkhurst & Hopmeyer, 1998).

3.3.1.2 Friendship and interpersonal outcomes

Various researchers have emphasized the benefits of friendship for interaction processes, including information and knowledge exchange as well as joint problem solving (e.g., Brass 1984; Converse & Foa, 1993; Heimer 1992; Jehn & Shah, 1997; Krackhardt 1992; Labianca, Brass, & Gray 1998; Lincoln & Miller 1979; Uzzi, 1996). Previous studies have established that affective relations, such as trust and friendship are important in advice seeking behaviour. For instance, Snijders, Lomi and Torló (2013) proposed that we are more likely to seek advice from people we consider our friends than otherwise, and that the structure of the advice network can be understood as evolving from the friendship network and the dependence of advice on friendship. Friendship also creates generalized trust, allowing people to risk personal vulnerability (Ebbeck & Weiss, 1998) and to discuss sensitive issues (Sias & Cahill, 1998). Additionally, friendship indicates likeability and positive affect (e.g., Waugh & Fredrickson, 2006), which has been associated with perceptions of competence and expertise (Cialdini, 1993). Consequently, friendship has been associated with higher competence ratings in peer assessment (e.g., Pond, Ul-Haq, & Wade, 1995).

Hypothesis 1: Friendship is positively associated with interpersonal outcomes (receiving advice, trust in intention and competence)

3.3.2.2 Friendship, popularity and interpersonal outcomes

As previously noted, there are two key motivations behind interpersonal friendship connections. First, an expressive one, based on the expectations to receive advice, knowledge and personal support. Secondly, a more instrumental motivation, aiming to strategically increase one's own status by befriending individuals high on popularity (e.g.,Kilduff & Krackhardt, 1994). People interact with those whom they consider to be particularly influential or popular, because they seek to profit from that person's influence by being associated with them (also see Balance theory; Heider, 1958). Building on prior research suggesting interdependence between affective ties and influence (Ho & Levesque, 2005; Krackhardt, 1990) friendship and perceived popularity should neither be mutually exclusive nor independent. For example, *John* may think of *Jane* as a close friend while at the same time perceiving Jane to be popular. Likewise, John's perception of Jane's popularity, may be influenced by his friendship with her. In both cases, the relationship between John and Jane is multiplex (e.g.,Wasserman & Faust, 1994), consisting of a friendship and a perceived popularity tie. The main hypothesis of the current study is that expected relationship between friendship and interpersonal outcomes (receiving advice, trust in intention and ability) is weaker if perceived popularity is high.

Hypothesis 2: The relationship between friendship and interpersonal outcomes (receiving advice, trust in intention and ability) is weaker if perceived popularity is high.

In the following, we outline two main reasons for this proposition. The first one relates to *friendship motivation* and the second one to the *negative characteristics associated with perceived popularity*.

3.3.2.2.1 Friendship motivation

As discussed, friendship can be pursued for varying motives. Highly popular individuals tend to receive more friendship nominations (e.g.,Dijkstra, Cillessen, & Borch, 2013). Here we propose that perceiving someone as popular, provides an instrumental motive for friendship (increasing one's own reputation by being friends with the popular). If, on the other hand, a friendship is with someone who is not perceived as particularly popular, it is likely that this friendship is "purely" motivated by expressive factors such as trust, sympathy and helpfulness. It is theorized that if high perceived popularity accompanies a friendship tie, it is likely that the friendship tie is motivated by the existence of a perceived popularity tie. In other words, perceived popularity qualitatively affects the friendship relation. Therefore, the motivation for the friendship might not exist to provide positive affect and trust, but may serve a reputational "basking in reflected glory" purpose (see Cialdini, 1989 for a review). Building on this, we expect that friendship ties to individuals, who are perceived as popular, tend to be more instrumental in nature and thus less "valuable" on an interpersonal level. Consequently, correlates of friendship including advice exchange and trust, should be reduced if the friendship tie is accompanied by perceived popularity.

3.3.2.2.2 Negative characteristic associated with perceived popularity

Being perceived as popular is related to social impact (reputation-based popularity), rather than social preference (preference-based popularity), and those people are more likely to be controversial than actually sociometrically popular (Parkhurst & Hopmeyer, 1998). Parkhurst and Hopmeyer (1998) found that individuals high on perceived popularity, but not sociometrically popular, were aggressive and arrogant but not helpful and trustworthy. While sociometric popularity is related to

below-average aggression, peer-perceived popularity is related with above-average aggression. Even though perceived popularity indicates social visibility and admiration, it is also described as a key predictor of becoming the perpetrator of bullying (Bruyn, Cillessen, & Wissink, 2009; Cillessen & Mayeux, 2004; Cillessen & Rose, 2005; Bruyn & Cillessen, 2006; Faris & Felmlee, 2011). For example, Faris and Felmlee (2011) state that students high on perceived popularity, are more likely to bully others. Consequently, individuals are often interested to interact with perceived popular peers, but not automatically keen to become emotionally close (Adler, Kless, & Adler, 1992). Therefore, while people strive to be considered as being friends with the popular, they do not necessarily trust their intention/ability and request their advice.

To summarize, it is proposed that high levels of perceived popularity weakens the expected positive association between friendship and interpersonal outcomes. On the one hand, this might be due to the often instrumental nature of friendships with popular individuals, and on the other hand, to the negative characteristics that are associated with perceived popularity.

3.3.2 Method

3.3.2.1 Participants

A total of eighty-one Master's students (61 female), with a mean age of 27 (StD = 6.79) at a London University participated in the study. Ethnicities of the students were as follows: forty White, thirty-three Asian, three Hispanic and one African American. Again, we used a roster format questions to measure network variables considered (Wasserman & Faust, 1994). We achieved a 95% response rate to the questionnaire (77 respondents).

1.3.2.2 Measures

   Sociometric questions. Respondents were presented with an alphabetical list of their peers. Participants answered on a 5-point Likert scale ranging from (1 = 'Never', 5 = 'Often') if not otherwise indicated.

   Advice. A central matter in social network data gathering is concerned with respondent accuracy (e.g., Borgatti & Cross, 2003). Previous work has demonstrated that participants struggle with remembering their interactive relations accurately (e.g., Freeman, Romney, & Freeman, 1987; Bernard et al. 1982). In order to deal with this issue we followed Borgatti & Cross (2003). Rather than focusing on the perception of advice seeking, in this study our aim is to assess what predicts who *actually* goes to whom for advice. To alleviate this issue, we used the estimate pooling technique proposed by Borgatti and Cross (2003) asking participants not only how often they would ask a person for course-related help or advice (GoAd) but also how often they would get asked by another person (GiveAd). To create the DV of study we added the transpose of the GiveAd matrix to the matrix of the GoAd matrix and divided it by two.

   Friendship. Because the term friend is ambiguous and can be used in a relatively unsystematic way (Fischer, 1982), we operationalize friendship as non-work related interaction. Participants were asked if they consider a focal individual to be their personal friend (how frequently they socialize with them and spend non-work related time with them).

   Perceived Popularity. Perceived Popularity is resultant from peer nominations for how popular group members are (e.g., Dijkstra et al., 2013). In order to measure perceived popularity previous researches have simply asked "who do you perceive as being popular?" (yes/no). Yet, this measure does not appear particularly sensitive in measuring perceptions of popularity in friendship networks. One possibility would be to employ Krackhardt's Cognitive Social Structures (CSS) to assess each

participant's cognitive map of all possible relations in the group (Krackhardt, 1990). This method would involve considering all possible dyads in a group (e.g., in a group of 30, 30 x30= 900 dyads) asking the participants if they think that actor x in the dyad would consider actor y to be his/her friend. Perceived popularity can then be defined as the in-degree centrality of an actor in a cognitive social structure of the participant. This method is extremely time-consuming and unmanageable with larger sample sizes. Therefore, we simply asked participants to indicate, for every student in their group, how many students they believe are personal friends with him or her.[7]

Trust. To measure trust, respondents were asked indicate the people in their group they would trust to keep their best interest in mind. The people they think they can count on. Respondents rated this on a 5-point scale.

Perceived Competence. To assess trust in ability, or perceived competence, participants were asked to rate how knowledgeable and how much expertise each member of their group has (1= Minimal, to 5= Exceptional).

Control variables. Like in the previous study, similarity with respect to gender, age and race were used as control variables. For gender and race similarity matrices were constructed where a "1" indicated that two individuals involved in a dyad had the same gender or race. For age, the matrices were constructed based on the difference values with respect to each variable.

We further included a measure of *Sociometric popularity* in our regression models as well as an interaction terms with Friendship. Sociometric popularity was measured based on the sociometric friendship data to assess how many friends people attract. The tendency for people to have high sociometric popularity - to receive more

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[7] Note. *Coding*: 1=0-2; 2=3-4; 3=5-6; 4=7-8; 5=9-10; 6=10-15; 7=16-20; 8=>20)

friendship nominations – was measured by the *receiver effect*. A positive receiver effect would mean that sociometrically popular individuals are more likely to be asked for advice, more trusted and perceived as more competent.

3.3.2.3 Procedure

All participants were sent a personalized link to the online questionnaire distributed through the survey platform *Qualtrics*. On average, participants took 20 minutes to complete the questionnaire.

3.3.3 Results

3.3.3.1 Descriptive statistics and correlations

Once again, the level of analysis in this research is the dyad. Accordingly, each variable is structured as a matrix in which rows and columns represent individuals and cells represent the relational state between the individual (Raider & Krackhardt, 2001). Since our network measures are expected to be highly correlated, the quadratic assignment procedure (QAP) with double semi-partialling (DSP) (Raider & Krackhardt, 2001; Dekker et al., 2007) is adopted, due to its robustness against multicollinearity and network-autocorrelation. Data was analysed using UCINET 6 (Borgatti et al., 2002). QAP correlation analysis was used to produce a bivariate correlation matrix (see Table 27) and QAP regression was employed to test the hypotheses (see Table 27-29).

Table 26

Descriptive Statistics and QAP intercorrelations

	M	StD	1	2	3	4	5	6	7	8
1 Age (d)	26.61	6.79	1							
2 Gender (s)	74%	n.m.	0	1						
3 Race (s)	n.m.	n.m.	0	-.01	1					
4 Friendship	2.24	.43	-.02	-.03	.09**	1				
5 S. Popularity	2.24	.43	.09	-.03	.02	.15***	1			
6 P. Popularity	3.43	.94	.02	-.04	.04	.81***	.17***	1		
7 Advice	1.97	.40	-.01	-.04	.09**	.89***	.13***	.80***	1	
8 Trust	2.69	.38	-.02	-.03	.10***	.89***	.10***	.80***	.89***	1
9 P. Competence	3.42	.46	-.06**	-.05*	.06**	.81***	.14***	.80***	.82***	.83***

Note. *p < .05; **p < .01; ***p < .001. N = 5, 852 dyads among 77 individuals; Significance tests based on correlation quadratic assignment procedure tests using 5,000 permutations; n.m. = not meaningful; (d) = difference, (s) = similarity, (re)= receiver effect.

3.3.3.2 Regression analysis (QAP)

Table 27

Results of hypotheses tests using QAP regression predicting advice ties

	Model 1	Model 2	Model 3
	Unstandardized coefficient (st. error)/standardized coefficient		
Control Variables			
Age	.00(.00)/.00	.00 (.00)/.00	.00(.00)/ .00
Gender	-.08(.04)/-.03	-.01 (.02)/-.00	.01(.02)/ .00
Race	.19(.05)/.09	.03(.01)/.01	.03(.01)/.01
Main effects			
Friendship		.61 (.03)/.73***	.67(.03)/.81***
Sociometric popularity		-.04(.03)/-.01	.02(.03)/.01
Perceived Popularity		.12 (.02)/.21***	.14(.02)/.26***
Interaction effect			
Friendship x Sociometric Popularity			.09(.03)/.05***
Friendship x Perceived Popularity			-.06(.01)/-.20***
Adj. R-Square	.01***	.82***	.84***

Note. *p < .05; **p < .01; ***p < .001. N = 5, 852 dyads among 77 individuals; Multiple Regression Quadratic Assignment procedure tests using 5,000 permutations

Table 28

Results of hypotheses tests using QAP regression predicting trust

	Model 1	Model 2	Model 3
	Unstandardized coefficient (st. error)/standardized coefficient		
Control Variables			
Age	.00(.00)/.02	.00 (.00)/-.01	.00 (.00)/-.01
Gender	-.09(.05)/-.03	.00 (.03)/.00	-.01 (.03)/.00
Race	.29(.06)/.10*	.07(.03)/.02*	.07 (.02)/.02*
Main effects			
Friendship		.76 (.05)/.68***	.86 (.06)/.77***
Sociometric popularity		-.16 (.02)/-.05**	-.09 (.03)/.-03
Perceived Popularity		.19 (.03)/.25***	.22 (.03)/.31***
Interaction effect			
Friendship x Sociometric Popularity			.02 (.04)/.01*
Friendship x Perceived Popularity			-.07 (.01)/-.19***
Adj. R-Square	.01***	.81***	.82***

Note. *p < .05; **p < .01; ***p < .001. N = 5, 852 dyads among 77 individuals; Multiple Regression Quadratic Assignment procedure tests using 5,000 permutations

Table 29

Results of hypotheses tests using QAP regression predicting perceived competence

	Model 1	Model 2	Model 3
	Unstandardized coefficient (st. error)/standardized coefficient		
Control Variables			
Age	-.01(.00)/-.06**	-.01 (.00)/-.06**	.00 (.00)/-.06**
Gender	-.15(.06)/-.04*	-.05 (.04)/-.01	-.01 (.04)/-.01
Race	.20(.07)/.06	.02(.03)/.01*	.01(.03)/.00
Main effects			
Friendship		.55 (.05)/.45***	.67 (.06)/.55***
Sociometric popularity		.02 (.04)/.01*	.11 (.05)/.03***
Perceived Popularity		.34 (.03)/.43***	.38 (.03)/.49***
Interaction effect			
Friendship x Sociometric Popularity			.11 (.05)/.04**
Friendship x Perceived Popularity			-.09 (.02)/-.22***
Adj. R-Square	.01***	.72***	.74***

Note. *$p < .05$; **$p < .01$; ***$p < .001$. N = 5, 852 dyads among 77 individuals; Multiple Regression Quadratic Assignment procedure tests using 5,000 permutations

3.3.4 Discussion

The purpose of the current study was to illustrate the importance of studying friendship and its correlates in the context of perceived popularity. Existing work examining network-based status measures is relatively scarce. Different from previous studies, focusing on individual attributes, the present study took the dyad as level on analysis, studying the effects of friendship and popularity on other important behavioural and attitudinal interpersonal outcomes.

Hypothesis 1 predicted a positive effect of friendship on the existence of advice, trust and perceived competence ties. In line with previous studies, empirical results give support to this proposition. Friends appear to be approached more for advice and are perceived as more trustworthy and competent. The fact that perceived popularity is highly correlated with friendship, supports our basic assumption that perceived popularity is a key motivational factor for befriending peers. This is consistent with previous research by Dijkstra et al. (2012) stating that highly popular individuals tend to receive more friendship nominations. In hypothesis two, a negative moderating effect of perceived popularity on the association between friendship and advice, trust and perceived competence was predicted. Findings of the study support this effect. Furthermore, consistent with previous literature (e.g., Cillessen & Rose, 2005; Lansun & Cillessen, 2012; Lease et al., 2002; Parkhurst & Hopmeyer, 1998) perceived popularity was only weakly associated with actual sociometric popularity. Interestingly, only perceived popularity, but not sociometric popularity, was a strong predictor of interpersonal outcomes considered. Consequently, it is who we *perceive* to be popular in friendship networks, and not who is actually popular, that impacts who we approach for advice, who we trust and consider competent. Once again, perception, not reality, seems to be crucial in determining attitudes and behaviour.

Our main contribution however is the finding that high levels of perceived popularity are associated with a weaker link between friendship and positive interpersonal outcomes. In other words, friendship is more likely to be related with advice seeking, trust and perceptions of competence, if that friendship is with someone who is not perceived as being particularly popular. This is tought to be due to the often instrumental nature of friendships with popular individuals. Further, we interpret these findings to suggest that people who are seen as having high perceived popularity, exhibit some feature that negatively affects advice seeking and trust. This is in accordance with prior findings proposing that high levels of perceived similarity is associated with higher levels of aggressiveness and arrogance and lower levels of helpfulness and trustworthiness (e.g., Parkhurst & Hopmeyer, 1998).

For the sake of completeness, we additionally included the interaction between sociometric popularity and friendship in our statistical models. Results show that not only perceived, but also sociometric popularity affected the relationship between friendship and outcomes. Effects were relatively weak, yet notably positive, rather than negative. Therefore, while friendship ties accompanied by perceived popularity appear to be qualitatively *less* valuable, those friendship ties appear to become *more* valuable if they link to people who are actually, sociometrically popular.

One difference to other previous studies is our measure of perceived popularity. While previous work simply asked for the most popular peers or colleagues, participants in the current study were asked to rate how many others would consider a specific peer to be their friend – reflecting how much others are perceived to want to be associated with that peer. Our goal was to tap into the perceived attractiveness of an individual to be affiliated with, aiming to capture a reputation-based aspect of popularity. Weak correlations with preference-based, sociometric popularity, suggest

that the measure used, indeed captured a distinct perceptual, reputational based aspect of peer relations.

3.3.4.1 Limitations and future research

The current study has limitations that need to be considered. First, as in previous studies, the use of a cross-sectional, not longitudinal design, limits our ability to describe or deduce causality. It is likely that causality between friendship and interpersonal outcomes runs in both directions, being mutually reinforcing. Nevertheless, without longitudinal dyadic follow-up data, questions about how perceived and sociometric popularity influences friendship quality over time, remain unanswered. Furthermore, it could be argued that people who are perceived as being more popular appear to be busier and less approachable and are therefore not asked for advice, offering a simple alternative explanation for hypothesized negative interaction. Yet, since we tested our theorizing by also considering *affect based* (i.e., trust) and *attitudinal* outcome measures (i.e., perceptions of competence) next to the behaviourally based outcomes (advice seeking), we believe that potentially restricted time and cognitive capacity of popular people is unlikely to account for our findings. Lastly, the current research was conducted in a relatively small sample that was limited to university student cohorts, excluding potential important peer relations outside of that cohort. Even though, we found relatively stable patterns concerning the role of perceived popularity in affecting friendship quality, future research may profit from larger samples.

As such, larger research studies, particularly those involving longitudinal data collection, are needed to arrive at a more nuanced understanding of the role of perceived and actual popularity in affecting friendship quality.

In this paper we examined how perceptions of popularity - one form of prestige and power - impact general quality of dyadic friendships. Currently, research

combining both friendship and status/power relations is scarce. One reason may be that these concepts are traditionally seen as independent constructs, since friendship is primarily seen as voluntary, while social influence and power are hierarchical systems (Stump, Kathryn, Biggs, & Hawley, 2015). Yet, various research suggests that friendships are rarely egalitarian (e.g., Veniegas & Peplau, 1997) and that, as discussed before, friendships are often gateways to status and power. Future studies could consider various measures of social friendship motivation in selection and socialization. Incorporating different forms of status and power into questions related to the development and quality of friendship, might yield a better understanding how and why individuals become friends and how this friendship can be qualitatively characterized.

Another promising direction for future research is to learn more about the process of how the more popular dyad member, is affected by the less popular dyad member. We find that the positive relationship between friendship and interpersonal outcomes is weaker, if perceived popularity is high. What has not been examined so far, is how high ratings of perceived popularity is associated with an actor's behaviour and cognition. In other words, on a dyadic level, what characterizes an actor that is perceived as being highly popular? For example, it may be that people who are seen as having high reputation or status are less likely to ask individuals with lower popularity/stats for advice, to not reduce their own status (see Dijkstra et al., 2012 for a similar argument), or are generally less likely to take advice due to elevated feelings of power (see See et al., 2011 for a similar argument).

3.3.4.2 Conclusion

Despite some limitations, the present study contributes to the theoretical understanding of popularity and dyadic friendships. There are instrumental as well as expressive reasons for friendship. Interestingly, there seems to be a trade-off. While friendships to people that are perceived to be popular may increase (feelings of) one's

own popularity or status, it appears to negatively affect the behavioural and attitudinal benefits typically associated with friendship.

3.4 Study 3: The effects of Power and Prestige on Perceptual Accuracy of Social Network Relations

3.4.1 Introduction

3.4.1.1 Power and social information processing

Interpersonal power is a key feature of social interactions and an increasing focus of research (Guinote & Vescio, 2010). Having or lacking power has been shown to impact a host of psychological processes such as cognition (e.g., Galinsky, Gruenfeld, & Magee, 2003; Guinote, 2007; Smith & Trope, 2006), feelings (e.g., Langner & Keltner, 2008), and behaviours (e.g., Maner, Kaschak, & Jones, 2010).

Much of the previous research on power and cognition has emphasized on the issue of lazy or biased social information processing (Fiske, 1993; Fiske & Dépret, 1996; Goodwin, Gubin, Fiske, & Yzerbyt, 2000; Guinote & Phillips, 2010; Keltner & Robinson, 1997; Lammers, Stoker, & Stapel, 2009; Lammers, Stoker, & Stapel, 2010), yet, the research findings are unclear. Several studies have shown that having low power, results in more controlled cognitive processing, whereas high-power prompts people to think in a more automatic, top-down fashion, relying on categorical cues and heuristics (Fiske, 1993, Keltner, Gruenfeld, & Anderson, 2003; Overbeck & Park, 2001; Stevens & Fiske, 2000). Thus, individuals low in power appear to engage in a more diagnostic and systematic way of thinking about the social word, whereas individuals high in power tend to engage in more spontaneous/intuitive cognitive processes (Keltner et al., 2003). Furthermore, powerful individuals focus more on the self and are

predominantly inspired by their own experiences rather than by the experiences of others (Van Kleef, Oveis, Homan, van der Löwe & Keltner, 2015).

Despite those findings, there is evidence that this is not always the case and some research has demonstrated an improved interpersonal sensitivity in power holders (Cote et al., 2011; Goodwin et al., 2000; Lammers et al., 2009; Mast, Jonas, & Hall, 2009; Overbeck & Park, 2001; Russell & Fiske, 2010). For instance, power-holders who feel a sense of responsibility for others have been shown to engage in thoughtful cognitive processing to form an accurate impression. In an attempt to reconcile these contradictory results, researchers increasingly emphasize the multi-faceted nature of power, acknowledging that power may stem from different sources (e.g., French & Raven, 1959; Lammers et al., 2009; Overbeck, 2010).

Building on this, in the present research, we assume that the way power is conceptualized is crucial when investigating the extent to which it may impact an individual's social information processing. For example, power may be conceptualized as the ability of a person to influence others, or to exercise control over others (Weber, 1978) this type of power is often referred to as *social power* (Lammers et al., 2009; Van Dijke & Poppe, 2006). On the other hand power may mean freedom (independence) from others; the ability to do and get what you want, without being affected by others (e.g., Cartwright, 1959; Emerson, 1962; French & Raven, 1959). Here power is the ability to "ignore the influence of others, to control one's own outcomes, and to be personally independent." (Lammers et al., 2009, p. 1543). Scholars refer to this type as *personal power* (Galinsky, Magee, Gruenfeld, Whitson, & Liljenquist, 2008; Lammers et al., 2009; Van Dijke & Poppe, 2006). Interestingly, Lammers et al. (2009) demonstrate that these different conceptualization have distinct consequences. For example, while personal power appears to increase stereotyping, social power has been

linked to reduced stereotyping. This underlines the importance of acknowledging the different ways power can be construed and measured and to take on a more refined view on if, and how, it affects social information processing.

3.4.1.2 Power, prestige, and perceptual accuracy of social relations

So far, little direct evidence is available on what predicts an individual's cognitive accuracy of his/her social network structure. Previous literature has considered the role of individual's formal position and centrality in informal networks (Casciaro, 1998; Krackhardt, 1987, 1990) together with various personality and motivational characteristics (Casciaro, 1998). Findings indicate that in-degree centrality (prestige/popularity) as well as motivational traits, including the need for achievement and affiliation appear to be predictive of accuracy in friendship networks.

Prior research linking power to social network perception has yielded somewhat inconsistent results. While some studies have found a negative association between power and perception of network ties (Casciaro, 1998; Simpson & Borch, 2005; Simpson, Markovsky, & Steketee, 2011), others did not find significant results (Krackhardt, 1990). Simpson and Borch (2005) experimentally explored two key ideas: firstly, that "power begets perception"- high power actors are more accurate due to their central network position – and secondly, that "dependence begets perception" - the idea that low-power individuals "will invest more cognitive resources in making the best of their disadvantaged situation" (Simpson & Borch, 2005, p.280). Simpson and Borch (2005) concluded that individuals with low power have more accurate tie perception, since low-power observers need to consider more cautiously who is connected to whom. This is consistent with literature in social psychology suggesting that low power is associated with outcome dependency has a positive effect on individuation, probably to increase predictability and control (Fiske, 1993; Neuberg & Fiske, 1987).

3.4.1.3 Differentiating power and prestige

There is a long-standing theoretical distinction between "power" and "status/prestige" in social psychology as well as sociology (e.g.,Blau, 1964; Fiske, 2010; Kemper, 2006; Lamertz & Aquino, 2004; Magee & Galinsky, 2008). Whereas power tends to refer to the relative degree of asymmetric control or influence an individual has over valued resources (Blader & Chen, 2012; Boldry & Gaertner, 2006; Dépret & Fiske, 1993; French & Raven, 1959; Keltner et al., 2003; Magee & Galinsky, 2008) prestige (social status) refers to an individual's reputation, or to the relative degree to which an individual is popular, respected or admired by others (Blau, 1964; Fiske, 2010; Goldhamer & Shils 1939 ; Ridgeway & Walker, 1995; Zelditch, 1968). Therefore, status and power are conceptually distinct, since they are differently derived, experienced and used.

Despite their differences, power and prestige have frequently been found to be strongly positively related, in naturalistic as well as laboratory-based groups (Carli & Eagly, 1999; Guinote, Judd, & Brauer, 2002; Sidanius & Pratto, 1999). This association may be due to the fact that influence is a consequence of both power and prestige even though being conceptually different. One of the most commonly used experimental manipulations of power involves actual or imagined assignment to a manager (powerful) vs. subordinate (powerless) social roles (e.g., Dubois, Rucker, & Galinsky, 2010; Galinsky et al., 2003; Weick & Guinote, 2008; Wojciszke & Struzynska–Kujalowicz, 2007). A potential issue with this kind of manipulation is that some individuals assigned the powerful role may exert influence via their ability to control rewards and punishments (i.e., power), yet others may do so by signifying empathy, trustworthiness, and responsiveness (i.e., prestige). This however may then differently impact the way the manipulation influences the person's social cognition (e.g., their ability and motivation to process social

information). In this study we attempt to make a distinction between power and prestige by simultaneously considering both in terms of self- and other ratings.

3.4.1.4 The current study

Using a SNA methodology, we examine the relationship between an individual's a) actual prestige in a friendship network, b) self-perceived prestige c) peer-rated power d) dispositional (self-perceived) power (i.e., personal sense of power), and their ability to accurately process dyadic friendship relations in a social network. Due to the scarce and rather inconsistent evidence existing on predictors of cognitive accuracy in social networks, the main goal of this study is to systematically explore the question of how prestige and power predicts perceptual accuracy. Nevertheless, based on prior research findings, some expected effects are outlined below.

Prestige. We chose to consider the individuals position in the friendship network to infer (peer-perceived- or actual-) prestige. Centrality measured by in-degree (e.g., Freeman, 1978) represents how much a particular actor is sought after; or in friendship networks, the number of individuals who nominate a focal person as a friend. Previous social network research has widely used in-degree centrality as a measure of prestige (e.g., Barnett, Danowski, Feeley, & Stalker, 2010; Russo & Koesten, 2005; Romero, López, Luna, & Ventura, 2013). In-degree centrality has been related to high visibility and increased access and exchange of information (Freeman 1978; Knoke, & Yang, 2008), which should facilitate a good overview of group dynamics. Furthermore, it has been proposed that involvement in a social system – being in the core rather than in the periphery - increases one's ability to accurately perceive the social system (Bondonio, 1998; Casciaro, 1998; Freeman & Romney, 1987; Freeman et al., 1987; Lee et al., 2016). This positioning appears to provide individuals with a benefit in accurately perceiving classmates' relationships. Casciaro (1998) examined the effects of structurally determined

power (occupying a high/low-level position in a company hierarchy) on the accuracy of an individuals' perceptions of friendship and work-related advice ties. Results suggest that both an actor's position in the formal and informal social network, impact perceptual accuracy. While formal hierarchy (power) level had a negative impact, in-degree centrality in both networks beneficially affected accuracy. Based on these insights, we expect accuracy to be better for individuals with high prestige, conceptualized as in-degree centrality in friendship networks.

Self-perceived prestige. Self-perceived prestige was conceptualized as self-reported in-degree centrality: "How many people would consider me to be their friends?" Students who perceive themselves as having a higher level of popularity are generally less likely to suffer from anxieties, fears and depression (Li & Zhang, 2008) tend to have higher levels of Self-esteem (Reitz, Motti-Stefanidi, & Asendorpf, 2016) as well as elevated levels of aggression (Mayeux & Cillessen, 2008). In a recent study by Sorokowski et al. (2016) self-perceived prestige (popularity) has been associated with histrionic personality, which is characterized by a self-promoting behaviour, a careless cognitive style, shallow representations of others, a disjointed psychic structure and fickle mood and temperament (Blagov, Fowler, & Lilienfeld, 2007). In particular when controlling for actual levels of prestige (how many people consider a person to be their friend), we expect self-perceived prestige to have a negative effect on perceptual accuracy.

Dispositional and peer-perceived power. Both self-perceived (dispositional) and peer-perceived power was assessed. Dispositional or personal sense of power can be defined as the subjective sense that one is powerful and influential, regardless of whether this is really the case (Anderson et al., 2012). As such, power can be viewed and studied as the psychological state, characterized by the perceived ability to influence others (Anderson et al., 2012; Galinsky et al., 2003; Magee & Galinsky, 2008). Peer-perceived power, in this

study, is the aggregated average ratings of peer perceptions of an individual's influence and power. A recent article demonstrated that females and people with lower self-esteem have more accurate cognitive social map perceptions (Lee et al., 2016). Both, being female and low levels of Self-esteem has been associated with having a lower sense of power and being perceived as less powerful (e.g.,Anderson et al., 2012; Bischoff & Reiter, 1999; Ragins & Sundstorm, 1989). Based on this and the previously discussed research on power and social information processing, we expect dispositional, as well as peer-perceived power, to be negatively associated with perceptual accuracy.

In summary, high power, should lead to less accurate perceptions, due to less deliberate social information processing. Consequently, it is proposed that dispositional power, being perceived as powerful and seeing oneself as prestigious, has a negative impact on the individual's ability to accurately process information. Actual prestige however, means holding a more central network position, which should enable an individual to access more information and have a better overview of the social relations around him or her, consequently increasing perceptual accuracy.

3.4.1.5 The cognitive representation of social networks

Research on cognitive social networks has investigated the accuracy of an individual's perceptions of network ties (Casciaro, 1998; Casciaro, Carley, & Krackhardt, 1999, Freeman et al., 1987; Simpson, 2011). Perceptual accuracy, in this study, is conceptualized in line with Casciaro et al. (1999, p. 286) as: "the degree of similarity between an individual's perception of the structure of... relationships in a given social context and the actual structure of those relationships." Individual's perceptions about friendship relationships in their group was assessed using a cognitive social structures (CSS) network approach (Krackhardt 1987, 1990). The CSS approach assumes that social

relations can be represented in a form of personal mental maps of the social environment often referred to as cognitive social structures (CSS).

This cognitive perspective assumes that each network member has a unique perception of the informal ties in his/ her social structure (Krackhardt, 1987). While traditional network analysis approaches assess an individual's perception about their personal direct ties, CSS also assesses an individual's beliefs about the relationship of every possible dyad in a group. With friendship networks, for instance, group members are not only asked to indicate who *they* consider a personal friend, but also who they believe is friends with who in a group (Krackhardt, 1987). As such, CSS captures the relationships an individual perceives to exist among members in a social network (including one's own ties). Carrying out a full CSS results in *n* individual matrices and a Locally Aggregated Structure Matrix (LASM). The LASM indicates the interaction between actors based on their own agreement. The individual matrices are then correlated with LASM allowing for an assessment of the individual's perceptual accuracy.

3.4.2 Method

3.4.2.1 Participants

Participants were from three different student exchange groups traveling together for three weeks and spending their last days at a London University, where the data was gathered. *Group 1* had twenty-eight students (4 males, 24 females), *Group 2* consisted of eighteen students (2 males, 16 females) and Group 3 of twenty-eight students (3 males, 26 females). The mean age was 20.64 (StD=1.50). Participants were mainly white (83%), with the rest being of Asian origin.

3.4.2.2 Measures

In-degree centrality (prestige) in the friendship network. A popular prestigious actor can be defined as one who is the recipient of many social ties (Wasserman & Faust,

1994). Thus we measured prestige as the amount of people considering an individual to be their friend (in-degree centrality) - the number of ties converging on that actor.

Peer-rated perceived power. We asked participants directly about their perceptions of power and influence of every other member. Specifically, on a 5-point Likert Scale (not at all - extremely) they were required: "Please indicate the extent to which you consider each person listed below to be influential – that is, people who seem to have pull, weight or clout in this group" (see Cross & Parker, 2004, p.148).

Dispositional power. Power is measured using the well validated 8-item *Personal sense of Power Scale* (Anderson et al., 2012). The measure is based on the idea that individuals form internal representations of their power relative to others across contexts and relationships Participants are asked to think generally about their degree of power across their relationships with their group members answering questions such as ''I can get them to listen to what I say'', and ''If I want to, I get to make the decisions''. All items were answered on a scale ranging from 1 (*disagree strongly*) to 7 (*agree strongly*) with a neutral midpoint at 4 (*neither agree nor disagree*). The Cronbach's alpha coefficient of .89 indicates very good scale reliability.

CSS Network assessment. The dependent variable in this study is accuracy at identifying the friendship within the student group. A paper questionnaire was used to assess Cognitive Social Structures (CSS) (Krackhardt, 1987, 1990) using a matrix design (see Casciaro, 1998). The survey listed the names of the individuals within the group repeated along the sides and top of a square matrix. Measuring cognitive accuracy entails the assessment of two sets of network relations. First, the "real" friendship network must be identified (who actually is friends with who) against which accuracy can be assessed. Second, following Kilduff et al. (2008) participant *k* in the group is asked if he/she thinks that a person *i* considers a person *j* a personal good friend. If person *k* believes this is true

they were asked to place a cross in the cell of the friendship matrix that was associated with a link from *i* to *j*. This process was repeated for every colleague in the group. During that process participants also indicate who they consider friends (out-degree), as well as who they think considers them to be a friend (perceived in-degree). Consequently, the CSS of a social network is conceptualized as a three-dimensional array of relationships, among a set of N individuals, where *i* is the sender of the link, *j* is the receiver and k is the perceiver of the link between *i* and *j* (Krackhardt, 1987). Accuracy is determined by measuring how well the individual's cognitive map approximates the actual network of communicative relations (Krackhardt 1990). Again we follow Kilduff et al. (2008) and define the "actual" network as the locally aggregated structure (LAS intersection; Krackhardt, 1987) which constructs a matrix in which a connection between *i* and *j* exists if both *i* and *j* agree that it exists. Once LAS matrices have been computed, individual slices were compared to the LAS. Specifically, each participant's friendship slice was compared to the groups friendship LAS. Accuracy was assessed using UCINET (Borgatti et al., 2002). Calculation of a Pearson correlation coefficient between the original elements in the actual and cognitive social structure was used to generate a normalized accuracy score for each respondent's perception of the friendship network within their group. The indicator of *accuracy of friendship about who knows whom* is the resulting score, which ranged from 0 to 1.

 Self-perceived in-degree (prestige) in the friendship network. Self-perceived social influence was derived from the CSS data. Specifically, we took an individual's CSS matrix and considered the row where they indicate who they think would consider them as a friend (perceived in-degree centrality).

3.4.2.3 Procedure

Three days before the testing, the researchers approached the coordinator of the course via email to obtain the names for all the members of the course. On the day of testing, participants gave verbal consent prior to the commencement of the study where they received two set of questionnaires after being given verbal instructions on how to answer the questionnaires. Completion of the paper questionnaire took approximately 30 minutes. A raffle determined two participants who were each rewarded with £50. Finally, the participants were debriefed collectively.

3.4.3 Results

3.4.3.1 Descriptive statistics and correlations

Pearson correlations (See Table 30) show that actual and self-perceived in-degree centrality was negatively and significantly related to their Pearson's accuracy score. Furthermore, peer-perceived as well as dispositional feelings of power were negatively correlated with accuracy of network perception, yet only dispositional power reached statistical significance. Figure 25 visually represents a relatively accurate and inaccurate cognitive representations and the real friendship network of one of the groups surveyed.

Table 30

Pearson correlation between a respondent's slice and the true matrix

	M	StD	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Age	20.64	1.50	-.09	.03	-.10	-.06	.06	.09	-.14
Gender	.88	.33	1	-.06	-.25*	-.23*	-.34**	-.30**	.15
Race	.82	.38		1	.41***	.30**	.32**	.05	-.34**
In-degree (ID)	.26	.13			1	.40***	.50***	.15	-.32**
Self-perceived ID	7.05	4.96				1	.35**	.17	-.29*
Peer-perceived Power	2.75	.73					1	.35***	-.16
Dispositional Power	4.90	.87						1	-.31**
Pearson's Accuracy	.48	.10							1

Note. *p < .05; **p < .01; ***p < .001.

3.4.3.2 Regression analysis

Our main hypothesis argued that dispositional power would be negatively related to network accuracy. This hypothesis was tested by regressing network accuracy scores on various measures of prestige and power in a linear regression models (see Table 31). First only the controls were entered into the model, then in step two the prestige and power variables were entered. Entering the power and prestige variables increased the variance explained by an additional 11% above the controls only model. Only dispositional power remained significantly negative predictor of friendship accuracy.

Table 31

Multiple Regression predicting Pearson accuracy

	Model 1		Model 2	
	β	t	β	t
Gender	.13	1.29	.05	.44
Age	-.08	-.63	-.06	-.48
Race	-.13)	-1.21	-.11	-1.07
Group 1 (Dummy)	-.27*	-2.18	-.28**	-2.14
Group 2 (Dummy)	-.54 ***	-4.04	-.58 ***	-3.73
In-degree (ID)			.05	.38
Self-perceived ID			-.06	-.56
Peer-perceived Power			.03	.22
Dispositional Power			-.33***	-3.02
R-Square (Adjusted R-square)	.30 (.25)		.41(.32)	

Note. *p < .05; **p < .01; ***p < .001. Standardized coefficients are reported;
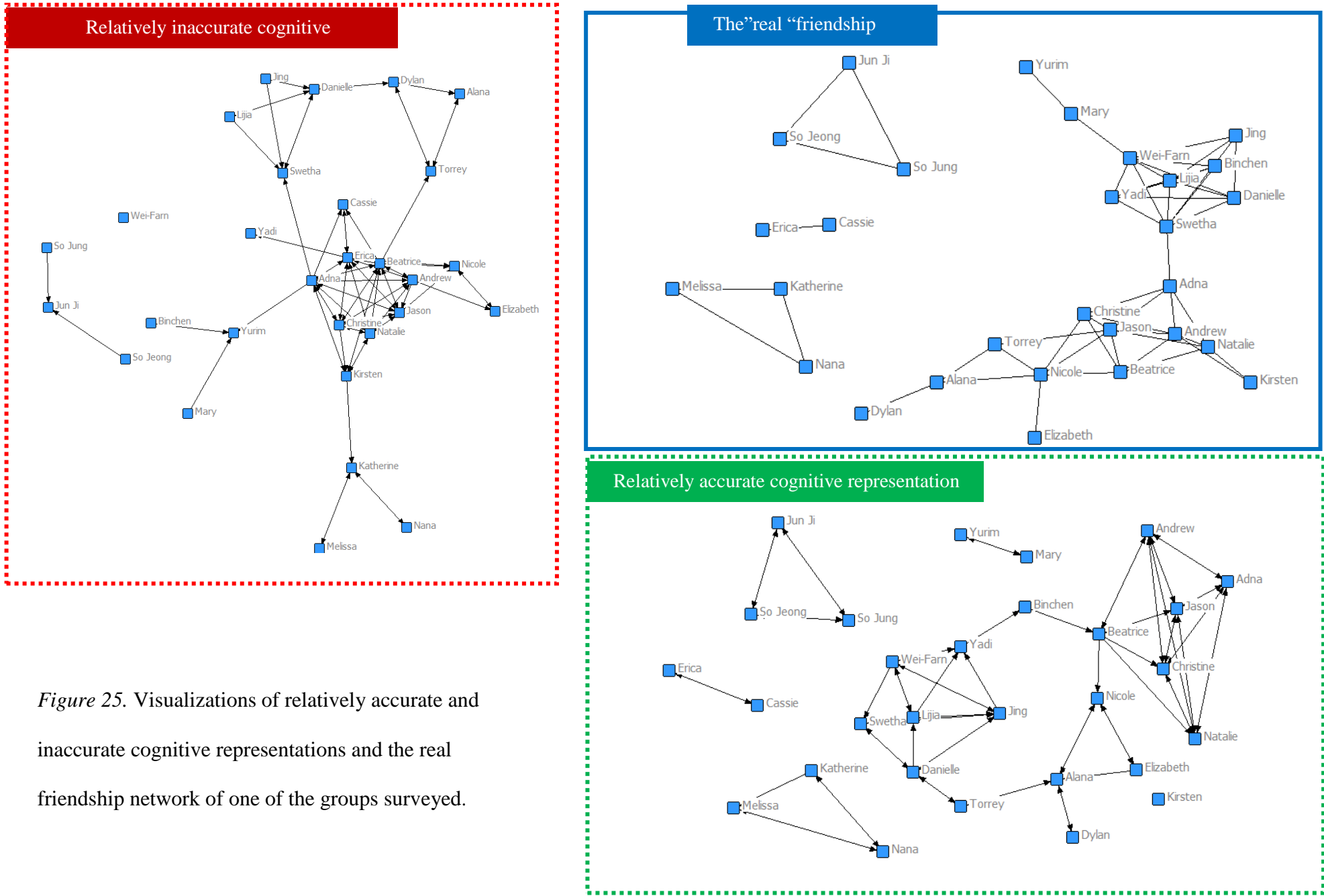
Figure 25. Visualizations of relatively accurate and inaccurate cognitive representations and the real friendship network of one of the groups surveyed.

3.4.4 Discussion

Cognitive conceptions of network relations are important determinants of how people think and behave. Past research in sociology and organizational studies offered divergent results and arguments with regards to whether power and prestige impact perception of social relations. Using a SNA approach, the current study set out to explore the influence of an individual's (self- and other-perceived) power and prestige on their perceptual accuracy of dyadic relations in a friendship networks.

Drawing on previous literature concerned with the social psychology of power, it was expected that power and self-perceived prestige, negatively relate to perceptual accuracy. Furthermore, based on findings of previous research, prestige (in-degree centrality in the friendship network) was expected to be positively associated with accuracy. Results showed that, when controlling for each other's effect, only the effects of dispositional power (self-perceived power) remained a significantly negative predictor of perceptual accuracy. This finding is consistent with previous research in social psychology suggesting that an elevated sense of power leads to a more "lazy" processing of social information. Further, this parallels previous social network studies demonstrating negative associations between power and network accuracy (Casciaro, 1998; Simpson & Borch, 2005; Simpson et al., 2011). Yet, importantly, the study also reveals that effects of power appear to be contingent on how it is conceptualized and measured. While, dispositional power had a significant impact, effects of peer-perceived power and self-perceived prestige were almost non-existent. This implies that what matters in determining cognitive accuracy is a subjective sense of power - a psychological state occurring if one feels able to influence others. This is compatible with results of previous work, demonstrating that *a sense* of power is able to better explain and predict outcomes than more objective power indices (e.g.,Anderson & Berdahl, 2002; Anderson & Galinsky, 2006; Haidt & Rodin, 1999). In line with this, a subjective sense of power has been shown to play a crucial role in

explaining the association between power and overconfident decision-making (Fast, Sivanathan, Mayer, & Galinsky, 2012). It is suggested that power positively impacts confidence in one's knowledge, by inducing a personal sense of power and that it is this *subjective* feeling that drives overconfident decision-making. Surprisingly, and in stark contrast to previous findings (e.g., Bondonio, 1998; Casciaro, 1998; Freeman & Romney, 1987; Freeman et al., 1987; Lee et al., 2016) prestige (in-degree centrality) did not lead to greater network knowledge. One possible explanation for this unexpected finding may be that the groups only knew each other for approximately three weeks. During this time, it is unlikely that actual friendship relations have developed. Consequently, those central individuals may have not (yet) benefited from the increased access to information, which is thought to result in a superior overview of group dynamics. Furthermore, it may be that early stage friendship networks, as observed in the current work, are relatively unstable and superficial and are likely to be based on perceived similarity, social attractiveness and perceptions of influence and popularity, rather than trust and reciprocity (Selman, 1980). Consequently, it could be that in-degree centrality, in early stages is indicative, of the ability of individuals to effective self-presentation, rather than genuine friendship. Consistent with this idea, research has linked popularity in early stage, but not later stage friendship networks, to high levels of self-monitoring (Bhardwaj et al., 2016), which does not seem to be associated with increased perceptual accuracy of social relations (Casciaro, 1998).

3.4.4.1 Limitations and future research

The present study had various limitations. Firstly, and most noticeably, the sample size was relatively small. Sample sizes are usually small for CSS studies (e.g., Casciaro, 1998; Casciaro et al., 1999). CSS data is very time-intensive to collect for participants and increasing the sample is problematic since including groups larger than forty would be very likely to produce participant fatigue and consequently unreliable data.

Furthermore, due to the cross-sectional nature of the data, causality concerning the association between personal sense of power and perceptual accuracy cannot be claimed. It could indeed be that low perceptual accuracy causes an elevated sense of power, yet there appears to be no conceptually sound theoretical argument supporting such an effect. Instead, it appears more likely, as theory suggests, that personal feelings of power affect an individual's motivation and ability process social information.

Future research should further examine potential antecedents and outcomes of social network accuracy. For example, investigating how situational factors and individual differences interact, to influence perceptual accuracy and how this in turn affects certain outcomes of interest (e.g., job performance, leadership or team working skills). For instance it may be that achieving a fairly accurate perception of social relations offers informational and political advantages. This would be in line with Krackhardt's (1990) study showing that in an organizational context, accurate perception of relations, is a source of power in itself.[8] Additionally, future longitudinal studies could investigate whether individuals with low power are actually able to use their more accurate perception of social relations to increase their influence, and what strategies are used to do so. Similarly, it appears fruitful to examine the consequences of cognitive misperceptions of social networks. Lastly, exploring different network types (e.g.,advice, friendship, work-flow, (dis)like) may be important. For instance, it seems plausible that power may lead to more lazy cognition in some networks (e.g.,expressive), while positively impacting the ability to accurately perceive others (e.g.,instrumental).

3.4.4.2 Conclusion

The present study explored how power and prestige may impact social network accuracy. Overall, our research contributes to psychological and sociological work on

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[8] Individuals with more accurate network cognitions were perceived as more powerful by others in the organization.

power and social cognition. On the one hand, it provides a contribution to psychological research by using a social network approach, studying the effects of prestige and power on social cognition in a field setting. On the other hand, the study advances the structural tradition in sociology by introducing individual psychology in the relatively under-investigated area of power and perceptual accuracy. To our best knowledge, the current study is the first to simultaneously consider various measures of prestige and power, demonstrating that it is predominantly the *subjective sense of power* that appears to reduce the ability to effectively identify and process social relations.

CHAPTER 4: EFFECTS OF WORKPLACE SOCIAL NETWORK RELATIONS ON JOB ATTITUDES

– Quantity versus Quality

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4.1 Overview

We live in a world where social network engagement is typically tracked by quantity (Facebook, Twitter, LinkedIn etc.) not quality (see Pollack, Rutherford, Seers, Coy, & Hanson, 2016). Consequently, the underlying assumption of many commercial as well as academic studies, considering effects of the social network an individual is embedded in, is that bigger networks are better.

"The (often implicit) theoretical argument is that bigger, larger networks offer more social capital, and more social capital is better for individual goal attainment (Van der Gaag & Snijders, 2003, p. 4)".

Going beyond this "more is better" philosophy, this chapter aims to highlight, that considering various qualitative aspects of social networks – next to their size – is key to arrive at a more complete understanding of how social network characteristics are associated with organizational outcomes.

Specifically, it is proposed that research to date tends to overlook qualitative features, in particular aspects related to multiplexity; the existence of two or more types of relationships with the same person. For instance, when considering friendship and its organizational outcomes, researchers tend to use "pure" friendship relations interchangeable with multiplex work relations (relations where this friendship is

accompanied by some other social relation, such as professional advice or formal work flow requirements). This approach makes it impossible to determine effects of friendship that can be exclusively attributed to friendship. In two studies, we advance the literature by identifying tie (connection) qualitative aspects that act as important antecedents to job attitudes. Differing from previous research we disentangle and separately study various network relational configurations that are qualitatively dissimilar and consequently are thought to have different effects on organizational outcomes.

Study 1 focuses on the effects of multiplexity (a work-related *advice tie* co-occurs with a more personal *discussion tie*) and tie strength (conceptualized as average interaction intensity) on employee work engagement. **Study 2** aims to examine how employees' advice relations in formal and informal work contexts relate to their job satisfaction. Previous studies presented inconsistent results regarding effects of advice giving and receiving on work outcomes. While in general it appears that receiving advice comes with various benefits, giving advice appears to also entail costs. In this study, we hypothesize that the difference between the benefits of receiving advice and the costs associated with giving it, are particularly strong if connections take place outside the formal workflow – where individuals are not formally required to work with each other. As such, we assume that advice ties, occurring in and outside the formal workflow, are qualitatively different.

4.2 Study 1:   Network quality over quantity: Effects of tie multiplexity and tie strength on employee engagement

4.2.1 Introduction

4.2.1.1 Employee engagement

The notion of employee engagement has become an important topic among management practitioners and in popular business press. Work engagement is most commonly defined as positive, fulfilling, work-related state of mind, characterized by *vigor*, *dedication*, and *absorption* (Schaufeli, Salanova, González-Romá, & Bakker, 2002). While *vigor* refers to high levels of energy and mental resilience, *dedication* describes strong involvement in one's work and a sense of significance, enthusiasm and challenge. *Absorption* is associated with being fully concentrated and happily engrossed in one's work (Schaufeli & Bakker, 2004). More recently work engagement has begun to attract wider academic attention and significant progress has been made with respect to defining and clarifying the concepts (Hallberg & Schaufeli, 2006) and understanding its precursors and outcomes (Bakker, Demerouti, & Sanz-Vergel, 2014; Christian, Garza, & Slaughter, 2011; Crawford, LePine, & Rich, 2010; Demerouti, Cropanzano, Bakker, & Leiter, 2010; Halbesleben, 2010; Mauno, Kinnunen, Mäkikangas, & Feldt, 2010; Saks, 2006). Despite increased interest in the topic, low levels of employee engagement continue to be a major challenge for organizations around the globe. For example, Aon Hewitt (2016) observed trends in global engagement and stated that 35% of the employees surveyed were not engaged and 15% were actively disengaged.

4.2.1.2 Social network matters

In the last decade, globalization as well as technological advancement have transformed the corporate world and has changed the way organizations operate. In this interdependent and highly connected business environment, individuals need to

communicate and coordinate across geographies, functions, levels and organizational boundaries to achieve success. As a result of this new trend, work increasingly occurs through informal communication channels. Importantly, recent organizational research provides evidence that the social network connections an employee has, have a strong influence on factors such as wellbeing (e.g., Agneessens & Wittek, 2008), employee turnover (e.g., Mossholder et al., 2005) and other measures of individual and group performance (e.g., Sparrowe et al., 2001). The present study sets out to explore how an employee's social network qualitative characteristics – *tie type* (multiplex or simplex) and tie strength (*frequency of tie activation*) – may be associated with their levels of engagement.

4.2.1.3 Social networks and engagement

Consulting firms widely acknowledge internal communication as a driver of employee engagement, and various authors have suggested that frequent communication is a key predictor of organizational outcomes (Bakker, Albrecht, & Leiter, 2011; Ensher & Murphy, 1997; Johlke & Duhan, 2001; Kim & Umanath, 1993; Zeffane & Gul, 1993). Bakker, Albrecht and Leiter (2011) argue that communication and interaction patterns are part of the organizational context in which (dis)engagement occurs. Indeed, effective social interaction has been widely recognized as an underlying factor related to employee engagement (e.g., Baumruk, 2006; Bindl & Parker, 2010; Hoover, 2005; Iyer & Israel, 2012; Kahn, 1992; MacLeod & Clarke, 2009; Papalexandris & Galanaki, 2009). For instance, communication abilities of leadership teams have been identified as critical in driving employee engagement (Iyer & Israel, 2012). Similarly, MacLeod and Clarke (2009) highlight social interaction as an important factor for increasing performance through engagement. These authors identify poor inter-organizational interaction as barrier to engagement and consequently as a cause of disengagement.

Furthermore, Bindl and Parker (2010) suggest that frequent social interaction is thought to effectively convey values of the organization and familiarize employees with key organizational goals leading to higher levels of engagement. "Even in a time of crisis, good communication keeps employees engaged and the organization moving forward" (Hoover, 2005, p. 25).

Yet, empirical research investigating this association remains scarce, and the few studies available often tend to assume that the bigger a person's social network the better it is. Using SNA, the current study aims to address this gap by providing empirical data to explore the predictive validity of social relations at work, as antecedents of employee work engagement.

As discussed in previous chapters, SNA allows to investigate the patterns and content of interactions within and between social units. These ties may be of different kind: formal or informal, frequently activated or infrequently activated, personal or purely professional. Network scholars use the term "tie type" to specify the type of relation between two entities (Granovetter, 1973). One way to classify ties is to make a distinction between ties that are simplex and ties that are multiplex. Ties are multiplex, when individuals interact in multiple social contexts (e.g., professional and personal) and simplex if interaction is restrained to one context. Moreover, ties in one's social network can be rather dormant or frequently activated. As such, interaction can be conceptualized not only in terms of the number of specific ties but also in terms of the average time spent activating these ties (i.e. tie strength).

Notably, in the present study we go beyond the idea of "more is better" by considering the content or type of social tie, as well as their strength. Specifically, we independently analyse the effects of *simplex* (one relationship) and *multiplex ties* (when actors are connected by more than one kind of relationship). Furthermore, next to

capturing the number of each type of tie, we capture tie strength, by measuring how frequently social relations are activated. In the following, effects of these two tie characteristics will be discussed with respect to their expected effects on employee engagement.

4.2.1.4 Effects of multiplex ties

Multiplex workplace ties are a common organizational phenomenon (Ingram & Zou, 2008). They are ''overlapping social networks where the same people are linked together across different roles'' (Portes, 1998, p. 16). In more general terms, multiplex ties occur when actors have more than one relationship type (Wasserman & Faust, 1994). Often, a professional or instrumental relation is merged with a more affective personal relation (Gersick, Bartunek, & Dutton, 2000; Ibarra, 1993; Lazega & Pattison, 1999; Sias & Cahill, 1998). Interestingly, researchers to date, tend to not distinguish between purely simplex (one-dimensional) relations (i.e. composed exclusively of one tie type) and multiplex relations (Hayton, Carnabuci, & Eisenberger, 2012; Ingram & Roberts, 2000; Kuwabara, Lou, & Sheldon, 2010; Methot, Lepine, Podsakoff, & Christian, 2015). For example, studies linking affective relationships such as friendship to employee outcomes frequently use "purely" personal or professional ties interchangeably with multiplex relations (e.g., Baldwin et al.,1997; Chiaburu & Harrison, 2008; Jehn & Shah, 1997; Mehra et al., 2001; Roberts & O'Reilly, 1979). This research strategy does however not allow differentiation between whether effects of a specific tie can be uniquely attributed to it, or if the effect only emerges when combining multiple types of ties. In agreement with Methot et al. (2015), we argue that differentiating between different types of ties is crucial to understand the effect of networks on organizational outcomes, since they "serve different functions and place different demands on the parties relative to unitary relationships" (p.313).

While a simplex tie only provides one type of information, multiplex connections offer various types (Bullis & Bach, 1991), enabling employees to more efficiently deal with work demands, due to a better set of social resources (Oh, Chung, & Labianca, 2004). Burt (1992) argued that multiplex ties benefit an individual in three distinct ways: access, timing and referrals. *Access* refers to the fact that networks offer effective information screening and spreading processes, enabling members to gain access to valuable information. Second, *timing* relates to the role of networks in facilitating very fast information processing, making critical information immediately available through network contacts. Thirdly, *referrals* take place when individuals have access to information with regards to available opportunities. Endorsement of close network contacts and reputation are likely to improve chances of success.

Furthermore, multiplex network ties warrant strong network connections between workers, facilitating coordination and information distribution, while promoting the enforcement of norms against uncooperative or deviant behaviour (Portes, 1998). These high-quality multiplex connections, with various interaction bases, are stronger than simplex, one-dimensional connections (Ibarra, 1993). Multiplex ties are thought to encourage uncertainty-reducing conversations (Albrecht & Hall, 1991), thus increasing levels of trust. They can facilitate feedback, follow-ups and in-depth discussion, in turn leading to an improved understanding of work-related problems and processes. Consequently, a large number of multiplex ties suggests that an individual is better able to validate information (Baldwin et al., 1997) access resources (Kram & Isabella, 1985; Lin & Westcott, 1991; Mehra et al., 2001; Nahapiet & Ghoshal, 1998; Rook, 1984; Thoits, 1995), think critically and gather diverse information (Van Maanen & Schein, 1979). Furthermore, decisions can be made more informed and effectively (Casciaro & Lobo, 2005). Lastly, employees with both

professional and personal workplace connections tend to have more control over how they accomplish their work tasks (Sparrowe et al., 2001; Zagenczyk & Murrell, 2009).

In short, a network composed of multiplex ties implies better access to high-quality professional and personal resources, higher levels of trust and normative control, and increased control over work processes. Trust in colleagues reduces the need to monitor or worry about hostile behaviour from them, enabling employees to become increasingly dedicated and fully engrossed in their work (Mayer & Gavin, 2005), which is characteristic of higher levels of employee engagement (Schaufeli et al., 2002). Taken together it is proposed that a high number of multiplex ties positively impacts levels of employee work engagement.

Hypothesis 1: The number of multiplex ties in a person's network has a positive effect on his or her work engagement.

4.2.1.5 Effects of tie strength

Granovetter (1973) defines tie strength as "a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie" (p.1361). Though tie strength is a multi-dimensional theoretical construct, most previous research uses measures of interaction frequency as proxy for tie strength (Aral & Walker, 2014; Marsden, 1990; Nelson, 1989; Uzzi 1996, 1999). Interaction frequency refers to how often social ties are activated and the amount of time spend on them (Hansen, 1999). While some researchers such as Granovetter (1973) emphasized the benefits of weak ties (i.e., access to non-redundant information), most scholars have argued for the positive effects of strong ties.

Strong ties are desirable, since they facilitate the development of trust and reciprocity, enabling the exchange of complex information and reduction of uncertainty (Brass, Butterfield, & Skaggs, 1998; Coleman, 1988; Darr & Pretzsch, 2008; Hansen, 1999; Krackhardt et al., 1992; Kraatz, 1998; Levin & Cross, 2004; Li, Zheng Zhou, Lam, & Tse, 2006; McAllister, 1995; Reichers, 1987; Uzzi, 1997; Vanneste, Puranam, & Kretschmer, 2014). Strong, frequently activated ties, are related to increased cooperation, intimacy, empathy and psychological proximity (Brass et al., 1998). With repeated interaction, individuals identify with one another and identification is known to lead to increased trust over time (Vanneste et al., 2014). Frequency of interaction has also been positively associated with employee adjustment rate (Reichers, 1987) and trust in leadership (Li et al., 2006; McAllister, 1995). Furthermore, frequently activated ties are especially useful when employees face uncertainty and challenges at work (Krackhardt, 1992; Pool, 1980). Accordingly, low-conflict, compared to high-conflict organizations, tend to be characterized by stronger, more frequently activated social ties (Nelson, 1989). Truss, Soane, Edwards, Wisdom, Croll and Burnett (2006) argue that giving employees frequent opportunities to voice their views and ideas and keeping them well informed about organizational issues are key drivers of employee engagement. While low frequency of interaction, and a large social distance, is likely to result in employees avoiding asking for feedback and other resources (Walumbwa, Avolio, & Zhu, 2008), high interaction intensity presents a considerable transfer advantage, especially in the transmission of complex or implicit knowledge (Darr & Pretzsch, 2008). Frequently activated ties enable more detailed information exchange and cooperation (Coleman, 1988) and are thus positively related to knowledge gained from that contact (Kang, 2007). Taken together, previous empirical evidence is supportive of the idea that interaction frequency has a positive effect on employee engagement levels.

Hypothesis 2: Average tie strength in a person's network has a positive effect on work engagement.

Departing from prior research, we analyze the effects of interaction intensity and number of ties separately, by considering the average amount of time spent on each social connection. This measure is independent of the number of social connections available in the network. As such, it is a purely qualitative measure, reflecting an individual's tendency to create strong or weak ties.

4.2.2 Method

4.2.2.1 Participants

The data was collected from two business units of a large multinational organization. There were 311 employees in the first business unit, of which 138 returned usable surveys (44.4%). The second business unit had 140 employees, of which 99 surveys were usable (70.7%).

4.2.2.2. Measures

Sociometric questions. In line with standard social network research practices, a name generation technique was used to assess personal networks. The number of nominations was restricted to seven. Previous research has shown that as few as 5 names are sufficient to elicit reliable network data (Merluzzi & Burt, 2013).

Work-related advice network. Participants were asked to indicate up to seven co-workers they typically turn to for role or task specific advice – people who are thought to have expertise in areas that are important to the kind of work they do.

Personal discussion networks. Respondents were asked to indicate up to seven co-workers to whom they typically turn to discuss role or task related challenges, or share personal success.

Multiplex workplace ties. Multiplex workplace ties were conceptualized as the number of overlapping ties, that is individuals listed in work-related and personal networks (Grosser, Lopez-Kidwell, & Labianca, 2010; Ingram & Roberts, 2000). We also included exclusive work-related or personal connections (simplex ties) in the model: the number of contacts an individual only listed in one of the networks mentioned above.

Tie strength. To capture tie strength, participants were asked to rate how often they actually approach the people they nominated in the two sociometric networks. An online table was populated with the names people indicated in the name-generator questions. Next to the names, participants were able to indicate on a scale from 0 to 5 how often they actually interact with these individuals: (1) Very seldom; (2) at least once a month; (3) at least once a week; (4) several times and a week; (5) daily. Tie strength was defined as the mean out of these ratings.

Engagement. Work engagement was assessed using the 9-item version of the UWES (Schaufeli, Bakker, & Salanova, 2006). Each sub-dimension was assessed with three items: vigor (e.g., "At my work, I feel bursting with energy"), dedication (e.g., "I am enthusiastic about my job"), and absorption (e.g., "I get carried away when I'm working"). The response scale ranged from 1 = *never* to 7 = *always*. Cronbach's alpha for the total engagement score was .91, for vigor it was .86, for dedication .75 and for absorption .76.

Control Variables. Several demographic controls which might have an impact on how social network characteristics affect employee engagement were taken into consideration including gender, department, organizational grade and tenure.

4.2.2.3 Procedure

A survey was conducted including demographic, attitudinal, job specific and sociometric (network) items. E-mails were sent out with information regarding the purpose of the study and how to participate. Participants clicked on a link directing them to an online survey which took seven minutes on average. The HR department continuously followed up with employees to boost participation.

4.2.3 Results

4.2.3.1 Descriptive statistics and correlations

Means, standard deviations and correlations amongst all variables are reported in Table 32. The number of simplex advice ties was not related to levels of engagement. Yet, the number of discussion ties and, to an even stronger extent, multiplex ties, are significantly positively associated with engagement. Furthermore, overall levels of engagement are positively correlated with tie strength. Among controls, organizational grade is significantly positively related to engagement.

Table 32

Correlation Table

		M	SD	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)	Gender	.38	.48	23***	-.12**	-.09	-.04	-.03	-.01	-.03	-.08	-.04	-.08	.01
(2)	Team	1.31	.47		.02	.03	.14*	.03	.01	.07	.13**	.10*	-.28***	.01
(3)	Grade	3.26	1.44			.60***	.20**	.27***	.23***	.25***	.15***	.15**	.29***	.04
(4)	Tenure	5.96	6.15				.06	.11	.04	.08	.12*	.13*	.24***	-.01
(5)	Vigour	4.52	1.06					.86***	.70***	93***	.11	.14*	.27***	.11
(6)	Dedication	4.85	1.04						.74***	.94***	.11	.17**	.25***	.14*
(7)	Absorption	5.02	1.02							.89***	.06	.17**	.19**	.09
(8)	Engagement	4.79	.96								.09	.17**	.26***	.13*
(9)	Nr of advice ties	1.82	2.02									.38***	.43***	30***
(10)	Nr of discussion ties	1.20	1.41										.32***	29***
(11)	Nr of multiplex ties	1.60	2.02											25***
(12)	Average tie strength	1.86	1.09											

Note. *p < .05, **p < .01, ***p < .001

4.2.3.2 Regression analysis

Several multiple regression analyses were conducted to assess the effect of the network variables on engagement outcomes. Three sets of regressions were computed with global engagement, vigour, dedication and absorption respectively, entered as dependent variables. Number of simplex and multiple ties and average tie strength were entered simultaneously as predictor variables. Regression coefficients are reported in Table 33. As can be seen in Table 33 multiplex ties as well as interaction intensity positively predict global levels of employee engagement. Whereas simplex advice ties have no effect, multiplex ties consistently have a positive and statistically significant effect on engagement and its individual facets. Similarly, in line with what was hypothesized, regression results show that average tie strength has a positive effect.

Table 33

Multiple Regression Analysis

	Engagement		Vigor		Dedication		Absorption	
	β	t	β	t	β	t	β	t
Gender	-.06	-.79	-.08	-1.08	-.04	-.52	-.03	-.39
Business Unit	.11	1.54	.19**	2.63	.07	.97	.03	.42
Grade	.26**	3.10	.18**	2.19	.26**	3.08	.27**	3.14
Tenure	-.12	-1.46	-.10	-1.21	-.08	-.94	-.16*	-1.88
Number of advice ties	-.02	-.28	-.01	-.08	-.01	-.06	-.04	-.54
Number of discussion ties	.13*	1.83	.11	1.63	.11	1.54	.14*	1.92
Number of multiplex ties	.17**	2.24	.17**	2.35	.15*	2.00	.14*	1.80
Average tie strength	.18**	2.55	.18**	2.56	.19**	2.73	.11†	1.47
R-Square	.15		.14		.14		.11	
Adjusted R-square	.12		.11		.11		.08	
	$F(8, 210) = 4.33, p < .001$		$F(8, 210) = 4.09; p < .001.$		$F(8, 210) = 4.12; p < .001.$		$F(8, 210) = 3.12; p = .002.$	

Note. †$p<0.1$, *$p < .05$, **$p < .01$, ***$p < .05$; 1-tailed

4.2.4 Discussion

One of the first questions about interaction in organizations one may ask is whether more is better. Although previous research has mostly argued for a "the-more-the-better" philosophy, empirical evidence so far has been somewhat mixed. A logical question therefore is, controlling for network size, what *type* of tie leads to positive outcomes? On a broad level, the current study highlights the importance of considering qualitative interaction aspects, in addition to the mere number of connections in a social network. Specifically, results of the current study suggest that next to tie number, the multifaceted nature of exchange relations between individuals, as well as how frequently those relations are activated, are important characteristics to consider when studying social network effects on employee outcomes such as engagement.

4.2.4.1 Managerial implications

This work holds significance for practitioners, offering two main insights. Simply encouraging employees to network more may not be enough. Organizations should encourage qualitatively valuable ways of communication and collaboration, promoting an awareness of qualitatively beneficial ways of networking. Our results and theorizing suggests that employees should be actively encouraged to interact through multiple roles, to develop multifaceted work relations. Workspace and processes could be designed in a way that facilitate different types of interactions (e.g., personal, creative, professional and even physical). The development of more personal ties, especially when they occur together with work-related ties, should promote levels of employee engagement. Additionally, managers may want to assist the development of strong – frequently activated – work connection. This might be particularly relevant during on-boarding processes since "interaction frequency is the primary mechanism through which newcomers are transformed into insiders" (Reichers, 1987, p. 286). In summary, building

these strong ties is expected to positively influence attitudinal engagement, since they appear to help employees to clarify potential ambiguities, increase trust and identification, stimulate learning of complex information, and promote feelings of social support and wellbeing.

4.2.4.2 Limitation and future research

We can only attribute relatively small effects to the network variables considered. There are numerous predictors of work engagement that have not been included in the study, but that would be important to fully understand the influence of network variables. For the sake of simplicity and model parsimony, we did not consider any organizational factors that might impact the relationship between network variables and engagement. It could for instance be that task contingencies and other contextual aspects, weaken or strengthen positive effect of multiplexity and tie strength on engagement. For example, Perry-Smith (2006) suggests that individuals who are connected for a long time and who are frequently interacting are less creative, presumably since they are more likely to receive redundant information in these networks. This means that if the task of a workgroup is of creative nature, strong and/or multiplex ties may harm success and may, as such, not relate to higher levels of engagement.

Another limitation is that data used was cross-sectional and therefore not suitable for investigating the causal relationships involved. Due to the cross-sectional nature of the data it is possible that employees first become disengaged and as a result alter their networking behavior by disengaging from others. This would be in accordance with research on "withdrawal" (see Saari & Judge, 2004 for a review). Therefore, it is recommended that future research employs a longitudinal design to study effects of social network characteristics on levels of engagement.

4.2.5 Conclusion

In agreement with Methot et al. (2015), the present study supports the notion that previous network research and theory needs to be revisited. Various research argues for the relevance of simplex ties (e.g., work-related advice, personal support, friendship, aversion) on work outcomes, without considering potentially diverging effects depending on if those relations occur together or in isolation. Consequently, it seems important, that future work, investigating social network effects in the workplace, take into account the multidimensionality of employee relations and their distinctive mechanisms, through which they impact organizational and individual outcomes.

**4.3 Study 2: Advice giving and receiving in formal and informal work relations –
Effects on job satisfaction**

4.3.1. Introduction

One of the most frequently studied attitudes in organizational research is job satisfaction (O'Reilly, 1991). Job satisfaction has received frequent attention in the management and career development literature, as it is thought to affect both organizational performance as well as employee wellbeing (e.g., Bowling, Eschleman, & Wang, 2010; Judge, Thoresen, Bono & Patton, 2001). Job satisfaction is defined as a pleasurable or positive feeling or affect, resulting from the evaluation of one's job and job experience (Locke, 1976). It has been associated with reduced stress and burnout (Siefert, Jayaratne, & Chess, 1991; Terry, Nielsen, & Perchard, 1993) as well as greater organizational commitment (Yoon & Thye, 2002) engagement (Brunetto, Teo, Shacklock, & Farr-Wharton, 2012) and lower job turnover (Lambert, Hogan, & Barton, 2001; Lee, 1988; Moynihan & Pandey, 2008).

While a plethora of studies have examined antecedents of job satisfaction, most of these research efforts have focused either on the role of extrinsic factors, or on individual characteristics (e.g., Loher, Noe, Moeller, & Fitzgerald, 1985). Factors such as industrial sector (Hanson, Martin, & Tuch, 1987), job characteristics (Judge, Bono, & Locke, 2000), job insecurity (Buitendach & De Witte, 2005), employee education and gender (Miller, 1980), age (Clark, Oswald, & Warr, 1996) as well as personality factors including core-self-evaluation (Judge, Bono, Erez, & Locke, 2005) and locus of control (Spector, 1997) are known to impact job satisfaction. However, studies investigating effects of the social network in which individuals are embedded are scarce. By employing a social network perspective, the current research aims to contribute to a better understanding of this relation by exploring how employees' formal and informal advice giving and receiving relationships impact their levels of job satisfaction.

4.3.1.1 Social networks and social capital

The basic premise of social network analysis is that the relational patterns or characteristics among a set of actors (e.g., individuals, teams, organizations) will partly explain individual and particular collective outcomes and behaviours (Wasserman & Faust, 1994). As previously discussed, when theorizing about the benefits of social networks, sociologists use the term "social capital"; an analogy to the resources conferred from physical and human capital (Coleman, 1988; Putnam, 1995). This prominent perspective assumes that relations to others give access to useful resources, and social networks are often considered to be a means to achieve individual goals that otherwise cannot be attained. The structure of social interaction is thought to impact the accessibility of critical organizational resources such as information (e.g., Brass et al., 2004; Granovetter, 1973; Sparrowe et al., 2001), as well as career support (Ibarra, 1995) and is consequently thought to have important behavioural, perceptual and attitudinal implications (Knoke & Kulinski, 1992). Together this suggests that such networks of relations may impact how individuals experience their employment and therefore their levels of job satisfaction.

4.3.1.2 Advice networks and employee satisfaction

One form of social capital is the work-related advice network, containing ties used to share work-specific information and knowledge. Employees who are central in advice networks (have numerous connections) are generally thought to have an advantage over those with fewer contacts. Indeed, previous research has shown that an employee's position in the advice network impacts access to vital resources (Burt 1997), organizational knowledge and performance (Morrison, 2002; Sparrowe et al., 2001) citizenship behaviour (Settoon & Mossholder, 2002) and perceptions of influence (Brass, 1984; Brass & Burkhardt, 1993).

Surprisingly, the association between social network position and job satisfaction has rarely been explicitly researched and the few existent studies yielded inconsistent results or/and fairly weak effects. Some studies have found a significant impact of social network on organizational behaviors and attitudes (e.g., Brass & Labianca, 1999; Burt, 2000; Feeley & Barnett, 1997; Feeley, 2000; Flap & Völker, 2001; Hurlbert, 1991; Kilduff & Krackhardt, 1994; Mossholder et al, 2005; Robert & O'Reilly, 1979 ; Susskind, 2007), whereas others have demonstrated negative, nonlinear, or no effects (e.g., Brass, 1981; Krackhardt, 1999; Labianca & Brass, 2006; Totterdell, Wall, Holman, & Epitropaki, 2004). In an early example of this research, Robert and O'Reilly (1979) found that employees that were relatively isolated in the communication network were less satisfied compared to more central employees. Similarly, Brass and Labianca (1999) show that, in small work groups, central actors tend to be more satisfied in comparison to peripheral actors. Flap and Völker (2001) argue that social networks impact job satisfaction; yet, they also stress that "different contents and structures of a network promote satisfaction with different aspects of one's job, especially with job rewards and relationships at work" (Flap & Völker, 2001, p.302). Further, Brass (1981) found no effect of network centrality on employee levels of satisfaction. In fact, centrality within the entire organization had a negative impact on satisfaction.

Again, the underlying assumption of many of those previous studies, considering effects of social capital, is that the bigger the network the better. Here we argue that, next to network size, in order to understand the relationship between advice networks and job satisfaction, the *type* of tie has to be taken into account.

Employees rarely connect purely voluntarily; instead, their social network structure tends to be strongly impacted by formal structures and work processes (Brass et al., 2004). That being said, sometimes employees build relationships that go beyond

the formal organizational structure. These ties can be characterized as "purely" informal. In the following it is suggested that there is a qualitative difference between formal and informal relations, and that this difference plays a significant role in how advice giving and receiving impacts employee satisfaction.

The present study seeks to add clarity, by considering whether advice exchange occurs between individuals that are formally required to work with each other, or whether they interact outside this formal work context. This resonates with suggestions by Podolny and Baron (1997) that organizational and workflow specific factors are contextual qualifiers of the effects of network characteristics on the employment experience. Specifically, in the present study we propose that particular gains associated with receiving, and costs associated with giving advice are higher in informal networks.

The contents of this research study will unfold as follows. First, benefits and costs of advice giving and receiving will be considered and their anticipated effect on job satisfaction. Second, the effect of type of tie –formal or informal –on the costs and benefits involved when receiving and giving advice will be discussed. Aside from documenting the impact of the different kinds of ties on advice giving and receiving, plausible causal mechanisms underlying these effects are offered. Second, drawing on data from a multinational professional services company we present the results of a study testing our hypotheses. We isolate the effect of advice ties occurring in a formally required setting from advice ties that are informal and examine their effect on job satisfaction. Subsequently, theoretical and practical implications are considered.

4.3.1.3 Advice giving and receiving: benefits and costs

Interestingly, the majority of studies on advice networks do not take into account the direction of advice (e.g., giving or seeking) even if they are two very different acts (Zagenczyk & Murrell, 2009). Yet, it is likely that advice-giving (network

in-degree centrality) and advice-receiving (network out-degree centrality) have very different effects on work-related attitudes.

Receiving advice, in particular, may affect how much an employee feels supported by the organization's social network (Soltis et al., 2013). Links to other employees provide access to new, diverse information (e.g., Rulke & Galaskiewicz, 2000) and an expansive advice network enables employees to access the right information in a timely way (Burt, 1992). Correspondingly, Morrison (2002) demonstrated that new employees with many advice ties have more organizational knowledge compared to new employees with smaller networks. Several streams of literature speak to the importance of access to co-workers to help promote social support and integration (O'Reilly, Caldwell, & Barnett, 1989) and to reduce work-place stress/strain and boost satisfaction (Apker & Ray, 2003; Ganster, Fusilier, & Mayes, 1986; Schyns & Croon, 2006). Salancik and Pfeffer (1978) suggest that employee attitudes are formed by information they receive through networks. Receiving advice provides individuals with social cues and information about organizational processes and events. This enables employees to better understand work-place specific norms and goals, which is likely to make their work more meaningful (Zagenczyk & Murrell, 2009). Moreover, individuals who receive advice have more alternative sources of job-related information, providing them with more options and hence more control over how they complete their work (Sparrowe et al., 2001). Lastly, receiving advice should also be related to higher levels of feedback, allowing employees to evaluate the effectiveness of their work. As feedback increases job satisfaction increases (e.g., Ercikti, Vito, Walsh, & Higgins, 2011, Hackman & Oldham, 1980).

The potential relationship between *giving advice* and job satisfaction is less straightforward and requires more comprehensive considerations. According to the social status perspective, giving advice increases the professional and social status of

the advice giver (Blau, 1979). Further, those who provide advice are likely to feel more in control over how they accomplish their work and the fact that they are approached for advice indicates that they are seen as knowledgeable (Settoon & Mossholder, 2002) or own information power (Brass, 1985). From a resource dependence or exchange theory perspective, people who control relevant resources, increase others' dependence on them, thereby acquiring expert and/or referent power and influence (Burkhardt & Brass, 1990; French & Raven, 1959). Consequently, giving advice may be an expression of referent power and influence, which can be leveraged in times of need (Agneessens & Wittek, 2012; Brass 1984). Sparrowe et al. (2001) concluded that advice giving positively impacts task and contextual performance, arguing that advice in-degree centrality (advice giving) is a form of contextual performance, allowing employees to attain knowledge useful for the completion of their own work. Similarly, Settoon and Mossholder (2002) showed that giving advice was positively related to both personal and task-based citizenship behaviors. Yet, numerous other researchers stress that network ties do not always produce positive outcomes (Brass et al., 2004; Cross & Prusak; 2002; Labianca & Brass, 2006; Riley & Eckenrode, 1986; Soltis et al., 2013; Stokes, 1983). Indeed, relational ties in the workplace can be a source of both social capital as well as social liability and as such social ties are not always beneficial (Soltis et al., 2013; Labianca & Brass, 2006). When employees are highly sought out for advice they may be overburdened because giving advice comes at a certain cost (Solits et al., 2013). Popular advice givers may frequently be distracted by requests requiring cognitively effortful task switching. Under that high demand, employees may become frustrated due to their inability to complete their own work (e.g., Cross & Prusak, 2002). Finally it has been suggested that the process of giving advice is cognitively burdensome due to the large amount of information that has to be processed, potentially

leading to "information overload" which is known to be harmful (Rader, 1981; Edmunds & Morris, 2000).

Taken to together, in general it appears that in terms of job satisfaction it is better to receive than to give (also see Zagenczyk & Murrell, 2009), with advice receiving having a more positive effect than advice giving. We denote this discrepancy between the costs of giving and the benefits of receiving advice as the *cost-benefit gap*. Consequently our first hypothesis is as follows:

Hypothesis 1: The effect of advice receiving on job satisfaction is positive and stronger (larger) than the effect of advice giving.

4.3.1.4 Type of tie and job satisfaction

Organizational theory generally acknowledges the role of both formal and informal structures and processes. Yet, existing literature seems to focus on either one or the other. While early research examining effects of organizational social structure appears to mainly focus on formalized arrangements and processes (Tushman &Nadler, 1978), more recently increasing attention has been drawn to the importance of informal social relations. Network research, in particular, emphasizes the importance of informal social structures operating "behind the organizational chart" as playing a significant role in shaping how work gets accomplished in organizations (e.g., Krackhardt & Hanson, 1993). Yet, this research often fully neglects the role of formalized organizational structures and processes. As put by McEvily, Soda and Tortoriello (2014): "The surge in scholarly attention to informal social structure... has created a sort of amnesia about the role of formal elements in explaining the functioning, performance, and nature of organizations" (p.302). Having said that, some researchers have started to acknowledge the concurrent existence and interplay between formal and informal aspects of organizations (McEvily et al., 2014; Soda & Zaheer, 2012).

In general, formal relationships - as represented via organizational charts - describe ties characterized by limited agency. Employees often have little influence in changing, building or dissolving those connections (Soltis et al., 2013). Formal communication channels follow workflow processes and are officially recognized by the organization (Anderson & Narus, 1984). Informal ties complement the formal structures of the organization by providing alternative routes to get work done, therefore playing a crucial role in organizational life (Crampton, Hodge, & Mishra, 1998). While formal networks are designed to serve job-specific or organizational purposes (Ogaard, Marnburg, & Larsen, 2008*),* informal networks are driven by homophily, agency and attraction and are frequently triggered by private purposes often acting as a source of organizational identity (Ibarra & Smith-Lovin, 1997; Kilduff & Tsai, 2003).

We expect that job satisfaction is shaped by both formal and informal connections serving as "channels" for retrieving and exchanging resources. Consequently, our approach considers advice relations in *both* formal and informal organizational structure and examines influences on employee's job satisfaction. Given the qualitative difference between formal and informal ties, the previously outlined costs and benefits of giving and receiving advice should differ depending on the type of tie. Building on this, we propose that benefits of receiving advice and the costs of giving it, are stronger in informal work-relations. While in formal networks giving and receiving are expected to have similar effects (a relatively small *cost-benefit gap*), in informal networks the *cost-benefit gap* is expected to be larger. Advice relations outside of the formal workflow offer higher returns but also entail potentially higher losses. In the following we explain probable mechanisms behind this expected *cost-benefit* discrepancy.

4.3.1.4.1 Benefit of receiving advice

We propose two mechanisms that are likely to increase gains of receiving advice if relations are informal. The first mechanism relates to the *perceived value* of advice received. Soltis et al. (2013) showed that the ability to seek advice from employees with whom one is not formally required to work with reduces employee turn-over intention. They suggest that receiving advice is a form of social support, which is perceived as more valuable if it occurs between people that are not required to work together. If advice is received from co-workers, one is formally required to work with, it is uncertain if this advice is given out due to a genuine desire to help rather than a sense of obligation, thus making it less "valuable". Receiving informal advice makes the employee feel that "he or she is being done a favor and perceives greater social support (Soltis et al., 2013, p.566). In short, the more advice is perceived as voluntary, as in the case of purely informal ties, the more valuable in the eyes of the receiver.

The second mechanism is concerned with the *diversity advantages* associated with brokerage (Burt, 1992; Granovetter, 1973). Individuals who bridge structural holes in the organization enjoy faster access to more diverse, non-redundant information (e.g.,Burt, 2002). Advantages of access to diverse contacts have been shown in numerous previous studies using brokerage as proxy for diversity gained from social capital (e.g.,Aral & Van Alstyne, 2011; Fleming, Mingo, & Chen, 2007; Burt, 2002). We argue that informal advice ties tend to be "bridging" ties, reaching outside of the immediate work team to various individuals in different corners of the organization. If this is true, informal advice relations should connect more heterogeneous individuals, who offer access to diverse and novel information. In other words, advice received through informal ties may not only be perceived as more valuable but may in fact be more valuable given the advantages enjoyed by brokers in intra-organizational networks.

4.3.1.4.2 Cost of giving advice

Two distinct mechanisms are expected to underlie higher costs of giving advice in informal networks compared to formal networks. The first is *unmet rewards*. As mentioned before, relations can be overburdening, in particular when they are relations that go beyond duty. Individuals sought out for advice by numerous employees may become overextended, especially if they perceive themselves to not be adequately rewarded by the organization for their extra efforts. This should be especially evident if this extra effort goes beyond what one is expected to be doing due to one's specific work role. Furthermore, informal advice giving may be more discreet and consequently more likely to remain unnoticed by superiors, resulting in a lack of real or felt recognition. Lastly and related to this, giving advice leads to feelings of entitlement to future benefits (Agneessens & Wittek, 2012). People are willing to give advice to others, expecting that the help will eventually be returned. We theorize that a potential lack of direct reciprocity is particularly harmful when giving informal advice, since it is not seen as a required part of a job role and individuals are not directly rewarded by the organization for doing so.

The second mechanism is *cognitive overload*. The burden of increased task-switching due to advice requests should be intensified by the fact that, as we argue, informal networks are more diverse. Higher diversity from advice seekers may translate into disparate needs and requirements on the advice giver and increase the cognitive efforts required to address them properly. In comparison, individuals who are formally connected are likely to be involved in similar projects and share similar goals. Advice givers should be able to give advice to those individuals more easily, since they are presumably working along similar lines. These advice relations are likely to be part of their job design and advice-giving obligations are derived from their specific role in the organization's workflow.

In short, we expect that in informal networks, effects of advice giving and receiving should be farther apart (larger gap) in in their effects on levels of satisfaction compared to formal networks (see Figure 26 for a graphical illustration). Perceived value and diversity make gains in satisfaction from receiving advice larger, while unmet rewards and cognitive overload increase cost and reduce satisfaction derived from advice giving.

Hypothesis 3: The cost-benefit gap between advice giving and receiving is significantly larger in informal networks.
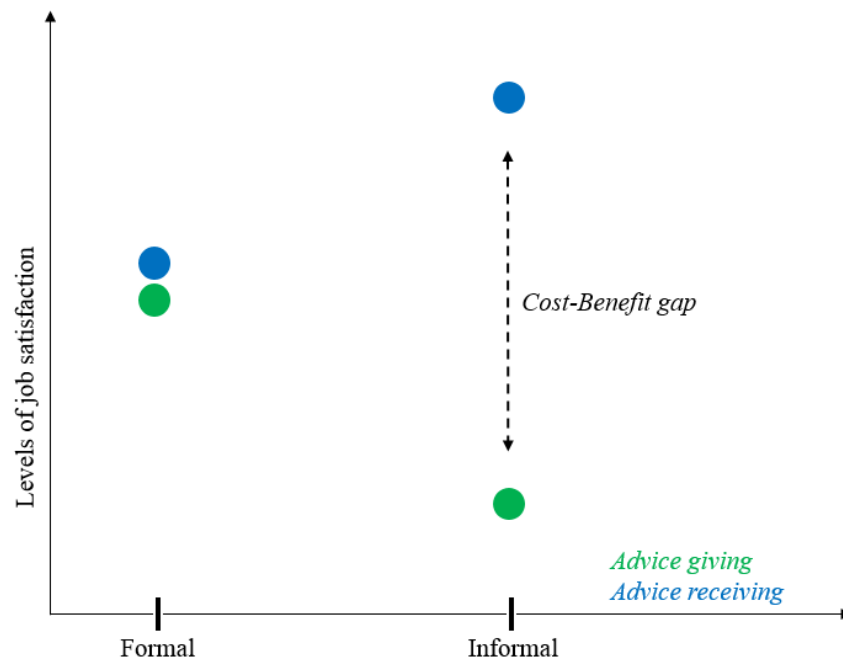
Figure 25. Expected *cost-benefit gaps* between giving and receiving advice in formal and informal work contexts.

4.3.2 Method

4.3.2.1 Participants

As in the previous study, the data was collected from two business units of a large multinational organization. There were 311 employees in the first business unit, of which 138 returned usable surveys (44.4%). The second business unit had 140 employees, of which 99 surveys were usable (70.7%).

4.3.2.2 Measures

Sociometric questions. In line with standard social network research practices, a name generation technique was used assess personal networks (quote some general reference on generators). The number of nominations was restricted to seven. Previous research has shown that as few as 5 names are sufficient to elicit reliable network data (Merluzzi & Burt, 2013).

Work-related advice network. Consistent with Borgatti et al. (1999), out-degree centrality in the advice network was defined as the total number of co-workers each employee reported to be a source of role- of task-specific advice. Similarity, in-degree centrality was defined as the total number of times an individual was identified to be a source of advice by others. As such, in-degree centrality represents employee advice giving and out-degree employee advice receiving. Specifically, we asked participants to indicate up to seven co-workers they typically turn to for role or task specific advice – people who are thought to have expertise in the areas that are important to the kind of work they do. We explicitly isolate formal from informal advice receiving and giving relations to uncover potentially divergent effects on job satisfaction. We will refer to these as formal and informal advice ties, which does not mean that advice receiving or giving is necessarily formally required. Rather, it simply defines the context in which the advice relationship is embedded.

Required ties. To capture if ties are voluntarily or required, an online table was populated with the names people indicated in the previous network question. Participants were asked to tick a box next to the name if they were required to work directly with this person to get their work done? (E.g.,receiving inputs, providing outputs or formally reporting).

Job satisfaction. Job satisfaction was measures using the overall job satisfaction scale of the Michigan Organizational Assessment Scale (Cammann et al., 1979). Items were "In general, I like working here", "In general I don't like my job" (reverse scored), and "All in all, I am satisfied with my job." The scale was highly reliable with a Cronbach's alpha of .89.

Control Variables. Several demographic controls which might have an impact on how social network characteristics affect job satisfaction were taken into consideration including gender, department, organizational grade and tenure.

4.3.2.3 Procedure

As in the previous study a survey was conducted including demographic, attitudinal, job specific and sociometric (network) items. E-mails were sent out with information regarding the purpose of the study and how to participate. Participants clicked on a link directing them to an online survey, which took seven minutes on average. The HR department continuously followed up with employees to boost participation.

4.3.3 Results

4.3.3.1 Descriptive statistics and correlations

Table 34 presents the means, standard deviations, and correlations among variables used in the multiple regression model (Table 35). Network variables appear to be only mildly positively correlated. Job satisfaction is positively correlated with formal advice giving and informal advice receiving.

Table 34

Correlations between network measures (N=209)

		M	StD	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	Gender	.38	.49	.23***	-.12**	-.09	-.12**	-.05	-.07	-.04	-.08
(2)	Sample	1.32	.47	1	.02	.03	-.02	.26***	-.02	.27***	.16**
(3)	Grade	3.26	1.44		1	.60***	.46***	.31***	-.01	-.06	.08
(4)	Tenure	5.96	6.15			1	.36***	.35***	-.04	-.03	.09
(5)	Formal advice in	.60	1.10				1	.37***	.16***	.01	.16**
(6)	Informal advice in	1.20	1.95					1	.02	.21***	.09
(7)	Formal advice out	.61	1.15						1	.19***	.06
(8)	Informal advice out	1.20	1.83							1	19**
(9)	Job satisfaction	5.04	1.34								1

Note: *p < .05, **p < .01, ***p < .001

4.3.3.2 Regression analysis

Results for the multiple regression analyses are summarized in Table 35. Three models were tested. Model 1 was run with only control variables. Model 2 included advice receiving and giving measures. Model 3 separated advice receiving and giving measures used in Model 2 into formal and informal. In line with previous literature, advice receiving positively predicted job satisfaction (Model 2) yet, advice giving had no statistically significant effect. When separating formal from informal ties (Model 3) informal advice receiving ties continued to have a statistically significant positive impact, while informal advice giving turned out as a slightly negative predictor. Surprisingly, formal advice giving had a statistically significant positive effect on job satisfaction, while effects of formal advice receiving were weaker but still positive. Most importantly, results lend support for our hypothesis that only in informal relations, advice giving and seeking significantly differ in their effects on job satisfaction.

Table 35

Results of a multiple regression predicting job satisfaction

	Model 1		Model 2		Model 3	
	β	t	β	t	β	t
Gender	-.13	-1.83	-.10	-1.37	-.01	9.91
Sample	.18**	2.62	.16*	2.18	.18**	-1.40
Grade	.06	.75	.04	.40	.02	2.43
Tenure	.04	.42	.02	.19	-.02	.21
Advice giving			.05	.61		
Advice receiving			.19**	2.68		
Advice giving (Formal)					.18**	2.19
Advice receiving (Formal)					.10	1.41
Advice giving (Informal)					-.05	-.68
Advice receiving (Informal)					.17**	2.29
R-Square	.05		.09		.11	
Adjusted R-square	.03		.06		.07	
	$F (4, 209) = 2.61$; p=.037		$F (6, 209) = 3.14$, p =.006		$F (8, 209) = 2.96$; p =.004	

Note: *$p < .05$, **$p < .01$, ***$p < .001$ (1-tailed). For the sake of model parsimony and rational (there was no significant effect of team membership on satisfaction) we did not include the team membership in our analysis.

4.3.3.3 Additional analysis

To test H2 more directly a Wald test was conducted comparing the unrestricted Model 3, with a restricted model in which the coefficient for advice giving was set to be equal to the coefficient of advice receiving. The results of the test suggest that the difference between advice receiving and giving was statistically significant at the .05 level only for informal relations. In other words, as hypothesized, the size of the cost-benefit gap is only significant when considering informal relations.

Furthermore, an additional piece of analysis directly tested our assumption that informal advice networks tend to be more diverse compared to formal networks. Diversity was assessed by considering an individual's formal and informal contacts and counting the number of distinct categories (for the team and rank variable) present. Gender diversity was established considering the percentage of men in the network. Table 36 shows a series of t-tests demonstrating a consistent pattern of results, evidently suggesting that contacts in informal networks tend to be more diverse.

Table 36

Advice network diversity in formal and informal work contexts

Type of Diversity		Sample 1			Sample 2		
		M	*St D*	*T-test result*	*M*	*St D*	*T-test result*
Diversity (*Formal*)	Grade	1.95	1.01	t (149) = -3.45; p <.001	2.08	.99	t (222) = -1.42; p =.07
Diversity (*Informal*)	Grade	2.60	1.19		2.27	1.07	
Diversity (*Formal*)	Gender	.80	.26	t (149) = -6.97; p <.001	.87	.21	t (222) = 2.10; p =.017
Diversity (*Informal*)	Gender	.69	.26		.81	.23	
Diversity (*Formal*)	Team	1.53	.80	t (149) = 2.79; p =.003	1.13	.42	t (222) = 1.10; p =.135
Diversity (*Informal*)	Team	2.78	1.23		1.19	.44	

Note: Diversity Gender; values closet to zero indicate greater diversity

4.3.4 Discussion

The general aim of the present study was to take a more nuanced look at the relationship between intra-organizational advice ties and job satisfaction by considering the context in which advice relations occur. The study contributes to the literature in several important ways. On a broader level, we illustrate the importance of considering the direction of advice relations as well as the type (formality) by showing differential effects advice giving and receiving, in formal and informal contexts, on employee attitudes. While a plethora of previous studies has focused on the size of the advice network (i.e. degree centrality), fewer studies have distinguished between in- and out-degree (giving and receiving), and even less on differentiating formal and informal

advice relations. Consistent with previous research, emphasizing that an employee's position in advice networks has important consequences (e.g., Brass et al., 2004), results of the current study further clarify under which conditions giving and receiving advice is likely to beneficially or adversely affect job attitudes. The study's main contribution however, is to show that costs and benefits of giving and receiving advice are more pronounced in informal, compared to formal networks. As hypothesized, giving and receiving advice have similar impacts on job satisfaction in formal networks. However, in informal networks effects of giving and receiving advice significantly differ. Receiving, more than giving, positively impacts job satisfaction and effects are particularly strong when informal ties are considered. Interestingly, findings show that the gap not only is smaller in formal networks, but that *giving more than receiving* has a positive impact on satisfaction (see Figure 26, orange circle).
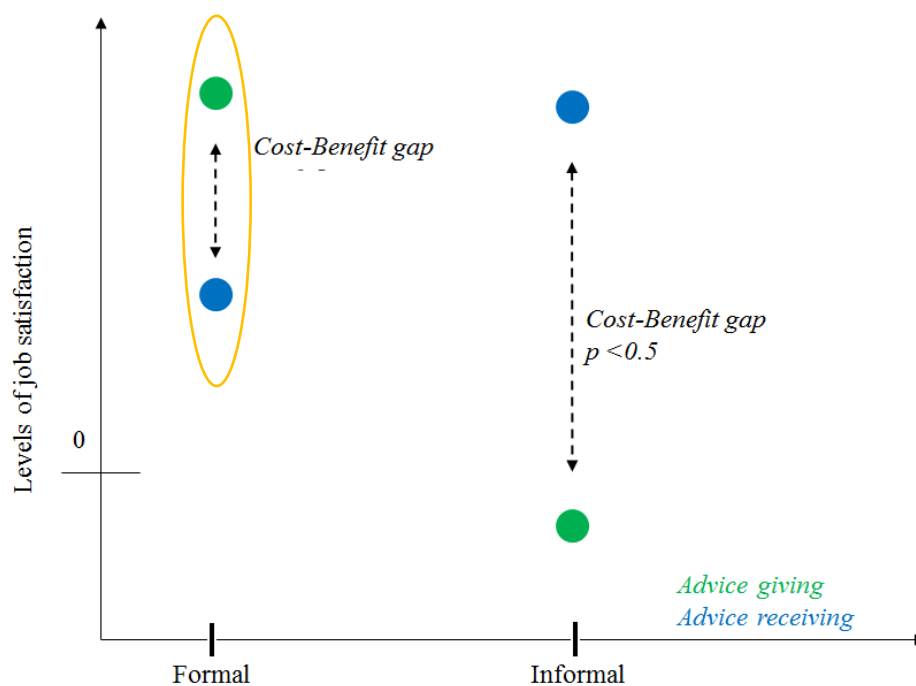

Figure 26. Cost-benefit gaps between giving and receiving advice in formal and informal work contexts.

4.3.4.1 Managerial implications

The present research provides various practical insights. On a broad level, for a human resource manager, the findings signal that a potential benefit may accrue from supporting employees to strategically strengthen their social network. As advice giving and receiving is associated with employees' job attitudes, it is important to attend to the power of how an employee is integrated in the advice network of an organization, *both in terms of costs and benefits* - there is no "free lunch". In other words, results should encourage an awareness that employee may be central in an advice network, but not necessarily more satisfied. Consequently, exclusively stressing the quantitative aspect of networking – the more the better – is unlikely to be beneficial. Rather, *both* organizational formal *and* informal processes have to be considered to understand the effects of personal networks on employee's work satisfaction.

The data available allowed us to conduct a further piece of analysis which gave support to one of the potential mechanisms proposed to be underlying this relationship. Table 36 in the results section suggests that informal networks are indeed more diverse (in terms of gender, team and grade). Consequently, creating a culture were informal advice seeking is psychologically safe, encouraged and positively rewarded is likely to have a positive effect on job satisfaction and job related outcomes in general. The finding that informal advice giving did not show a positive effect of course poses a slight dilemma; yet, the benefits of informally receiving advice appear to outdo the potential burden of giving informal advice. To further minimize this potential burden of informal advice giving, managers should try to understand who is giving advice, to provide additional support and recognition. As such, organizations may need develop a sensitivity in spotting and rewarding (by pay or praise) those workers who

give informal advice, since their efforts are easily overlooked. Lastly, acknowledging these efforts by making informal advice giving and mentoring a part of people's job design appears promising.

4.3.4.2 Limitations and future research

The study has various limitations potentially constraining generalizability and warranting some caution in the interpretation of findings. Results are limited to self-report attitudinal data. However, network measures, in particular advice giving, were based on data reported by others, reducing the likelihood of single-source biases (Sparrowe et al., 2001). Furthermore, as the current research depends on cross-sectional data, no causal conclusions can be made. The theoretical perspective in this study implies that network structure precedes attitudes. Most network literature considers social network variables as antecedents to personal or group outcomes (Brass et al., 2004), yet, of course, we cannot rule out that this relationship is reciprocal or reverse. For example, it is possible that satisfied employees are more motivated to make the extra-effort to reach outside of the formal network. Furthermore, since this study took place in a highly traditional, hierarchical organization it may not be generalizable to more decentralized organizational structures. The great importance and salience of the formal structure may have biased our results. In organizations with flatter, decentralized structures, it may well be that the qualitative difference of formal and informal ties is minimized. Replication in various other organizations is needed, as network variables are likely to have different consequences dependent on the context.

The current work offers numerous avenues for future research. Very little longitudinal research has considered whether an employee's network characteristics influences his or her attitudes or whether attitudes impact network position. This could address the limitation of outstanding uncertainty about causality between networks and

attitude variables. As such, future studies should consider a longitudinal research design exploring the causal ordering of social network characteristics and employee attitudes. The fact that formal (but not informal) advice-giving and informal (but not formal) advice- receiving is positively associated with job satisfaction suggests that formal structures may bring about an interesting trait-off. Extending the comparison of formal vs. informal ties to other outcomes such as performance, is a natural next step to this study. For example, examining under which conditions advice ties inside or outside the formal workflows are more or less beneficial, could be one fruitful approach. It seems plausible, that if one needs to coordinate action (a task focused on productivity and efficiency within ones workgroup) formal ties appear more beneficial. On the other hand if innovation and creativity is part of the job, a bigger, more diverse informal network may be beneficial since the greater diversity of information that comes with these networks is known to enhance capacity for innovation and creative problem solving (e.g., Burt, 2000). Although we proposed four mechanisms (i.e., perceived value, diversity, unmet rewards and cognitive overload) that may account for the cost-benefit gap, we didn't test them directly. Future research can focus on this and provide more compelling evidence on the causal paths underlying the differences in formal and informal ties we document in the present study. Lastly, findings from the present study indicate that the type (or combination) of ties is important in shaping job attitudes. While we considered formal and the advice networks, future research might consider other social relations, such as expressive ties (e.g., friendship, social support) or negative/adverse ties to explore unique effects of them occurring by themselves or in conjunction.

4.3.4.3 Conclusion

To conclude, advice relations can positively impact work engagement. Importantly the strength of this effect appears to be contingent on their existence inside or outside the formal organization. Consequently, our study highlights the importance of considering the interplay of various social relations - rather than viewing them isolation - allowing for the possibility of divergent effects depending on their co-occurrence.

CHAPTER 5: GENERAL DISCUSSION

5.1 Overview

During the last decade, SNA theory and practice has gained attention, experiencing a substantial development and rapid expansion into various different research fields. At its best, SNA draws from research and theory in sociology, psychology and other fields to describe how interpersonal relational patterns are related to different cognitive, attitudinal and behavioural outcomes.

The various chapters reflect on how individual differences influence network positioning and outcomes, how people perceive themselves and social relations, the perceptual inaccuracies they may experience and finally on the role of network qualitative (rather than purely quantitative) characteristic in an organizational setting. Different from previous research in the social network literature, which defined actors purely by the structural position they occupy, the emphasis in this thesis was focused on the individual and his/her psychological characteristics and their distinct ways of building and perceiving social relations. In other words, we aimed to highlight the role of the individual in the context of social network structuring. Using a diverse range of theoretical and empirical research, the goal was to promote a more integrated view on social relations and their associations with individual (social) perceptions, attitudes and individual differences.

In this last chapter, the key questions addressed in this thesis will be revisited. Central themes and theoretical, methodological and practical research conclusions will be highlighted. Furthermore, the most important limitations are outlined and implications for future research are proposed.

5.2 Summary of research findings

5.2.1 Integrating SNA and Psychology

The human system exhibits an exceptionally high level of interplay between its various "elements": cognition, emotions, actions, social relationships, etc. This notion presents a key challenge to psychological research. Due to methodological requirements, psychological processes tend to be studied in isolation. Yet, outside the lab, every psychological process is, in one way or another, related to everything else. Prior research has successfully torn apart the various human system "elements" to assess their functioning in isolation, yet, there are relatively few efforts concerned with putting the system back together. This issue has often been brought up together with calls for more holistic and interdisciplinary research efforts. Such calls have frequently been ignored, primarily due to a lack of a feasible methodology. However, in recent years, this lack of methodological tools, is slowly being addressed by current research efforts on complex systems and social networks. These fields offer a considerable range of systematic, precise, and scientifically recognized methods allowing social scientists to consider and assess how an individual is embedded in a social structure.

Chapter 1 of this thesis, picked up on this notion and introduced SNA as a distinct research approach – due to its relational nature - within the social and behavioural sciences. It was proposed that taking into account network characteristics, rather than only individual level data, will offer a more comprehensive approach to understanding human cognition and behaviour. In addition to this, the importance of understanding SNA *measures of position* was emphasised and a three-level-framework, integrating various key measures of network position, has been offered. The proposed approach was constructed with the aim of providing a general framework, enabling researchers to, step-by-step engage in content-related considerations, to arrive at a theory-fitting measure of

social network positions. This should help to avoid confusion, promoting a better, more discriminate understanding among researchers and practitioners from various disciplines. Additionally, we hope that the framework proofs useful at facilitating discourse within and between different research fields concerned with antecedents and outcomes of network positioning.

5.2.2 The psychology of network differences

There has been a long-lasting research gap between network scholars emphasizing the relevance of characteristics of the social structure and scholars focusing on personality and individual differences (Kilduff & Tsai, 2003). Chapter 2 attempts to integrate these two research approaches, connecting individual differences to network structure. Specifically, this chapter examined antecedents and consequences of (cognitive) social network structures.

Results of the first study suggest a stable positive association between Extraversion and perceived network *density*, *bridging (brokerage)* and *centrality*. Furthermore, Agreeableness appears to be positively related to perceived network *density* and *reach*. These results are interesting, especially in light of the notion that perceptions of network advantages may be more important than actual network realities in predicting outcomes of importance. Consistent with this idea, we further demonstrated that social network perceptions moderate the relationship between some personality trait and subjective wellbeing. Moreover, differences in general *personal network* perceptions and perceptions in a *work-specific setting* were considered. Findings revealed that in the work-specific setting, traits including Conscientiousness, Self-esteem and Promotion Focus were positively related to perceived *network bridging*.

INDIVIDUAL DIFFERENCES IN PERSONALITY AFFECT HOW PEOPLE PERCEIVE THEMSELVES IN SOCIAL NETWORKS. THIS PERCEPTION IMPACTS HOW PERSONALITY IS RELATED TO PERSONAL OUTCOMES SUCH AS SUBJECTIVE WELLBEING.

Study two of this chapter considers how the Big Five personality traits may act as precursors of different social relations in student networks. Using the relational dyad as unit of analysis, we attempted to validate previous literature, investigating to what extend personality traits influence the likelihood of selecting and attracting network ties. Additionally, personality homophily effects were considered. Prior research, investigating these associations has yielded conflicting empirical evidence. Overall, our findings are similarly inconsistent. Results reveal that while extroverts select more people to be their friends and have a higher propensity to trust, conscientious individuals trust others less and tend to seek advice less frequently. Similarity in Extraversion was found to be positively related to the presence of advice and friendship ties. Furthermore, similarity in Openness was positively associated with the presence of advice ties, while similarity in Neuroticism seems to make friendship more likely.

BIG FIVE PERSONALITY DIFFERENCES AFFECT NETWORK CHARACTERISTICS. YET, EFFECTS ARE SMALL AND INCONSISTENT. THE INTERPLAY BETWEEN INDIVIDUAL BASED AND SOCIOMETRIC VARIABLES SEEMS TO BE MORE COMPLEX THAN PREVIOUSLY ASSUMED.

Study three was concerned with the question of whether differences in motivation explain the extent to which individuals take advantage of social network opportunities. In an organizational context, it was explored how social needs that motivate employees — affiliation, dominance, autonomy and achievement—are related to degree centrality and brokerage, the most well-known structurally beneficial positions in

organizational social networks. No support was found for a significant effect of any of the four motivational strivings on social network positioning.

CONTRARY TO WHAT WAS EXPECTED, MOTIVATIONAL VARIABLES WERE UNRELATED TO NETWORK CHARACTERISTICS. RATHER THAN ATTRIBUTING THIS TO THEORETICAL REASONS, EXCEEDINGLY CAREFUL METHODOLOGICAL CONSIDERATIONS APPEAR NECESSARY.

The last study of this chapter examined how individuals with high levels of political skill may differ in their social networking style in organizations. Individuals with high political skill showed a preference to occupy bridging positions, actively striving to maintain the separation between network contacts. Furthermore, politically skilled individuals were more likely to perceive themselves in bridging positions in their organization, even after controlling for perceived network centrality (size). A partial mediation model demonstrated that political skill affects job attitudes directly and indirectly through perceived network characteristics, both bridging and centrality.

POLITICAL SKILL, IS ASSOCIATED WITH PREFERENCE OF BRIDGING POSITIONS AND PERCEPTION OF OCCUPYING STRUCTURALLY ADVANTAGEOUS NETWORK POSITIONS. AS IN STUDY ONE, THIS PERCEPTION SEEMS TO AFFECT HOW POLITICAL SKILL IS RELATED TO PERSONAL OUTCOMES (I.E. JOB ATTITUDES).

5.2.3 Social perceptions and network realities

SNA reveals the social structure beneath the content of social relations, yet, so far, has neglected the potential importance of perceptions. As has been established in chapter two, network perceptions are important in their own right, directly influencing certain personal outcomes such as wellbeing and job attitudes. With three studies, chapter three aimed to demonstrate the importance of social (network) perceptions and how they might interrelate with social network realities.

Study one in chapter three was concerned with effects of self-monitoring and perceived similarity on popularity in friendship and advice networks. Many preceding studies have established effects of self-monitoring personality in shaping social network structure. Yet, so far, the mechanism underlying this association remained unexplored. In a three-wave social network study, it was shown that high self-monitoring scores are associated with higher levels of perceived similarity, as reported by others. It was theorized that this perception of similarity increases the likelihood of being considered a friend and being asked for advice. Results suggest that perceived similarity, (at least partially) mediates the relationship between self-monitoring and popularity (in-degree centrality) in friendship and advice networks.

PERCEIVED SIMILARITY EFFECTS APPEAR TO (PARTIALLY) EXPLAIN THE WELL-ESTABLISHED EFFECT OF SELF-MONITORING ON IN-DEGREE CENTRALITY. INDIVIDUALS HIGH ON SELF-MONITORING ARE ATTRACTIVE INTERACTION PARTNERS, BECAUSE OTHERS PERCEIVE THEM TO BE MORE SIMILAR TO THEMSELVES.

In study two we considered perceived popularity as a moderator between friendship and its interpersonal consequences. The research investigated how perceived popularity affects the relationship between friendship and interpersonal outcomes including advice seeking, trust and perceptions of competence. Results demonstrated that the relationship between friendship and interpersonal outcomes is weaker if perceived popularity is high (i.e., friendship and perceived popularity were found to interact negatively with respect to their effect on interpersonal outcomes considered). Findings suggest that beneficial effects typically associated with friendship, are reduced when the target is considered highly popular. Two explanations have been offered. Firstly, that perceived popularity indicates that the friendship is of instrumental, rather than expressive nature, because individuals befriend these popular others to enhance their own popularity

("basking in reflected glory"). Secondly, that prior research has related perceived popularity to dominance, aggression and distrust. Both factors are thought to undermine positive interpersonal outcomes, typically associated with friendship.

PERCEPTIONS OF HIGH POPULARITY APPEAR TO AFFECT THE QUALITY OF A FRIENDSHIP RELATION. THE ASSOCIATION BETWEEN FRIENDSHIP AND OTHER INTERPERSONAL OUTCOMES (I.E. ADVICE SEEKING, TRUST AND PERCEPTIONS OF COMPETENCE) IS WEAKER IF THE FRIENDSHIP TIE IS ACCOMPANIED BY PERCEPTIONS OF HIGH POPULARITY.

There is a wide-spread recognition that mental representations of social networks are not accurate real world projections, but are biased by memory, motivation and personal desire. The last study of this chapter was concerned with the effects of power and prestige on perceptual accuracy of social network relations. For both, power and prestige, self- and peer- perceived measures were considered. Correlational analysis indicated negative relationships between measures of power and prestige with perceptual accuracy in friendship networks. Yet, when predictors were entered into a multiple regression model, only dispositional power (self-perceived power) remained a significantly negative predictor of perceptual accuracy. Predictions were tested using Cognitive Social Structure (CSS) network data collected from three different samples.

INDIVIDUALS HAVE A DECREASED ABILITY TO ACCURATELY PERCEIVE SOCIAL NETWORK RELATIONS, IF THEIR PERSONAL SENSE OF POWER IS HIGH.

5.2.4 Job attitudes – considerations on network quality

Previous research has typically assumed that bigger networks are better. Chapter four questioned and empirically tested this notion. It is demonstrated that, next to network size (i.e., tie quantity) various qualitative characteristics of social network

relations are crucial to gain a more comprehensive and accurate understanding of how social relations are related to organizational outcomes.

Results of the first study suggested that while simplex advice ties have no significant effect on employee engagement, the co-occurrence of these ties with more personal discussion ties, significantly impacts how engaged employees felt. Furthermore, the study demonstrates that the presence of strong, frequently activated ties is associated with higher levels of employee engagement.

ADVICE TIES ARE POSITIVELY ASSOCIATED WITH EMPLOYEE ENGAGEMENT ONLY WHEN CO-OCCURRING WITH MORE PERSONAL TIES. AVERAGE FREQUENCY OF RELATIONAL TIE ACTIVATION WAS ALSO SIGNIFICANTLY POSITIVELY ASSOCIATED WITH INCREASED LEVELS OF ENGAGEMENT.

Findings of the second study show that while in formal work settings both giving and receiving advice have a similar impact on job satisfaction, in informal work settings effects of giving and receiving advice differ from one another in a way that receiving advice had a significantly more positive effect compared to giving it.

COSTS AND BENEFITS OF GIVING AND RECEIVING ADVICE ARE MORE PRONOUNCED IN INFORMAL, COMPARED TO FORMAL NETWORKS.

Both studies point to the importance to not view relations in isolation, but to consider their interplay and possible co-occurrence, and with this, the possibility of different effects on organizational outcomes.

5.3 Key limitations and future research

In this section recurring and general patterns of limitations, relevant to the research studies of this thesis are discussed. The *general limitations* section (5.3.1), shortly summarizes common research limitations the thesis is subject to. The *SNA specific limitations and considerations* section (5.3.2), focuses on fundamental methodological

issues particularly with respect to SNA study design, data collection/analysis, as well as general assumptions made.

1.3.1 General limitations

In a few of the studies the **sample size** is rather small for conducting some of the analysis (e.g., OLS regression). Larger samples should be considered in order to obtain more reliable results. Related to this, for the sake of **model parsimony**, we were not always able to include all the variables that may have been important to fully understand the influence of individual and network variables. Therefore, caution should be exercised in generalizing the results. The **external validity** of some of the studies in this thesis suffered from traditional case-study limitations. Samples tend to represent only one type of group or organization indicating that results may not be generalizable beyond the selected sample. Network studies, in particular, are difficult to generalize, since contextual features tend to be unique. A further limitation most of the studies are subject to, is their reliance on the **survey methodology** and self-report data and the single source bias (common-method) associated with this. To remedy this limitation, most network measures used, were also based on data reported by others (e.g., in-degree centrality), reducing the likelihood of single-source biases (Sparrowe et al., 2001). A **cross-sectional design** was used in the majority of studies in this thesis, which does not allow to test the direction of the causal argument. In general, social network studies, involve non-experimental and non-longitudinal data, making it impossible to clearly establish causal paths among the variables. Lastly, we can only attribute relatively **small effects** to the network variables considered. Actual (as opposed to perceived) network variables only explained, if at all, a very small amount of the variance. However, this is in line with prior social network research (e.g., Fang et al., 2015). Importantly, this is suggesting either

fundamental measurement and methodological issues or simply the presence of other factors that are more important than social network variables.

5.3.2 SNA specific limitations and considerations

Network Analysis requires a high **response rate** (>50%), since missing a few significant actors may greatly bias results (Tichy, Tushman, & Fombrun, 1979). SNA is much less forgiving of **missing data** compared to other research forms**.** This causes mathematical problems, especially with small networks. For example, in a network of five actors betweenness centrality can give very different results if only one actor is removed (i.e., the most peripheral actor becomes the most central; Marschall, 2007). Throughout the thesis, response rates were acceptable. Yet, the relatively low response rate in chapter four raised some concern. Hence, results should be interpreted with some caution. **Defining network boundaries** is another major challenge in SNA research. Complete networks, are based upon links, which exist between entities within a predefined and bounded population (e.g., school class, town, organization). This excludes potential important peer relations outside of that population. It may be that an association between an individual level variable, such as their personality, and a network variable does exist, but may not manifest itself when only considering one particular network of an individual. This may lead to flawed results and premature conclusions. Another important, and often overlooked issue is how to mathematically deal **with node strength** (i.e., node centrality in weighted social networks). Generally, to capture node strength, degree centrally is extended by simply adding up the weights of ties (e.g., activation frequencies from 1 (less than once a month) -7 (every day)) (Opsahl, Agneessens, & Skvoretz, 2010). Yet, this is a fairly blunt way of measuring node strength, because it fails to capture the number of ties which is the main feature of most degree centrality measures (Freeman, 1978). This limitation is highlighted for degree centrality by the three

ego networks in Figure 26 below. The three people (A, B & C) have very similar interaction frequency (weighted in-degree is roughly the same). However, if Freeman's (1978) original degree centrality measure is used, person A has a score that is almost 5 times larger as person C's.
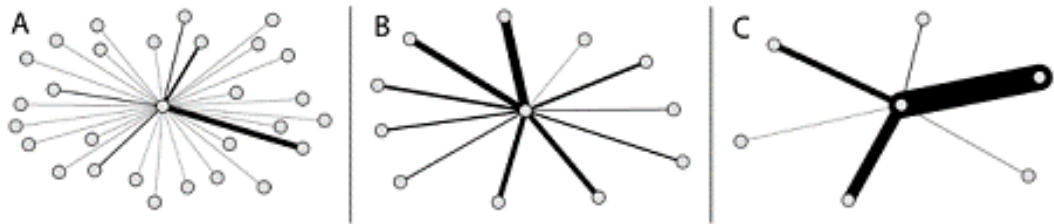

Figure 27. Ego networks of three people (A, B &C). Tie width corresponds to tie weight (e.g.,interaction frequency). Adapted from Opsahl et al. (2010).

Another crucial point is the importance of carefully considering the **rhetoric way network questions are formulated**, when investigating antecedents and consequences of an individual's network features. Because of the specific character (i.e. usually one-item) of social network questions measuring complete social networks, special attention is needed for their construction in terms of question formulation. For example, in most social network research, network questions are neither phrased in a strictly hypothetical nor factual way. Typically, researchers simply ask: "Who do you go to for advice/information/social support?" Even though this should theoretically tap into factual past behaviour (this is what is widely assumed), it is somewhat unclear and ambiguous. Who do you go to for advice formally? ... typically? ... in theory? ... in practice? ... tomorrow? Added to this, a fundamental issue in network data collection concerns **accuracy** (Borgatti & Cross, 2003) with past research indicating that respondents have difficulties to accurately recall with whom they have interacted (Bernard, Killworth, & Sailer, 1982) showing considerable biases (Freeman, Romney, & Freeman, 1987). It is therefore all the more important to be very explicit in the way

network questions are phrased, carefully adapting them with respect to the particular

research question in mind. This issue is essential, since small linguistic differences in

the network question asked, may yield very different results when subsequently linking

individual network metrics to antecedents or outcomes. For instance, the previously

mentioned question of hypothetical versus factual ties in social networks may be more

important than previously acknowledged. By asking participants who they would go to

for advice - as has been done in previous research (e.g., De Lange, Agneessens &

Waege, 2004; Krackhardt, 1987; Krackhardt & Porter, 1986; Krackhardt, 1999; Soltis et

al., 2013) to derive at the network of interest - the number of people to which an

individual *would consider turning* to if they are in need of personal or job-related

support is likely to be captured (which is technically hypothetical in nature). No

reference is made to what factually has occurred in the past. Although some people may

consider, or even have the intention, to approach a person, they may not take any action.

Previous research has addressed this issue by asking respondents to think back in time

(i.e., over the last three month) and to specify the people they have actually approached.

Yet, there are two likely problems when asking the question in a way assessing actual

past behaviour. This method may be prone to recall errors and secondly rather than

being indicative of the availability of support, it may be more an indication of being

confronted with a certain problem or situation (De Lange et al., 2004). Yet, asking

about the factual and not just hypothetical number of employees one seeks out, gives a

higher level of certainty that personal support or advice was actually sought out (and

likely given). As part of a bigger project, we asked two hundred full or half time

employed US participants to think of their job and they were asked to write down all the

people they *would consider turning to* for personal support or advice (explicitly

hypothetical) followed by a question assessing the number of people who *were actually*

approached for personal support or advice in the last three month (explicitly factual). Hypothetical support or advice seeking was significantly positively related to job attitudes (satisfaction and intention to stay in the organisation), yet, factual support or advice seeking had a significantly negative association. It appears that hypothetical advice or support seeking may reflect the size of the potential social support network perceived by an individual, leading to more positive job attitudes. Factual support or advice seeking refers to the number of people one actually has turned to. We found this metric to negatively affect job attitudes. This appears sensible, since actively seeking out for personal support is often a result of personal problems which is likely to be linked to tend negative job attitudes (see Faragher, Cass, & Cooper, 2005 for a review). Thus, rather than advice seeking negatively impacting job attitudes, it seems more likely, that the underlying motivation for the factual seeking of personal support causes dissatisfaction in the workplace. Taken together there appears to be a need to (more) carefully consider the rhetoric way network questions are formulated. The standard way of asking question may be ambiguous and may be understood in various ways leading to inconsistent results. Making inferences based on factual questions may be misleading since one might have approached someone in the past for advice, yet that person (consistently) failed to give good advice and therefore (e.g.,a poor manager), based on this experience, they would not go back in the future. On the other hand, if the question is asked in a hypothetical rather than factual way, people who have never been approached but are merely perceptually suitable may appear as central in the network. Further research is necessary investigating the problem of which questions are suitable for acquiring what kind of information in social networks.

One further point scholars tend to neglect is that the order in which those network questions are asked may impact how respondents answer them. As pointed out

by Pustejovsky and Spillane (2009), multiplex social network data might be vulnerable to **question-order effects** (i.e., the order in which the questions are presented – advice followed by friendship or vice versa – may influence who is nominated) such as priming, satisficing, respondent fatigue, and training effects. For example, if a friendship network is asked before the work-related advice, people may not nominate the same people in the work-related advice network, even though they are the people most often approached for work-related advice. This may be because they are thought of as friends in the first question and are not recalled again in the more professional setting (i.e., priming effect). In other words, if the work-related advice network would be asked first, people may be more likely to nominate their friends, than if the questions are asked in the opposite order. Lastly, **size reduction and transformation procedures**, common in published SNA studies, often significantly influence results. Size reduction, refers to the loss of data points due to the sampling method and transformation refers to the process where researchers manipulate data by using techniques such as block modelling, dichotomisation or symmetrisation. These transformation procedures tend to significantly impact the data and its meaning, which is fatal, in particular if a solid theoretical reasoning for the particular transformation procedure used, is lacking.

Taken together, it appears that current network methods are producing somewhat questionable results. It seems that various approaches to data collection may colour results in a certain way. Furthermore, they tend to have numerous implicit assumption. As such, in spite of the increasing popularity and success of modern social network analysis, there appear to be numerous a basic fundamental issue that need to be addressed to allow for a more systematic treatment of error and biases in social network data collection and analysis.

5.3.3 Future research

5.3.3.1 Conceptualization and measurement of social position

As outlined in chapter one, numerous different definitions of network position exist, together with a myriad of theoretical assumptions, mathematical algorithms, methodological procedures, analytical programs and, ultimately, conclusions drawn. In the future, we hope to see research that **systematically** examines how various *local* and *global* measures of network position (as described in chapter one) contribute to outcomes of interest. Future work should promote the use of a consistent framework of network positioning, integrating the range and complexity of structural concepts. This would also be the first step towards a more discriminating research approach of social phenomenon, using precise methodologies and analysis directly connected to specific hypotheses, prior empirical research and theoretical arguments.

5.3.3.2 Actual and perceived network position

Network centrality and brokerage are structural network characteristics, yet, perceptions of these characteristics may strongly differ from reality, as demonstrated by past research showing that people lack accuracy in social network perception (e.g., Kilduff et al., 2008). Even though this gap has been widely acknowledged, previous literature, so far, has not simultaneously considered effects of network perceptions and realities. This is surprising since, from a theory perspective, we would expect them to influence each other reciprocally. This perspective may, for instance, help to understand why individuals do, or do not engage and benefit from their social network. It might, for example, be that occupying an advantageous network position is not enough, and that an individual needs to be aware of this structural advantage to leverage and benefit from it. We encourage future research to systematically and simultaneously consider the

constraints and opportunities offered by perceived and actual structures and their

interplay in predicting various outcomes.

5.3.3.3 Causation and interaction

  a)   Do individual differences contribute to network structuring?

  b)   Does network structure shape the individual?

  c)   Do individuals and social networks co-evolve?

      Another fruitful area of future research appears to be the collection of

longitudinal data to assess some of the causal pathway arguments outlined above (a, b & c),

by simultaneously studying the unique effects of, and influence processes between, social

structure and individual agency. This perspective would consider the (dynamic) co-

evolution of individual differences in affect, behaviour and cognition together with the

social network structure an individual is embedded in. For example, it seems plausible that

an individual's characteristics influence their networking patterns in the social environment

and that this environment, in turn, affects an individual's characteristics. Further, taking on

a longitudinal research design would allow to consider tie dissolution and change, rather

than merely focusing on their formation (e.g., how do individual differences, over time,

affect the development of new ties and the dissolution of old ties?).

5.3.3.4 Network position and expression of individual traits

      Another avenue for future research is concerned with the possibility that

network positioning influences the degree to which individual traits/characteristics are

expressed. For example, as discussed before, network centrality often reflects power and

influence. This increased power has been linked to enhanced cognitive function (Smith,

Jostmann, Galinsky, & van Dijk, 2008) greater willingness to engage in action

(Galinsky et al., 2003) but also increased risk-taking behaviour (Anderson & Galinsky,

2006). Future research could consider findings like this, to study how network

positional characteristics may act as constraining or activating/triggering factors of certain individual traits.

5.3.3.5 Networks and group/individual-outcomes: potential moderators

Future research would benefit from exploring potential moderating and mediating variables that may affect the relationship between individual and team-network structure and performance. The inconsistent results of prior studies suggest that multiple factors may influence this relationship. For example, Xiao and Tsui (2007) show that individual advantageous associated with bridging positions tend to be much weaker in cultures that value collectivism and cohesion. Along similar lines, Tröster, Mehra and van Knippenberg (2015) demonstrated an interactive effect of network social structure and cultural composition (heterophily/homophily) on sales team potency and performance. Those authors show that structural effects were contingent on team composition. Similarly, it may be that, dependent on company culture, certain structural effects depend on organizational culture and objectives. For example, while open network may be more beneficial in dynamic and entrepreneurial organizations, closed cohesive networks may be more successful in market and results oriented organizations. We encourage future researchers to carefully think about the effect of these – often context or culture specific - variables and how they may affect the *network-outcome-relation* under investigation.

5.3.3.6 Mixing data collection techniques

Modern methods of collecting and measuring various types of social network data, through social network websites (e.g., Facebook, Twitter, Instagram), apps (e.g., WhatsApp, Slack, Google Hangout), (mobile) phone or email communication, offer an exciting extension to the traditional sociometric network methodology. We particularly encourage a mixed method approach, simultaneously considering various networks, based on recall and observational methodologies, in offline and online settings. For

example, Johnson, Kovács and Vicsek (2012) compared email networks and off-line social networks in a medium sized bank. Results showed that while off-line social networks – data collected by a traditional sociometric survey - are strongly influenced by gender, tenure, and hierarchical position, these factors are much less relevant in shaping email networks. Studies like this, indicate that network insights may greatly diverge dependent on methodological differences. For instance, if one investigates gender, tenure and hierarchical homophily, the two networks (sociometric and e-mail) would show very different results.

Related to this, future research would strongly benefit from the development of methods that reliably analyse interaction **content**, enabling scholars to consider the quality of network relation and differentiate between different kinds of networks (e.g., friendship, advice, and information, positive or negative affect).

5.4 Overall conclusion

This thesis intended to bring together the study of psychological processes and social networks to stimulate a greater recognition of the interdependence of individuals and social networks. We take on the view that individual attitudes, behaviours, and other outcomes cannot be fully understood without taking into account the structuring of social contexts in which individuals are embedded. Similarly, social network structure and change cannot be fully understood without acknowledging the psychology of individuals. Even though this proved to be a challenging enterprise and research findings were mixed, we hope that this work encourages future researchers – in psychology and network science - to appreciate the advantageous of simultaneously considering individual level variables and the social structure individuals are embedded in.

In conclusion, the network perspective appears to be a novel and valuable resource for researchers in psychological science and organizational behaviour. Only time

will tell to what extent the approach proves to be sufficiently compelling to lead research

from an emphasis on the individual to a genuine appreciation for the social context.

Marco Polo describes a bridge, stone by stone.

"But which is the stone that supports the bridge?" Kublai Khan asks.

"The bridge is not supported by one stone or another," Marco answers,

"but by the line of the arch that they form."

Kublai Khan remains silent, reflecting. Then he adds:

"Why do you speak to me of the stones? It is only the arch that matters to me."

Polo answers: "Without stones there is no arch." (Calvino, 1972, p. 74)

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