The role of advice networks in the design and development of jobs

Helen Philippa Narelle Hughes

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The candidate confirms that the work submitted is her own, except where work which has formed part of jointly-authored publications has been included. The contribution of the candidate and the other authors to this work has been explicitly indicated below. The candidate confirms that appropriate credit has been given within the thesis where reference has been made to the work of others.

Ideas and results from the thesis have been presented at 5 conferences during the development of the PhD. Some of the wording used in the 2016 (sole-authored) conference abstract is used in the introduction chapter of the thesis. Some of the wording from the 2013 DOP conference paper is used in the second literature review chapter. The full references are:

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Abstract

This thesis considers the ways that different types of advice operate within an employee's network, and the choices that employees make about who to approach for advice, and when to do so. In elucidating these behavioural triggers, this thesis highlights how over time, advice behaviours and the networks in which they are embedded become crafted, contributing to the design and the development of a job.

The research uses a mixed methods approach in order to build an explanatory case study of the advice networks within a population of engineers employed by a multi-national manufacturing organization. The case study is built through a four-stage methodology (context building interviews, a network questionnaire, follow-up interviews, and a follow-up questionnaire), which utilises both qualitative and quantitative techniques. Some hypotheses are deductively tested, but equally, there is much of inductive interest in the quantitative measurement of the network, which is considered in its own right. Thematic analyses also yield valuable insights. These emergent findings are integrated in order to present this single, explanatory case study.

The theoretical implications of this are considered. This includes the presentation of a model for conceptualising *social job design*, and within this, a model of the advice seeking process. Together, these insights are consolidated to suggest some directions for future research in this domain.

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List of abbreviations

RQ(s)	Research Question(s)
JCM	Job Characteristics Model
STS	Socio-technical systems
SNA	Social Network Analysis
KM	Knowledge management
CE	Concurrent engineering
JD-R	Job Demands-Resources model
SIP	Social Information Processing
LMX	Leader-Member-Exchange
PCO	Propensity to connect with others
TD	Top-down
BU	Bottom-up
VIN	Voluntarily initiated networks
IIN	Involuntarily initiated networks
IPT	Integrated product team
ISK	Intention to share knowledge
OSSK	Organizational support for sharing knowledge
Jcraft	Job crafting (overall)
RJC	Relational job crafting
PJC	Physical job crafting
CJC	Cognitive job crafting
WKL	Workload
Job-ten	Job tenure
Org-ten	Organizational tenure
Grp-ten	Group tenure
Age	Age
Mgr-not	Manager or not (dichotomous variable)
Mgr	Type of manager (people, projects, both, none)
Location	Location
B-indeg	Bonacich's in-degree centrality
F-indeg	Freeman's in-degree centrality
Jsat	Job satisfaction
Out-deg	Out-degree centrality
L-betw-cen	Nlog of Freeman's betweenness centrality scores
L-eigenv	Nlog of eigenvector centrality
Csat	Career satisfaction

Chapter 1: Introduction

The aim of this thesis is to understand the nature of advice behaviours in the 21st century workplace, and the consequences that such networks have for the design and development of jobs. The seeking and sharing of advice is vital in most contemporary organizations (see wider discussions in Cross, Borgatti & Parker, 2002; Garvin, 2000; Ruggles, 1998). The products and services being developed by organizations continue to become increasingly complicated, and no single person has the complete picture (Elliott & Deasley, 2007; Ottens, Franssen, Kroes, & van de Poel, 2005). Work is no longer undertaken in silos by individuals, but by teams from multi-disciplinary backgrounds, with differing specialisms and knowledge. In other words the completion of work is a *social* process. No single individual has all of the answers, but they need to know who to go to, to solve their problems, and they need to know what the *right* questions to ask are (see Cross, Ehrlich, Dawson, & Helferich, 2008; Cross, Thomas & Light, 2009).

Organizations are increasingly facing contradictory challenges – for instance, they need to be able to encourage innovation and creativity, but at the same time, reduce the likelihood of duplication, and increase efficiency in the undertaking of work (Cross et al., 2002; Cross & Parker, 2004; Ruggles, 1998). This means that individuals need to have systems in place that enable them to *capture* knowledge; but crucially they also need to actively *seek* and *share* information with each other, and they need to know *who* to do this with, and how and when to do so. Certainly, there is a body of evidence to show that efficient and effective knowledge sharing processes are absolutely essential to the successful functioning of organizations (Borgatti & Cross, 2003; Cross, Davenport & Cantrell, 2003; Cross, Ernst & Pasmore, 2013). Organizations with efficient and effective advice channels are associated with positive organizational outcomes (see Uzzi, 1996 and 1997) such as enhanced job performance (e.g., Brass, 1981 & 2012; Burt, 2004; Cummings & Cross, 2003), innovation (e.g., Burkhardt & Brass, 1990; Cross & Sproull, 2004; Tushman, 1977), productivity (e.g., see Cross et al., 2008), and leadership (e.g., Skerlavaj, Dimovski & Desouza, 2010; Tsai, & Ghoshal, 1998; Zhang & Peterson, 2011). Conversely, in organizations where such channels are weak or inefficient (e.g., comprising too many person-to-person referrals), this effect is reversed, and may result in the duplication of work, reductions in quality, longer time completions, and greater requirements for re-work (e.g., Hansen, 2002). This is because social networks in organizations are known to play an important role in the acquisition of knowledge, learning how to do job tasks, and solving complex tasks collectively (Borgatti & Cross, 2003; Brass, 1985).

Advice behaviours can present challenges for organizations of all sizes (e.g., due to employee resistance, perhaps for reasons of territoriality, or because employees fail to recognise

opportunities for sharing information). For complex organizations, however – for instance multi-national organizations, or multi-tiered organizations that employ matrix structures subsuming large numbers of employees – this presents significant challenges, which can become a strategic threat as an organization competes in an increasingly globalised market (Cross & Baird, 2000). On the other hand, this presents the opportunity for commercial advantage (Cross, Cowen, Vertucci, & Thomas, 2009; Cross & Funk, 1997; Cross et al., 2001; Cross et al., 2013). If organizations can find ways to manage advice behaviours in such a way that they can facilitate, or even promote them through the organizational structures and jobs that they design, then the potential benefits are plenty (Cross, Thomas, Dutra, & Newberry, 2007).

Although organizations may deliberately design their organizations and departmental structures to facilitate advice behaviours (i.e., a top-down approach) (e.g., see Ashkenas, Ulrich, Jick & Kerr, 2015; Barley, 1986; Katz & Kahn, 1978;), there is also evidence that often advice behaviours are facilitated through the informal networks that we hold, in other words, through connections that have not been created by the organization (i.e., a bottom-up approach) (e.g., see Cross, Borgatti & Parker, 2002; Krackhardt & Hanson, 1993; Miles & Snow, 1986 & 1995). Such networks might be created for instance, through shared social connections such as friendships, prior work experiences and mutual attendance of the same events. Certainly, there is evidence that the advice behaviours reported by individuals do not map neatly onto the organizational structures and hierarchies that the organization has put in place (e.g., Cross et al, 2002; Cross & Parker, 2004), though they may be influenced by them.

The kinds of issues raised by such findings have been explored previously through the research of many of those scholars cited in the previous paragraphs; though these have typically been considered by researchers from the related (though distinct) fields of strategic management and knowledge management (e.g., see influential work by Rob Cross, Noshir Contractor, and Steve Borgatti). The distinctive contribution of this thesis is that it positions these dilemmas as issues for job design researchers, and demonstrates how the behaviours of advice networks are not well understood or explained by current job design theory or practice. This is because theories of job design predominantly consider the characteristics of individuals or groups/teams, the individual roles that employees have, and their job performance. Although some *social* level variables have been explored in the literature (for instance through the related literature on groups, team work, and leadership), such studies have tended to focus on the characteristics of the *individuals*, rather than characteristics of the *ties* that connect the individuals. It is imperative that job design theories are developed to reflect a better understanding of the social nature of work and jobs, and in particular, the crucial role that advice behaviours play in job performance; given the likely implications for performance characteristics such as the cost, speed, and quality with which work is completed. A central proposition of this thesis is that the

combination of top-down and bottom-up advice behaviours that manifest within the network, collectively drive the design and development of jobs.

This thesis will present an explanatory case study, built through a sequential, four-phased, mixed methodology. The case study is based in a multi-national manufacturing organization, within a population of engineers. The study comprises both quantitative and qualitative research techniques, and both deductive and inductive reasoning. It is argued that each approach offers a complementary perspective to the other[1], such that the quantitative phases enable measurement of the network (and therefore comparison of different networks), whilst the qualitative phases facilitate a richer understanding of the experiences of job holders in the network.

The overarching aims of the thesis are therefore:

1. To understand the advice behaviours of a population of engineers, by exploring advice behaviours and the networks in which they operate.

2. To specify the implications of these advice behaviours, for individuals, organizations, and contemporary theories of job design.

In order to address these aims, it will explore the following research questions (RQs), which are explored in more detail in Chapters 2 and 3:

RQ1: To what extent are advice networks a product of organizational design (top-down)?

RQ2: To what extent are advice networks organically developed by employees (bottom-up)?

RQ3: How do advice networks influence the design and development of jobs?

RQs 1 and 2 arise in order to understand the relative balance of organizational design and organic factors in the development and maintenance of networks. RQ3 arises because it seems likely that interplay between organizational design (top-down) and organic (bottom-up) network development will play a role in the emergence of new job designs, or the development of existing jobs.

All three research questions are explored through the qualitative and quantitative phases of the research, but to differing degrees. Within the quantitative phase the network is measured and a number of specific hypotheses are tested, in particular, with respect to RQs 1 and 2. These hypotheses, and their underpinning rationale, are outlined in greater detail in the literature review chapters. RQ3 considers the process of influence, and the creation and diffusion of social

[1] The underpinning philosophy of this research design is outlined further in Chapter 4

capital in the network; and as such, refers to incremental, dynamic, and iterative processes. This is better suited to a qualitative approach and is explored through thematic analysis. The quantitative data is also, nonetheless explored in relation to this question, in order to test a specific hypothesis, and to consider inductive lines of enquiry.

1.1 Thesis organization

The thesis has been organized into eight chapters, as follows:

Chapter 1 presents the overarching rationale and contribution of the thesis, and culminates in the specification of aims and hypotheses for the thesis.

Chapters 2 and 3 present the literature review. Chapter 2 considers the role of relationships in 21st century work organizations, focusing in particular on the nature of contemporary engineering design, as this provides a context for the case study in this research. The chapter highlights the importance of advice behaviours. It explores some of the formal attempts that organizations have made in order to organize relationships, for instance, through the implementation of team structures and concurrent engineering; as well as the psychological contingencies that are known to affect these behaviours. Towards the end of this chapter, advice behaviours are contextualised within the larger structures in which they operate – organizational networks. The review considers what is known about such networks, particularly within management literatures. This chapter culminates in RQs 1 and 2, and the hypotheses nested within these. Chapter 3 builds on this by considering the importance of advice behaviours in the design and development of jobs. The review considers the ways in which jobs might be *socially* designed, and how the study of advice networks may help further elucidate such processes. This review positions RQ3. A proposed model of the a priori hypotheses (tested through the quantitative research phase) is provided for clarity.

Chapter 4 presents the methodology for the research. The chapter explains the epistemological and methodological approach taken to data collection, before outlining the processes involved in the delivery of each of the four research phases. The overarching analyses performed in each phase are outlined.

The results of the work are presented in two corresponding chapters, 5 and 6. These outline the quantitative and qualitative results respectively. Both chapters are organized by research question. The quantitative results address each hypothesis in turn, and consider the evidence in support of each. The qualitative results explore the ways in which the data provides insights into each of the three research questions. At the end of each section in Chapter 6, the key findings pertaining to each research question are consolidated into conclusions.

Chapter 7 presents the discussion, which considers the theoretical implications of this research. The first part of the chapter sets out the process of advice seeking according to the data uncovered within this case study. It considers the different types of value that seekers attribute to relationships and the cognitive decisions that are made during the advice seeking process. The second part of the chapter contextualises this process within a more macro perspective, which considers the way that this can affect the design of jobs as well as role development over time. It presents an explanatory model that is intended to represent this process as iterative and dynamic; and it considers the implications of this new knowledge for the advancement of job design theory. Throughout this discussion, future research avenues are considered.

The final chapter draws together some conclusions from this research, reflecting on the limitations of the research, as well as the implications for practice.

1.2 Thesis contribution

On this basis, the thesis makes the following unique contributions:

1. It makes an empirical contribution by elucidating the factors that affect the development of advice networks, and by better explaining the *process* of advice seeking within such a network.
2. It reconceptualises job design as a *social* phenomenon, and in so doing consolidates literatures from a number of domains, including social network analysis, knowledge management, team work, leadership and job design. It uses these empirical data to inform a typology for understanding the types of advice behaviours that underpin job design; and consolidates the implications of this for job design scholars.
3. It draws on the empirical data from this thesis to propose a conceptual framework which builds on some of the earlier ideas presented by Clegg and Spencer (2007) in their circular model of job design. This framework seeks to explain the role that social networks can play in the design and development of jobs.

Chapter 2: The role of relationships in 21st century work organizations

The literature review chapters consider the central role that relationships play in today's work organizations. It will be argued that advice relationships are at the heart of workplace behaviours, in particular in terms of how jobs are designed and subsequently develop; but that such relationships are only very superficially understood, and moreover, are wholly underrepresented and under stipulated in current job design theory. This first review chapter will consider the role of advice behaviours in contemporary workplaces. It will consider the ways that organizations are thought to manage social connections through the design of work. It will pay particular attention to the context of design engineering, as this environment is considered to represent the *knowledge work* characteristics that so epitomise today's workplaces (Elliott & Deasley, 2007), and is the context chosen for the case study built through this research. The chapter will then consider how a range of psychological contingencies (organic, bottom-up factors) impact on advice choices, in addition to those implicated by the structural elements. This review will then consider the ways that such behaviours operate within broader networks of connections in an organization. The chapter will culminate in two research questions; through which the relative balance of top-down and bottom-up factors will be considered. Specific hypotheses will also be presented.

2.1 Knowledge work

It is well documented that the rapid development of technological solutions has facilitated the globalisation of marketplaces and organizations, and that improved communication opportunities have led to the emergence of multi-national organizations (e.g. Grant et al, 2010). In parallel, and at least in part as a consequence, the nature of the economy has changed, with greater emphasis on the production of knowledge and service (Grant et al, 2010). *Knowledge work* is differentiated from other types of work, through its central focus on the non-routine solving of problems. It is skilled work, simultaneously involving creative, convergent and divergent thinking (Reinhardt, Schmidt, Sloep & Drachsler, 2011); and characterises a wide range of professions (e.g., physicians, accountants, lawyers, engineers, teachers). In such environments, Milkman, Chugh and Bazerman (2009, pp. 379) have argued that, *"A knowledge worker's primary deliverable is a good decision"*. Thus it is becoming increasingly important for organizations to better manage their knowledge assets (Cross & Sproull, 2004; Ruggles 1998), and ensure that they are conducive to the sharing of data, information and knowledge.

2.2 Design engineering in the 21st century

The case study developed within this thesis is built within the context of design engineering, where the production and management of knowledge is pivotal (Bucciareli, 1996;

Elliot & Deasley, 2007). It is obvious that choices occurring during the design of a product are futile if that design is not manufacturable, or is too expensive to produce at scale. However, in design practice this means that every choice made by the design team will affect, to some extent, the work of other teams members and teams. In the design of an aerospace engine, for instance, seemingly minute choices about a new fan blade design (whether related to materials, size, shape, position) can impact on combustion, compression, weight, cost, reliability, noise and so on; all of which can have widespread consequences for the overall efficiency, safety, and cost of the product (Elliott & Deasley, 2007).

The roles of such design engineers are highly interdependent, even though day-to-day work can appear quite independent; and the decisions and choices made by one engineer will impact on the work of others (see Bucciarelli, 1996). Of course, this impact is sometimes obvious and immediate, but more typically it is nuanced, and can be difficult to directly attribute. Furthermore, design engineering problems such as these are complex and present designers with competing pressures and demands, which require insights and trade-offs to resolve, control, or optimise. Moreover, in today's organizations, products and services are not usually designed by individuals, but instead through design *systems* (Blanchard & Fabrycky, 1990) in which design outputs are considered to emerge through the completion of tasks and subunits, which are completed by multiple people, who collectively possess the diversity of skills to enable them to do so. Fundamentally then, design is *social* (Bucciareli, 1996); and the efficient sharing of information and knowledge is essential for effective design.

In such design organizations, organizations usually manage these inter-dependencies formally, by designing organizational structures and job roles that *engineer* information sharing paths, which are usually facilitated by work-group and team configurations. *Teams* and *multi-team systems* have become the building blocks of such organizations (e.g., Guzzo & Dickson, 1996; Marks, DeChurch, Mathieu, Panzer, & Alonso, 2005; Salas et al, 2004), characterised by interdependence and shared goals. These inherent team features mean that relationships are at the heart of team work, which enable team members to collectively understand, conceptualise, and resolve problems (Jones & George, 1998; LePine, Piccolo, Jackson, Mathieu, & Saul, 2008; Marks, Mathieu & Zaccaro, 2001).

A particular type of team configuration in design engineering is the cross-functional (Parsaei & Sullivan, 2012) or integrated product team (IPT - see Medhat & Rook, 1997); which are teams that are generally connected for a short, fixed-term purpose, and often disband or reconfigure on completion of the work. In the design of an aerospace engine, IPTs are commonplace. This is because, for instance, each engineer will have their own niche area of expertise of *job role*, specialising perhaps in design, manufacturing, mechanics, or combustion.

However, in these kinds of contexts, single individuals rarely have all of the answers; rather they need to know who to go to, to solve their work problems; they need to know what to ask (e.g., Mathieu, 2000), and when to do so in order to get the job done (e.g., Cross et al., 2003; Elliott & Deasley, 2007; Garvin, 2000; Ruggles, 1998). Knowledge utilisation is primarily, therefore, a social process (Wegner, 1987). As Cross et al. (2001, pp.216) have noted: *"Who you know has a significant impact on what you come to know, as relationships are critical for obtaining information, solving problems and learning how to do your work".*

In design engineering, IPTs usually operate in complex matrix structures whereby members simultaneously hold multi-team memberships, because they often follow a cycle of concurrent engineering (CE) (Parsaei & Sullivan, 2012). In CE each function is able to work in parallel (i.e., concurrently) on complete sections of the design process. It is argued that CE offers a competitive advantage to organizations by facilitating earlier information sharing, and thus enabling more efficient operations, reducing development costs, shortening the development cycle, and leading to higher output quality (Fleming & Koppelman, 1996). Communication is at the heart of CE design processes, because, as Bucciarelli (1996) has demonstrated through the discourse analysis of engineering conversations, effective design is as much about sharing understanding and obtaining agreement on design definitions, as it is about hard artefacts.

2.3 Information and advice seeking

Once regarded as a *solo* activity (Pahl & Beitz, 1984), engineering design is now well recognised as both a social and collaborative process. For instance, Robinson (2012) has shown how social processes are integral to work completion in design engineering, even in roles that were traditionally thought of, or designed to be, autonomous. Using electronic diaries to record behaviours throughout the course of a week, Robinson found that design engineers, spent approximately 27% of their time in *social unplanned* discussions with colleagues, and a further 13% of their time in *social planned* discussions, such as meetings. This suggests that even *independent* roles have social elements and dependencies.

There has been some careful attention in the information management literature to delineating interrelated concepts such as information, advice, knowledge and communication (see Ruggles, 1998). Some authors have conceptualised these concepts as layers within a pyramid (known as the DIKW hierarchy – see Frické, 2009), in which *data* forms the most rudimentary level, but through interpretation becomes *information*. When one is able to interpret this information theoretically, it becomes *knowledge.* Here, it is argued that at the top of this pyramid is the ability to apply practically this knowledge. This is known as *wisdom* or *"actionable knowledge"* (Cross & Sproull, 2004), and is most advantageous in today's

organizations, because this is the *"knowledge that leads to immediate progress on a current assignment or project"* (Cross & Sproull, 2004, pp. 446).

Advice is not knowledge or wisdom, but it can be based on this. Fundamentally, advice can be considered a form of communication – i.e., it is usually transmitted interpersonally. Advice is not always based on knowledge, as it can be offered based on fact, information, and/or personal experience or opinion (which might well be entirely ill-informed!). Advice is, however, more than simply *communication* or *information*; it is a type of communication in which the advisor (the giver of the advice) offers the advisee (the recipient), guidance or recommendation on some matter (Bonaccio & Dalal, 2006). Moreover, authors such as Cross and Sproull (2004) have differentiated between different types of such advice (discussed later in this chapter). As an umbrella term, the Oxford English Dictionary definition will be used in this research, which considers advice to be *"guidance or recommendations offered with regard to prudent action"*. The term *'advice behaviours'* will be used as an overarching term to encapsulate advice behaviours in both directions (giving and receiving), unless the direction is more explicitly stated, and covering the full range of advice types.

Although some such advice can be transmitted in ways that are not necessarily *social* (e.g., through websites, manuals or blogs), relationships are known to be an integral part of the advice process. For instance, research has shown that such workplace communications impact on the efficiency and effectiveness with which work is completed (Barry & Fulmer, 2004; Sproull & Kiesler, 1992). Advice behaviours and effective communication are therefore closely related concepts, because effective advice seeking behaviour relies on a range of dependencies, such as knowing *who* to seek information or advice from, *what* to seek, *when* to seek it, *where* it can be found, and *how* to access it (see Sproull & Kiesler, 1992).

The communication process itself has been explored extensively in the literature. For instance, at the most basic level, scholars have examined the ways in which messages are both coded and encoded in order to effectively denote and decipher meaning (e.g., Bartol and Martin, 1998). The frequency of communication has been shown consistently to be an important factor in work completion (e.g., Patrashkova-Volzdoska, McComb & Green, 2003). Although Smith et al. (1994) have suggested that communication frequency is negatively related to the overall performance of a team, they suggested that this was a result of team problems which led to increased communications aimed at resolving these, rather than the converse. In their review of communication frequency, Patrashkova-Volzdoska et al. (2003) showed that face-to-face communication frequency had a curvilinear relationship with goal achievement, whilst for emails this relationship existed for both goal achievement and project efficiency, suggesting that in both cases moderate communication levels were most effective. In addition, they found that

the optimum level of communication was higher for face-to-face communication than for email communication, which it was suggested caused overload earlier. Finally, they demonstrated that as physical distance between team members increased, email communication increased, whilst face-to-face communication decreased. Telephone communication did not significantly change, however. Although the rapid evolution of e-technologies over the past decade (e.g., teleconferencing, social networking, text, and instant messaging) have likely implications for the generalizability of these findings in today's work environment, these findings highlight the importance of communication frequency, media, and content, in the sharing of advice and information in the workplace.

A range of other factors have also been shown to impact on the advice process. The expertise of the sharer, for instance, has also been shown to influence the way that advice is shared (Feigenbaum, 1979; Jaikumar & Bohn, 1986). For instance, Goh (2002) has shown how failure to recognise one's own knowledge (heuristic, explicit, and tacit knowledge) can hinder advice behaviours. In explaining these findings, researchers such as Kalyuga et al., (2003) and Ericsson (2006) have considered the differing ways that experts and novices rely on schemas in order to determine what they share. Notably, experts function using heuristics based on highly automated *schemas*, but this can lead them to abandon *basics* when advising others. Consistent with insights from the memory literature, novices and experts also vary in the *amount* of information they can hold and recall (e.g., Waldron, et al, 1987), affecting the nature and amount of advice they need to seek.

Often it is assumed that advice behaviours occur through *design* channels in organizations (e.g., through deliberately created hierarchies, roles and organizational structures, such as work-groups). Certainly, Gold, Malhotra and Segars (2001) suggest that such structures are preconditions for effective knowledge management. However, it is also recognised that there are limitations to this perspective, as information is often transferred through informal communication channels (Bartol & Martin, 1998), such as the so called *grapevine*; that is, that communication can occur rapidly through unofficial channels, and irrespective of hierarchical or task requirements. Friedman (1981, cited in Bartol & Martin, 1998), however, has suggested that in such instances, although information can be relayed quickly, the accuracy relayed in such information is often reduced by anything from 50% to 90%, due to misinterpretation based on incomplete information (Pace, 1983). Nevertheless, despite clear limitations to grapevines, there are also cited benefits. For instance, Inkpen and Tsang (2005) suggest that grapevines or *social networks* transmit important organizational values and traditions, which can facilitate organizational cultures, and foster innovation by encouraging communication, and high reaction times through informal communication channels.

It is clear that advice behaviours matter in the design engineering process. However, this literature has tended to be rooted in work coordination and organizational efficiency (see, for instance, Kang, Morris, & Snell, 2007; Sproull & Kiesler, 1992). In many ways this communication and information sharing literature views the purpose of relationships as *transactional* – that is, effective work completion is the product of transactions; work cannot be completed, or will be completed to a poor standard, without effective advice behaviours. Such transactional relationships might be thought of as advice behaviours that exist between people to enable a job holder to successfully complete their work.

In this literature the terms *information* seeking and *advice* seeking are generally used interchangeably (e.g., Nebus, 2006; Sproull & Kiesler, 1992). Nevertheless, some attempt has been made to distinguish between different *types* of advice, and some authors have demonstrated that the type of advice required can alter advice seeking behaviours. For instance, Cross and Sproull (2004) have shown that the completion of work can necessitate a range of advice *types*. They differentiate between five different types of advice: (1) people who help develop solutions (they know *what* or *how*), (2) people who can refer them to useful others or information sources, (3) people who can help them reformulate problems, (4) people who can help validate an idea or viewpoint, and (5) people who are sought for legitimation or authority. Interestingly, Cross and Sproull (2004) found that employees would often choose to seek different types of advice from particular, selected individuals, and would return to these preferred individuals, even when others are available. Beyond the mechanistic and transactional purposes, it is clear that relationships have other inherent properties that influence the completion of work.

2.4 Psychological contingents in advice seeking behaviours

Many of the power and influence dynamics characteristic of human relationships have been well explored in the social psychology literature; for instance through the exploration of phenomena such as conformity (Asch, 1951, as cited in Willis, 1965, and Bond & Smith, 1996), group-shift (Wallach, Kogan, & Bem, 1964), and group-think (Janis, 1972); where it is evident that individuals in organizations alter their behaviours and attitudes in response to the feelings, attitudes, motivations, and behaviours of others. At times, they will *consciously* modify their behaviour. At other times, they may not recognise that others have influenced their behaviour (e.g. see Willis, 1965). The influence of these interpersonal dynamics on the effectiveness of work teams is well documented (e.g., Cohen & Bailey, 1997; Guzzo & Dickson, 1996; Marks et al., 2001; Salas et al., 2004).

It is also well documented that trust plays a pivotal role in decisions to share advice. For instance, low levels of trust amongst colleagues have been shown to lead to financial costs and

less effective responses to crisis situations (Rousseau, 1998). This is because trust has been shown to underpin a willingness to communicate, and so is critical for knowledge sharing in teams (Mooradian et al., 2006; Gillespie & Mann, 2004). Differentiating between trust in integrity (i.e., trust in a person's motives, or *affective trust*) and trust in ability (i.e., their competence, or *cognitive trust*), Lee, Gillespie, Mann, and Wearing (2010) have demonstrated that trust also plays a critical role in team dynamics, including those relating to leaders and their subordinates. In their study of 34 engineering project teams, they demonstrated that where a leader focused on improving the team's expertise, this was positively related to a greater willingness to share information within the team, and improved team performance ratings.

Moreover, others have shown how advice behaviours are affected by the attitudes of employees. For example, at an organizational level, the *climate* in which communication takes place has also been shown to create nuances and political undertones which can affect the clarity and interpretation of messages (e.g., Searle, Den Hartog, Weibel, Gillespie, Six, Hatzakis, & Skinner, 2011). For instance, Goh (2002) shows that organizational culture and values (e.g., trust, co-operation) and infrastructures (e.g., breaking of hierarchical levels and silos) are important enablers of effective knowledge transfer. Attitudes to advice behaviours have also been shown to affect employees' behaviour. For instance, Goh (2002) has shown that being the holder of *critical knowledge* (an expert) can create reluctance to share advice, because experts can perceive there to be personal costs to doing so. Experts perceived costs such as increased workload, devaluing of their own expertise, and they often under-recognised the benefits that advice sharing could bring in terms of, for instance, being able to learn from others, or better manage their workload. Not only do attitudinal factors affect what advice is shared, but also how such messages are received, and the utility and value that is placed on them.

In addition, a range of perceptual biases affect the interactions between people. It is well evidenced that interactions between employees are subject to a range of biases which limit their decision making process. Such biases, however implicit, are a feature of almost *all* interactions, because, as is argued in social identity theory (SIT; Tajfel, 1979), humans are hard-wired to form *in-groups* and *out-groups* on the basis of their own social identities. We respond well to people whom we perceive to be *like us* in some way, and less well to people whom we perceive to be *different* to us. There is evidence of such homophily in our preferences about who to connect with (Alexopoulos & Buckley, 2013; McPherson et al., 2001).

Collectively, these insights into interpersonal influence, dynamics, trust, and cognitive biases illustrate that whom we choose to seek information from is not only a product of the organizational design structures put in place within organizations, but also of complex interpersonal behaviours and social preferences, which are likely to affect the quality of the

decisions we subsequently make, and the individual and collective performance of a work-group. For instance, in their research about actionable knowledge, Cross and Sproull (2004) demonstrated that although different people held different types of information, individuals in a group were more likely to seek different types of advice from the same, *go to* individuals. They had opportunities to seek advice from others, but chose to return to a core set of individuals – they created and used a *network*.

2.5 Advice networks

So far, this literature review has considered the connections that exist between two people, and the impact that such connections are thought to have on the completion of work. Certainly, the body of research presented in the previous section suggests that such individualised connections are enriched sources of information and thus important in this process. *Social network* approaches take this notion further, because central to this concept is the assertion that a person's connections do not exist in isolation, but rather they are embedded in a pattern of connections; and that this pattern of connections affects the way life and work is experienced. This can be demonstrated in Figure 2.1 (source: Hanneman & Riddle, 2005) which displays the advice relationships between employees in a workplace (where employees are represented as the dots, known as *nodes* or *actors*, and labelled A, B, C, etc.). It can be seen that the experience of work for employee *A* will likely be very different depending on the network configuration. This is because node A has much more power when positioned in the *star* network (2.1a), where they have more accessible opportunities and alternatives than the other nodes. They are also closer to the other actors here, so can bargain or exchange directly, without relying on others. However, they might also experience overload, as they are the only broker to others in the group. This could be time-consuming, and potentially stressful. In contrast, when positioned in the line network (2.1c) node *A* loses social power, because it (and node *G*) have fewer direct connections, and so a greater number of steps to connect to others in the group. In contrast again, node *A* becomes equal to all others in the circle network (2.1b), because they have the same number of connections and gaps in their network as everyone else.

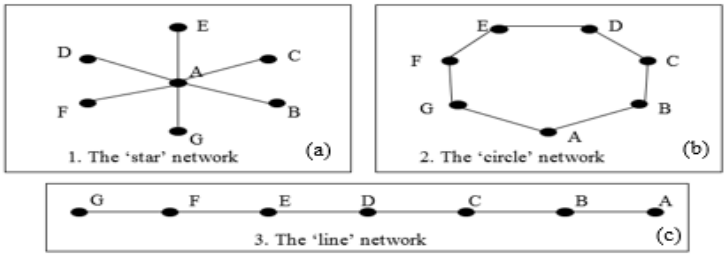


Figure 2.1: Different types of network configuration (examples).
Adapted from "Introduction to Social Network Methods", by R. A. Hanneman, & M. Riddle (2005). Copyright (2005) by University of California, Riverside.

At least two key messages are clear from this. First, *position* in a network matters, as this has important implications for workplace opportunities and restrictions. Second, it seems likely that theories about the way that jobs are designed and developed would benefit from understanding more about the social fabric in which relationships are embedded. Not only is it important to understand who *you* know, but also who the people you know, know, and so on. This is because individuals do not operate solely as dyads, but are affected by the dynamics of their wider social environment (e.g., see Carter et al., 2015).

2.6 Network approaches

The idea that such networks exist is not new or novel, but rather has been discussed and debated across disciplines ranging from sociology to computer science since the early 1900s – in fact the notion of social networks is apparent in writings going back to the Ancient Greeks (e.g., see Christakis & Fowler, 2010). Fundamentally, a network can be thought of as a set of *nodes*, sometimes also referred to as *actors* or *entities* (which might represent individuals, teams, organizations, and even nations). Nodes are connected by *ties* (which might represent anything from financial exchange to friendship or communication - see Hanneman & Riddle, 2005). Not all of the pairs in the network will be connected, and indeed some will be connected through multiple relationships. Social network analysis is an approach which tries to understand the structure and patterns of these relationships, by mapping and measuring the strength of the ties, and understanding how these patterns relate to other variables such as organizational productivity (Totterdell, Holman & Hukin, 2008). Social networks – not to be confused with social *media* such as Twitter and Facebook which are not social networks themselves, but which capitalise on social networks in their applications (see Watts, 2004) – have been defined as:

> *"A specific set of linkages among a defined set of persons, with the additional property that the characteristics of these linkages as a whole may be used to interpret the social behaviour of the persons involved".*
>
> (Mitchell, 1969, pp.2).

Brass has suggested a more abstract definition, referring to a network simply as *"a set of nodes and the set of ties representing some relationship or absence of relationship between the nodes"* (Brass, 2012, pp.670), whilst Cross and Parker (2004) describe social networks simply as *'invisible webs'*, where *"the building block"* is a single tie between two nodes, where the *node* represents a person, and the *tie* represents a relationship between them.

Networks are powerful phenomena, and the evidence of this is compelling – for instance, see analysis of terrorism and insurgency (e.g., Alexander, 2011; BBC, 2011a; Zech & Gabbay, 2016); analysis of the UK phone hacking scandal (BBC, 2011b); the spreading of the

2011 UK riots (Riots Communities and Victims Panel, 2012). In the organizational science literature social networks have been powerfully illustrated as drivers of organizational success (e.g., see Christakis & Fowler, 2010; Cross et al., 2009). In this age there are a number of reasons for this. With rapid and continuing developments in technology, and in an era characterised by globalisation, organizations are becoming more fluid and less bounded than ever, creating a need to think, communicate and share knowledge and information more laterally in order to maintain a competitive advantage (Brass, 2012; Cross & Parker, 2004; Malby & Mervyn, 2012). Cross and Sproull (2004) have noted that individuals are being asked to resolve more complex problems, and deliver solutions in increasingly rapid time-frames. Thus *actionable knowledge* networks (i.e., networks underpinned by a shared cognition of *who knows what*), can help facilitate more efficient and effective working. Other scholars have shown that employees' networks influence knowledge sharing practices (e.g, Brass, 2012; Burkhardt & Brass, 1990; Cross, Parker, Prusak & Borgatti, 2001; Cummings & Cross, 2003; Tichy, Tushman, Fombrun, 1979), the adoption and diffusion of innovation (Burkhardt and Brass, 1990; Cross & Sproull, 2004; Tushman, 1977), job performance (e.g., Brass, 1981 & 2012; Burt, 2004; Cross et al., 2001; Cummings and Cross, 2003), and creativity (Rodan & Galunic, 2004).

There is clearly, therefore, a body of knowledge which demonstrates that social networks play a role in the *completion* of work. Nevertheless, this literature review found no empirical research that related social network approaches explicitly to the *design* of work, or to explain the way work and job roles develop in organizations, despite a number of recent authors highlighting this *"long neglected"* area of research (Grant et al., 2010, pp.148), and the need to pay it greater attention (Grant & Parker, 2009; Humphrey et al., 2007; Kilduff & Brass, 2010; Oldham & Hackman, 2010).

2.7 Network characteristics

Networks are characterised by a number of core features.

2.7.1 Characteristic 1: networks are relational

First, networks are *relational*. In network analysis the relational component of a network can be explored according to a range of dimensions (e.g., see Totterdell et al., 2010):

1. The *type* of tie that exists may differ (for example, the relationship may be defined by interaction ties – e.g., the transactional or transformational ties outlined earlier, affective ties, role-based ties, or influence ties). Some ties in an organizational network can reasonably be expected to exist in order to share role-related information or data; whereas

for others, the primary purpose of the connection might be friendship, support, careers advice, or signing off (authority).

2. The *intensity* of the ties may differ (for example, ties may be viewed along a continuum from weak to strong).
3. The *direction* of the ties may differ (i.e., ties may be instigated by an actor, but not received; be instigated and reciprocated; or be received by the actor but not instigated by them.

Network size and the strength of ties have proved popular focal points in the broad social network research. Intuitively, there might be a tendency to presume that larger networks comprising strong ties are favourable, and there is evidence to support this in some circumstances (see e.g., Hanneman & Riddle, 2005). A range of studies have also pointed to the value of weaker ties in a network (e.g., Burt, 1992; Cross & Cummings, 2004; Mizruchi and Stearns, 2001). Granovetter (1973, 1982) paved the way for this research with his pioneering empirical paper on job searching, *"The strength of weak ties"* (1973). Here he argued that weak ties were fundamental in a *good* network, because without them, ideas and information can only circulate within a given *clique* of nodes. Conversely, weak ties enable ideas to become more widely spread, and therefore are more conducive to momentum gathering. More recently, social media such as Facebook and LinkedIn are creating fascinating opportunities for research into these kinds of areas, and are enabling networking behaviours to be explored experimentally and at large scale. For example, in a study of Facebook users' information sharing behaviours, researchers at the University of Michigan employed a longitudinal (they followed behaviours over 7 weeks) and an experimental design (they altered the settings for half of all Facebook users), which was based on the information sharing behaviours of 250 million users, and a data sample that included more than 1.2 billion incidents (see Bakshy, Rosenn, Marlow, & Adamic, 2012). Their findings also supported weak tie theory, and showed how social media websites such as Facebook can generate heterophily (a tendency for people to associate with different others) through weak ties, providing important implications for the role that such ties might have in job development, and subsequent career progression.

2.7.2 Characteristic 2: networks are patterned and structured

A second characteristic of social networks is that they are structured, for reasons explained previously; and a node's position within that structure is important (Totterdell et al., 2010). Although dyadic relationships form the building blocks of networks, the broader network in which an individual is embedded is of interest. In describing this patterned behaviour, Kilduff and Brass (2010) have noted that: *"Jobs tend to be experienced holistically – they bathe in the reflected light of individuals' social relationships with their co-workers"* (pp. 311). Referring back to Figure 2.1a, it can be seen that the higher level of social power and capacity for leverage

that exists in the star network for node *A*, is so because, in this format node A has higher degree centrality (i.e., a greater number of direct paths to other connections) than all other nodes, and because structural holes exist between all other nodes (i.e., their connection to others is completely dependent on node A) (Hanneman & Riddle, 2005). Homing in on a particular triad in this star (represented in Figure 2.2, below), it can be seen that an individual's power changes when a connection is made between nodes B and C (2.2a) – perhaps because colleague A invites both colleagues to a meeting, or because all three are asked to work together on a particular project. Then, all nodes become structurally similar and have equal degree centrality, and the network is cohesive because there are no structural holes. However, the power that node A was previously able to exploit (see 2.2b) is no longer present in the network. This is in spite of the fact that their *own* network position and relationships have not changed. The structure of a person's social network will radically alter the way that a person experiences work and relationships, in much the same way that raw carbon is experienced very differently (e.g., as diamond, graphite, or coal) depending on the differences in the covalent bond structures *between* the carbon atoms (Bird & Ross, 2012).

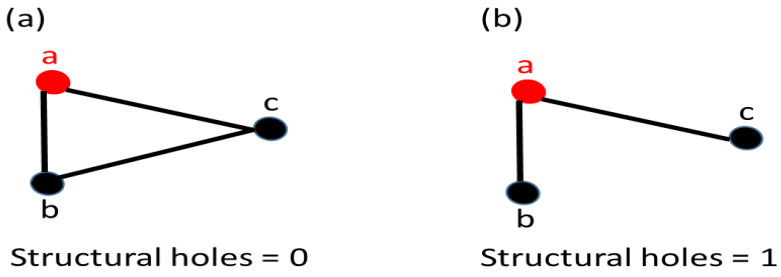


Figure 2.2: Illustration of structural holes in a network
Adapted from "Introduction to social network methods", by R. A. Hanneman and M. Riddle (2005). Copyright (2005) by University of California.

Actors in a network will benefit differentially based on the people they connect to, and the positions they hold in the overall network. Such social structures likely change over time, sometimes through organizational design (e.g., you move work-groups), and sometimes from moment to moment, through organically instigated interactions, or depending on the role and tasks you are involved in at any particular time. An actor's structural position in the network can be categorised in different ways (see Hanneman & Riddle, 2005, and Table 2.1, for summaries). Indeed, a body of research has focussed on defining such network characteristics, and exploring the relationship that these have with outcomes such as knowledge sharing, innovation, productivity, and leadership (e.g., Burt, 1992; Cross et al, 2001; Skerlavaj et al., 2010; Zhang & Peterson, 2011). Measures such as centrality can be considered at both an egonet (or individual), and also at the whole-network level. In a *centralised* network, each actor interacts directly with

a small number of more centrally located members, whereas in *decentralised* networks, each member communicates with most (or all) other members (Mullen, Johnson, & Salas, 1991 - cf Figure 2.1 described previously). On this matter alone, there has been a plethora of research exploring the most effective network types, and/or the circumstances in which each is advantageous. For example, exploring communication networks, Leavitt (1951, and later Shaw, 1964) showed that centralised networks (e.g., the *star*) are most effective for simple problem solving, as communication is channelled through a leader, whereas de-centralised networks (e.g., where each of the nodes are connected to all others), in which nodes communicate directly, are more effective in solving complex problems.

2.7.3 Characteristic 3: networks can be formal or informal

Most organizations try and shape the patterns of connectivity in their organizations by creating formal, top-down processes (e.g., organizational hierarchies) (Cummings, 2004; Fredrickson, 1986). However, there is also mounting evidence that the networks that enable work completion in organizations often transcend organizational boundaries – sometimes even the organization itself. Work completion networks are also influenced by more organic, bottom-up processes, such as those occurring as a consequence of individuals' traits, cognitions and behaviours (e.g., Carter et al., 2015; Cross & Parker, 2004). It is not unusual for people to seek advice from colleagues they have worked with in previous jobs and organizations, or from people that they know through other dimensions of their life (e.g., their sports club or social group) (Brass, 2012; Cross & Parker, 2004). Using thematic analysis, Cross et al. (2001) showed that four network characteristics were instrumental in a person selecting an advice seeking target in their network: (1) having a shared cognition of a person's expertise; (2) being able to access the person in a timely fashion; (3) willingness of the sought-after person to reciprocate; (4) *safety* in the relationship (in order to promote learning and innovation).

2.7.4 Characteristic 4: networks are loaded with context

Finally, networks are loaded with context. Contingency theorists have long held the position that job designs cannot be considered abstractly, but must be understood as embedded in the context in which they operate (Parker, 2015). It is known from a range of literatures, for instance, that a person's motivation to undertake work is affected by political, cultural characteristics, previous interactions with others, expectations, and the meaning given to those interactions (Grant & Parker, 2009; Hackman & Lawler, 1971; Salancik & Pfeffer, 1978). In other words, relationships with peers (e.g., Wrzesniewski & Dutton, 2001) team members (e.g., Cordery et al., 2013), and leaders (e.g., Carter et al., 2015) play a role in the way work is experienced and ultimately completed.

Network analysis brings with it a range of terminology, which are routinely applied in order to describe network characteristics. Some of the key terminology have already been outlined, but they are also summarised for ease of reference in Table 2.1. Whilst *centrality* is a term that refers broadly to the connectivity of a node in the network, it can be seen from this table that there are a number of different variants on this measure. In some ways this is similar in principle to measures of central tendency – the mean, mode, median – in summary statistics. Whilst they all provides a measure of the central value of a distribution, each provides a slightly different perspective on this concept, and can yield a different value. For centrality, the most straightforward type is Freeman's degree centrality which measures the number of ties that a node has coming to it (in-degree) or going outwards from it (out-degree). Bonacich's degree centrality is based on Freeman's degree centrality, but also takes account of the connectivity (centrality) of the nodes it is connected to. For this reason it is often described as *power centrality*. This is underpinned by the logic that the power of a node is derived socially; that is, a node is only as powerful as the nodes it is connected to. Eigenvector centrality extends the principles of Bonacich's centrality further still, by providing a node's power centrality relative to the other nodes in a given network. Betweenness centrality, on the other hand, considers the capacity that a node has for bridging connections to other nodes; or bridging structural holes in a network. Whilst these measurements will usually correlate with one another, each of these measures provides a slightly different indicator of a node's potential for power and influence.

Whilst many of the terms used by network analysts describe centrality at the node level, centrality measures can also be applied to a whole network or defined groups of nodes within the network. The density of the network describes the proportion of ties that exist in a network relative to the total number of ties that are possible. This provides a good indicator of connectivity in a network overall. Moreover, some of the terminology used within the network literature can appear emotive. For instance, a group in which all nodes are connected to all others is referred to as a *clique*; whilst a node that is unconnected within a network is known as an *isolate*. Nevertheless, in both instances the literature shows that early judgement should be avoided, as the desirability of cliques and isolates will depend on the context underpinning the network (Hanneman & Riddle, 2005).

Term	Definition
Tie/ vector/ edge	The *lines* in a network diagram that indicate a connection or relationship to another node in a network. Ties can be applied to indicate a wide range of phenomena – communication, trade, trust, or friendship. Arrowheads are often used where a direction of connection is represented (e.g., one-way communication).
Node/ actor	The *dots* in a network diagram. Dots often represent a person, but equally, could describe anything from an organization or country, to a project or event.
Outgoing ties (out-degree)	Network analysis can distinguish between the direction of relationships. Outgoing ties are relationships that are instigated by a particular node. Out-degree ties are a node's *given* ties e.g., the number of people they say they seek from).
Incoming ties (in-degree)	Relationships that a node has with other nodes in the network that are instigated by others. In-degree ties are a node's *received* ties.
Freeman's degree centrality	The number of ties that a node has coming into or out of them. This is an indicator of how well connected each node is in the network, as it provides the number of *direct connections* that an individual node has, and can be measured in different directions (in- or out-degree).
Bonacich's in-degree centrality	A measure of a node's power in the network. This modifies Freeman's centrality to account for how well connected or influential a node's direct connections are.
Eigenvector centrality	Similar to Bonacich's measure, eigenvector centrality also measures how well connected a node is to influential others. This provides a measure of power centrality relative to other nodes in the network.
Betweenness Centrality	The extent to which a node lies along short paths between other nodes in the network. This measure shows how often a node connects unconnected nodes or groups, and so provides an index of brokerage.
Closeness Centrality	A node's ability to access independently all other nodes in the network (shortest path).
Density	Network density indicates the proportion of ties in a network relative to the total number of possible ties. It is a good indicator of connectivity in a network.
Structural Hole	A measure of the potential that a node has to bridge across the white spaces in a network.
Clique	This exists when every node in a given group is connected to every other node in that group.
Isolate	Used to describe a node that is unconnected to other nodes in the network.
Cohesion	Measures the number of steps it takes, on average, to reach any other node. This usually describes a whole network or group in a network rather than an individual node.
Symmetric network	Whether a tie from one node to another is reciprocated or not. The whole-network can be reciprocated (symmetrical), indicating that for a tie to exist it must be reciprocal. On other occasions it may not make sense for all ties to be reciprocated (e.g., where a tie represents trust). Some network analyses can only be performed on symmetric network data.

Table 2.1: Key network terminology. Definitions are based on the descriptions provided by Hanneman and Riddle (2005).

2.8 Research Questions 1 and 2

This part of the literature review has demonstrated that in contemporary workplaces, advice networks are at the heart of effective and efficient job performance. It has shown how relationships can serve a transactional purpose in the workplace by enabling employees to complete their work. However, it is also evident that relationships also have important *transformational* properties. Relational characteristics can be seen to not only interact with the value that employees place on a person's advice, but these interactions also impact on employee's job satisfaction, with the potential to transform their attitudes and motivations. Two research questions therefore arise from this part of the literature review. First, it is unclear to what extent a person's network is a product of top-down organizational design features (RQ1); and second, to what extent it results from more organic factors (e.g., individual attitudes and behaviours) which would occur irrespective of the job role parameters (RQ2). These two research questions, along with some related hypotheses, are outlined in the following sections.

2.8.1 RQ1: To what extent are advice networks a product of organizational design?

The earlier literature review has shown how the structure and coordination of work in today's organizations are designed to facilitate advice behaviours. Certainly, most organizations are designed to facilitate the development of networks at least to some extent, through their organizational structures and hierarchies, which are usually developed with at least some degree of purpose (Cummings & Cross, 2003; Cummings, 2004). There is a body of research on organizational structure outlining the varied ways that organizations organize employees in order to shape communication and behaviours, and to facilitate the achievement of organizational goals (e.g., Burt, 1986; Jacobides, 2007; Pugh, Hickson, Hinings & Turner, 1968; Tushman, Lakhani, & Lifshitz-Assaf, 2012). CE practices and the organization of teams are examples of such activities; but a range of broader organizational design practices might be expected to contribute to this end – office and workspace arrangements designed to facilitate communication channels (Davis, Leach, & Clegg, 2011); the creation of interdependent job roles (Wagerman, 1995; Yuan, Fulk, Monge,& Contractor, 2010), and choices about work team design and composition (Campion, Medsker & Higgs, 1993). The importance of such factors are considered in the qualitative research phase, but some a priori hypotheses are also tested.

2.8.1.1 Chain of command, work-group proximity and project proximity

The purpose of organizational hierarchies and charts are to provide a structure and navigation map for individuals who work in such an environment (e.g., see Burt, 1986; Pugh et al., 1968). It is proposed that such structures are likely to impact on the advice seeking patterns that exist in organizations for two reasons. First, in bureaucratic organizations, structures of this kind ensure that some channels of communication are stipulated by organizational processes (Hinds & Kiesler, 1995). Although this is likely to be minimized in less bureaucratic

organizations (e.g., Hage, Aiken, & Marrett, 1971), it is suggested that this structure (communicated, for instance, through organizational charts and process maps) will provide a basis for job design networks, because such networks make roles, responsibilities and departments (or disciplines) transparent, enabling people to effectively and efficiently navigate the organization. Second, it is argued that a useful by-product of organizational structures are that they create exposure for people working in organizations, so that when they are faced with a question, or work problem, they know who they *could* go to in order to resolve it, thus leading to cohesive, informal networks. In line with these arguments, it is proposed that the advice networks reported by employees will reflect the chain of command.

However, it is also argued that the type of advice required will affect the choices people make about who they seek and share advice with. Within the networks literature there has been some interest in understanding the different types of advice involved in work completion. Cross and Sproull (2004) have studied the types of relationship that exist in an organizational network, and have found that people nurture relationships for different types of advice in their work organizations, seeking knowledge and advice from different people for different purposes. They categorised these into a range of types: (1) solution networks (people who help them *know what* or *know how*); (2) referral networks (e.g., people that point them to people or databases); (3) problem reformulation; (4) validation; and (5) legitimation networks. They suggest that people are most effective when they seek the right person for the right purpose. In research prior to this, Cross, Borgatti, and Parker (2001) demonstrated similar dimensions, which they showed could form a uni-dimensional scale, whereby an advisor who was able to provide any one such service was also likely to be asked to help with others. Building on this research, in the current study it is suggested that for transactional advice seeking types (e.g., legitimation or authorisation), the correlation of the informal advice networks reported by participants with the chain of command will be stronger. This is because there are clearer reporting lines (which might be thought to represent formally specified communication channels), and because a person is more reliant on specified others in order to get their work done. It is argued that for transformational advice types (e.g., problem solving and validation), the relationship between the formal and informal networks will be weaker, because other factors (e.g., attitudes, personal preferences, and trust) will also affect the choice of advisor (see RQ2). The following hypotheses relating to chain of command, work-group and project proximity are therefore tested:

H1 (a) The chain of command (formal hierarchy) will be positively related to informal network position (as reported by participants).

(b) The strength of this association will be contingent on the type of advice being sought, and will be strongest for authorisation.

H2 Work-group proximity will be positively related to tie strength, such that participants will report higher numbers of connections to the other members of their work-group, than they will to members of other work-groups.

H3 Project proximity will be positively related to tie strength, such that ties between participants will cluster according to projects that they share an affiliation with (i.e., projects they have worked on together).

2.8.1.2 Location Proximity

Although relatively little is known about the effects of workspace and location on communication practices (e.g., Davis et al., 2011), the desire to improve communication frequency is often credited as the rationale underpinning the design of open-planned office spaces (Van den Bulte & Moenaert, 1998), and the co-location of workers (Allen, 1977; Zalesny, & Farace, 1987). A number of authors have shown how the creativity of teams is improved through communication (Guzzo & Dickson, 1996; Salas et al., 2004), and Allen (1977) has shown how the effective transfer of engineering knowledge requires both the transfer of information, and of important contextual information, which is better communicated face-to-face. They and others (e.g., Andres, 2002; DeMeyer, 1991) have shown how face-to-face interaction improves this transfer. Combined with the previously presented research on communication frequency (Patrashkova-Volzdoska et al., 2003), these findings suggest that the physical proximity of employees may help determine the advice networks of employees. The following hypothesis is therefore tested:

H4 Location proximity will be positively related to tie strength such that participants will report higher numbers of ties to colleagues located at their site than to colleagues located at other sites.

2.8.1.3 Job role

In a rare attempt to integrate the fields of knowledge management and job design, Leseure and Brookes (2001) proposed a framework that highlights the likely impact of job role on the purpose of inter-personal behaviour. This proposes that interaction patterns will vary for different types of job role, depending on the frequency of interactions that are possible (low or high), and whether the role holder needs to *create new* or *re-use existing* knowledge. Specifically this model proposes that individuals do not need frequent interactions in order to complete their work where that work is codified, simplified, and routinized. Whereas if a job incumbent's performance is dependent on them *creating* knowledge by identifying problems, and developing solutions, they argue that the role will necessitate the development of open networks, and dynamic, flexible job designs.

It seems likely that the job role a person is appointed to will influence a person's network structure, as well as their associated network characteristics (e.g., centrality). For instance, two senior managers in a network might both be expected to have strong connections to their team members (so their network structure will be determined in part by their role responsibilities). It might also be expected that they would have high in-degree centrality for authorisation advice amongst these connections (as their subordinates will report seeking authorisation from them), but simultaneously they might have lower than average levels of out-degree centrality amongst the group (i.e., they will seek authorisation from fewer others). Two such managers, with similar role characteristics, might therefore be described as having networks with *structural equivalence* (Borgatti et al., 2013). On this basis, job role is expected to play an important part in determining workplace network characteristics. One hypothesis is tested relating to job role:

H5 Job role similarity will be associated with tie pattern similarity.

2.8.2 RQ2: To what extent are advice networks organically developed by employees?

Whilst many network theorists agree that social networks can be influenced by hierarchy and social structure (Cross et al., 2001), social networks themselves are considered distinct from specified power lines in organizations. This is because they are influenced by other factors such as attitudes and individual differences, and as such, *"Can provide an x-ray of the way in which work is, or is not, occurring"* (Cross et al., 2001, pp. 103). This is because in reality, *"interactions continually reshape beliefs, norms and values, and ultimately interactions"* (Dietz & Henry, 2008, pp. 13189). RQ2 considers the extent to which reported advice networks are the product of organic factors related to individual differences in the disposition and attitudes of job incumbents, for instance; as well as factors related to the work environment. The full range of factors affecting a person's choice of advisor are explored qualitatively in Phase 3 of the research. A number of avenues are, however, explored in the quantitative phases, in terms of the ways a person's attitudes and perceptions are related to their advice behaviours and resultant networks.

2.8.2.1 Tenure

It is suggested that job and organizational tenure will affect network centrality. For instance, it is argued that organizational and job tenure will have the by-product of improving an individual's ability to navigate the network, simply because through that tenure a person will have had exposure to a larger number of people and projects in the organization (e.g., Rodan & Galunic, 2004). This review has shown how experts and novices in an organization approach advice seeking differently, whilst Cross et al., (2001) have shown that once a person has had a good experience with an advisor, they will return to them for other advice types. As tenure

increases, the likelihood of prior interactions will also increase, particularly where a person remains in the same work-group over a period of time. It is argued that the effect of tenure on network centrality will be greater than the effect simply of age (which brings with it no guarantee of such exposure within the organization or role). The following hypotheses are therefore proposed:

H6 (a) Organizational tenure will be positively related to network centrality.
(b) Work-group tenure will be positively related to network centrality.
(c) Job tenure will be positively related to network centrality.
(d) Work-group tenure will have a stronger effect on network centrality than organizational tenure and job tenure.

2.8.2.2 Intention to share knowledge

Bock et al (2005) note that hoarding or being guarded about one's personal knowledge is a natural human tendency. Authors such as Constant et al., (1994) have argued that many organizations actively *discourage* the sharing of knowledge and advice in order to reduce overload, and to avoid diverting employees' attention from their goals. There is also evidence that individuals' knowledge sharing behaviours are influenced by their motivations, and organizational climate (e.g., Bock et al., 2005; Gibbert & Krause, 2002).

One avenue explored in this research, is that people develop networks, at least in part, as a result of their attitudes towards that behaviour. This argument is based on the well supported *Theory of Planned Behaviour* (Ajzen & Fishbein, 1977), which proposes that most social behaviour is goal directed, with attitudinal dispositions that lead to a person's behaviours or behavioural intentions. Although attitudes towards the sharing of advice and knowledge do not appear to have been studied directly in relation to network behaviour, positive attitudes to knowledge sharing have been found to be an important antecedent to effective knowledge management in organizations (Bock et al., 2005; Davenport & Prusak, 1998; Goh & Sandhu, 2013). Hsu and Lin (2008) for instance, found that individuals reported a positive relationship between their attitude to knowledge sharing and behavioural intentions to use a blog system; a finding that has been replicated in a range of other contexts (e.g., Bock et al., 2005; Lin & Lee, 2004). Accordingly, it is proposed that a positive attitude towards the sharing of knowledge will be positively related to network size, as a person seeks to share and receive advice in their endeavours to achieve this. It is also proposed that the extent to which a person is favourable to sharing knowledge will relate positively to their network centrality. This extends earlier studies which have provided confirmation of the relationship between attitudes to knowledge sharing and behavioural intentions (e.g., Bock et al., 2005; Davenport & Prusak, 1998; Goh & Sandhu, 2013).

It is also proposed that this positive relationship will be moderated by a person's workload. This case is underpinned by goal hierarchy theory (e.g., Unsworth, Yeo & Beck, 2014), in which it is proposed that at any one time a person is trying to satisfy a number of potentially competing goals. Prior research has shown that workload affects a range of organizational outcomes, including performance and job engagement (e.g., Faragher, Cass, & Cooper, 2005; Smith & Bourke, 1992; Taylor, Johnson, Cooper, Cartwright, & Robertson, 2005). In particular, high workload has been found to act as a workplace demand, with meta-analysis reporting strong consequential effects on reduced job satisfaction, and high job strain and burnout amongst employees (e.g., Faragher et al., 2005). It is therefore proposed that a positive attitude to knowledge sharing will only result in knowledge sharing behaviours where workload is low or moderate. The following hypotheses are therefore tested:

H7 (a) Intention to share knowledge (ISK) will be positively related to network centrality.
(b) Workload will moderate the relationship between ISK and network centrality.

2.8.2.3 Individual differences: Job crafting behaviours

A number of scholars have considered whether particular types of intra-personal characteristics, affect the social networks that people organically develop. It is clear that although all employees *have* a network, even if it is just the formal network that they inherit from a predecessor, or a network that has been stipulated by the organization through structure and process. However, what is less clear is whether and how people *mobilise* these networks in order to get their work done, or to proactively develop and craft their job content, cognitions, or relationships. Burt, Janotta, and Mahoney (1998) have suggested that some people are more likely to engage in proactive networking behaviours. They coined the term *'network entrepreneurs'*, developing a personality profile which identified particular personality characteristics which characterise individuals who have structural holes in their networks. Burt et al (1998) found that these individuals preferred to be in authority, and that they created excitement and were instrumental in instigating organizational change. Others (e.g., Becker, 2004) have found that the relationship between personality characteristics and network behaviour is generally weak, and have instead suggested that the relationship between an individual's personal dispositions and their network behaviours is likely to be mediated by proximal antecedents, such as attitudes, and perceived control over the network. For instance, Totterdell et al. (2008) found that individuals differed in one such attitude described as their *'propensity to connect with others'* (PCO), that is their inclination to make connections with people that they do not know; and that this characteristic was a significant predictor of network characteristics such as size, betweenness centrality and brokerage. Moreover, the effects of PCO extended beyond those explained through personality traits.

Though the areas have not been empirically connected, there are synergies here with discussions of relational job crafting behaviours (discussed further in Chapter 3), which could arguably be considered a behavioural enactment of PCO. This is because job crafting refers to the proactive shaping, or changing of job boundaries (Wrzesniewski & Dutton, 2001). Such boundaries can be cognitive or physical, and can also be relational – for instance, changing the type or number of people that one speaks to in completing work activities. Scholars such as Grant and Parker (2009) have suggested that proactive personality traits may be positively related to job crafting behaviours, as individuals displaying such traits have a greater dispositional tendency to instigate change (Parker & Sprigg, 1999). Given the central facet of *relational* job crafting in the original conceptualisation (Wrzesniewski & Dutton, 2001) it follows logically that high relational job crafting will be positively related to centrality. The following hypothesis is therefore tested:

H8 (a) Relational job crafting (RJC) will be positively related to network centrality.

As with ISK, it is argued that this positive relationship will be moderated by a person's workload. In this case, workload is conceptualised in accordance with the principles of the job-demands-resources model (JD-R, Bakker & Demerouti, 2007, 2011), which argues that job crafting is a mechanism for both coping with high demands, and for creating new job resources. Here, it is argued that a person experiencing high levels of workload will craft their role by reducing the number of connections (and centrality), to ensure that they are able to manage their connections, so that they do not become stressful; whereas a person with low workload will craft to enhance their centrality. The role of workload is also explored in the qualitative research phases, but the following a priori hypothesis is also examined:

H8 (b) Workload with moderate the relationship between RJC and network centrality.

2.9 Chapter Summary

This chapter has outlined the pivotal role that advice behaviours play in the completion of work. It has considered how these are embedded in a wider context of advice networks, and identified areas of literature where questions remain. The literature review that follows in Chapter 3, will consider how all of these issues are relevant to job design theorists. It will consider how job design can be socially conceptualised, focusing on how advice networks might be expected to contribute to the dynamic design and development of jobs in today's workplaces.

Chapter 3: *Social* job design

The previous review chapter has shown how advice behaviours impact on the *completion* of work. However, it seems likely that during this process, such advice behaviours within their networks will influence the way that a job is designed and developed. Since its early origins, job design researchers have been concerned with understanding the ways that work organization impacts on an individual's workplace performance and behaviour. It is argued in this thesis that job design can no longer be considered to be a static, discrete and management-led process (as indicated by dominating approaches such as the *Job Characteristics Model* (JCM – Hackman & Oldham, 1976). Rather, it is likely to involve pivotal relational experiences, and to date, inadequate attention has been paid to these social aspects. The following section considers dominating perspectives on job design theory, before exploring the likely role of relationships in the design and development of jobs.

3.1 Job design theory

The terms *job* and *work* design refer broadly to the ways that work is organised in order for it to be completed (Grant & Parker, 2009). For example, should one person do all of the work? Should people specialise in particular areas? What are the roles, responsibilities and goals that are necessary to fulfil the job? What are the alternative ways of working? Which of these options will be most optimal? These kinds of questions are all of interest to job design scholars. The terms *job* and *work* are often used interchangeably, though they represent different perspectives. Work design is generally considered to be broader. It does not focus on an individual job in isolation, but on the collective role holders, beneficiaries and colleagues embedded in the work. In contrast, Fried, Cummings and Oldham (1998, pp. 532) have explained that: *"Job design focuses on the work itself – that is, on the tasks and activities that individuals complete in the organization on a daily basis".*

It is evident that job design research has a complex, inter-disciplinary history, ranging from psychology (and in particular *organizational* psychology) and ergonomics, to economics, IT, engineering, and biology (see Campion & Berger, 1990 for detailed review). In particular, Campion and Thayer (1985) have noted four distinct, historical bases of enquiry, which is useful in highlighting the divergence in foci and approach:

1. Motivational approach (with origins in organizational psychology) – including ideas around job enrichment and motivating job characteristics.

2. Mechanistic approach (with origins in industrial engineering) – concerned with principles of *scientific management* (i.e., increasing efficiency of work, through the

simplification of jobs – see Taylor, 1911 as cited in Parker, 2014) and later task analysis (e.g., through time and motion studies).

3. Biological approach (with origins in work physiology) – concerned with the way that jobs relate to physical harm, stress and fatigue.

4. Perceptual/motor approach (with origins in experimental psychology) – concerned with the perceptual and motor job demands inherent in jobs; with origins in human factors and ergonomics.

Nevertheless, even in the earliest job design research, it was recognized that the social aspects of jobs played a fundamental role in work motivation. For instance, in the early 1950s the Tavistock Institute recognized the importance of *social structures* of work, with Trist and Bamforth (1951) writing of the negative social consequences of poor job design on team members collectively. They explored the *"reactive individualism"* (pp. 31), distrust and disdain that emerged within teams, where job roles that were essentially inter-dependent were designed in parallel, and isolated from one-another. The importance of interaction and friendship in the completion of work were also investigated by Sims, Szilagyi, and Keller (1976) and also Turner and Laurence (1965). In contrast, Salanik and Pfeffer (1978) concentrated on understanding the ways that work-based information was '*socially processed'*. Despite these research avenues, following Hackman and Oldham's (1976) demonstration of a weak relationship between social interactions and work motivation in the JCM, interest in social dimensions tired, in favour of interest in task characteristics, and their (generally) *intra*-personal, cognitive and behavioural consequences.

On the other hand, separate literatures emerged in organizational science with a clearer remit for considering *social* behaviour in work, concentrating explicitly on the work design of *teams* (e.g., Guzzo & Dickson, 1996; Ilgen, Hollenbeck, Johnson & Jundt, 2005; van Knippenberg & Schippers, 2007; Salas, 2004) or the role of leadership in job motivation (e.g., Duarte, Goodson, & Kilch, 1993; Epitropaki & Martin, 1999; Gerstner & Day, 1997; Graen & Uhl-Bien, 1995; Ilies, Nahrgang & Morgeson, 2007; LePine, Erez & Johnson, 2002; Vecchio, 1982). *Social* mechanisms such as social cognition (e.g., shared mental models, trust, transactive memory) and the role of work-group composition, have been studied in depth under these umbrella domains (e.g., Hodgkinson & Healey, 2007; Langan-Fox et al, 2001; Wegner et al., 1991), but not explicitly in relation to the implications for job design theories. Indeed Harrison and Humphrey (2010) have noted that although the role of team work has been well studied in other literatures, the nature of *job design* in teams has been largely overlooked. The focus on task variables has been longstanding, and until recently, most research into job design has focused on the individual aspects of job design, with most models of job design centring on

these intra-level variables (e.g., Grant et al., 2010; Kilduff & Brass, 2010; Tims, Bakker, Derks & van Rhenen, 2013). Oldham and Hackman (2010) themselves suggest that this was *"short-sighted"* in retrospect (pp.464).

Nevertheless, scholars have been able to largely ignore such concerns because traditional perspectives have been so successful at providing a body of empirically supported practical implications about the optimum level of control, autonomy, support, and other job characteristics essential to *good* job design (see Campion & Thayer, 1985; Campion & Berger, 1990 for comprehensive empirical reviews). Certainly, there is a compelling array of evidence to demonstrate that *good* work design characteristics, underpinned by the traditional models are positively related to a variety of work outcomes (e.g., Bakker & Demerouti, 2007; Clegg, 1984; Cordery, Mueller & Smith, 1991; Cox, Griffiths & Leka, 2005; De Jonge & Schaufeli, 1998; De Lange, Taris, Kompier, Houtman & Bongers, 2003; Grant, 2007; Hackman, 1987; Hackman & Oldham, 1976; Ilgen, Hollenbeck, Johnson & Jundt, 2005; Karasek, 1979; Macy & Izumi, 1993; Morgeson & Campion, 2003; Parker & Wall, 1998). Such insights had led researchers such as Ambrose and Kulik to conclude in 1999 (pp. 262) that, *"After twenty years of research, a clear picture of the psychological and behavioral effects of job design has emerged".*

The shift towards collective working in organizations, however, has been well recognized outside of the job design literature (e.g., De Church & Marks, 2006; Mathieu, Tannenbaum, Donsbach & Alliger, 2013; Salas, Cooke & Rosen, 2008). Moreover, changes in the business and political landscape facing organizations (Juillerat, 2010; Grant et al., 2010; Grant & Parker 2009) have seen a recent rejuvenation in the area (see e.g., Grant & Parker, 2009); as new job design practices (e.g., CE, as described in Chapter 2) have ensued in the absence of suitable theory. Certainly, evidence that work completion in the 21st century is inherently social (e.g., Bucciarelli, 1996; Robinson, 2012; Drury & Robinson, 2011), should have ramifications for job design theorists, who now face the challenge of incorporating such evidence and ideas within mainstream job design theories (Grant & Parker, 2009). One response to these pressures has been in expanded versions of existing job design models (e.g., Parker et al., 2001; Morgeson & Humphrey, 2006). However, others have argued that new work characteristics raise new questions about the nature and effects of job design, which are not addressed by the existing theories (Torraco, 2005; Grant and Parker, 2009; Challenger, Leach, Stride & Clegg, 2012; Grant et al, 2010).

3.2 Proactive (*bottom-up*) approaches to job design

Reacting to these challenges, there has been a surge of interest in the role that employees may play themselves in the design of their jobs, and new interest in the way that jobs can evolve more organically, through such proactive behaviours (e.g., see Black & Ashford,

1995; Clegg & Spencer, 2007; Frese, Kring, Soose & Zempel, 1996; Parker, 1998; Parker et al, 2003; Wrzesniewski & Dutton, 2001). Indeed, the notion of proactive role transition has been discussed for nearly 30 years (e.g., Kulik, Oldham & Hackman, 1987), and the idea that individuals take an active role in shaping their own job roles is not new. For instance, back in 1995, Black and Ashford demonstrated how new employees either *fit in* or *make jobs fit* when entering new roles; and in 1997, Parker, Wall, and Jackson explained how flattening organizational structures in manufacturing and production industries facilitated opportunities in which individuals could shape their job role boundaries. Implicit in these ideas is that job incumbents somehow negotiate (presumably with *someone*) these job developments, though this negotiation may not necessarily occur explicitly.

3.2.1 Job crafting

One theory to have attracted particular attention is Wrzesniewski and Dutton's (2001) theory of *job crafting*, which has been developed to explain: *"what employees do to redesign their own jobs in ways that foster job satisfaction, as well as engagement, resilience, and thriving at work"* (Berg, Wrzesniewski & Dutton, 2010, pp.159). Job crafting theorists suggest that as well as being given tasks by their employer, employees proactively and independently redesign their own jobs by redefining, modifying and/or renegotiating the boundaries of their job roles and duties (Wrzesniewski & Dutton, 2001). In other words, job design can also be a *bottom-up* process. The motivation for individuals doing so, they argue, is to enhance their identity, meaning or the purpose of their work, with positive effects on their job satisfaction, engagement and resilience (Berg et al., 2010; Clausen, Tufte & Borg, 2012; Slemp & Vella-Broderick, 2014; Wrzesniewski & Dutton, 2001).

Wrzesniewski and Dutton (2001) have proposed three distinct types of job crafting: (1) *physically* crafting the boundaries of work, for example, by altering the scope of the tasks, or the number of tasks that they undertake; (2) *cognitively* crafting, by altering the way they think about the work tasks and the relationships between these tasks; and (3) *relationally* crafting, for instance by proactively altering the number and nature of their interactions, and the relationships that they have with other people (Berg, Wrzesniewski & Dutton, 2010; Challenger et al., 2010). Wrzesniewski and Dutton (2001) describe crafting as a psychological, social and physical act, which can be *"incremental or radical – visible or invisible"* (p.180), but which affects both the way that an individual attributes meaning to their work and/or their work identity. More recently the definition of job crafting has been extended to include other forms (in addition to cognitive, relational or physical). For instance, Lyons (2008) found in a sample of sales people that where individuals crafted their roles this was most frequently in the form of *skill development*. Moreover, Grant et al. (2010) have shown how some employees *cut* tasks (as well as add to

them), by for instance, avoiding contact with or reprimanding customers who are difficult or unpleasant.

The consequences of job crafting are found to be both positive and negative. For example, crafting has been found to be positively related to work engagement (Bakker & Bal, 2010; Petrou et al, 2012; Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2009), to work meaningfulness and work identity (Bakker, Tims & Derk, 2012; Berg et al. 2008; Petrou, Demerouti, Peeters, Schaufeli, & Hetland, 2012), and job satisfaction (e.g., Berg et al., 2013). However, Demerouti, Bakker and Gevers (2015) did, find a *"dark side"* (pp.94) to crafting using the JD-R model, as they showed that job holders craft to preserve their resources by reducing their job demands, resulting in lower levels of task engagement and leading them to be viewed as less helpful by colleagues. Interestingly, Hornung, Rousseau, Glaser, Angerer amd Weigl (2010) have positioned the notion of job crafting as having effects on the psychological contract, and have considered possible *"zones of acceptance"* for job crafting. Though not explored empirically in their paper, it is proposed that job crafting will be deemed positively so long as an employee is crafting within the broad parameters of the set role. Where crafting occurs outside of these zones of acceptance, this may have detrimental effects on relationships with peers and superiors. Clearly then, there are *social* implications for crafting behaviours.

Little attention has been paid to job crafting in collaborative work environments (Cordery, 2013). However, this review found several emerging research developments, as some of the most explicit explanations of *social* job design seem to have occurred in this area. Leana, Appelbaum, and Shevchuk (2009, pp.1170) have described collective crafting as the ways in which teams *"together customize how their work is organized and enacted"*. Leana et al., (2009) examined team and individual crafting within the context of childhood classrooms showing that these were not mutually exclusive processes and could occur both in parallel and separately. They argued that the extent to which these processes emerged, was dependent on environmental factors such as the amount of discretion allocated to particular roles, and the extent to which roles were task interdependent, along with other factors such as the extent to which the supervision was supportive. Others, such as Tims et al (2013) have shown how teams collaboratively craft to increase their resources and decrease demands. They suggest that not all team members need to craft in the same way, but they decide how and what to craft, together.

3.3 Integrating top-down and bottom-up job design approaches

Mirroring the discussions in Chapter 2, it is clear from this review that job design can be led from both the top-down, and can also emerge from the bottom-up. Nevertheless, there have been few comprehensive theoretical attempts to theoretically integrate these ideas. Berg, Dutton and Wrzesniewski (2013) have proposed the notion of *job landscapes* in place of *job*

designs, as a way of recognising the balance needed between top-down and bottom-up job design, and also as a way of enabling organizations to consider groups of jobs with interdependences between them. Rather than prescribing the finer details of such roles, they suggest that organizations can create *landscapes* that enable individuals to shape their own roles proactively, but in line with appropriate shared goals and objectives – *"to color outside the lines of a job, one needs lines there in the first place"* (Berg et al., 2013, pp. 20).

It might also be argued that the *Job-Demands-Resources* model begins to integrate top-down job design with bottom-up processes, by incorporating job crafting as a mechanism in the most recent versions of the model, where it has been found to have positive effects (e.g., Tims, Bakker, 2010; Tims, Bakker & Derks, 2012). Here it is proposed that irrespective of job role and seniority, job crafting has three conceptually distinct dimensions: (1) it increases job resources; (2) it increases challenging job demands, and (3) it reduces hindering job demands (Alarcon, 2011; Bakker, Demerouti & Verbeke, 2004; Tims & Derks, 2012). Although the relational elements of job crafting are considered to be important in this process, little is known directly about the relational mechanisms. Nevertheless, it is clear in this version of the model that individuals may find support through *personal* (non-work) resources as well as through job resources such as autonomy and feedback. All of this demonstrates increasing recognition that individual differences and bottom-up job design play a part in the process.

In a further example, consolidating top-down and bottom-up job design processes, Clegg and Spencer (2007) have proposed a circular model of job design, which aims to capture the overarching process that people go through when designing their jobs. This job design model develops the concepts central to the JCM (i.e., empowerment, knowledge, motivation), but adds in some new dimensions to reflect job design in today's environment (see Figure 3.1). Although the model is relatively young, it has been cited by a number of influential authors (e.g., Oldham & Hackman, 2010; Daniels et al, 2013), and has received some empirical support (see Challenger, Leach, Stride & Clegg 2012). Importantly, Clegg and Spencer's model makes advances by explicitly formalising the evolving and incremental nature of job design, presenting it as a circular, rather than linear process, recognising not only the feedback loops that other theorists have referred to, but reinforcing the idea of job design as a fluid and dynamic process. It emphasises the idea of iterative adjustment, providing an illustration of how job design can occur gradually and continuously, rather than solely as a result of a major, strategic and management-led intervention. The model also demonstrates how job designs emerge through a combination of top-down and bottom-up processes.

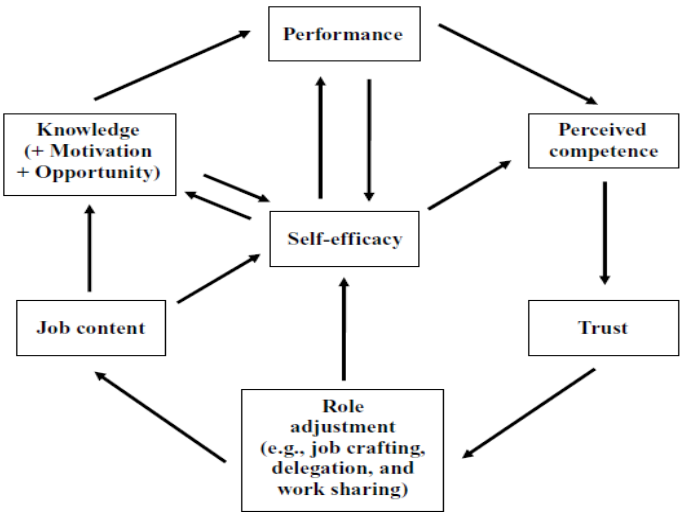


Figure 3.1: A circular model of job design.
Reprinted from "A circular and dynamic model of the process of job design", by C. Clegg and C. Spencer (2007), Journal of Occupational and Organizational Psychology, 80(2), p.336. *Copyright (2007) by Wiley.*

Importantly, these models begin to recognise that formally stipulated relationships (e.g., manager and subordinate) play a part in not only the initial design of a job, but also in how that job more incrementally develops and evolves over time. The following section will build on these ideas by showing that advice behaviours seem to play a pivotal role in transforming the way that work is experienced for job incumbents, which seems likely to impact both on the development of a job, and over time, a career trajectory. Three lessons from the prior research influence RQ3:

1. The move towards recognising the joint effect of organizational-led (top-down) and job-holder led (bottom-up) job design processes.
2. Recognition that jobs are designed through a more incremental (circular) process, characterised by iteration, feedback loops, and dynamism.
3. Despite recognition that relationships play an important role in the process, understanding of this is not yet conceptually sophisticated.

To date, theories of job design have tended to consider primarily the '*intra*-personal' work characteristics known to relate to positive work design (i.e., attitudes and cognitions that are experienced within a person). The following section will conceptualise the role of *inter*-personal work characteristics and *social* behaviours (i.e., the characteristics of the ties between two or more people) in the process of job design, focusing in particular on the role of social networks.

3.4 *Social* job design

It is apparent from this review, that the conceptualisation of *social* job design has the potential to mean a range of things, including:

1. That social *'partners'* are involved somehow;
2. That the *processes* (of negotiation/ approval/ implicit agreement) are in some way social;
3. That job *demands and constraints* are in part socially derived;
4. That *opportunities* are, at least in part, socially developed (e.g., new technologies).

The term *social* is broad, but central to most definitions are reference to *community*, *society* and its organization; in other words, they imply that communities are formed through collective behaviours. *Relational* on the other hand, is typically concerned with the way in which two or more people or things are connected. A key distinction then, is that *social* behaviours comprise of *relational* behaviours, but conceptually this is broader, perhaps representing a more macro, sociological perspective. In this discussion the term *'social'* is therefore adopted to denote both relational *and* social behaviours. Social job design and social network analysis study relational connections in order to understand broader patterns of connectivity within social communities.

In order to draw order on this construct, it is useful to consolidate the different kinds of variable that can be studied within psychological research. Typically psychological variables are classified across two dimensions: *inter*-personal and *intra*-personal; behavioural and cognitive (Robinson & Jackson, 2007); where intra-personal variables are those relating to processes *within* a person; and inter-personal variables are those interactions *between* people. Behavioural variables can be directly observed; whereas cognitive variables refer to latent thought processes which must be inferred. Considered in relation to the job design literature, it is evident that while many current theories allude to inter-personal (or *relational*) behaviour and cognition; these have rarely been explicitly conceptualised or measured. Some theories appear to imply *cognitive*, inter-personal behaviour. For instance the Clegg and Spencer model (2007) implies the central role of trust, social information processing (Salanik & Pfeffer, 1978) and shared cognition (e.g., Cross & Sproull, 2004; Langan-Fox et al, 2001; Mathieu et al., 2013). On the other hand, the socio-technical systems (STS) approach considers the interaction between technological changes and social cognitions in some of the more inter-personal *behavioural* measures of such behaviours (e.g., communication frequency; collective performance; problem solving speed). Others, such as Hackman and Oldham's (1976) JCM, operationalize these relational variables as *task* characteristics (e.g., autonomous job tasks, or feedback), paying little attention to the specific interactions that might occur between people.

Whilst such models do not yet elucidate all of the social mechanisms involved in job design, they do at least recognise that inter-personal cognitions and behaviours play an important role in one's job design and related workplace behaviour. On the basis of this literature review, it is suggested that the prior research can be meaningfully organized into two (related) categories: research that has considered the role of *transactional* connections, and research that has considered the role of *transformational* connections[2]:

1. *Transactional* ties: it is suggested that some ties or connections between people in organizations exist for transactional reasons (i.e., to facilitate task completion and job performance)
2. *Transformational* ties: it is suggested that some ties or connections between people in organizations exist for transformational reasons (i.e., they make people think differently about the work they are involved in, for instance, by motivating – or demotivating – them, or providing support to a person during their work).

In some ways this distinction is arbitrary, as there is clear overlap between these areas, with some theories suggesting interplay between transactional and transformational connections. However, this distinction is particularly useful in highlighting how these two types of connection appear to have origins in different literatures. These terms are not used in the current literature on advice behaviours, though relevant synergies are highlighted during this review. The following sections will outline some of the core developments in each of these areas.

3.4.1 Transactional ties

Transactional relationships can be thought of as interpersonal connections and behaviours that exist between people to enable a job holder to successfully complete their work (e.g., Kang, Morris, & Snell, 2007). Much of this literature has been reviewed in the previous chapter under the *knowledge management* umbrella. The typical rationale given for understanding these kinds of relationships is that job roles are interdependent and/or learning how to do work or solve problems is considered to be a primary objective (e.g., Cross & Sproull, 2004; Wang & Noe, 2010; Wegner et al., 1985). Much of what is known about such transactional connections has emerged from related literatures such as knowledge management and team work; meaning that these notions are not explicit in current job design theory.

Some such studies have measured the relationship indirectly through an observable, *behavioural* indicator; for instance, looking at how different group compositions affect group problem solving speed (e.g. see West, Borrill & Unsworth, 1998); or considering how different

[2] Note that although similar terminology is used within the leadership literature, a connection to leadership is not intended here.

group compositions affect the standard or speed of an individual's work completion (e.g. van Knippenberg De Dreu & Homan, 2004). Inter-personal behavioural variables (e.g., communication frequency – Patrashkova-Volzdoska et al., 2003; group cohesion – e.g., Reagans & McEvily, 2003) are treated as both independent and dependent variables. Transactional relationships have also been operationalised as a set of intra-personal *cognitive* variables, for instance, examining the extent to which an individual is motivated (generally) to share their knowledge (e.g., Wang & Noe, 2010), or the effect that a person's expertise has on advice behaviours (e.g., Kalyuga, et al., 2003). Usually, however, such variables are treated as consistent and homogenous – in other words it is presumed that such attitudes or motivations hold, irrespective of who they are asked to share information with. In reality, it seems likely that such attitudes will be socially derived, and affected by the interpersonal dynamics between advisors and advisees.

Some transactional relationships have been studied as inter-personal cognitive variables, in literatures related to job design, but not explicitly. There is, for instance, a body of work examining *trust* (e.g., how a job holder assesses the quality or credibility of information, or a colleague's competence or reputation – e.g., Butler, 1991; Costa, 2003; Huynh, Jennings, & Shadbolt, 2006; Moldoveanu & Baum, 2011), and the development of transactive memory (i.e., knowing who knows what within a work-group – e.g., Austin, 2003; Huczynski & Buchanan, 2001). This concept is similarly referred to in the networks literature as *actionable knowledge* (Cross & Sproull, 2004), as previously outlined, but most of this research has not been completed within mainstream job design literatures, however. Perhaps the most straightforward alignment with mainstream job design research is in the study of autonomy (Maynard et al., 2012; Parker & Wall, 1998) and task interdependence. Though the connection to job design is not overt in the advice behaviours literature, it is clear that notions of task interdependence and autonomy are implicit in the work of authors such as Barry and Fulmer (2004); Cross et al., (2001) and Sproull and Kiesler (1992) in their discussions of knowledge management. Similarly, the JCM, STS approach and job crafting theory, each emphasise the importance of job autonomy, and the negative effect that task inter-dependence can have on job completion (McClelland, Leach, Clegg & McGowan, 2014; Wrzesniewski & Dutton, 2001).

3.4.2 Transformational ties

Transformational ties might be considered those characteristics within a relationship that change the way we think about the work we do; perhaps making the experience of work feel more meaningful, or helping a person reformulate their work problems so that they feel less demanding, or so that the relationship is career-advancing in some way. Again, the existing literature relating to such transformational ties is disparate, though there have been several attempts within the job design literature to explain aspects of transformational relationships.

One early exception is the previously outlined work of Salancik and Pfeffer (1978) who introduced the notion of *social* job design within *Social Information Processing* (SIP) theory. They argued that context and the consequences of past decisions lead to choices in the workplace which can impact on job design and the completion of job tasks, because the cues in our environment (some of which would be social) signal how we should respond, because we react in accordance with the information that we have available to us at the time. The theory received mixed empirical support (e.g., Blau & Katerberg, 1982; Spector, 1992), with particular criticism that its portrayal of individual satisfaction was over-socialised. Others have defended this idea (e.g., Pollock, Whitbred & Contractor, 2000), arguing that these findings are likely to be grounded in poor methodological articulation, rather than theoretical flaws. Nevertheless, what is particularly useful about this approach is its explanation of how cognitions such as the motivation to share information (or not to), or attitudes (for instance, to sharing information) and behaviours (e.g., whether or not we approach someone for help when we need it), might be socially developed as we process social cues (e.g., past experiences or perceptions of a colleague's availability). The work that has followed SIP theory, has also built a case to suggest that social interactions such as these enable job learning to take place (e.g., see Pollock et al, 2000). It seems likely that such processes inform both transactional and transformational advice behaviours, and both the design and subsequent development of jobs.

In a more contemporary example, the circular model proposed by Clegg and Spencer (2007), also seeks to explain the ways in which employees interact with their peers and superiors in order to develop new knowledge, competences and skills. This particular theory alludes most heavily to the notion of *social* decisions, and also *transformational* relationships. For instance, role adjustment is modelled as an interactive process involving job holders and their supervisors and peers, in which there is a clear social mechanism. It puts the individual at the heart of the model, recognising that individuals contribute to their own development – that people develop self-efficacy, and that role adjustment occurs through a combination of job crafting, and related increases in motivation, knowledge and empowerment. However, it explicitly recognises interdependence – that the individual cannot change without opportunities to do so, and that they are reliant on others trusting their competence, to support their role expansion (i.e., job design is considered a balance of top-down and bottom-up processes).

Similarly, in job crafting theory a clear social mechanism is specified as *relational* job crafting is stipulated as one of three facets (Wrzesniewski & Dutton, 2001), which has been explored by various researchers (e.g. Grant, 2007; Morgeson & Humphrey, 2006). In the same paper Berg et al. (2013) write about the concept of *cognitive* crafting. They describe this as changes people make to their perceptions either to enable them to: (1) expand their perceptions about the purpose or impact of a job, (2) to narrow (focus) this job scope, or (3) to draw *mental*

connections between aspects of their job (linking). Conceptually, this seems to be constructed as an intra-personal cognitive variable (i.e., there is no suggestion in their paper that this particular process is socially influenced). However, other literatures around social influence (e.g., Asch, 1951; Wallach et al., 1964; Janis, 1972), which show how cognitions are influenced by the connections that we have to others, suggest that this *is* likely to be a social process, at least to some extent (e.g., see Ilgen et al., 2005; Salas et al., 2008). To date however, the relationships, including potential interplay between the facets of job crafting and the social dynamics of collective crafting are not yet well understood. All of these processes, though social, relate to ways in which a job holder might develop and utilise relationships to improve their own *individual* job performance. They still presume that jobs can be demarcated to remove interdependence.

On the basis of this review, it seems likely that the design and development of jobs occur through intricate inter-personal patterns, which will involve both transactional and transformational relationships. Certainly, evidence from the wider psychological literature shows that individualised relationships do play a role in the shaping of ideas – that is, they have transformational properties. Indeed, Leana, Applebaum and Shevchuck (2009) have shown how individuals working together can *'collectively craft'*, such that they *"together customise how their work is organized and enacted"* (pp. 1170). Moreover, the leader-member exchange (LMX) literature, demonstrates how leaders and members can vary dramatically in the evaluations and perceptions of one another (e.g., Boies & Howell, 2006), and that these individualised workplace relationships can lead to differential treatment of multiple subordinates, and ultimately influences the activity of the group (e.g., Henderson et al, 2009). Indeed Berg, Dutton, & Wrzesniewski (2013) have discussed the importance of leader-member exchanges (LMX) in the job crafting process, whilst authors such as Hornung et al, (2010) have shown (through LMX theory) that supervisory support can result in individuals feeling that they can better negotiate the task parameters of their work by creating so-called *I-deals*. Although this behaviour is in part proactive, it is also *approved* which could arguably negate the need for job crafting in these circumstances. Rousseau, Ho and Greenberg (2006) for instance, found that employees negotiated these I-deals with their employers before accepting a new role. The experience of I-deals has been found to be negatively related to stressors and positively to job complexity, showing another way in which individuals can proactively design and develop their jobs (Hornung et al., 2012).

3.5 Why does the study of advice networks offer benefit to job design theorists?

There are three main reasons why this thesis advocates that advice networks might yield important insights for the 21st century job design theorist. First, given the current focus in the literature on *intra*- rather than *inter*-personal behaviour, the social network approach offers an

alternative way of framing the issues of interest to job design theorists. Moreover, social network analysis provides a set of analytical tools which are able to identify, describe and explain relationships (e.g., Borgatti et al., 2013; Prell, 2012; Hanneman & Riddle, 2005), thereby offering a fresh perspective on job design problems old and new (Kilduff & Brass, 2010). Second, as already outlined, there is compelling evidence that networks contribute to individual and organizational behaviour and performance. Such effects have been demonstrated in a range of areas of organizational research, including related but distinct fields such as knowledge management (see Cross et al., 2001), leadership (see Carter et al., 2015) and career development (see Forret & Dougherty, 2004). These insights collectively demonstrate the value of the approach. However, this review found that to date there has been no empirical research (see also Kilduff & Brass, 2010) using a social network approach, in the theoretical domain of job design, so this research represents a major advancement here. Third, the characteristics of job design that have been outlined during this review can be mapped neatly to the primary features of social network analysis. That is, contemporary theories paint a picture of job design as social (it exists between people), structured (it is patterned, and a person's experience of their work depends on both the strength and nature of their particular relationships), and that it occurs through a balance of formal and informal processes (top-down and bottom-up). Finally, it can be seen that it is a phenomenon that is shaped by context.

3.5.1 Presenting job design from a new perspective

Job design theory and research has over time been dominated by well-established approaches/tools; specifically, linear, sequential, input-process-output models that are tested typically through linear, multiple regression or structural equation models (e.g., Bakker & Demerouti, 2007, 2011; Hackman & Oldham, 1976; Kilduff & Brass, 2010; Parker et al, 2001). In most such cases, the individual job incumbent is the focus and is placed at the centre of work performance. To date, most of the evidence relating to job design has arisen from studies grounded in positivistic science; though there are some qualitative exceptions. There are many strengths to this approach, and this body of research has greatly advanced our understanding of job design practice. Nevertheless, this positivistic approach assumes that all connections in organizations are the same; that they are equal in value, and experienced unambiguously and unanimously by all members of a group/organization. It is clear, from integration of the wider evidence that this is not the case, as work-groups are inherently heterogeneous populations comprising unlimited combinations of characteristics and so the possible range of interactions in an organization, when viewed in this way, is infinite. Moreover, it has been argued that research and practice have grown steadily divergent in recent times, with calls for greater focus on evidence-based practice (Grant, Fried, Parker & Frese, 2010; Oldham & Hackman, 2010), and a wider range of tools to be applied to the area (e.g., Clegg & Spencer, 2007; Hughes, Clegg,

Robinson, & Crowder, 2012; Hughes, Machon, Bolton, & Clegg, 2017) to enable job designers to (for example):

- Test circular, loopy, dynamic models of job design (Clegg & Spencer, 2007);
- Incorporate wider socio-technical issues (e.g., the impact that business models might have on job design) – (e.g., Beaumont, Bolton, McKay, & Hughes, 2013);
- Develop alternative job designs in principle, reducing the range of options before testing in the real-world (– e.g., see Clegg, Robinson, Davis, Bolton, Pieniazek, & McKay, 2017);
- Model and/or simulate possible consequences of job design changes, without the risks associated with real-world organizational change (Hughes et al., 2012);
- Better conceptualise the social dimensions of job design.

Although it is not argued that social network analysis is the answer to all of these problems or questions, much has been written about the methodological advantages that such an approach can offer to the social and organizational sciences (e.g., Carter et al., 2015; Cross et al., 2001; Hanneman & Riddle, 2005; Kilduff & Brass, 2010). By focusing primarily on the *ties* inherent in the networks and their properties, rather than the actors themselves, social network analysis can offer a fresh perspective on many research problems. In their 2010 paper, Kilduff and Brass outlined an agenda for the application of network analysis in job design research by first recognising that *"tasks and the people who perform them are embedded in structures of relationships with other tasks and people"* (pp. 310). They suggest that a network approach is relevant to better understanding the nature of job design because in using social network analysis you are *"explicitly considering the organization of work as a network"* (pp.310). By taking a social network approach to the exploration of job design, this research represents a shift in paradigm. Instead of focusing on the static traits and behaviours of individuals and their job tasks, a network approach advocates paying attention to the complex and patterned relational processes which interact with the situational context in which they are embedded. It is argued that these processes together will jointly lead towards the emergence and development of job roles and work. This is because a social network approach to job design would advocate that job design can only be understood in the context of the social relationships in which work is embedded. It is considered in this research that the positioning of job design as a *network* creates a distinctive conceptualisation of the job design and development process, and therefore makes a major contribution to this literature.

In social network research, it has been widely accepted that networks develop because people need connection with others – they are *'social beings'* (Brass, 2012; Christakis & Fowler, 2010). However, beyond that level of explanation, even here, there is a notable lack of theory (Salancik, 1995) in terms of, for instance, when and why people mobilise their top-down

networks as opposed to their bottom-up networks, and vice versa. As Brass (2012) has noted: *"Despite reference to an amorphous 'social network theory' in the management literature, perhaps the most frequent criticism of the approach is that it represents a set of techniques and measures devoid of theory"* (pp. 24). Although research often draws on principles of homophily and heterogeneity to explain network connections, there is no single unifying theoretical approach to explain why and how networks develop – though this is perhaps reflective of the fact that networks are largely considered to be an analytical toolkit, which can be used to explore these kinds of questions, rather than a theoretical disposition in themselves (Brass 2012). The application of network analysis in the development of job design theory represents a further area of contribution of this thesis.

3.6 RQ3: How do advice networks influence the design and development of jobs?

This research question considers how the characteristics of a person's advice network affect the way that work is experienced by job incumbents, and the way that they influence the design and development of jobs. Certainly, on the basis of this review, it seems highly probable that informal advice networks play a role in the formal and informal design and development of job roles in organizations, though the specific mechanisms involved in this process remain unexplored. The qualitative research phase focuses on understanding the different possible functions that advice networks serve, and the balance of transformational and transactional connections operating within them. It explores the overlap between top-down and bottom-up network connections, as well as the extent to which such connections operate independently. In this way, it can be said that RQ3 considers the central role of social *context* in the development and emergence of jobs, which has not been well addressed by existing job design research. By exploring the experiences of actors in the network, it aims to better explicate the role that networks play in the development of jobs over time.

By examining network ties in relation to the experiences of individuals in this network, this question will consider the role that social capital (i.e., *"how people do better because they are somehow better connected with other people"*, Burt, 2005, pp.4) plays in the development of jobs. Bourdieu (1997) has proposed that social networks are key to the development of social capital, arguing that the amount of social capital a person has is a function of the number and strength of the network connections they have available to draw upon, as well as the financial, human and cultural capital that each network member has. Hanneman and Riddle (2005) have termed this notion *'social power'*, noting that *"the network approach emphasises that power is inherently relational. An individual does not have power in the abstract, they have power because they can dominate others"* (ch.10, pp.1). They argue that the power in network systems can be calculated using various network indices (again demonstrating how network theory and network analysis are intertwined).

This research question also considers the consequences of these network behaviours for a job incumbent's career progression. This question arises because although Clegg and Spencer (2007) begin to consider the ways in which relationships contribute to the dynamic design and development of jobs, they stop short of relating this development to the subsequent development of a career. This model assumes that the iterative cycle of job development behaviours are satisfying for job incumbents. A natural extension of this model is that this cycle of job development will affect career progression as job incumbents build up social capital and trust from their superiors. Certainly, in other areas of the literature there have been some attempts to consider the relationship between jobs and careers. For example, Vinkenburg and Weber (2012) talk of *'work role or career transitions'* (Nicholson, 1984; Nicholson & West, 1988), which describes the process of disengaging from a role and engaging in a new one (Ashforth & Saks, 1995), and these have tended to be thought of as the demarcation points in a person's career. However, the mechanisms and tipping points that underpin these points have not been well explored by research to date, and the literatures on job design, career progression and social networks are currently not well connected.

In large part, RQ3 is considered through the qualitative research phase. However, some *a priori* hypotheses are explored to consider the relationship between job and career satisfaction. In the organizational network literature, there has been considerable interest in the role that network position has on a person's longer term career prospects. In particular it is demonstrated that a node's relationship to powerful others is important, particularly in terms of one's career progression (e.g., Campbell, 1988; Cingano, & Rosolia, 2012; Loury, 2006). For instance, examining network position and career progression, Burt (1992) showed that for women, and those new to an organization, connecting to well–connected others (i.e., eigenvector centrality) was an important predictor of the rate of early promotions within the organization. The key mechanism explicating such a relationship is usually that social networks create social capital, and that the related network characteristics (e.g., whether or not one is well connected enough, or connected to influential others) will affect whether or not job satisfaction subsequently leads to career satisfaction at a subsequent time point. A key hypothesis is tested to this end, in the quantitative study. However, key to this thesis is the argument that this relationship is likely to be more complicated than this, involving more iterative and dynamic cycles of job development. These ideas are developed further in the qualitative phase. The following hypotheses therefore consider the relationship between job and career satisfaction:

H9 a) Job satisfaction at T1 will be positively related to career satisfaction at T2.
b) Network centrality (T1) will moderate the relationship between job satisfaction (T1) and career satisfaction (T2), such that the relationship is strongest for individuals with high network centrality.

3.7 Chapter summary

The literature review chapters have together highlighted the central role of relationships and advice behaviours in the design and development of jobs. This chapter has considered the conceptualisation of *social* job design, and the possible relationship between this and the longer-term careers of job holders, which might be mediated by an incremental process of job development, in which relationships and social capital have a central role. In summarising the a priori hypotheses that are tested through this research, the model below (Figure 3.2) is provided as a summary; and the hypotheses and research questions are then summarised in full in Table 3.1, which follows. It is noted that a linear model is denoted here for simplicity; though in reality, a more iterative, and dynamic, *'circular'* (Clegg & Spencer, 2007), model is likely to exist. This representation is considered again in the results and discussion chapters.

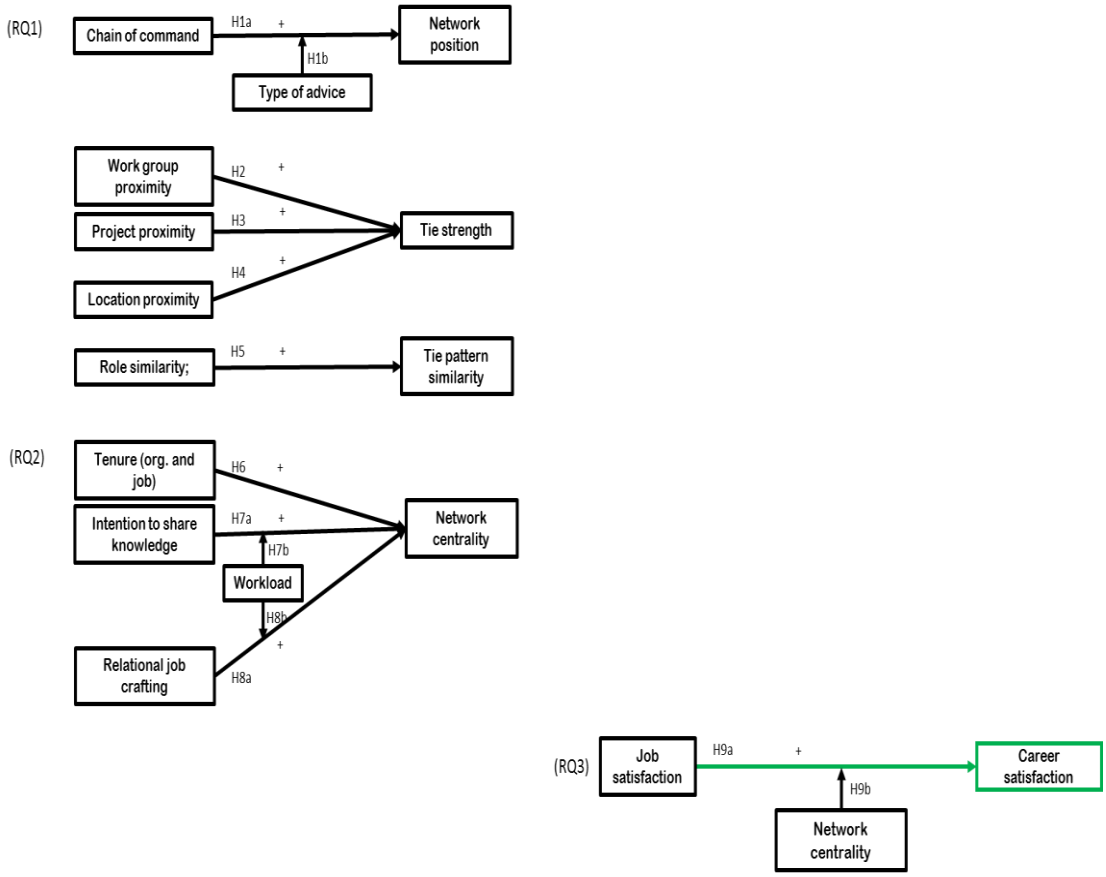


Figure 3.2: Model of hypothesised relationships

Table 3.1 below summarises the proposed hypotheses.

RQ1: To what extent are advice networks a product of organizational design (top-down)?	Chain of command	H1(a): The chain of command (formal hierarchy) will be positively related to informal network position (as reported by participants). H1(b): The strength of this association will be contingent on the type of advice being sought, and will be strongest for authorisation.
	Work-group proximity	H2: Work-group proximity will be positively related to tie strength, such that participants will report higher numbers of connections to the other members of their own work-group, than they will to members of other work-groups.
	Project proximity	H3: Project proximity will be positively related to tie strength, such that ties between participants will cluster according to projects that they share an affiliation with (i.e., projects they have worked on together).
	Location proximity	H4: Location proximity will be positively related to tie strength such that participants will report higher numbers of ties to colleagues located at their site than to colleagues located at other sites.
	Role similarity	H5: Job role similarity will be associated with tie pattern similarity.
RQ2: To what extent are advice networks organically developed by	Tenure (org. and job)	H6(a): Organizational tenure will be positively related to network centrality. H6(b): Work-group tenure will be positively related to network centrality. H6(c): Job tenure will be positively related to network centrality.

employees (bottom-up)?		H6(d): Work-group tenure will have a stronger effect on network centrality than organizational tenure and job tenure.
	Intention to share knowledge	H7(a): Intention to share knowledge (ISK) will be positively related to network centrality. H7(b): Workload will moderate the relationship between ISK and network centrality.
	Relational job crafting	H8(a): Relational job crafting (RJC) will be positively related to network centrality. H8(b): Workload will moderate the relationship between RJC and network centrality.
RQ3: How do advice networks influence the design and development of jobs?	Career satisfaction	H9(a): Job satisfaction at T1 will be positively related to career satisfaction at T2. H9(b): Network centrality (T1) will moderate the relationship between job satisfaction (T1) and career satisfaction (T2), such that the relationship is strongest for individuals with high network centrality.

Table 3.1: Research questions and hypotheses tested in this research

Chapter 4: Methodology

4.1 Overview of research design

This chapter will provide an overview of the methodological approach taken in order to develop this thesis. Collectively the methods employed generate an explanatory case study which has been developed by working with a focal group of engineers, employed by a multi-national manufacturing organization based in the UK. The research took an action learning approach (Eden & Huxham, 1996), working sequentially through four key phases, with each phase of the work building on the last. Each research phase produced a variety of research outputs, as outlined in Figure 4.1. Further details are provided in the sub-sections that follow.

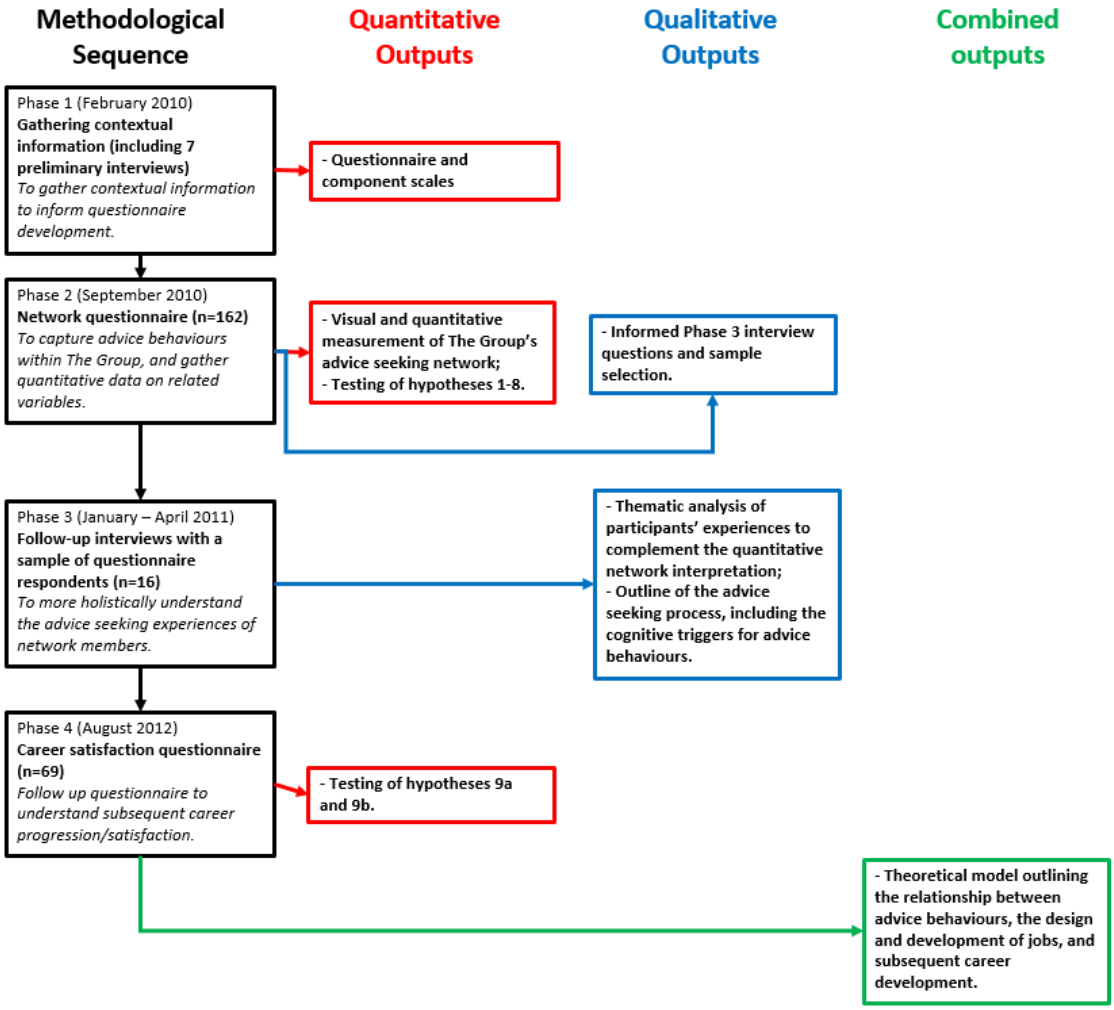


Figure 4.1: Research sequence and related outputs

4.2 Epistemology and approach

In developing *models* that represent our world, we develop *theories* about the way in which things relate to each other. Several authors (e.g., Thorngate, 1976; Daft & Weick, 1984) have written of the challenges of model development, with North and Macal (2007) noting that: *"The only perfect model of a system is the system itself. Everything else is an approximation" (pp. 13).* A particular influence on the approach taken in this research is the work of Gareth Morgan (and to some extent that of related authors, e.g., Cornellisen, 2005). Morgan (2006) presents the view that theories are essentially *metaphors*, and can provide interesting, and even fundamental insights. Morgan takes the idea of theory as an approximation further than North and Macal (2007), by recognising that theories deliberately and necessarily ignore some features of the target system. Morgan presents different descriptive metaphors for organizations, for instance, comparing an organization to a brain, a machine, and a political institution. Crucially, he argues that *all* are ultimately *"incomplete, biased, and potentially misleading"* (Morgan, 2006, pp.5) because each is loaded with implications; akin to taking a photograph with a set of different lenses: what you choose to focus on is affected by your view of the world. Recognising these limitations, I consider the organization through the metaphor of a *network* in this research, whereby individuals and their work are intertwined through the connections that people and parts of the network system have to others.

Scott (2013) has noted that: *"Social science data are constituted through meanings, motives, definitions and typifications... this means that the production of social science data involves a process of interpretation"* (pp.3). Accordingly, social scientists have developed particular data types, for which different types of analysis are appropriate. In spite of this, organizational research has tended to be dominated by a positivistic paradigm (e.g., Kilduff & Brass, 2010; Clegg & Spencer, 2007); and though this has yielded ground-breaking insights, a number of questions remain unanswered, as outlined in Chapter 3. It is argued that this positivistic preoccupation is short-sighted, because methods are choices which are not neutral; rather they lead us in certain directions, and afford certain kinds of theoretical development. Thus, the drive towards ever-more sophisticated, multi-level modelling in areas such as job design, take us towards more complex multi-variate models (usually based on derivatives of the job characteristics model), which may stifle theoretical innovation. It is therefore important to employ new methods – and indeed mixed methods – to enable the exploration of old problems in new ways (and vice versa), in order to foster development and innovation.

A realist position (Amis & Silk, 2008) is taken in this research, because it is assumed that the networks measured exist. Advice networks are accessed and measured quantitatively, though I am also interested in participants' interpretations and experiences of their networks. A position of pragmatism is taken (Symon & Cassell, 2012), as I suggest that we embrace the

different perspectives that these mixed methods provide, and consider any discrepancies in the data they yield with interest rather than criticism (Easterby-Smith, Golden-Biddle & Locke, 2008). It is suggested that neither quantitative nor qualitative approaches are without limitation; and that neither approach provides in isolation, a complete picture of network behaviour. When carefully integrated, however, they can provide complementary *lenses* on the issues outlined in the previous literature review, leading to a more holistic and richer view on the problem domain.

Given the previous assertion in Chapter 3 that job design is partly a product of organizational context, and given the longstanding relationship with the participating organization, the overarching aim was to develop an explanatory case study of the role of advice behaviours in the design of jobs and the development of careers. This case study will highlight the implications that arise when two different lenses are used to examine this network: a lens that focuses on the *organization* as a whole, examining the more macro-level features of the network; and a lens that illuminates *individuals* as case studies within the network, exploring their individual networks, experiences and behaviours.

4.3 The network paradigm and mixed methods

A number of approaches might enable the exploration of advice behaviours. The general linear modelling approach (e.g. see Robinson, 2016) has been well utilised in this area, yielding great insights (e.g., Campion & Berger, 1990; Parker, 2014, 2015). Nevertheless, such inferential statistics require relationships to be aggregated into homogenous variable categories, based on a general linear model (Field, 2013). In contrast, other researchers have chosen qualitative approaches to understand the richness of relationships based on arguments around the importance of context (e.g., see Cassell & Symon, 2012, Easterby-Smith et al, 2008). Social network analysis (SNA) is conceptually central to the mixed methods research methodology selected for this research. SNA can be considered both a methodological approach as well as a paradigm in its own right (Marin & Wellman, 2011; Tichy, Tushman and Fombrun, 1979). It is chosen because it seeks to bridge these gaps by focusing on the social structures that *connect* individuals, projects and ideas (Borgatti et al., 2013). Sometimes referred to as '*organizational* network analysis', SNA is able to make patterns of advice behaviours visible. By mapping and measuring the strength of such ties between employees, SNA enables a researcher to explore how the *structure* of ties affects individuals and their relationships: *"Social network analysis can provide an x-ray of the way in which work is, or is not, occurring in these informal networks"* (Cross, et al., 2001, pp.103). These x-rays can be visually displayed in socio-grams, as shown in Figure 4.2, overleaf:

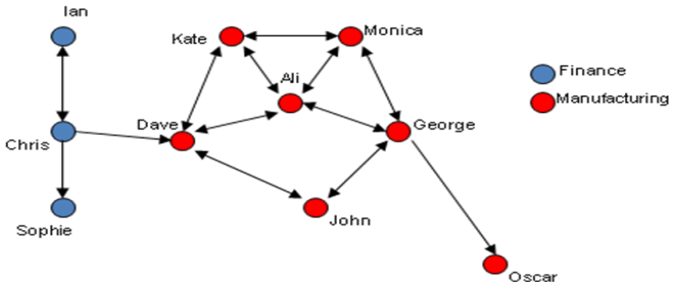


Figure 4.2: An exemplar sociogram representing advice behaviours
NB. Dots (nodes) represent people, and lines (ties or vectors) represent the connections between people. Arrow heads denote the direction of advice behaviours. Colours denote the department of employment.

SNA is also beneficial for this research because different levels of structural and relational analysis can be explored (see Totterdell et al., 2010; Hanneman & Riddle, 2005). The broad characteristics of the overall *macro*-level network can be described in terms of the overall network density, cohesion, and so on. Particular *nodes* can also be explored at the *micro*-level in terms of their relationship to other nodes, and position in the overall network. The mixed methods and levels approach to network development has been shown to be beneficial (Edwards, 2010), because: *"Network analysis corrects a tendency in organizational theory to focus on the trees rather than the forest, on the actions of individual organizations rather than on the organization of their actions"* (Salancik, 1995, pp.345-6).

Network data can be collected in a number of ways, most commonly using tools such as network questionnaires, observations, interviews and archival records (e.g., see Wasserman & Faust, 1997). However, data collection methods are often novel and eclectic, and consequently methodological pluralism is characteristic of many SNA projects (e.g., Crossley et al., 2015; Edwards, 2010; Brieger, 2004). Authors such as Brieger (2004, pp. 5) have gone so far as to argue that, *"The effort to maintain distinctions between qualitative and quantitative forms of data analysis is challenged by the progress that has been made in the analysis of social networks"*, such is the fluidity of inductive and deductive philosophy in this type of research. Commonly quantitative data resulting from questionnaires, can be enriched with contextual, interview or other archival data, providing more holistic insights. This can be useful to triangulate, but also to complement statistical information with a qualitative view, by enabling exploration of the factors underlying the relational structures (see Hammersley, 2008, for discussion of the benefits of complementarity and triangulation in network analysis).

This philosophy underpins the design of the research phases underpinning the research. In this research, network data is captured through a series of questions about advice behaviours.

Network analysis is then applied to the resultant questionnaire data, to describe and explain the findings at several levels of analysis. The networks of individuals (known as *egonets* – Hanneman & Riddle, 2005) are explored through Phases 2 and 3; whilst the dyads, triads, groups and organizations in which the advice networks operate are explored in the context of the wider social system of the focal group are explored through Phases 2 and 4, and through the thematic analyses stemming from Phase 3. Such multi-level organizational analyses have been called for by journal editors (e.g., Bansal & Corley, 2011; George, 2016).

4.4 Organizational context

The research was conducted within a large, multi-national manufacturing organization, with a key site in the UK. The department of interest, referred to hereafter as The Group, was involved broadly in systems engineering. In this research The Group is the case study unit of analysis. The Group could be considered an example of a cross-functional work-group; and comprised a number of sub-groups, each representing a different systems engineering discipline. The sub-groups shared some common characteristics. They are: (1) interdependent on each other for the effective delivery of their products and services; (2) from a range of different disciplines; (3) organised in matrix formations where individuals are members of a work-group, but simultaneously work across these groups on work projects; (4) based in different locations (sites or countries), where there are different cultures, norms, processes and communication channels. Whilst independent in many ways, all sub-groups were united in an overarching aim, and inter-dependent to differing extents. One purpose of The Group's organizational structure is to facilitate knowledge sharing both within and between sub-groups:

> *"I'd like to see all of the first line working away co-operatively, to deliver, to meet the commitments of the people funding us, and talking about where the organization is going to move to strategically ...I'd like to see us better interfacing with the departments that we have to live with; you can't do that without having a network."*
>
> Participant 8, Director of The Group (preliminary interview extract)

I was initially invited to work with The Group to explore the commercial value of SNA as a means of improving Knowledge Management, within a broader portfolio of research undertaken by our research centre. At the time of Phase 2 an organizational structure had been recently established, aimed at realizing an ambitious knowledge sharing vision. By bringing together previously dispersed domain experts, this structure aimed to deliver organizational benefits including: integration across disciplines, faster flow through to implementation, clearer accountabilities, and a global, consistent strategy. Although I was not an employee of the

organization, I was a well embedded Associate of the organization and had already worked with The Group for three years. This enabled me to identify and consider relevant additional information (e.g., political and bureaucratic challenges), in the creation of the case study. Such information was deliberately obtained during Phase 1, and over the three year duration of the data collection, continued to be obtained through related project reports and interactions. It is recognised that this organizational embeddedness would have potentially affected the thematic analyses of Phase 3, though as is subsequently outlined (page 80), clear attention was paid to ensure the dependability, credibility and authenticity (Guba & Lincoln, 1994) of these insights.

4.5 Participants

Research participants were the members of The Group; in total encompassing 162 employees (91% of whom were male, and the mean age range was 36-45 years). Predominantly participants were engineers, whose work related to the design and manufacturing of engines. Engineers in all such roles were considered to be knowledge workers, with general, day-to-day job activities characteristic of such engineers, as summarised in Robinson (2012). Robinson's data, which examined work tasks amongst similar engineers from this organization, shows that technical engineering work typically comprised over 60% of an engineer's workload, increasing with role seniority. *Social* activities (e.g., meetings and collaborative projects) also increased with seniority, and accounted for around 30% of all work activities. Advice behaviours (including both seeking and sharing) were clearly integral to all levels of this work (Robinson, 2010), as engineers in this organization worked on a range of interrelated projects, operating in concurrent engineering cycles, as standard practice.

A bachelors degree in engineering is essential for base level entry to The Group, so these participants were well educated. Many would have been educated to post-graduate and Doctoral levels, though the exact numbers in this sample are unknown. Engineers comprised the largest population in The Group (n=132), and were predominantly male (92%), and many had lengthy organizational tenures. Data collected during Phase 2 showed that by that point in the research, 48% of the participants had worked for the organization for over 16 years, and 45% of participants had worked in The Group or a previous variant of The Group for between one and five years (SD = 1.48), whilst 64% had worked in their present job role for between one and five years (mean = 1-5 years, SD = .87). Figures 4.3, 4.4, and 4.5 (overleaf) provide more detailed breakdown of this data.

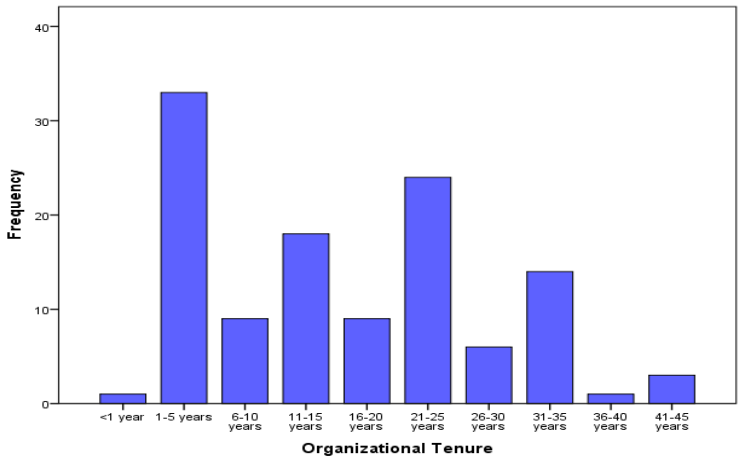


Figure 4.3: The organizational tenure of participants (at Phase 2)

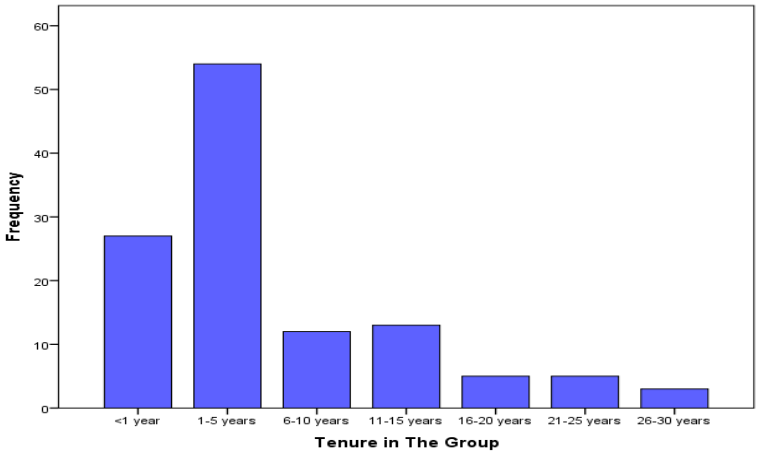


Figure 4.4: The Group tenure of participants (at Phase 2)

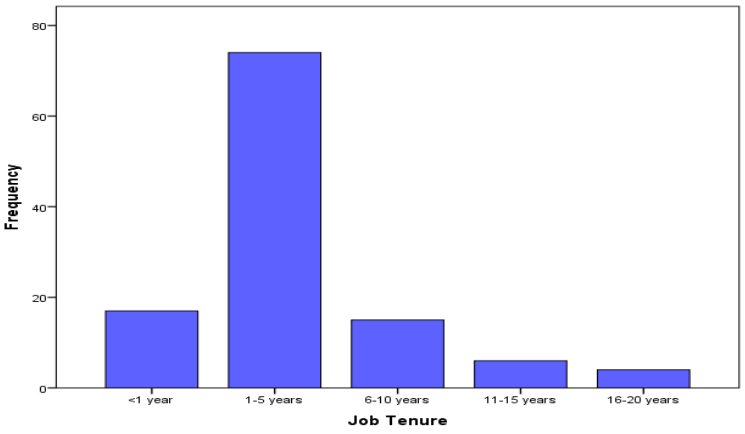


Figure 4.5: The job tenure of participants (at Phase 2)

Engineers were supported in their daily activities by Project Managers (n=26), Administrators and Secretaries (n=4). In most cases Project Managers also had an engineering

background, so these categories were not mutually exclusive. In their current role, their core responsibilities were to manage the delivery of service by the technical engineers, and coordinate projects.

Organograms (organizational charts) denoting the organization's structure showed that The Group operated hierarchically, through sub-groups (work-groups), in which each sub-group was managed by a leader, whose role was to coordinate staff members within their sub-discipline. Organizational documentation also showed that project teams typically transcended these boundaries, and were led by key, named individuals. Outside of the core sub-groups, a number of senior engineers formed the *Management Team* for The Group, including the sub-group leaders and a number of senior others, whose work was not allocated to a specific discipline. Most such individuals held a boundary-spanning role – e.g., one individual was responsible for the Research and Development strategy of The Group; another was effectively the most senior Project Manager, responsible for ensuring the strategic coordination and delivery of value from projects undertaken by the sub-groups.

Participant response characteristics are shown in Table 4.1:

	(Phase 1) 2009	**(Phase 2) 2010**	**(Phase 4) 2012**	**(Phase 3) 2010-2011**		
Sub-group	Face-to-face interviews	Time-1 Questionnaire	Time-2 Questionnaire	Telephone	Face-to-face	Total
Group A (N = 47)		*37*	*21*	*1*	*2*	*3*
Group B (N = 27)		*16*	*10*	*2*	-	*2*
Group C (N = 16)		*8*	*7*	-	*1*	*1*
Group D (N = 18)		*14*	*5*	-	*2*	*2*
Group E (N = 31)		*24*	*15*	*1*	-	*1*
Group F (N = 8)		*5*	*3*	*1*	-	*1*
Group G (Management Team) (N = 15)	*7*	*12*	*8*	*3*	*3*	*6**
Total (N = 162)	**7**	**116 (72%)**	**69** (43%)**	**8**	**8**	**16**

**Includes 3 sub-group leaders*

***61 of these responses can be matched to T1 responses*

Table 4.1: Number of participants taking part in each research phase.

4.6 Ethical considerations and approval

Interviews and questionnaires in the social sciences are subject to a range of common ethical dilemmas relating to issues such as informed consent, confidentiality and the anonymity of data, withdrawal from research, and so on (APA, 2002, 2017; BPS, 2009, 2014). These kinds of issues, with typical solutions are well documented (e.g., see Knapp & VandeCreek, 2003, 2006; Lefkowitz 2003), and are usually remedied by measures such as consent sheets, the anonymisation of participants, the aggregation of data, and so on (Howitt & Cramer, 2005). Network analysis poses additional ethical considerations, however, for two key reasons (Hoppe & Reinhardt, 2010). First, in questionnaire research, individuals typically provide information about themselves (e.g., preferences, views, attitudes); whereas in network analysis, individuals provide information about the *other people* with whom they hold a relationship. For instance, they might be asked to identify the people they like, the people they trust the most (or least), the people they consider to be most competent, or simply people they work alongside. This can mean that even if an individual actively chooses *not* to participate, they might still be identified in the research by someone else, thereby contravening their wishes. To remove their name altogether, however, can skew quantitative findings (e.g., if an influential node – such as a key manager or broker, is taken from the sample), by changing the structural or relational properties of the network. Second, in traditional research, the data presented back to organizations are aggregated, whereas in network research, resultant structures are unique, and are linked directly to individuals, through the complex relational structures that the data creates. Related to this are issues around the comparability of data. Typically, individuals who participate in a questionnaire, can subsequently compare their data with *norms* (by studying average variable scores). This is more difficult with network data, because network analyses do not aggregate in this way (Borgatti et al., 2013), and although there are some common measures (e.g., centrality), which enable comparison, it is difficult for individuals to benchmark their results against others. This lends itself to data misuse by individuals and organizations who act on erroneously interpreted network profiles.

These points were extensively deliberated in the data collection methodology, and were considered alongside other perspectives. For example, from an organization's perspective, it could be argued that network data is of limited use where nodes are completely anonymised; whereas if the organization could identify overloaded or isolated individuals, it could take better informed action to remedy this. On the other hand, it was recognised that the identification of participants could lead to the unethical misuse of the data. It was also recognised that self-reported data on variables such as job satisfaction and motivation tends to be skewed, compared with more *objective* research methods (Lelkes, Krosnick, Marx, Judd & Park, 2012). It was therefore decided that anonymity would be guaranteed to participants (the norm in

organizational research), as the resultant data was likely to be of higher quality, because people would be more inclined to honestly respond (Podsakoff et al., 2003).

4.6.1 Chosen approach:

In this research it was decided that network data would be anonymised in all information presented back to the organization. Before agreeing to take part all participants were given information outlining the ways in which ethical issues would be addressed, and the way data would be treated. Cover letters made clear that the research was being carried out independently of the organization, that participation was entirely voluntary, and that data would be treated confidentiality and anonymously (see Appendix A). The organization has never had access to any raw data. This anonymity meant that nodes representing participants who had not themselves completed the questionnaire were included in the subsequent analyses, though any identifying features (e.g., gender) were removed. These commitments were also clarified in early methodological discussions with the organization. With this information, participants gave their informed consent at each stage of the research. During the process of data collection, a number of emails were sent to encourage higher response rates from participants. Having completed the questionnaire, several participants volunteered to waive their right to anonymity to enable exemplars of the findings to be presented within the organization, to champion the SNA approach. Such examples are included in this thesis, with informed consent. Questionnaire responses were collected electronically, with the resultant data stored on the University of Leeds' secure server. Ethical approval for the research was obtained by the research Ethics Committee at the University of Leeds (AREA 11-203). The research also adheres to the British Psychological Society's *Code of Ethics and Conduct* (BPS, 2010), and *Code of Human Research Ethics* (BPS, 2014). This guidance was provided in both the initial questionnaire invitation, on the front page of the questionnaire (in the form of a cover letter), and when approached to take part in all interviews.

4.7 The Research Phases:

In the sections that follow, the methodology for each of the research phases is outlined in detail.

4.7.1 Phase 1: Gathering contextual information

Background data was sourced from the organization to capture the richness of the organizational context. Data sources included the obtaining of organograms, seating arrangements for the main office, key strategy documents relating to The Group's objectives and intended role in the wider organization. The organization's longstanding relationship with the University of Leeds also enabled me to access other project reports, providing additional insights into work systems and strategic vision, employees' job roles and desired employee

competencies. This information was synthesised and used to facilitate the development of an organizationally-relevant questionnaire (Phase 2), and informed the semi-structured interview schedule for preliminary, *scoping* interviews with The Group's Director and his first line.

Preliminary interviews were undertaken with key members of The Group (n=7) to identify cultural and organizational norms related to advice behaviours both *within* and *between* sub-groups. The interview schedule was semi-structured, to ensure that interviewees had the opportunity to provide views on key areas of enquiry, but sessions were open-ended to enable exploration of new or unanticipated areas (see Appendix B). A snowball sample, starting with a meeting with The Group's Director, identified key participants to interview. The final interview sample included all sub-group leaders (including international counterparts), and one other senior member of The Group's management team.

Each interview was recorded with participant consent. As interviews were designed to understand how The Group embedded in the wider organizational system (Cherns, 1987), interview content was examined using template analysis (King, 2012), based on a socio-technical framework (Davis et al., 2014). This approach to analysis has been utilised in the prior literature (e.g., Hughes et al., 2017) and produced a template comprising 6 primary interrelated themes (goals; people; processes; infrastructure; culture; technology). The following extract, for instance, was simultaneously coded under goals, culture, people and processes – aligning with socio-technical theory, which advocates understanding parts of a system in relation to one another (Clegg, 2000).

> *"When I got seconded into this role, we must have spent about nine months talking about how we were going to do it* ***(GOALS_strategy)****. And then we spent another nine months – because the company does not have a means of deciding who is deciding, you know* ***(CULTURE, PROCESSES)*** *... And we just sort of – we eventually – we ended up having to do a kind of multi-stakeholder marketing exercise... And because there is no process that says: so and so in this role is responsible for deciding these things* ***(PROCESSES)****, everybody of course thinks they have a vote and that they have a veto. Yeah? So it took us many, many – even when we took it to [The Most Senior Company Director] and said, "This is our plan, what do you think?" He says, "Well, do that bit." Okay then. So we went off.* ***(PEOPLE_leadership)*** *And even that took another six months to get it actioned!* ***(CULTURE)***
>
> P8 – Director of The Group (preliminary interview extract)

Preliminary interview data was primarily used to understand the organizational and political landscape underpinning the network. Interview data also facilitated the prioritisation of variables for inclusion in the Phase 2 network questionnaire, which aimed to capture advice networks within The Group, and the factors associated with their development. The impact of workload on behaviour appeared to be a particularly strong theme, for instance; with participants reporting that this affected their ability to consider or enact change. Workload was therefore incorporated as a variable in the Phase 2 questionnaire, and considered as a potential moderator of behaviour. The final template is found in Appendix C.

4.7.2 Phase 2: Online network questionnaire

Phase 2 involved the measurement of the network, together with related variables.

4.7.2.1 Boundary specification and participants

In SNA, the term *boundary specification* describes the focal population and the sampling strategy for identifying participants (Laumann, Marsden, & Prensky, 1989). A network can be *bounded* (i.e. participants are asked to indicate from a specified list of individuals who they seek advice from), or *unbounded* (where participants can specify individuals outside of a named group). There are pros and cons to both types, and the optimality depends on the research objectives (Knoke & Yang, 2008; Laumann et al., 1989). This choice is important, given the sensitivity of network analysis to missing data (Wasserman & Faust, 1997). For this research, a bounded approach was chosen for three reasons:

First, the research sought to look at the advice networks *within* an established organization (representing a specific employee population), and whether these relationships related to belief structures, behaviours, and outcomes. Second, an organizational boundary could be outlined around The Group with reasonable clarity. Whilst this network did not exist in isolation of broader organizational and environmental structures, the research aimed to establish advice behaviours within formal job-role structures (e.g., to what extent did they mirror the organization's formal, hierarchical structures). It sought to understand the role that particular individuals in The Group played in informal network behaviours. Third, the focus on organizational advice networks meant that a whole-network analysis was appropriate. In a bounded network, individuals are asked about their connections to a pre-formulated list of names, so it is possible to calculate response rates. This had the benefit of enabling the strength of connections (e.g., network density and reciprocal relationships) to be identified with greater precision. With an unbounded network, the *completeness* of the network would have been difficult to establish, as the network is potentially limitless. A limitation of this choice, was that the questionnaire did not enable identification of influential *advisors* outside The Group (e.g., family members, peers from other organizations, ex-members of The Group). However, this

matter was addressed in Phase 3, where individual egonets (personal networks) were examined in more detail, and where participants were asked to consider the influence of advisors from their wider networks.

The boundary set for the Phase 2 questionnaire was all members of The Group (n=162), comprising employees of the *Management Team* and six sub-groups.

4.7.2.2 Questionnaire measures

The questionnaire aimed to capture employees' current networks and was hosted online by Cross Network Analytics™[3], as the collaborating organization had access to this. This tool was selected for its ability to work with network questions, which are less well catered for by similar packages (e.g., Qualtrics[4]). The data was downloaded directly in standard *.csv* files compatible with Microsoft Excel and UCINET (Borgatti et al., 2002). The questionnaire included two types of question: (1) questions about the structure of relationships (relational variables); and (2) questions about the attributes (personal characteristics) of individual participants (known in SNA as compositional variables).

4.7.2.2.1 Relational questions

Two relational questions were selected for inclusion, based on published measures by Cross and colleagues (Cross et al., 2001a), which were deemed to encompass both transactional and transformational advice behaviour types. Both relational questions used the roster method[5] (Wasserman & Faust, 1994). This method collects reciprocal information, because it gauges the relationship from both sender and receiver. This can help overcome self-reporting biases, which are a common problem in questionnaire research (Podsakoff et al., 2003), because *incoming tie* (rather than *out-going tie*) measures can be used as the unit of analysis.

In the first question, participants were asked: *"Over the past 6 months, how frequently have you sought advice from each of the following people to get your work done?"*. Data were reported using a 6 point scale (Cross et al., 2001a) using the anchors: *1 = Do not know this person; 2 = Know this person, but have not sought advice from him/her; 3 = Rarely (e.g. a few times a year); 4 = Frequently (e.g. monthly or more); 5 = Very frequently (e.g. weekly or more); 6 = Daily (e.g. every day, and often several times daily)*. The questionnaire was then

[3] This product has since been sold, but was formerly found at: http://www.crossanalytics.com/nrt/
[4] https://www.qualtrics.com/
[5] Participants are asked to identify connections from a list of named individuals - see Wasserman & Faust, 1994, for discussion of this approach

programmed, so that if an advisor was identified as someone who was sought *Frequently* or more often, their name was shortlisted into a list for the next question[6].

In the second question, participants were asked to identify the *type* of advice they had sought from the short-listed names. The possible answers to this question were based on the 5 different types of advice behaviour identified by Cross et al., (2001b). The advice labels were modified slightly based on piloting feedback, to ensure relevance and ease of interpretation for the population, but the definitions remained those of Cross et al (2001b, pp.231-232). The new titles (with the original noted in brackets) were defined as follows:

1. ***Gathering information*** *(solutions)**:** "Turning to a colleague for answers to fairly specific or detailed questions at work."*

2. ***General guidance*** *(meta-knowledge)**:** "Turning to a colleague for general guidance or referrals to other sources of information."*

3. ***Problem solving*** *(problem reformulation)**:** "Turning to a colleague to help you think through a problem even when they might not have specific information that you need."*

4. ***Validating ideas*** *(validation)**:** "Turning to a colleague to talk through ideas, to bolster self-confidence and make you more willing to introduce your ideas to others."*

5. ***Authorisation*** *(legitimation)**:** "Turning to a colleague to seek authority, or just so you can say you have spoken to that person about your ideas. The individuals may be in a higher position within the organization, or may be a perceived expert in a given area."*

Participants could select all advice types that applied to the relationship.

In this research, gathering information, general guidance and authorisation were considered examples of transactional ties (advice required in order to complete work). Validating ideas and problem solving were considered examples of transformational ties (advice that might change the way a person thinks about their work). The likely overlap across these categories was recognised, and so is explored further in both the results and discussion chapters.

4.7.2.2.2 Compositional variables

The questionnaire also measured a number of socio-demographic variables, using categorical and free-format measures (as below):

[6] The questionnaire was first piloted so that all known individuals were included in the shortlist, but this substantially increased questionnaire completion time, which the organization would not agree to.

- *Sub-group:* The sub-group the participant is part of (mutually exclusive categories were provided by the organization, yielding nominal data).
- *Location:* Place of work (geographical site location).
- *Age:* Age in years and months.
- *Gender:* Whether male or female.
- *Job grade:* Job grade (categories provided by the organization).
- *Manager/ non-manager:* Whether or not an employee is a line manager, project manager, manages both people and projects, or is not a manager.
- *Contractor/ non-contractor:* Whether or not an employee is a contractor.
- *Company tenure:* Length of time employed by the organization.
- *Group tenure:* Length of time employed as part of The Group (and previous formations of The Group).
- *Job tenure:* Length of time employed in their current job post.
- *Projects:* The projects they had worked on, either now or previously (selected from a drop-down list – project names were provided by the organization).

The questionnaire also measured a range of compositional variables relating to attitudes, states and traits, as listed and operationalized below:

4.7.2.2.3 Intention to share knowledge (ISK)

This review found no suitable measure of ISK, and so a scale was developed expressly for this questionnaire based on earlier unpublished work by Shepherd (2008). For each question *knowledge* was the focus, and considered to be distinct from related terms *information* and *advice* for reasons outlined in Chapter 2. Within this question were three intended sub-scales, covering *intention* to share knowledge, *opportunity* to share knowledge, and the extent to which the sharing of knowledge was considered a *priority* at work. For all three sub-scales responses were provided on a 5-point scale ranging from *"strongly agree" (4)* to *"strongly disagree" (0)*, with the midpoint, *"neither agree nor disagree" (2)*.

Three items were developed to measure the extent to which the employee *intends* to share knowledge with colleagues in The Group, which asked whether a person *"intended to"*, would *"try to"* or would *"definitely"* share knowledge. The internal reliability for these three items alone was: $\alpha = .75$. Three items were designed to measure the extent to which the employee considered there to be *opportunities* and support systems in place for knowledge sharing. The internal reliability for these three items alone was: $\alpha = .71$. Three items were designed to measure the relative *importance* that the participant attached to sharing knowledge on work-related matters with their colleagues, compared to other work commitments. The internal reliability for these three items alone was: $\alpha = .72$.

Exploratory factor analysis using principal axis factoring was performed on the nine items. Oblimin rotation was performed on the data, due to the matrix indicating that some items within the overall scale were inter-related (correlations of .20 were found between some of the items, as well as a factor correlation of -.67). The Kaiser-Meyer-Olkin measure confirmed the sampling adequacy for the analysis (KMO = .75; Hutcheson & Sofroniou, 1999). An initial analysis was run to obtain eigenvalues for each factor in the data. Two factors had eigenvalues over Kaiser's criterion of 1, and in combination together they accounted for 57.67% of the variance. These two factors were retained owing to the relatively small sample size, the convergence of the scree plot, and Kaiser's criterion on this value. The two-factor solution revealed one cross-loading item (*'takes precedence over other commitments'*: .40 and .38). This was removed, and the analysis re-run. This yielded a clear two-factor solution, accounting for 60.08% of the cumulative variance. Table 4.2 shows the final factor loadings, following rotation. Items loading onto Factor 1 represent *'intention to share knowledge'* (ISK), and on Factor 2 represent *'perceived organizational support for sharing knowledge'* (OSSK). ISK is used in the subsequent hypothesis testing.

Item	FACTOR 1 Intention to share knowledge (ISK)	FACTOR 2 Organizational support for sharing knowledge (OSSK)
I will try to share knowledge with colleagues.	.81	
I will definitely share knowledge with colleagues.	.76	
Sharing knowledge is absolutely essential in my job.	.64	
Sharing knowledge with colleagues is a high priority for me compared to my other commitments at work.	.60	
I intend to share knowledge with colleagues.	.56	
The work environment supports knowledge sharing.		.94
Our knowledge management systems provide opportunities to share knowledge with colleagues.		.64
There are always opportunities for me to share knowledge with colleagues.		.46
Eigenvalues	**3.29**	**1.90**
% of variance (after rotation)	**36.56**	**29.12**
Cronbach alpha	**.80**	**.71**
Scale mean	**3.18 (SD = .64)**	**2.00 (SD = .82)**

Extraction method: Principal axis factoring. (n=117)

Rotation method: Oblimin with Kaiser Normalization.

a. Rotation converged on 4 iterations.

Table 4.2: Exploratory factor analysis using principal axis factoring for knowledge sharing items

4.7.2.2.4 Workload

Workload is operationalized in a number of ways (e.g., see Moray, 1979), but without universal consensus (e.g., see Gopher, 1984; Hill et al., 1992; Wierwille, 1983). In this research it is operationalized as a state variable measuring the employees' perception of their role overload in terms of the amount of work assigned to, or expected from them, in a given time. This review found physiological, subjective and performance measures of workload, which

were examined for inclusion in the questionnaire. As this research was concerned with belief systems, a self-reported (subjective) measure of workload was considered an appropriate instrument. A number of measures were reviewed (e.g., De Waard, 1996; Tattersal & Foord, 1996; Yeh & Wickens, 1988), with the selected measure considered less intrusive and time-consuming than alternatives. Eight items were selected from Caplan et al. (1971). This measure has been well cited and adapted (e.g., Caplan, Cobb, French, Harrison, & Pinneau, 1975; Caplan & Jones, 1975), with Cronbach's alpha reliability for the scale ranging from α = .77 (Caplan & Jones, 1975) to α = .86 (Caplan et al, 1975). Low repeat reliability (e.g., Caplan & Jones, 1975, who found it to be .06) is consistent with conceptualisation as a state variable that is affected by changes in the work environment. Responses were provided on a 5-point scale with the anchors: *"rarely or never" (0), "occasionally"(1), "often" (2), "very often" (3), "constantly" (4)*.

4.7.2.2.5 Job crafting

The review found no complete questionnaire measures of job crafting (though Tims, Bakker & Derks, 2012, and Nielsen & Abildgaard, 2012 have since been published), so an unpublished scale by Leach and Searle (2009) was used. This was based on the three categories of job crafting (relational, cognitive and physical) identified by Wrzniewski & Dutton (2001) and outlined in Chapter 3. Items were bound to the past 6 months, and measured the extent to which an employee believed they had voluntarily changed relational, cognitive and physical work boundaries (see Table 4.3). Responses were given on a 5-point scale, using the indicators: *"not at all" (0), "just a little" (1), "a moderate amount" (2), "quite a lot" (3), "a great deal" (4)*. Exploratory factor analysis using principal axis factoring analysis was performed on the 15 job crafting items, given that this was a new scale. An oblimin rotation was performed with Kaiser normalisation, due to the correlation matrix revealing a correlation of > .20 between some of the items, indicating that some items within the overall scale were inter-related; as well as theoretical justification for item interrelatedness. The Kaiser-Meyer-Olkin measure confirmed the sampling adequacy for the analysis, KMO = .92 (*'marvellous'* according to Hutcheson & Sofroniou, 1999). An initial analysis was run to obtain eigenvalues for each factor in the data. The scree plot was ambiguous but inflexions suggested that three factors should be extracted. Two of these factors had eigenvalues over Kaiser's criterion of 1, but together the three factors accounted for 73.80% of the cumulative variance. Principal axis factoring analysis was re-run, this time extracting three factors, which loaded distinctly, providing three scales with acceptable Cronbach's alpha reliabilities (Table 4.3). These factors were consistent with Wrzesniewski & Dutton's job crafting dimensions. The third factor (RJC) was used for hypothesis testing.

Item	Physical crafting	Cognitive crafting	Relational crafting
The variety of work tasks you perform.	.92		
The kinds of work tasks you do.	.75		
The number of different work problems you try to solve.	.70		
The number of work tasks you perform.	.70		
The number of different skills you use in you work.	.40		
The amount you collaborate with others to get your work done.	.34		
How you see your work activities.		-.84	
Your views about the value of your work.		-.89	
How you think about your part in the bigger picture at work.		-.80	
Your views about what your job is all about.		-.54	
Your ideas about how your various work tasks fit together.		-.50	
The number of people you regularly talk to as part of your work.			.98
The number of people you interact with in the course of your work.			.75
The range of people you talk to in the course of your work.			.67
The variety of people you associate with at work.			.47
Eigenvalues	**8.88**	**1.31**	**.88**
% of variance (after rotation)	**59.22**	**8.74**	**5.84**
Cronbach alpha	**.91**	**.91**	**.89**
Scale mean	**1.66**	**1.50**	**1.78**
	(SD = .88)	**(SD = 1.00)**	**(SD = .98)**

Extraction methods: Principal axis factoring (n=117)

Rotation method: Oblimin with Kaiser Normalization

a. 3 factors extracted. Rotation converged in 14 iterations.

Table 4.3: Exploratory factor analysis using principal axis factoring for job crafting items

4.7.2.2.6 Job satisfaction

Job satisfaction was operationalized as the extent to which an individual is content with their job. Several relevant scales were reviewed, including single and double item measures

(e.g., Dunham & Smith, 1979; Wanous, Reicher & Hudy, 1997), as well as longer scale measures (e.g., Judge, Boudreau, & Bretz, 1994; Scarpello & Campbell, 1983). The items selected were from Brayfield and Rothe (1951), and had previously demonstrated high internal consistency (α = .77, for the full original scale), as well as reporting good face and criterion validaity. A 5-item version was used, where internal consistency had been consistently reported at α=.80 or higher (Judge, Bono & Locke, 2000) – a sample item from this scale is: *"I feel fairly satisfied with my present job".* Two reverse-coded items were subsequently removed following piloting, leaving a three-item measure. Responses used a 5-point scale ranging from *"strongly disagree" (0),* to *"strongly agree" (4),* with the midpoint, *"neither agree nor disagree" (2).* Cronbach's alpha reliability for the final scale was: α = .84.

Prior to dissemination, the questionnaire was piloted with a small, representative sample from The Group (n=8) to establish face validity and credibility. Minor iterations were made in accordance with their feedback[7]. The full questionnaire (offline version) can be found in Appendix A.

4.7.2.3 Questionnaire response rate

A specific concern for network analysis questionnaires is that a particularly high response rate (c.70%) is necessary (Kossinets, 2003; Totterdell et al, 2010). Although it is possible to measure the number of *incoming* ties to a node as an index of their network size (i.e. the number of people who identify that person as someone they seek advice from), true conclusions can only be made if all reciprocal connections can be identified. This is illustrated by examining the network diagram presented earlier (Figure 4.2). For instance, without knowing Sophie's outgoing ties, it could be incorrectly (and misleadingly) concluded that Sophie has no connections to manufacturing.

4.7.2.4 Procedure

An up-to-date spreadsheet containing The Group members' details (name, job title/role, contact email address, telephone number, sub-group and line manager) was provided by the organization. This provided useful information about the chain of command (enabling the testing of H1), and job role similarity (enabling the testing of H5). An email was sent from The Group's UK Director, emphasising the importance of the research, and the research was introduced by sub-group leaders in their weekly briefings. Participants were then emailed an invitation to complete a questionnaire. Initially, participants were given three weeks to respond, with occasional prompting emails sent over a further two-week period. Each reminder stressed the voluntary nature of participation. This approach yielded an overall response rate of 72%,

[7] *Intrinsic job motivation*, *proactivity* and *engagement* were also measured for internal use by the organization.

which fluctuated slightly across sub-groups. Once the overall response rate had settled at 72% for two weeks, the questionnaire was closed.

4.7.2.5 Phase 2 analyses

4.7.2.5.1 Dummy variables:

Dummy codes were created for three variables, to enable categorical data analysis (Field, 2013). For *work-group*, the *Management* sub-group was the baseline, creating 6 new dummy variables. *Location* was also dummy coded, with the dominant UK location as the baseline, creating 3 new dummy variables[8]. *Role* was coded into dummy variables, with *senior management* as the baseline. The long list of role categories provided by the organization were grouped into 6 meaningful categories (Admin, Junior Technologist, Senior Technologist, Junior Manager, Middle Manager, Senior Manager), resulting in 5 new dummy variables[9]. *Age*, *Job Tenure*, *Organizational Tenure* and *Group Tenure* were measured using numerical ranges (e.g., 16-25, 26-35, 36-45), so for the analyses each participant was allocated the value equivalent to the midpoint of the range category selected as is conventional (Horton & Kleinman, 2007), enabling hierarchical regression analysis to be performed on this data.

4.7.2.5.2 Data screening

SPSS data were screened prior to testing. Linearity was examined through inspection of residual scatterplots. All centrality scores were found to experience positive skew. Three clear outliers were removed from the dataset based on their extreme centrality scores (IDs: 58, 107 and 94). No outliers were identified in the wider questionnaire data. Participants 58, 107 and 94 were still included in the *network* analyses as such analyses are unaffected by non-normality (Borgatti et al., 2013); and through this lens, outliers were deemed to represent interesting cases worthy of exploration. For tests based upon general linear models, however (e.g., linear regression, ANOVA) where the aim is to look for general patterns of behaviour, it was sensible to remove these outliers, given there were so few of them. This enabled exploration of the relationship between psychosocial variables and advice behaviours amongst the more homogenous population. This was sufficient to normalise the scores for in-degree centrality (Freeman's and Bonacich's). However, in order to further reduce negative skew, a logarithmic (Log 10) transformation was applied to all of the other centrality indexes (eigenvector, betweenness) (Tabachnick & Fidell, 2007). A number of final outliers were removed from subsequent analyses once matched pairs were removed (as they had centrality scores but no attitudinal ones). This resolved remaining normality issues.

[8] Multiple sites within the same city were grouped together.

[9] The 'unsure' categories were recoded as missing data, and such participants were excluded from the subsequent analyses.

Singularity was ensured by inspecting the correlation coefficients. Multicollinearity and variance inflation factor (VIF) scores were examined for each of the variables in the regression models, to ensure predictors were not too strongly correlated with other variables (Field, 2013). In all cases these scores were below 3, satisfying Myer's (1990) recommendations, who advocates scores above 10 should be investigated, as well as the more stringent *above 4* guide provided by Miles & Shevlin (2001). Cook's distance statistic (measuring the overall influence of a particular case), suggested that no outliers remained (value < .15, which was within the acceptable range; Cook & Weisberg, 1982). Therefore the single outlier indicated by the Mahalanobis distance statistic was ignored.

4.7.2.5.3 Regression analyses

A number of regression analyses were performed during the analysis. In all cases, multicollinearity checks were made, including examination of the acceptability of VIF and Tolerance scores, which were all within acceptable threshold levels (Menard, 1995; Myers, 1990), indicating that it was acceptable to proceed with this approach, unless otherwise described. For moderation and mediation analyses, Hayes' Process macro was used (Hayes, 2015; Preacher, Rucker & Hayes, 2008). However, given ongoing debates about the merits of alternative statistical modelling approaches (e.g., Baron & Kenny, 1986; Shrout & Bolger, 2002; Tomarken & Waller, 2005; Zhao, Lynch, & Chen, 2010; and to take into account the likely measurement error found in psychological measurement (e.g., Gerhart, Wright, Mahan, & Snell, 2000), a number of relationships were also tested in alternative ways.

4.7.3 Phase 3: Follow-up interviews

> *"When one's concern is the experience of people, the way that they think, feel and act, the most truthful, reliable, complete and simple way of getting that information is to share their experience"*
>
> (Douglas, 1976, pp.112).

The purpose of Phase 3 was to consider the three core research questions through the lens of individual network members, by undertaking semi-structured interviews with a sample of questionnaire respondents. Interviews aimed to tease out more detailed information about the precise nature of work relationships, with a view to understanding *why* ties existed (or did not exist), and the factors leading to the development of their networks. Through discussion of experiences, Phase 3 also sought to understand the interplay between top-down and bottom-up structures, in order to better elucidate the complete range of factors affecting advice behaviours in this sample. In so doing, it explored the value that individuals attribute to, and derive from, their social connections within The Group and broader organization. It unpicked some of the more incremental, dynamic cycles of job development stemming from a person's interpersonal

relationships, and explored the ways in which these experiences can be seen to affect the development of job roles. It also enabled the intricacies inherent in the relationships held by people to be explored (e.g., how relationships can impact on workload, or a participant's views relating to The Group's strategy).

Phase 3 aimed to provide complementary insights to those uncovered through Phase 2, and where appropriate, challenged these findings in the pursuit of a more holistic image of the advice networks. Viewed alongside Phase 2, Phase 3 helps create a richer, more holistic explanation of this organizational case study. Whilst the network questionnaire was able to provide important information about the structure and texture of The Group's advice networks, some questions remained unanswered. For instance, the *desirability* of certain attitudes and advice behaviours, particular *cliques* and *silos* was unclear. Interviews with members of the network enabled these issues to be explored. Certainly, it is possible that in some circumstances a small, tight network could more effectively enhance a role than a larger, more disparate network (see Brass, 2012). In some circumstances it may be appropriate for an individual or group to be *siloed* (isolated), for example, because their main network is with another organizational department, or a team that is beyond the network boundary (for instance, a group of suppliers).

4.7.3.1 Participants

A stratified sampling strategy was employed to select interviewees (n=16), whereby the approached participants comprised a balance of representatives from across socio-demographic groups (e.g., age, gender, geographical location, company tenure, sub-group). Individuals with unexplained egonet properties were also approached for interview; including individuals with particularly high/low network centrality, and individuals whose questionnaire patterns appeared interesting or unusual. Sixteen members of The Group were interviewed in total.

4.7.3.2 Interview measures

A semi-structured interview schedule was developed to enable actors' network experiences to be investigated (see Appendix E).The semi-structured nature of the interview schedule helped ensure key subject areas were covered in all interviews, whilst enabling participants to explore other areas of particular relevance to them. Each interviewee was given a report to consider (outlining their network properties and including a range of socio-grams) prior to the interview meeting (Appendix D[10] for an example). This report facilitated discussion on the core issues outlined above. The interview schedule ensured the factors underpinning their

[10] The respondent detailed in this appendix gave their informed consent to waive their right to anonymity.

network development were explored, along with the responses given to the attitudinal questions in the Phase 2 (Time-1) questionnaire.

4.7.3.3 Interview procedure

Phase 3 began three months after the completion of Phase 2. Interviewees were approached first via email. A pre-interview phone call was then arranged to provide more details about the work, and to arrange a suitable appointment. Of the interviews, 8 took place face-to-face, and a further 8 were conducted via telephone (either because the participant was based overseas or because they requested this). All interviews were recorded with participant consent and full anonymity was guaranteed. The interviews were between one and two hours in duration.

4.7.3.4 Analysis of interview data

A variety of network properties (including a range of centrality measures[11]) were analysed prior to the interviews taking place, and personalised reports were manually created for participants. These reports involved egonet analysis using the Cross-Analytics software, and were provided to participants via email, ahead of their interview. Interviewee characteristics are summarised in Table 4.4.

[11] See Table 2.1 for network terminology.

ID	Group (2nd affiliation)	Gender (M/F)	Tenure (Yrs)	Site	In-degree ties (n=)	Out-degree ties (n=)	Betweenness centrality	Structural holes (n=)	Grade (0-8[12])	Relational Job Crafting (M)	Workload (M)	Intention to share knowledge (M)	Job satisfaction (M)
1	D	M	11-15	USA	4	2	0	2	8	.25	2.25	3.00	4
2	G (C)	M	11-15	UK_1	14	19	773	18	8	2.50	1.5	2.8	2.25
3	G	M	31-35	UK_1	29	45	1283	36	7	3.75	2.25	3.60	3.5
4	C	M	31-35	UK_1	8	16	466	9	7	1.75	1.38	3.00	3.25
5	B	M	31-35	UK_2	14	20	302	14	7	1.75	1.25	3.60	3.5
6	A	F	6-10	UK_1	12	1	2	5	4	1.75	1.75	3.80	4
7	F	M	16-20	GERMANY	3	12	35	11	No data	1.50	1.88	4.00	3.25
8	G	M	31-35	UK_1	22	38	773	32	8	2.00	1.63	3.80	3.75
9	G (E)	M	6-10	USA	30	103	5341	90	6	3.25	2.25	3.80	2.75
10	A	M	21-25	UK_1	2	2	0	1	1	.50	0.75	2.00	2
11	A	M	21-25	UK_2	0	3	0	3	4	1.75	1.13	3.80	No data
12	B	F	11-15	UK_1	7	5	6	5	4	0	2	2.40	3
13	A	F	1-5	UK_1	32	28	1310	30	0	3.00	1	3.80	2.75
14	D	M	1-5	UK_1	3	25	155	17	3	2.50	0.63	3.20	3.75
15	G (D)	M	31-35	UK_1	13	2	3	6	8	1.25	1	2.80	3.5
16	D	M	21-25	UK_1	24	18	640	20	8	1.75	1.88	3.40	3.25

Table 4.4: Characteristics of Phase 3 interview participants

[12] Participants' job grades were translated to a scale based on company categories, where 0 represents the most junior grade (e.g., administrative), and 8 represents the most senior grade (e.g., Fellow or equivalent).

4.7.3.5 Thematic analysis

Thematic analysis was applied to the data (Roulston, 2001). Although this approach is commonly used, there remains no firm consensus on the optimal approach to it (Attride-Stirling, 2001). It is generally agreed that high quality analysis is dependent on a number of criteria being fulfilled (see Cassell & Symon, 2011; Johnson et al., 2006); though debate remains about the most appropriate criteria for this (Garrat and Hodkinson, 1998; Smith, 1990; Seale, 1999). I approached the analysis with a realist ontological approach which, *"Assumes that 'the world is the way it is', while acknowledging that there can be more than one scientifically correct way of understanding reality in terms of conceptual schemes with different objects and categories of objects"* (Lakoff, 1987, pp. 265). Nevertheless, given the previous context analysis and sequential nature of the research, my analysis of this data was interpretivist (Berger & Luckman, 1987), because it was shaped through these prior interactions, rather than being straightforwardly representational (Frazer & Lacey, 1993, pp. 182). For instance, although research questions were pre-planned, further questions arose during interviews leading to further explanations and emergent findings. The approach taken to the analysis was therefore iterative (Tashakkori, & Teddlie, 2010), combining both inductive and deductive techniques (Elo & Kyngas, 2008; Leech & Onwuegbuzie, 2009). Broadly, in the deductive stage, pre-existing categories (influenced by the particular research questions, interview schedule and literature) were created to organize extracted quotes. In the inductive phase, themes and dimensions were freely generated, based on the interview transcripts (Patton, 2002). Interviews were audio recorded and transcribed verbatim, paying attention to tone and verbal remarks. Transcripts were imported and analysed within NVivo (QSR International Pty Ltd, 2012), enabling the production of a thematic template (King, 2012). All interview audios and transcripts were replayed and re-read, to help develop a broad view of the material (Riessman, 1993).

4.7.3.5.1 Coding process

A *theme* was created to denote a pattern in participant responses, capturing something considered relevant to the underpinning research questions (Braun and Clarke, 2006). Flexibility in interpretation was important, and so during the first stage of analysis, themes were developed as soon as such a concept emerged in the data; a theme did not require a particular quantity of responses to qualify (Clarke and Kitzinger, 2004). Initial themes were extracted and explored, but without a particular coding frame. A subset of transcripts were explored in detail, to define a hierarchical theme structure. This contained broad themes and sub-themes (King, 2012). Here, initial themes were ordered, and a coding structure was then developed to reflect this structure, which produced an initial template (see Appendix F). The complete set of transcripts were then examined systematically within this template structure, and the corresponding code was applied to the extract where there was a match to a theme. During this process, new themes and sub-

themes emerged, expanding the original template. Raw text data units were classified into *sub-themes* (e.g., job crafting, factors affecting new networks), *higher order themes* (e.g., voluntarily initiated networks, involuntarily initiated networks) and *general dimensions* (e.g., top-down, bottom-up). Deductive analysis was then re-applied to these themes, to ensure that identified categories were recognisable in the transcripts, and to ensure these reflected participants' perceptions and views. Once all transcripts had been completed, the template was reviewed, and diagrammatic representations were produced to highlight the connections between themes and concepts. These diagrams supported the refinement of the thematic analysis, and as a result a number of sub-themes were moved to an area of the template where they formed a closer match. For instance, I decided the *collaborative crafting* node was better represented alongside other nodes related to *diffusion*, than alongside the other *job crafting* nodes, because social interaction and influence were such central features of this concept. This template provided a basis for interpreting the data set, and can be found in full, in Appendix G. These thematic templates are also depicted in diagrammatic format within Chapter 6 (e.g., see Figures 6.1, 6.2, and 6.3).

The quality of the template analysis, in particular in terms of dependability, credibility and authenticity (Guba & Lincoln, 1994) was assured in two main ways. First, the initial interpretation of the dataset was presented back to representatives from the organization, to enable respondent validation of the analysis. Secondly, the thesis supervisors were both involved in the interpretation of the extracts, to ensure that alternative explanations had been considered and reviewed. It was not possible to undertake complete member checks on the data, because a number of participants had retired or left the organization between the time of data collection and final analysis. Other participants were offered the opportunity to validate the accuracy and representiveness of their data (Miles and Huberman, 1994), but declined. Nevertheless, the data was triangulated through comparison with the participants' individual network profiles (Patton, 2005), and by exploring the themes in the context of Phase 2 findings outlined in Chapter 5. In particular, this enabled contradictions to be identified and considered. Finally, as a point of clarification, the categories provided in the template are not considered to be exhaustive, or mutually exclusive; rather they are an explanatory framework enabling consideration of the research findings (Medved & Brockmeier, 2004). An example is provided in Table 4.5 for transparency of analysis:

Data excerpt	General dimension	Higher-order theme	Sub-theme(s)
"I don't expect any result of working with [person X] to be two or more years away in terms of benefits for the customer, so it has to take a relatively low priority."	*Bottom-up* networks	Voluntarily initiated (crafted) networks	Workload, goals, metrics
			Attitude to sharing knowledge
"We know how the other one thinks, so it's just easier to get the message across."	Advice seeking process	Factors affecting choice of advisor	*Personality* (like-mindedness)
"I was having conversations with [X] about task and you soon get into having to talk about, well, people's development in terms of should this person be doing this type of job next or what they should be moving onto as part of – because the issue of getting the job done and trying to continually develop people and expose them to different things or consolidate experience obviously becomes very intertwined."	Dynamic network evolution	Leadership	Creating strategy
		Diffusion of mindsets	Passive diffusion

Table 4.5: Data examples alongside the coding applied to them

4.7.4 Phase 4: Follow-up questionnaire

The purpose of Phase 4 was to explore the relationship between the variables measured in the Phase 2 questionnaire, and participants' subsequent progression, in particular in terms of career satisfaction, two years later. A range of possible avenues for such a follow-up study were explored, and the benefits and limitations of each were considered at length. Based on the organizational access and ethical considerations outlined in this analysis, a short follow-up questionnaire was developed, to assess participants' career development and progression at this subsequent time-point.

4.7.4.1 Questionnaire measures

The definition of career success depends on the philosophical position one takes on the notion of *career* (e.g., Evans & Bartholme, 1980; Arnold, 2011). For example, advocates of the

protean and boundaryless career, would argue that objective measures of success, which were commonly used as dependent variables in the testing of the early theories, are irrelevant indicators, and instead advocate subjective measures capturing individuals' perceptions of their career experiences, and the meaning they place on their career path. Indeed Hall (1996, pp. 8) argues that for the protean career: *"the ultimate goal… is psychological success, the feeling of pride and personal accomplishment that comes from achieving one's most important goals in life, be they achievement, family happiness, inner peace, or something else".* Perhaps as a consequence of these challenges, Arnold and Cohen (2008) have noted that careers continue to be predominantly evaluated in *"organizational terms"* (pp.8) – for example, using measures of pay, promotions and pay-growth (i.e., the indicators of acceleration and power most aligned with the *traditional* rather than modern notion of a career) – because despite the popularity of new metaphors, career patterns are still thought of as *"objectively observable paths of movement through organizational or occupational hierarchies"* (Arnold & Cohen, 2008, pp. 2). In this research objective career success was operationalized as career progression *"that can be evaluated by an impartial third party, such as pay, promotion, and occupational status"* (Hofman, Dries & Pepermans, 2008, pp.397). Subjective career success was operationalised as: *"career success or career satisfaction [that] is concerned with idiosyncratic evaluations individuals make of their own careers"* (Hofman, Dries & Pepermans, 2008, pp.397).

Following a review of the literature, Greenhaus, Parasuraman, and Wormley's (1990) career satisfaction scale was selected to measure subjective career success. Cronbach's alpha reliability for the full original scale: $\alpha = .88$. Responses to these five items used a 5-point likert-scale with the anchors: *"strongly disagree" (0), "moderately disagree" (1), "neither agree nor disagree" (2), "moderately agree" (3),* and *"strongly agree" (4)*. Based on piloting feedback, anchors were adapted slightly from the originals (which used *"disagree/agree to some extent"* and *"uncertain"* in place of the corresponding anchors chosen). Responses to this scale were averaged, producing a total *career satisfaction* score. Objective career success was also measured, using expressly developed measures, following meetings with the HR manager, and The Group's Director[13], although these were not included in the quantitative analyses, owing to few reported instances. The full questionnaire can be found in in Appendix H.

4.7.4.2 Procedure

Network members were emailed two years after completion of the original (Phase 2) questionnaire. A cover letter was emailed to all participants, explaining the purpose of the work, and reiterating the ethical commitments given previously. Participants were asked to respond via

[13] The subject of each item referred to one of the reward mechanisms in place within the organization. Respondents were asked to indicate the number of such rewards that they had received in the two-year period since they completed the Time-1 questionnaire, administered two years previously.

return email. Of the 162 individuals named in the originally identified network, 69 responded to this questionnaire, which represented an overall network response rate of 42%. Of those 162 individuals, only 15 individuals had left the organization. It was possible to match 61 of the participants with their original Time-1 questionnaire responses (8 completed the Time-2 questionnaire, but had not provided a response at Time-1).

4.7.4.3 Analysis

As in Phase 2, the resultant data were screened for missing or erroneous data, the inspection of residual scatterplots and normality testing. No changes were required, so the career satisfaction scale was included in the analyses described previously, in Section 4.7.2.5.

Chapters 5 and 6 will now present the results of the research.

Chapter 5: Quantitative results

The results of the research are not organized sequentially; rather the quantitative and qualitative results are consolidated into separate chapters (5 and 6). Each chapter is organized in sections, corresponding to each of the research questions (and associated hypotheses, for the quantitative data). Chapter 5 therefore presents the results of quantitative data collected in Phases 2 *and* 4. Nevertheless, there is also considerable benefit in exploring network results *inductively* (Crossley et al., 2015) in addition to hypothesis testing; therefore emergent findings are also quantitatively explored and presented. Such findings also lead to emergent *questions*, which were explored in Phase 3, and are considered within Chapter 6. In addressing the research questions and building the case study, two types of quantitative analysis were performed on the network data: whole-network analysis, and egonet analysis (Hanneman & Riddle, 2005). Whereas whole-network analysis could explore tie patterns in the overall network, egonet analysis enabled exploration of particular network cases, focusing on the actors, their alters, and related characteristics. Egonet analysis was used particularly in RQ3.

5.1 Data screening

5.1.1 Missing data

Comma-separated values (CSV) data files were computer generated, based on the online questionnaire responses (a separate file was generated for each advice type), so the possibility of researcher input error was eliminated. Although the default position of *do not know this person* was considered important in reducing questionnaire completion time, it was possible that individuals could have missed people within their network as they scrolled through network names, though Kossinets (2006) and colleagues (e.g., Huisman, 2009; Ward, Hoff and Lofdahl, 2003), have demonstrated the effect of *tie* level missing data is not problematic, if not excessive, and can be dealt with through imputation measures. With no reason to suspect that missing tie-level data was deliberate, nor that advice *seeking* behaviours should necessarily be reciprocated, imputation was not used.

The 72% response rate meant that there was some node-level missing data (out-degree) for 46 participants. Although node-level missing data is potentially more problematic (Borgatti, Carley, & Krackhardt, 2006; Stork & Richards, 1992), because it can incorrectly infer weak relations (Burt, 1987), a number of authors have shown much smaller effects (e.g., Borgatti et al., 2006). Several authors have proposed methods for addressing the problem (e.g., Borgatti,et al., 2006 & 2013; Shafer & Graham, 2002), as it is argued that usual measures for dealing with missing data (e.g., see Rogelberg and Stanton, 2007), are less applicable to matrix network data. Ignoring the missing data by removing such nodes from the network (i.e., instead of 162 rows, dealing only with 116) was considered inappropriate, as this would have removed key

individuals who did not complete the questionnaire, but whose egonets and connectivity were deemed important and influential to others (Shafer & Graham, 2002). Missing values were not imputed in this instance, because the data were not logically symmetrical (i.e., advice seeking would not necessarily be reciprocated), and it was not possible to transpose using *get-give* scores, because participants were only asked about the directed relation in one direction. Instead, three strategies were used for dealing with the missing data, in accordance with the recommendations of Costenbader and Valente (2003). First, in-degree ties were analysed (indicating the volume of traffic going *to* a particular node) where the analysis was concerned with dyad/individual characteristics; because in-degree ties have been found to be less sensitive to missing data (Costenbader & Valante, 2003; Huisman & Steglich, 2008; Huisman, 2009). Second, where an analytical test would compare clusters or factions of nodes, and therefore structural equivalence was of interest, the *symmetrise* transformation function in UCINET was applied, in which a sent or received nomination is treated as a connection. In this instance, the eigenvector centrality measure (Bonacich's – i.e. a measure of how well a node is connected to important others) was of interest, as this has also been found to be a stable index (Costenbader & Valante, 2003; Huisman & Steglich, 2008). Third, where an analytical test related to *columns* of data rather than matrices, Rogelberg & Stanton's (2007) method was applied, deleting columns of data pairwise.

5.1.2 Descriptive information and the overall network

Table 5.1 displays the Pearson's correlations between each of the variables included in the analysis. These correlations are considered in several forthcoming sections. Significant ($p <$ .01) positive correlations (> .4) existed between a number of variables. The job crafting variables (JCraft, RJC, PJC, but not CJC) correlated moderately with intention to share knowledge (ISK). ISK also correlated significantly and positively with job satisfaction, subsequent career satisfaction; as well as all of the centrality variables. Higher levels of job crafting (RJC and PJC) were associated with higher subsequent career satisfaction scores. Job satisfaction at Time-1, was also positively related to subsequent career satisfaction at Time-2.

	Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1.	WKL	1.44	.73	*(.83)*																
2.	ISK	3.18	.64	-.09	*(.79)*															
3.	JCraft	1.64	.85	.06	.19*	*(.95)*														
4.	RJC	1.78	.98	.05	.26**	.87**	*(.89)*													
5.	CJC	1.50	1.00	.11	.06	.90**	.64**	*(.91)*												
6.	PJC	1.66	.88	.02	.20*	.94**	.75**	.76**	*(.91)*											
7.	Org-ten	16.25	11.56	.10	-.10	-.07	-.04	-.15	.01	-										
8.	Grp-ten	6.14	6.94	.18*	.05	-.19*	-.12	-.26**	-.13	.40**	-									
9.	Job-ten	4.36	3.95	.14	-.12	-.22*	-.23	-.23**	-.12	.29**	.48**	-								
10.	Age	44.43	9.56	.09	-.08	-.15	-.13	-.16	-.12	.60**	.37**	.30**	-							
11.	JSat	2.68	.86	-.09	.29**	.15	.04	.04	.20*	.07	.09	.06	.03	*(.84)*						
12.	CSat	2.24	1.12	.05	.31*	.30*	.33**	.33**	.33**	.06	.07	.17	-.06	.45**	*(.92)*					
13.	Outdeg[14]	9.55	10.79	.13	.31**	.36**	.27**	.32**	.36**	.03	.02	.08	-.09	.18	.12	-				
14.	F-indeg	9.80	6.32	.17	.34**	.20*	.23**	.20*	.20*	.09	.21*	.08	-.03	.13	.10	.54**	-			
15.	B-indeg	1692.80	1423.10	.18*	.40**	.24**	.26**	.17	.24**	.09	.11	.16	-.07	.19	.19	.59**	.93**	-		
16.	L-betw-cen	4.20	1.79	.17	.44**	.26**	.27**	.20*	.25**	.15	.07	-.10	.07	.17	.12	.71**	.65**	.57**	-	
17.	L-eig-cen	.05	.04	.13	.37**	.31**	.26**	.25**	.30**	.03	.04	-.16	-.15	.23*	.17	.80**	.84**	.91**	.63**	-

Table 5.1: Descriptive statistics and bivariate correlations[15]

*NB: Figures in parentheses are Cronbach's alphas. * p < .05. **p < .01. All variables measured in Phase 2, except CSat , measured 23 months later in Phase 4. Grid lines within the table differentiate the centrality variables from the psychosocial variables, for visual clarity.*

[14] All centrality variables used in the hypothesis testing and listed in this table (outdeg, F-indeg, B-indeg, L-betw-cen, L-eig-cen) are calculated from the overall advice seeking network, as this provided detailed ordinal data (as opposed to the binary data yielded in the other network matrices).
[15] Variable abbreviations are listed on page 10.

5.1.3 Network connectivity

Table 5.2 provides whole-network descriptive information about the 8 networks produced during the analyses. In examining the complete advice network, it can be seen that the overall network is well connected, with an overall density (*'connectedness'*, Prell, 2012) of .72 (of a possible 1), and a network distance of 1 (i.e., no node within The Group was more than a single reach away from another). However, overall density figures take no account of the frequency with which people are typically connected, as they capture *all* communication over the past 6 months (e.g., where a person has exchanged pleasantries within the last 6 months, but would not consider them to be part of their *go to* advice network). When the frequency of such interactions is taken into account (see italicised figures under *Overall Advice Network*), and only *'Frequently or more'* interactions were taken into account, the density of the network reduced dramatically, to .06; and network distance became higher (i.e., it takes more steps to reach another in the network).

The authorisation network had the lowest density of all the informal networks (with the formal network the only with lower density), which might be expected, given the hierarchical nature inherent in seeking authorisation advice. Here, the average number of out-degree nominations was the lowest of all the networks, compared with general guidance and gathering information, which had the highest average numbers of out-degree nominations (i.e., people go to a bigger range of others for these types of advice seeking). Although the mean for out-degree nominations was similar to that of general guidance, the range was considerably higher for advice that was considered gathering information; showing that some people go to a high number of advisors to gather the information they need to enable them to do their job.

Dataset	Network density	Total number of possible nominations	Average number of nominations	Range of out-degree nominations sent (min=0)	Average network centralisation	Average network centralisation *(in-degree)*	Average network centralisation *(out-degree)*	Average network distance	Dyad reciprocity
Overall advice network	.72	162	10.17	103	.28	.01	.28	1	.56
(Freq. or more, dichot.)[16]	*.06*	*162*	*10.17*	*103*	*.58*	*.24*	*.58*	*2.60*	*.29*
Gathering information	.05	162	7.90	102	.61	.19	.60	.29	.21
General guidance	.04	162	6.05	34	.18	.14	.18	3.26	.16
Authorisation	.02	162	2.30	27	.19	.14	.19	3.27	.03
Problem solving	.03	162	4.78	27	.15	.07	.15	3.54	.21
Validation	.03	162	4.07	29	.17	.07	.17	4.29	.17
Multiplex addition matrix (all types of advice)	.02	810	10.06	103	.17	.12	.06	3.54	.11
Formalised chain of command	.01	162	1	2	.01	.19	.01	1.79	0

Table 5.2: Characteristics of the networks

NB. Networks are binary with the exception of the 'overall advice network' which is scored on the basis of the frequency of the advice seeking connections to another. The formalised network refers to the network created by the organizational hierarchy chart. Whole-network measures used for average network centralisation (i.e. measuring overall cohesiveness centrality in the network).

[16] *Overall advice network* = advice sought within 6 months; *frequently or more* = advice sought within 1 month

Moreover, Figure 5.1, shows that across different types of advice behaviour, the *numbers* of ties varied considerably in the network. The most frequently sought after advice types were *information gathering* and *general guidance*, accounting for 33% and 24% of ties respectively. Participants reported smaller networks for *problem solving* and *validation* of their ideas, whilst *authorisation* networks were the smallest, accounting for just 8% of connections.

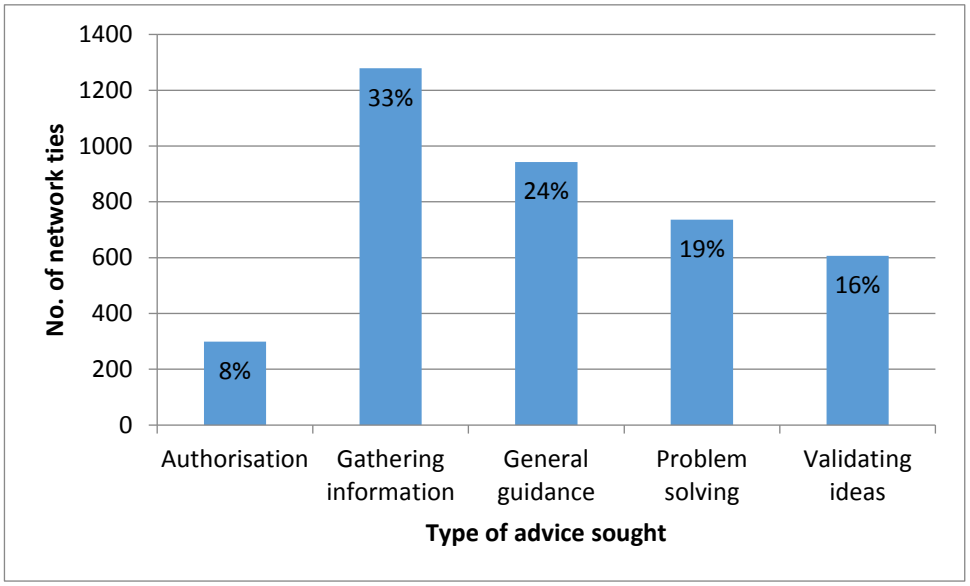


Figure 5.1: The numbers of ties between actors in the network for five different types of advice NB: For 'frequently, or more often' ties.

The relationship between the tie patterns in each of these matrices was assessed using quadratic assignment procedure (QAP[17], see Hanneman & Riddle, 2005) correlations. These measured the extent to which an actor was sought for multiple advice types. The 5 different types of advice behaviours were found to correlate positively, and highly significantly ($p < .001$ for all advice types), as shown in Table 5.3. This suggested that where a person was sought for one advice type, they were also likely to be sought for other advice types. In particular, the correlations were especially high between gathering information and general guidance ($r = .65$, $p > .001$), and problem solving and validation ($r = .70$, $p > .001$). Moreover, there were high, positive QAP correlations between the overall advice network (with no distinction between advice types) and gathering information ($r = .86$, $p < .001$) and general guidance ($r = .72$, $p < .001$), suggesting that these advice types were highly prevalent in the overall network.

[17] *Quadratic Assignment Procedure* – enables correlations of dyadic network data to be performed.

	Overall advice network	Gathering information	General guidance	Authorisation	Problem solving	Validating ideas	Multiplex	Formalised
Overall advice network	-							
Gathering information	.86	-						
General guidance	.72	.65	-					
Authorisation	.40	.36	.42	-				
Problem solving	.63	.34	.60	.34	-			
Validating ideas	.58	.58	.59	.40	.70	-		
Multiplex	.26	.22	.20	.12	.23	.22	-	
Formalised	.12	.10	.12	.24	.10	.12	.13	-

Table 5.3: Quadratic assignment procedure correlation matrix for each of the network types

NB: All correlations reported in this matrix are highly significant ($p < .001$) based on 5000 permutations (Pearson).

In addition, Figure 5.2 shows how the core connectivity of the overall network was accounted for by a much smaller number of individuals. There was a disproportionate loss in connectively in the overall network when a small number of individuals were removed from the network. For example, removing the 8 most connected brokers in the network resulted in an almost 50% loss in connectivity; and removing the top 30 most connected individuals resulted in a loss of over 80% of connectivity (see red arrows in graph).

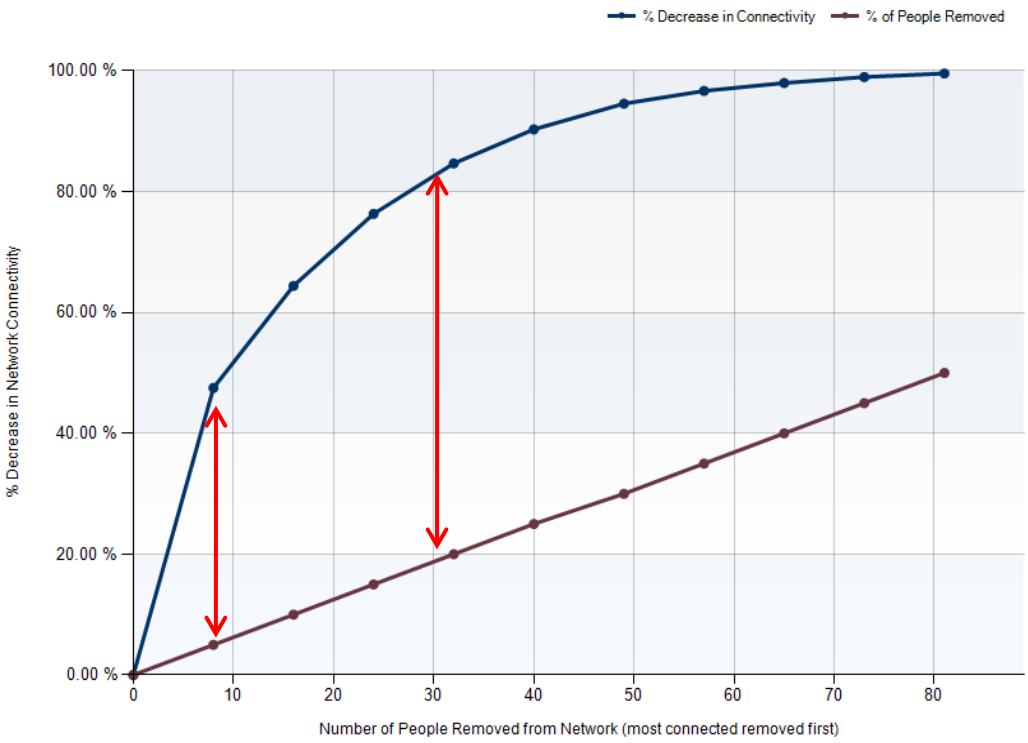


Figure 5.2: Decrease in connectivity, as connected actors are removed from the network

A final point of interest relates to the dyad reciprocity in the network. For the overall network, where advice type is not distinguished, over 50% of connections were reciprocated to some extent. However, when only considering connections that were monthly or more often, reciprocity reduced to less than 30%.

It can be seen from the earlier correlation matrix (Table 5.1) that the various centrality statistics for the overall advice seeking network (F-indeg, B-indeg, outdeg, L-eig-cen, L-betw-cen) all correlate significantly, to differing extents; indicating that a person with a high score on one measure is likely to also likely to have a high score on other measures of centrality. Nevertheless, each of these centrality indices measure a subtly different aspect of centrality, and as such, these correlations, though highly significant are less than 1.

5.2 RQ1: To what extent are advice networks a product of organizational design?

A number of analyses were performed on the data to assess the extent to which the reported advice connections were reflective of formal aspects of a person's job design.

5.2.1 H1: Chain of command

H1(a): The chain of command (formal hierarchy) will be positively related to informal network position (as reported by participants).

H1(b): The strength of this association will be contingent on the type of advice being sought, such that the association will be strongest for authorisation.

The extent to which the organization's *chain of command* was reflected within participants' advice networks was explored. The chain of command can be considered a *formalised network*, which is usually developed in organizations to formalise organizational command structures, providing an indication of the extent to which you might expect to see (for instance) seniority, power, and roles (see Cross et al, 2001; Cross and Parker, 2004).

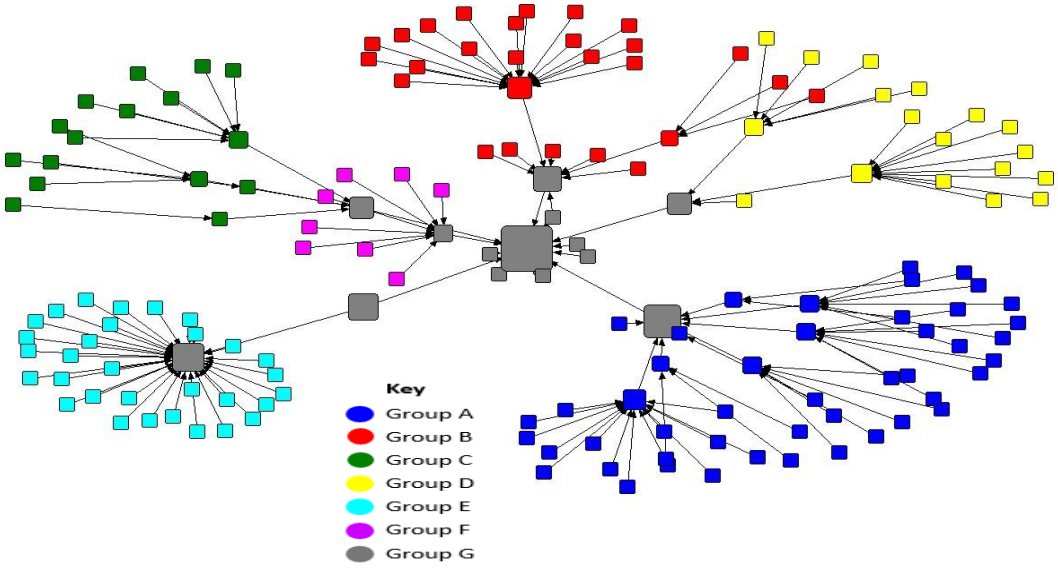


Figure 5.3: A network illustration of the chain of command for the whole group
NB: Nodes are sized according to their betweenness centrality in the network.

Using the hierarchy provided, this data was entered into UCINET to enable it to be plotted as a social network (see Figure 5.3). It was clear that the formalised network was characterised by a small number of centralised members, who served as brokers/gatekeepers to others in the network, and high distance and diameter (i.e., a high proportion of actors are otherwise unconnected). This means that some individuals are high in power potential, whilst those on the periphery are low. These characteristics indicated a hierarchical organization. The clear chains of command resulted in there being a clear *leader* (i.e., a single central actor, with a

number of powerful brokers to them, who were not otherwise connected to each other). At the periphery of the network there were no connections between actors.

In contrast, Figure 5.4 shows the *reported* advice network (overall), according to the network questionnaire, where nodes are sized according to their betweenness centrality. Here, visual inspection shows that the *actual* pattern of advice behaviour (for all types of advice) reported by The Group was far different to this, and was characterised by the following core features.

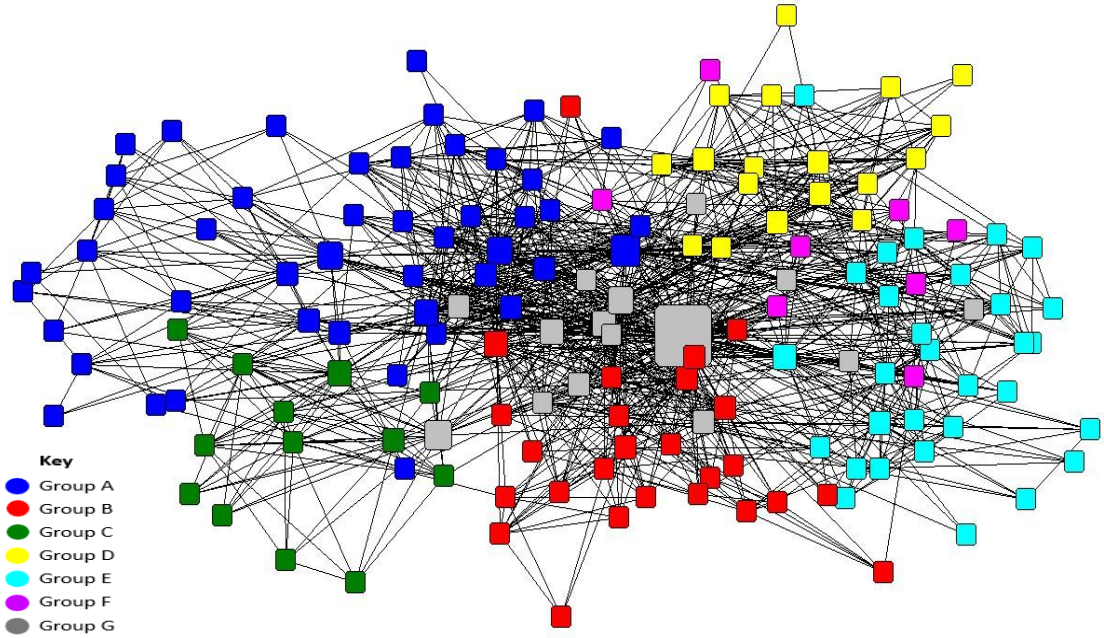


Figure 5.4: The advice seeking network based on responses to the network questionnaire

NB: In this socio-gram, the advice network have been dichotomised (displaying ties above 4 – i.e., 'frequent or more often'), and the data have been transposed to show incoming ties (giving a measure of each node's 'popularity' – De Nooy, Mrvar, & Batagelj, 2011). The socio-gram is organized according to multi-dimensional scaling, so that nodes' positions on the graph are displayed according to their tie-pattern similarity. Nodes are colour-coded according to their work-group. The size of the node indicates their betweenness centrality (i.e., a bigger node has a higher score).

First, although a number of the actors identified as central brokers in Figure 5.3 (formal hierarchy) remained central, a number of other actors also emerged, displaying high centrality scores. Therefore, it appeared that there were also other important brokers within the network. Although it is not necessarily obvious from this diagram, the betweenness centrality scores indicate that the node with the highest betweenness centrality score in Figure 5.4 (denoted by the largest, grey node) was *not* the same individual who held the most central position in the formal network in Figure 5.3. In fact, this individual was a Project Manager, who did not lead any of the sub-groups, and as such did not score high on betweenness centrality in the

organization's hierarchy. It was not immediately apparent from examination of the organizational hierarchy why this should be the case. Furthermore, a number of key brokers in the formalised network did *not* appear as centrally as they did in Figure 5.3, and the network more generally was far more cohesive than the formal network implied. Second, comparison of the core features of these two networks shows that the patterns of connections were dissimilar. Table 5.4 below, compares the centrality, density and distance of each of these networks. Whereas the organizational hierarchy would suggest a pattern of connections amongst the group that is characterised by high centrality, low density, and short distance, the *actual* pattern of connections across the group displayed characteristics dissimilar to this. In particular the density of connections in the reported advice network was higher than indicated by the organizational hierarchy.

	Density	Mean in-degree centrality	Mean distance	Mean betweenness centrality	QAP correlation between networks (Pearson)
Chain of command network (formal network)	.01	1	1.79	1.78	0.12 $P < .001$
Overall advice seeking network (reported network)	.06	10.17	1	173.22	

Table 5.4: H1(a) – Comparison of the formal hierarchy network (as revealed by the organogram provided by the company), and the informal advice network (as revealed by the advice seeking questionnaire), when both are described as social networks

In order to quantify the similarity of these networks and thereby test H1(a), QAP correlation analysis was performed on the two matrices. QAP correlation enables the tie patterns of two or more network matrices to be examined, and therefore can be used to explore the relationship between the formalised network (as revealed by the organizational hierarchy) and the informal advice network (as revealed through the network questionnaire). QAP correlation analysis indicates a weak, but significant relationship between the tie patterns in both networks (Cohen, 1992), indicating some similarity between the reported network and the organizational hierarchy; thus providing some support for H1(a).

However, it might be argued that the overall advice network is not a measure comparable to the formalised network, as this level of analysis does not differentiate between different *types* of advice seeking. In other words, an organizational chart might be considered an incomplete picture of the formalised organizational network (or *top-down job design*) as it seeks

only to formalise chains of command. It does not specify other patterns of communication that might result from organizational design, for instance, relating to specific work tasks. Whilst it was possible that horizontal connections of these kinds might have been specified by some lower level work process or job description documentation, these were not made available. In order to examine H1(b), a QAP correlation was performed to examine the relationship between organizational hierarchy and the reported advice networks for different *types* of advice (see Table 5.3, pp.91).

Examination of the QAP correlations (see Table 5.3) indicates that the formalised network had the strongest relationship with the authorisation network (r = .24, which is considerably higher than for other types of advice), indicating that these two matrices shared the greatest similarities in tie patterns[18]. Indeed when the authorisation matrix was visually presented and directed according to incoming ties, and organized using a spring embedded algorithm (which presents those nodes with the most similar patterns together), it could be seen that the authorisation network was visually reflective of the formal, top-down reporting structures created by the organization (see Figure 5.5). The arrowheads denote the direction of the connection (i.e., incoming ties). The Group's Director was positioned in the centre of the network, whilst the individual sub-group leaders (denoted as grey nodes) could be seen to hold central positions with high numbers of incoming ties from their sub-groups. There was, however, more overlap in the informally reported authorisation network than the formal hierarchy implied. Even though the formal structure did not require individuals to seek authority from others, it was clear that *authorisation* advice was also gathered horizontally, from across sub-groups.

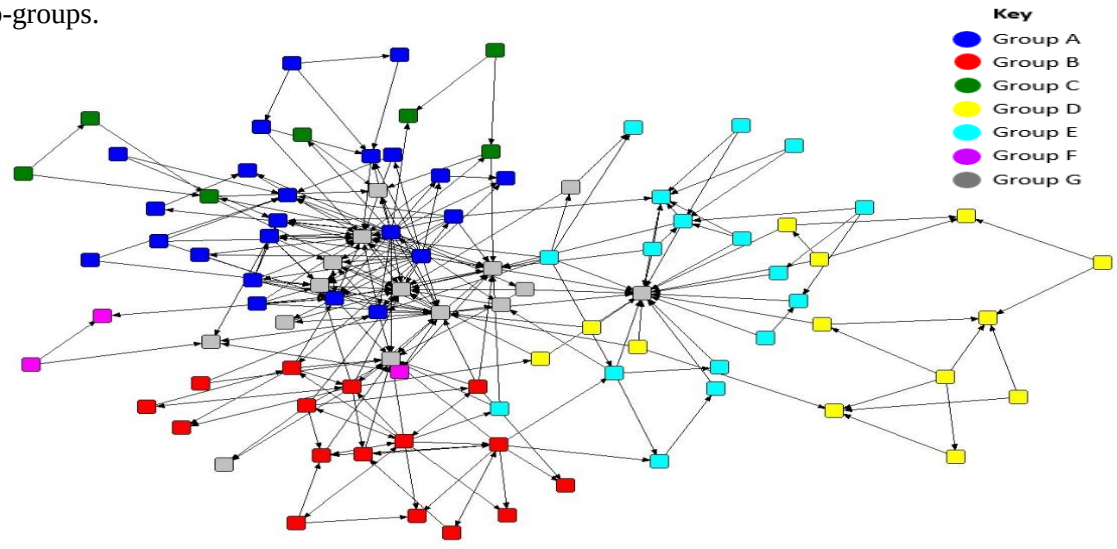


Figure 5.5: Visual representation of the authorisation network

[18] This approach to the determination of effect size is similar to that taken in meta-analysis, where correlations across different subgroups are examined to identify difference (Hedges & Pigott, 2004).

Overall, these findings are supportive of H1(a) and H1(b), indicating that advice tie patterns related positively to the formal organizational hierarchy.

5.2.2 H2: Work-group proximity

H2: Work-group proximity will be positively related to tie strength, such that participants will report higher numbers of connections to the other members of their own work-group, than they will to members of other work-groups.

The extent to which the advice networks reflected formal work-group allocation structures was explored. These patterns of connectivity can be seen in Figure 5.4, where nodes are colour-coded, describing pictorially the connections that people reported having to others in the network. Visual inspection indicates that overall, advice behaviours were associated with work-group (usually a node was closer to their own sub-group than to the others); and that generally, the management team served as central connectors in the network. In addition, Figure 5.6 displays the number of in-degree and out-degree ties for each of the sub-groups. This chart, though crude (based on raw numbers of ties, which do not account for sub-group population size), provides an indication of the extent to which each of the sub-groups sought and shared information from others sub-groups in the wider Group. This chart does not provide any information about the ties that exist *within* each of the work-groups, nor the specific work-groups from which advice is sought or provided. This chart does, however, reveal differences in the extent to which different sub-groups seek advice from others (i.e., out-degree ties), and the extent to which others seek advice from them (in-degree ties). Group D were the only sub-group for which the number of in-degree and out-degree ties were equal. Members of both Group A and Group G (the Management Team) sought information from others more than information was sought from them, whereas for the other sub-groups, the pattern was reversed.

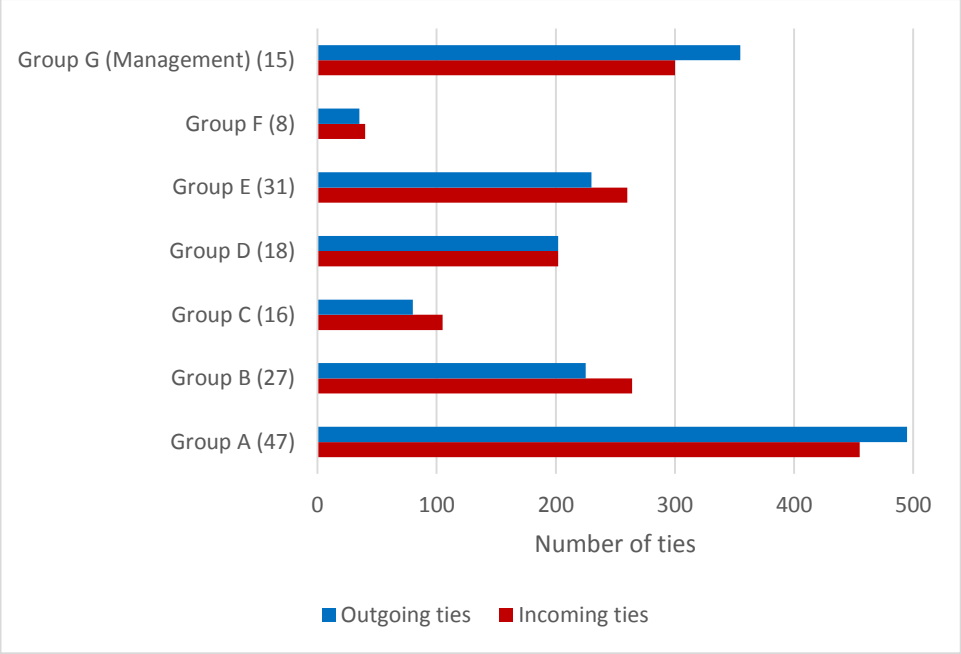


Figure 5.6: Number of incoming and outgoing ties for each sub-group

**For advice behaviours that were 'frequent or more often'. Note, this table presents raw data which is not corrected for population size. (Sub-group population sizes are provided in the y axis titles, in brackets.*[19]*)*

In order to test H2, the ties *within* and between work-groups were compared using E-I indices (group-external and group-internal indices), which were calculated in UCINET. The E-I index measures the number of edges (ties) that are external to a sub-group compared with those that are internal to, or between, vertexes within that sub-group (Krackhardt & Stern, 1988). Indices range from -1 to +1 (where -1 indicates all ties are internal to the group – i.e., within-group – and +1 indicates all ties are external, i.e., between-groups) (Hanneman & Riddle, 2005). In this analysis the E-I index is calculated for each individual sub-group and then the ties within and between sub-groups are compared overall. In this case, the overall number of internal ties (1422, 55.6%) and external ties (1136, 44.4%) yield an E-I index of -0.11, indicating a dominance of internal ties over external ties across the network as a whole. The permutation-based sampling distribution (across 5000 permutations) shows that the tendency towards internal connections is significant in this context ($p < .05$); supporting H2.

The degree centrality (Freeman's) of each of the groups was also examined. Freeman's in-degree centrality (F-indeg) provides an indication of the most important vertices (people) in the graph, and also shows how evenly centrality is distributed across the groups. The average number of direct connections that people had within the overall group was 10 (i.e. they were

[19] NB "Comparisons between networks that differ greatly in population size should be avoided, because an actor in a small network will, by virtue of the fact that there are fewer other actors to connect with, have a higher chance of connecting to a high proportion of the network" (Prell, 2012).

directly connected to approximately 6% of the overall network[20]). This shows that the relative cohesiveness of the sub-groups varied considerably. For instance, *within* the work-groups, for the tie strength *frequently or more often*, the Management Team (Group G) and Group D had the highest levels of F-indeg centrality, with colleagues within these groups being connected, on average, to 47% and 45% of the other colleagues within their work-groups respectively. Group A on the other hand, had the lowest degree centrality levels, as colleagues were connected to, on average, 15% of their Group A colleagues (though this is perhaps less surprising since this sub-group also had the largest population). The standard deviations for within-group degree centrality also revealed considerable variation in the average number of relationships for nodes, across the different sub-groups. For example, for the tie strength *frequently or more often*, the standard deviation from the mean for the network overall was 7, and for Group A it was 4. This shows that degree centrality varied substantially within the groups, with the relationships of particular actors skewing the mean number of connections in several of the work-groups.

Examination of *between* work-group ties also shows higher dependencies between some sub-groups within the network. Figure 5.7 displays this visually. The socio-diagram is organized so that nodes were positioned according to their sub-group membership, but it is magnified to enable the volume of traffic between sub-groups to be displayed, through the visible density of ties. Here, the advice network has been dichotomised (frequently or more often), and transposed to show incoming ties, and nodes have been colour-coded to indicate the work-group they belonged to. The denser lines show that there was more traffic between the Management Team (Group G) and Group A, than there was between other sub-groups in the network. Groups F and C had particularly sparse connectivity to other groups within the overall network. It is unclear from this data whether this relationship would be moderated in some way by the work characteristics of sub-groups. For instance, it is possible that the degree to which the sub-group's work provides a *specialist* (as opposed to *generalist*) function might affect the extent to which inter-group collaboration was necessary. The nature of the work was explored further in Phase 3 to further enrich this picture.

[20] The overall figure includes everyone in The Group, but each person is also a member of one of the sub-groups. The overall Group average of 10 relationships therefore includes the average number of relationships that a person has both within *and* between the sub-groups. When centrality in the sub-groups is calculated independently, this only considers the relationships *within* the sub-groups, thus the average number of relationships per sub-group is always <10.

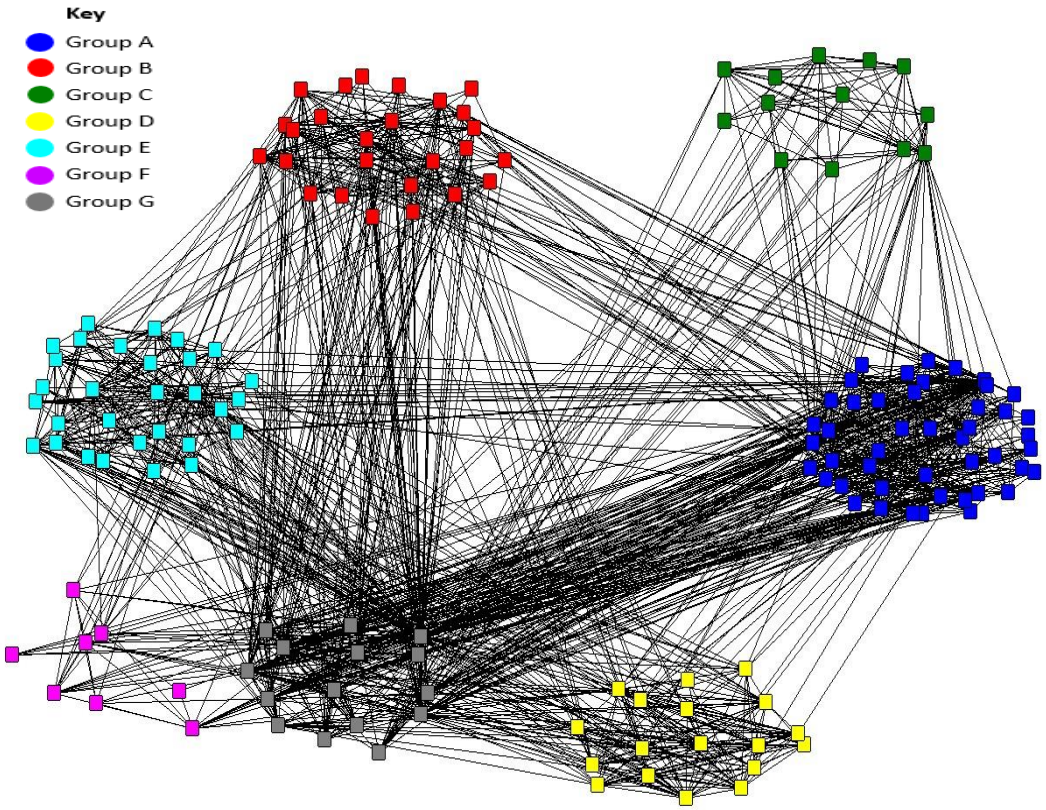


Figure 5.7: The overall advice network, positioned and colour-coded according to sub-group membership

Examination of the underpinning tie figures showed that all of the sub-groups (with the exception of Group C) had their strongest between-group link (i.e. the highest number of incoming ties) with the Management Team (Group G). Reciprocally, the Management Team's strongest advice-seeking link was with Group A (representing a third of their between-group ties). 54% of Group C's outgoing ties were to members of Group A. Moreover, it could be seen that Group C had no *frequent or more often* ties with Groups B, D, E, or F.

The dominance in the network of the different groups was also explored by visually comparing what would be expected if connectivity was proportionate to the population size of the group.

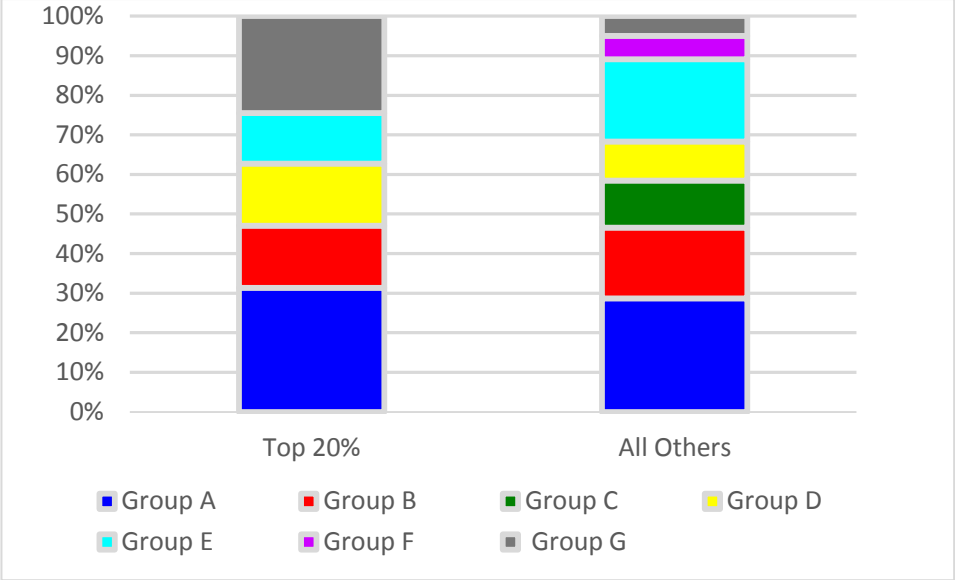


Figure 5.8: Group affiliation of the 20% most connected individuals in the network (n=32), compared with all others (n= 130)

Figure 5.8 shows the most and least connected sub-groups in the network, by comparing sub-group affiliations of the most connected people in The Group (left hand column), with the sub-group affiliations of those in the rest of The Group (right hand column). For there to be equal representation from all sub-groups, the stacked bars in each chart would need to be of equal size for each sub-group. Instead, this chart reveals that approximately a third of the most connected people (based on their in-degree centrality scores) are from Group A, and almost 25% are from the Management Team (Group G), which in both cases, is disproportionate to their population sizes. Conversely, the coloured bars of the two charts do not match up at all for Groups C, E and F – for instance, there is no green bar at all in the left-hand column. This suggests that these work-groups are under-represented amongst the top 20% most connected people in The Group overall.

On the basis of these collective findings, H2 can be supported. It is clear from these analyses that: (1) work-group membership appeared to relate to the advice patterns that existed within the overall Group; (2) some sub-groups were more cohesive than others (i.e., had higher within-group density); (3) some sub-groups had higher centrality within the overall Group – i.e., other sub-groups were more dependent on them; (4) some sub-groups were more internally facing than others. However, the reasons why some groups differed in their E-I indices was unclear at this stage. It was possible that there were contextual, organic factors underpinning this, so this was explored further in the qualitative work of Phase 3.

5.2.3 H3: Project proximity

H3: Project proximity will be positively related to tie strength, such that ties between participants will cluster according to projects that they share an affiliation with (i.e., projects they have worked on together).

It is possible that sub-group assignment created higher order structures that shaped advice networks within the group. However, it was also possible that the E-I indices uncovered in the previous section were a consequence of the projects people were assigned to work on. Given the cross-sectional research design, and unavailability of complete Time-2 data, it was not possible to examine the cause and effect of this association. Nevertheless, the extent to which the *projects* people worked on accounted for the connections between them was examined through two-mode network analysis. This enabled examination of the extent to which ties could be predicted, on the basis that two people worked on the same project (Borgatti et al, 2013; Prell, 2012).

In order to run the two-mode data analysis, an affiliation matrix was prepared, in which actors were listed by row, and the 20 different projects ongoing within the overall Group were listed as columns. Where an actor worked on a project, this affiliation was denoted as *1* (*0* if not). The resultant two-mode affiliation matrix represented *project ties* (i.e., projects that connected two individuals). This data is represented as a two-mode network in Figure 5.9. Here the orange squares represent projects, whilst actors have been colour-coded to indicate their work-group membership. Node size has also been scaled in this diagram to indicate centrality (larger nodes have higher betweenness centrality in the network, indicating that they are bridges – brokers – to other people and projects, that are otherwise unconnected).

The mean number of projects people worked on was 1.9 (SD = 2.54). However, three actors reported working on 11 projects, and a fourth (P9, a *Senior Project Manager*), reported working on 19 of the 20 projects. Three of these four actors were also members of the Management team (Group G). These data are captured in Figure 5.9, where these actors are denoted as larger, central grey nodes. From Figure 5.9 it can also be seen that some work-groups were strongly connected to a small number of projects (e.g., Group C), whereas other groups were more widely dispersed across a range of projects. Certainly, all of the Group C members reported working solely on one of two projects which were exclusive to them and therefore had low betweenness centrality within the wider network (see left, bottom corner of the socio-gram). This might explain their higher than average E-I index, relative to the other sub-groups (i.e., that they sought advice internally more than externally, compared to any other sub-group). It can also be seen that several actors were central in the network (participants 9 and 3 in particular) serving as key brokers between projects. All of these key brokers (larger grey

nodes in the centre of the diagram) were from the Management Team, thus it appeared that role and management status were entwined with project allocation. At this stage, the relative importance of each is difficult to further unpick. The importance of role is also unclear and so is explored further in the qualitative study.

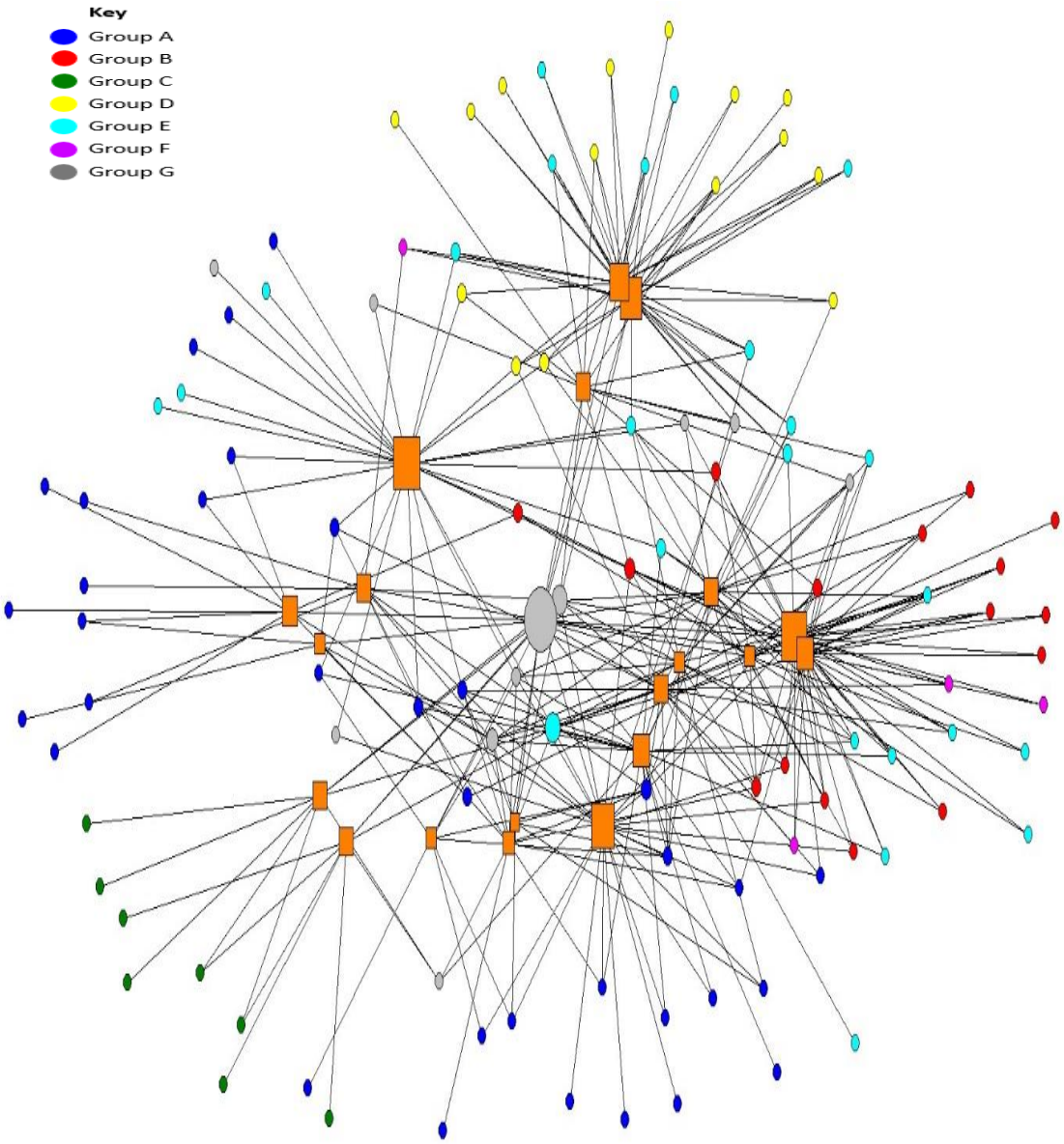


*Figure 5.9: Project affiliations: The extent to which working on a particular project connected people in the network**

**Square, orange nodes represent projects and the circular nodes represent people, who are also colour-coded according to their work-group membership, indicated by the above key.*

For descriptive interest, the degree centrality of each of the *projects*[21] was also explored, in order to understand the extent to which the projects connected Group members. This added to

[21] Where it was assumed that a tie between two projects indicated co-membership of people in the project team.

the picture by showing that in addition to there being key actors that served in brokering roles within the network (as indicated in Figure 5.4), a number of central *projects* connected members of The Group. K-core analysis was employed to examine structures (clusters) of tie patterns within the project network. Of the available network clustering techniques, k-core analysis was chosen because k-cores are not required to be cohesive per se, but rather, are required to contain cohesive sub-groups. They build on the concept of centrality, because a node is said to be part of a k-core where they have a degree centrality of *k* within that group. K-cores can be therefore viewed as nested hierarchies (e.g., if you are a member of a 4-core, you are also a member of a 3-core and a 2-core) (Prell, 2012). This procedure indicated 5 separate clusters of projects.

In Figure 5.10 the participants are displayed as nodes and have been positioned using K-core analysis, to display the ties connecting people across the projects within the group. Figure 5.10 shows the centrality of actors in the network dependent on their project affiliation (i.e., the network centrality of *individuals*, based on the centrality of the *projects* that they work on). Centrality is indicated by network position, with nodes also increasing in size, with higher degree centrality. To be explicit, ties between actors in this graph do not indicate reported advice behaviours; rather, working on the same project is assumed to indicate an underlying social relationship between the actors, or a potential opportunity to initiate one. Instead, the diagram assumes a tie between two people if they share an affiliation with the same project. As is customary for such network representations, this matrix was treated as undirected (see Borgatti, Everett & Johnson, 2013).

It can be seen visually from Figure 5.10 that the project co-occurrence network bore a strong resemblance to the reported advice network (displayed in Figure 5.4). QAP correlations were therefore calculated to test whether there was any relationship between the overall advice network reported by participants, and the project co-occurrence matrix (created by plotting connections between actors who reported working on the same projects[22]). This showed a significant positive relationship ($r = .32$, $p < .001$) between the patterns of ties across these two matrices. Working on the same project was associated with higher frequencies of advice behaviours with others working on those projects, supporting H3.

[22] The affiliation matrix was converted to a one-mode *co-occurrence* matrix, in which a pair of actors is *tied* to the extent that they share affiliations (i.e., both rows and columns now represent the names of participants, and the matrix cell value indicates the number of projects they are both working on. This matrix was produced through UCINET, by post-multiplying the two-mode matrix by its transpose – see Borgatti et al., 2013), using the equation:

$$c_{ij} = \sum_{k} \times_{ik} \times_{jk}$$

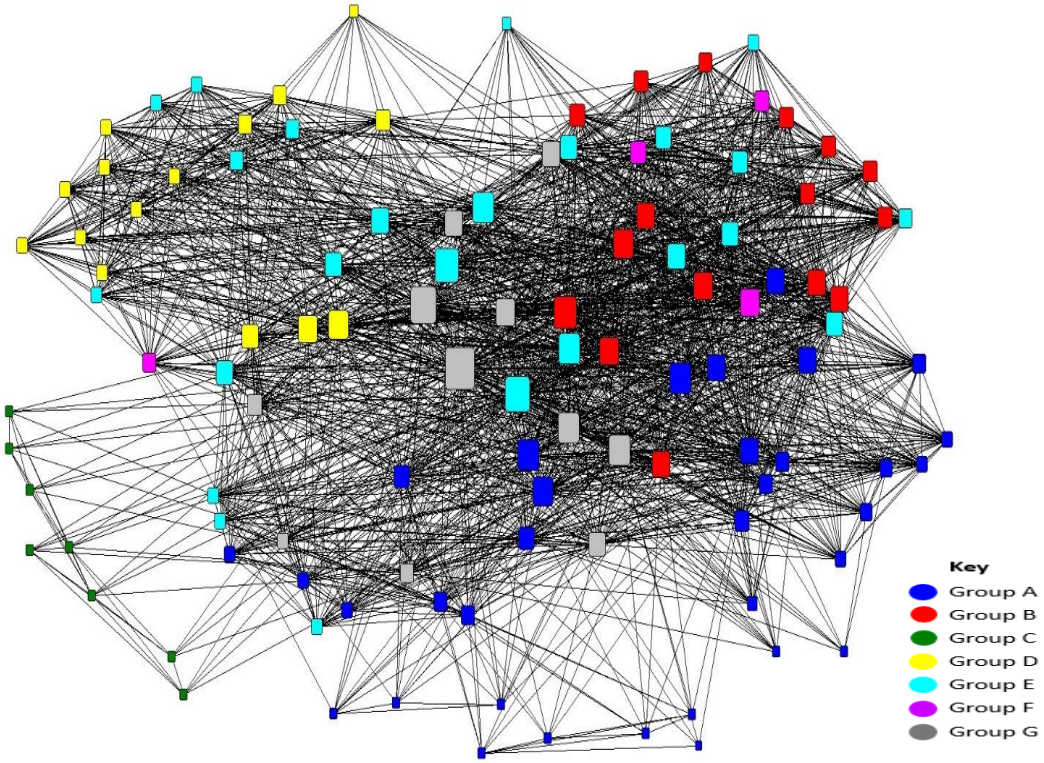


Figure 5.10: A co-occurrence network graph, where ties between nodes (people) represent shared project affiliations

NB: The projects themselves are not displayed in the graph, rather a pair of actors is 'tied' to the extent that they share project affiliations.

It was also interesting that some sub-groups worked on peripheral projects that were characterised primarily by *intra*-group membership (e.g., Group C) whereas other sub-groups (e.g., Group B) worked on some of the most central projects, which were also characterised by *inter*-group membership (i.e., they were inter-disciplinary *bridging* projects drawing together people with contrasting expertise). Projects 2, 4, 13 and 15 had the highest levels of connectability (betweenness centrality) and degree centrality, and together they directly connected 59 actors in the network (interestingly, none of whom were from Group C). Considering work-group within this wider context is useful, as it then seems less surprising that Group C had higher *in-degree* group centrality, no representation in the top 20% most connected individuals, and lower overall degree centrality within The Group, than sub-groups where members were better dispersed across projects. Collectively these findings indicate support for H3, by showing that project proximity was positively related to tie strength, as participants could be seen to cluster according to projects that they shared an affiliation to. The relative importance of work-group and project are explored further in Phase 3.

5.2.4 H4: Location proximity

H4: Location proximity will be positively related to tie strength, such that participants will report higher numbers of ties to colleagues located at their site than to colleagues located at other sites.

Figure 5.11 shows the percentage of network ties made up by each of The Group's site locations in the overall advice network. Site 1 was over-represented in the network compared to its population size, whilst members of The Group based at the German site did not feature at all amongst the top 20% of most connected members. Whilst the smaller UK site (Site 2) and the USA site were both represented in the network, these were less well represented in the top 20% of connected members. This figure suggests that Site 1 was disproportionately central in the network, relative to its population size.

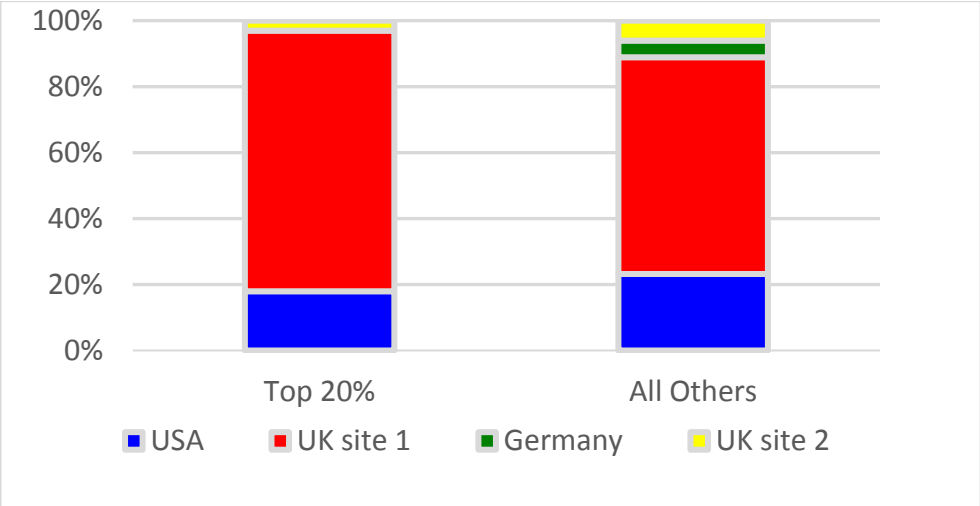


Figure 5.11: The site location of the 20% most connected actors in the network (n=32), compared to the rest of the network (n=130)

A multivariate analysis of variance (MANOVA) was carried out to examine differences in degree centrality across sites. Sites did not differ significantly in *out-degree* centrality. However, using Pillai's trace there was a significant effect for location on B-indeg and L-eigenv centrality scores at the < .05 level, $V = .11$, $F(6, 226) = 2.26$, $p = .04$. Separate univariate ANOVAs on the outcome variables also revealed significant effects for each of these variables, as reported in Table 5.5.

	UK Site 1 *(n=80)*	UK Site 2 *(n=7)*	USA *(n=25)*	Germany *(n=5)*	*F*-value	df	*p* (two-tailed)
B-indeg	2153.21	1426.21	1195.22	1061.16	3.87	3.87	<0.01
L-eigenv	.07	.05	.04	.05	3.86	3.86	<0.01

Table.5.5: ANOVA results for the effect of location on Bonacich's centrality

NB. Reported where equal variances were not assumed for any DV, based on the result of Levene's test, which was significant in each case.

Games-Howell's post-hoc tests indicated a significant difference between the L-eigenv centrality scores of participants at UK Site 1, and both the USA site (p = .000) and the site in Germany (p = .03); and also their B-indeg centrality scores where the centrality scores of participants in both Germany and the USA differed significantly from UK Site 1 (p = .000). None of the scores differed significantly for UK Site 2 (although this might be expected given the much lower site size).

Given that eigenvector centrality provides a measure of a node's influence[23] and betweenness centrality provides a measure of a node's power[24] (Bonacich, 1987; Prell, 2012), these findings suggest that the main UK site may have disproportionate power and influence in the network. Although these differences were not consistent across all sites and a causal relationship cannot be confirmed, they do provide partial support for H4, by suggesting that location is related to network connectivity. It seems likely that other contextual factors also moderated this relationship; this was considered further in Phase 3.

5.2.5 H5: Job role similarity

H5: Job role similarity will be associated with tie pattern similarity

The extent to which job roles accounted for the patterns of connections between people, was explored from several perspectives, in order to address H5. Visual inspection of socio-grams in which individuals were colour-coded based on the full range of grade categories provided by the organization, painted an unclear image of the relationship to connectivity. This is not especially surprising, as the job *grade* categories encompass a broad range of roles, such that the job roles and tasks themselves could vary quite substantially even between people on apparently similar job grades. Nevertheless, it could be seen that managers tended to occupy

[23] A node's *eigenvector* centrality is the sum of the in-degree centrality values of the nodes that it is connected to (Prell, 2012).
[24] A node's *betweenness* centrality quantifies the number of times it bridges the shortest path between two other nodes (Prell, 2012).

more central roles in the network, and that employees at Technologist level (junior and senior), who were non-managers tended to hold peripheral network positions.

5.2.5.1 Positional analysis of different roles

The similarity of the network positions held by people in similar kinds of job role were examined. Within the descriptive network analyses, it was apparent that the individuals in secretarial roles within The Group appeared to score disproportionately highly in terms of their Bonacich's centrality, indicating that they played a key brokering role within the overall network. This might be expected given their particular job responsibilities (e.g., organizing meetings and senior managers' diaries). An independent samples t-test was conducted to compare centrality scores of secretaries with non-secretaries, where a significant difference was found in the Bonacich[25] in-degree centrality scores of secretaries (M = 5861.73, SD = 2724.33) and non-secretaries (M = 1841.13, SD = 1423.14), $t(117) = 4.73$, $p < .01$. This shows that secretaries had greater power centrality in the network than non-secretaries[26] [27].

It was also apparent from visual description of the network (see Figure 5.13) that the Management team generally occupied central positions in the network. To test whether this represented a significant difference in network centrality, participants were dichotomously categorised as managers or non-managers[28], and independent samples t-tests were performed on the data to examine differences in their network centrality. The results of these tests are displayed in Table 5.6. This shows that the centrality scores of managers and non-managers were significantly different to each other for five types of degree centrality, with managers holding more central positions in the network for each. These findings are supportive of H5.

[25] A node's *Bonacich in-degree centrality* measures the connections that node has in the network, and also the connections of those to whom they are tied (i.e., how well connected they are to well-connected others).
[26] *Non-secretaries* included all others in the network, including managers and others. This comparison was undertaken on the complete network data, though one such secretary was later removed from the subsequent regression analysis because their extremely high centrality scores were considered to be outliers.
[27] Given the small N for secretaries, a non-parametric test was also undertaken. A Wilcoxon Signed-ranks test indicated that B-indeg centrality scores were different for secretaries and non-secretaries, Z = -2.54, p = .01.
[28] Individuals were categorised according to their response to: "Are you a manager?". Responses were grouped, such that managers of *projects* (n=10), *people* (n=5), and *both projects and people* (n=21) were grouped together as *Managers*.

	Managers (*n=81)* (SD)	Non-Managers *(n=36)* (SD)	*t*-value	df	*p* (two-tailed)
Outdeg	19.39	10.25	-3.79	45.09	<0.01
	(13.57)	(7.61)			
F-indeg	14.28	9.00	-4.14	55.19	<0.01
	(6.76)	(5.34)			
B-indeg	2872.34	1407.68	-4.90	48.97	<0.01
	(1641.51)	(1079.90)			
L-betw-cen	5.16	3.72	-4.17	67.97	<0.01
	(1.63)	(1.68)			
L-eigen-cen	.09	.05	-4.60	49.84	<0.01
	(.05)	(.03)			

Table 5.6: T-Test results for the effect of manager job role on centrality

NB: Reported where equal variances were not assumed for any DV, based on the result of Levene's test, which were significant in each case.

5.2.5.2 Role and advice type

Inductive exploration of the network also revealed interesting findings in relation to job role. The overall advice network was built on the basis of a participant's response to a general question about how frequently they sought advice from each of The Group's members. It did not allow individuals to explain dominating advice types which might have accounted for a higher than average score for one advice type (e.g., where a person controlled a budget and fielded daily advice requests, the high *authorisation* scores might have skewed that person's overall centrality score in the *overall* advice network socio-grams). To counter this problem, a multiplex matrix was developed, representing the in-degree sum for all 5 types of advice-seeking behaviours (Cross et al., 2002) reported in the network. In order to create such a multiplex matrix, the binary (0/1) matrices that were initially produced to represent in-degree ties in each of the five advice type networks, were added together (i.e., creating 5 layers) to produce a single multiplex matrix (Borgatti et al., 2013). In this matrix composite each possible connection was represented with a number between 0 and 5 (where 0 = no tie to that actor in any of the 5 networks, and 5 = 1 tie to that actor in each of the five networks). This meant that each advice network was given equal weighting, and higher in-degree tie scores indicated higher node centrality in the network, irrespective of advice type.

Initial examination of the multiplex matrix revealed that although the average (mean) number of ties was 23.85 (mode = 17, median = 18), there was wide variation in the range of in-degree ties that actors had in the network (see scatterplot in Figure 5.12; SD = 18.17). The trendline applied to this scatterplot shows that for a small number of nodes, their incoming ties were disproportionately higher than the average for The Group.

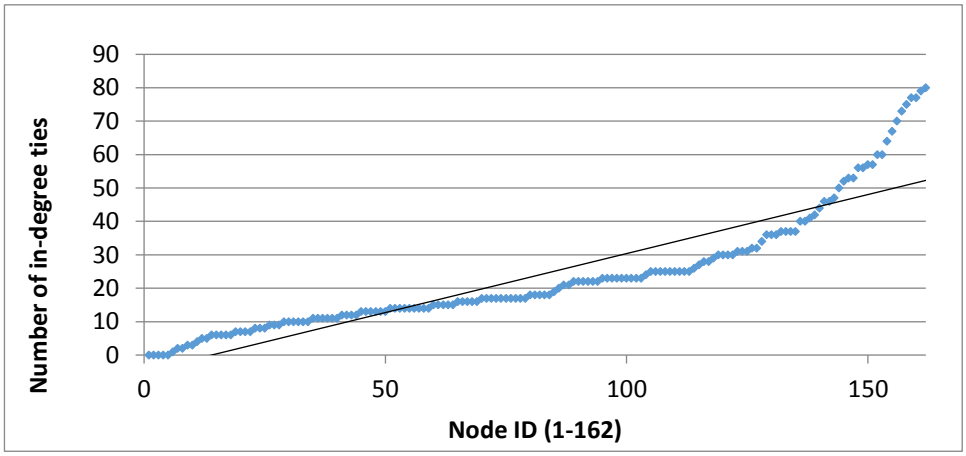


Figure 5.12: Scatterplot showing the number of in-degree ties (in ascending order) for each node in the multiplex matrix

When all advice types were given equal weighting in this way it could be seen that 11 nodes had F-indeg ties ≥ 60, of which 7 were from Group G (the Management team), 1 was The Group's secretary, and the other 3 were in middle-leadership roles. Moreover (reinforcing the earlier conclusions relating to H2), these individuals were all members of either Group G or Group A. An independent samples t-test was also conducted to compare F-indeg scores of managers and non-managers, when all types of advice were given equal weighting. As before, a significant difference was found in the F-indeg centrality scores of managers (M = 14.49, SD = 7.24) and non-managers, (M = 9.46, SD = 7.02), $t(117) = -3.58$, $p < .001$, with managers scoring higher in centrality for advice behaviours. This suggests that such managers not only serve an *authoritative* or gatekeeping purpose in the network, but are also important sources for other advice types.

Nevertheless, Figure 5.13 provides a more nuanced picture. It shows how the management team were still highly centralised in the network when all advice types were given equal weighting (based on overall in-degree advice connections). When the role of *manager* was broken down into more nuanced categories, based on job titles and employment grade[29], central *manager* brokers were not necessarily the most senior levels of manager (the red nodes); as

[29] Job titles and employment grades were reduced to 6 categories with input from the organization, though it is possible that there is some conflation between job grade and job role.

many were at the level of *junior manager or equivalent*. A number of those in senior management or equivalent roles were dispersed throughout the network. Figure 5.13 also highlights, as described previously, the two secretaries in the network who both held positional power in the network, serving as key brokers or gatekeepers.

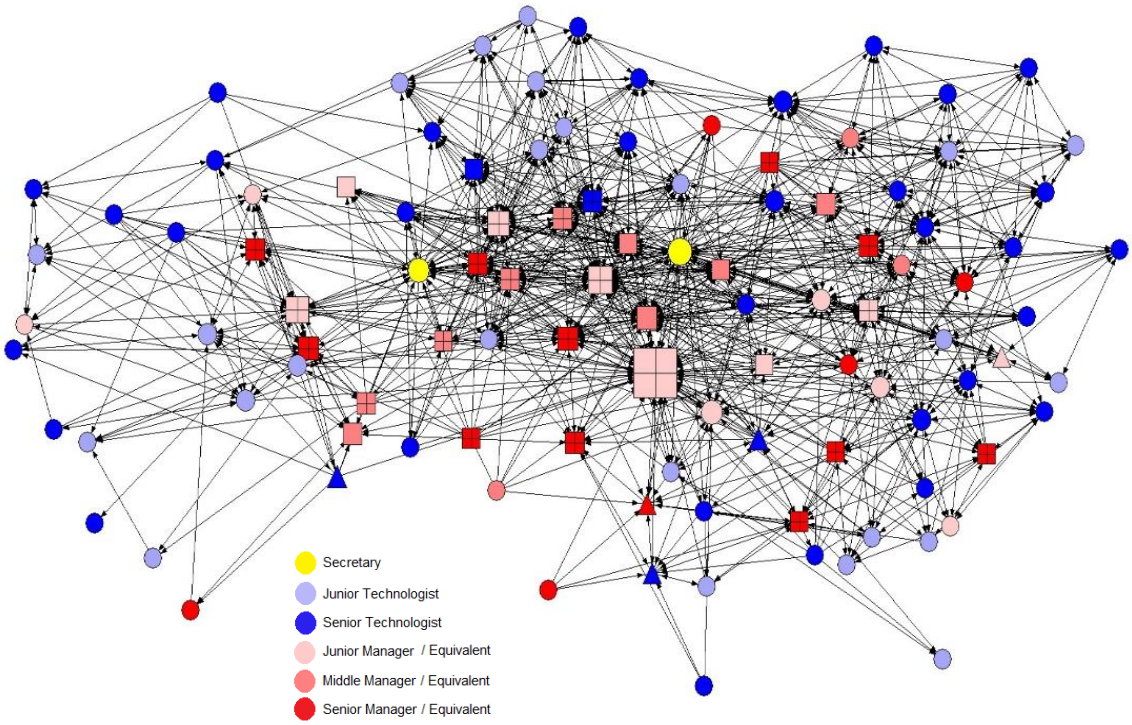


Figure 5.13: Multiplex data for all advice types combined, colour-coded by role

NB: Colours indicate role type, shapes indicate whether a manager or not. Nodes are positioned using the spring embedded algorithm, and sized according to betweenness centrality. Arrow-heads indicate the direction of the connection (incoming ties only). Nodes without attribute information have been removed for visual ease.

Shape key: Not manager=circle, project manager= square, line manager=triangle, both project and people manager=box

5.2.5.3 Structural analysis of different roles

Structural analysis was also undertaken, to explore whether people occupying particular job roles had similar patterns of network ties to those in similar/the same job roles. Positional analysis was chosen within UCINET, as this method examines the equivalence of substructures (clusters of central or cohesive ties) in the network; enabling examination of whether different types of role are related to different structures of connections in the network. A number of different hierarchical clustering procedures are available in network analysis to examine the equivalence of structures. Blockmodels are commonly used for this purpose, as they group nodes into clusters on the basis of the patterns of ties between them, and determine the

relationship between those clusters[30]. However, blockmodels are highly sensitive (i.e., the presence or absence of a single arc can turn a ranked cluster to one that is rankless), and also only feasible and effective for small dense networks (De Nooy, Mrvar & Batagelj, 2011). Moreover, block models are problematic in this kind of network, because they rely on *structural equivalence*, i.e., that exact ties connect nodes to exact others (see also Borgatti & Everett, 1992, for further discussion of structural equivalence and the restrictions it imposes).

For these reasons, analysis of *regular equivalence* was considered more appropriate for this population; i.e., understanding the extent to which actors shared similar ties to similar others (see Prell, 2012). This is a more *"relaxed or abstract form of equivalence"* (Prell, 2012, pp. 191), and therefore more appropriate for this population. Crucially, regular equivalence is not dependent on local proximity in the way that structural equivalence is (i.e., in regular equivalence, nodes are able to be completely unreachable; whereas in structurally equivalent networks actors are only considered to be equivalent if they share ties). In this research there was no reason to assume, necessarily, perfect structural equivalence (e.g., two secretaries might have similar patterns of connectivity, but if they were working for different sub-groups they would not necessarily be connected to the same people). It is interesting, however, to understand the extent to which occupiers of similar roles/seniority levels in the network developed similar network structures (e.g., did the networks of all *Principal Engineers* look the same?). In order to examine regular equivalence the REGE algorithm in UCINET was used (White & Reitz, 1983), which measures the extent to which an actor's ties with another similar (but not necessarily the same) actor's ties are equivalent. Unlike structural equivalence measures which provide a Pearson's correlation measure of positional similarity, the values in the cells produced by the REGE algorithm represent percentages (i.e., 0 = no equivalence, 100 = perfect equivalence). A number of similarities were found through examination of the resultant hierarchical clustering dendrogram (tree diagram); however, these could not be reconciled into meaningful categories based on role patterns. There were a number of possible reasons for these inconclusive results, as outlined previously. This might (in part at least) be a result of the conflation of job role and job grade in the information provided by the organization, as the organization operated within a clear chain of command. Moreover, some roles did not appear to have an equivalent in the network.

These findings provide some evidence that when specific roles are compared (e.g., managers and non-managers, or secretaries and non-secretaries), there appeared to be some

[30] Blockmodels consider whether one cluster is the centre and the other the periphery – rather than examining each node individually.

similarity in tie patterns. However, the tests of tie pattern structural equivalence were less conclusive, and did not clearly support H5.

5.3 RQ1 results summary: To what extent are advice networks a product of organizational design?

The results of this section have shown that:

- Chain of command was related to the reported advice networks. However, whilst the correlation between formal and informal networks was significant, it did not explain *all* of the connectivity found within this network, suggesting that other factors also influenced the connections people developed within the overall group. These factors are explored further in RQ2, and within Phase 3. It emerged through descriptive network analyses that the 5 different types of advice measured in the network correlated significantly, showing that actors did not always seek different people for different types of advice, but rather had some connections that they reached out to for multiple types of advice. Actors tended to develop larger and less cohesive networks for the purposes of gathering information and general guidance, but employed smaller networks for problem solving and validation. Authorisation networks were smallest, and accounted for the smallest number of ties in the overall network.

  H1(a) and H1(b) are supported.

- For most work-groups people shared and sought advice *within* their sub-group, more than they did *between* sub-groups. Although ties existed between work-groups, the work-groups themselves formed higher order structures, which appeared to determine, at least to some extent, a person's choice of advisor/advisee. It was unclear from the network data why this was the case, and so this was explored further in Phase 3.

  H2 is supported.

- Actors reported significantly higher numbers of ties to colleagues located within their site, than to colleagues at other locations; though these differences were not found across *all* sites, suggesting that some locations were better integrated, or that contextual factors played a role in moderating this relationship. The importance of location was therefore considered in Phase 3.

  H3 is partially supported.

- The projects people were assigned to work on played an important role in shaping advice behaviours. There was a significant correlation between the connections affiliated with project membership, and reported advice networks. Project membership was also related to work-group membership (i.e., some work-groups were associated with particular projects).

The relative influence of work-group and project membership in the instigation of network connections was unclear, as contextual factors were thought to play an important role. This was explored in Phase 3.

H4 is supported.

- Some roles held by members of The Group were associated with particular network characteristics (e.g., betweenness and eigenvector centrality). Hierarchical clustering analyses found limited evidence that roles were related to structural network characteristics, though it was shown that the roles of secretaries and managers were related to increased centrality within the network. The absence of a strong relationship might be explained by a combination of factors: e.g., the sensitivity inherent in clustering methods, and the possible crudeness of the role similarity measures (e.g., some roles might appear similar in title but be very different in terms of tasks or responsibilities). Job role was explored further in Phase 3.

  H5 is partially supported.

5.4 RQ2: To what extent are advice networks organically developed by employees?

A number of analyses were performed on the data to assess the extent to which the advice networks reported within The Group could be explained by organic factors. The analyses explored the extent to which the *demographic* factors *organizational tenure*, *work group tenure*, and *job tenure*, related to network centrality; the extent to which the *attitudinal* variables, *perceived workload* (WKL) and *intention to share knowledge* (ISK) related to the network centrality; and the extent to which reported *relational job crafting behaviours* (RJC) related to an actor's network centrality.

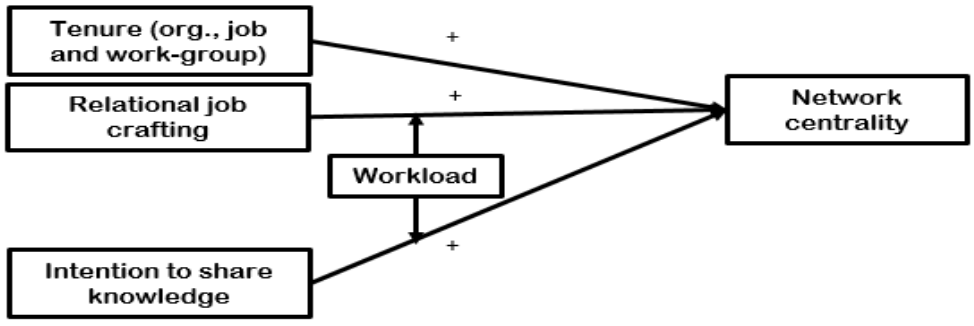


Figure 5.14: RQ2 Model, representing hypotheses 6-8 (inclusive)

Hypotheses 6-8 (summarised in Figure 5.14), were tested in relation to RQ2, using hierarchical regression modelling (Hayes, 2015). Given the assumed dynamism and iterative nature of networking, the methodological pluralism inherent in the research design (Crossley et al., 2015), and the richness of the network data (Borgatti et al., 2006), further insights were also

highlighted through network analytical techniques. This approach enabled some relationships to be empirically tested, whilst also enabling emergent avenues to be explored.

To reduce the risk of familywise error occurring, a number of separate hypotheses [H6(a-d); H7(a) and H8(a)] were tested within the same hierarchical multiple regression model. All preliminary assumptions were satisfied (Fields, 2013), as previously outlined in Chapter 4. Hierarchical regression was undertaken to collectively assess the ability of tenure (Org-ten, Grp-ten and Job-ten), RJC, WKL and ISK, to predict levels of centrality. In each case, separate hierarchical regressions were performed for each of three core types of network centrality: Freeman's in-degree, Bonacich's in-degree, and betweenness centrality (Borgatti et al., 2006; Prell, 2012). In order to separately test for the effects of each of the tenure variables on network centrality, the three tenure variables (Org-ten, Job-ten and Grp-ten) were entered into the regression models as a second block, after the effects of age were controlled for (entered at step 1). At step 3, RJC, workload and ISK were added to the model. These three variables were entered together, as there was no theoretical reason for further ordering entry of these (Field, 2013).

Overall, the adjusted R^2 figures show that these models accounted for between 18 and 23% of the variance (see Table 5.7). In all cases the hierarchical regression revealed that, at step one, Age did not contribute significantly to any of the regression models, and accounted for no more than .3% of the variance in B-indeg, F-indeg and L-betw-cen centrality scores.

Freeman's in-degree centrality

The overall model explained 23.3% of the variance in F-indeg centrality scores, $F(7, 104) = 4.51$, $p < .001$. Grp-Ten and ISK were both significant predictors in the model, although for F-indeg, Grp-ten recorded a higher beta value (beta = .28, $p < .01$) compared to that of ISK (beta = .26, $p < .01$). High Grp-ten and high ISK were both associated with higher F-indeg scores. The significance of each of the standardised beta score indicates that each predictor variable made a unique contribution in this model when controlling for the other, and also when age, Org-ten and Job-ten, RJC and WKL were statistically controlled for. WKL and RJC did not have significant effects on F-indeg scores.

Bonacich's power centrality

This overall model explained 23.2% of the variance in B-indeg scores, $F(7, 104) = 4.48$, $p < .001$. ISK, Job-ten and Org-ten were all significant predictors in the model; with ISK recording the highest beta value (beta = .27, $p < .01$). High levels of ISK were associated with high levels of in B-indeg centrality; high levels of Org-ten were associated with high levels of B-indeg centrality, and high levels of Job-ten were associated with low levels of B-indeg

centrality. Again, this model suggests that RJC does not make a unique contribution to B-indeg centrality when ISK is controlled for.

Betweenness centrality

This overall model explained 28.1% of the variance in betweenness centrality scores, F (7, 92) = 5.14, $p < .01$. ISK was the only significant predictor of L-betw-cen in the final step of the model, recoding a beta value of .38 ($p < .01$). Higher ISK was associated with higher betweenness centrality.

Step and predictor	F-indeg	B-indeg	L-bet-cen
Step 1			
Age	-.01	-.06	.06
Total R^2	.00	.00	.00
Step 2			
Age	-.14	-.18	-.03
Grp-ten	.36**	.25*	.26*
Job-ten	-.25*	-.29**	-.26*
Org-ten	.14	.22	.14
Total R^2	.124**	.115**	.087**
Step 3			
Age	-.11	-.16	.01
Grp-ten	.28**	.17	.16
Job-ten	-.17	-.21*	-.12
Org-ten	.13	.21*	.09
WKL	.10	.13	.09
RJC	.14	.13	.18
ISK	.26**	.27**	.38**
Total R^2	.233**	.232**	.281**
ΔR^2 *at Step 3*	.181	.180	.226

Table 5.7: Regression results examining the contribution of tenure, ISK, RJC, WKL and in centrality scores, when controlling for age.

NB: The standardised beta coefficients presented are those derived at the third step.
**p < .05, **p < .01, two-tailed.*

The implications of this regression model for each of the hypotheses are now outlined.

5.4.1 H6: Tenure

H6(a): Organizational tenure will be positively related to network centrality.

H6(b): Work-group tenure will be positively related to network centrality.

H6(c): Job tenure will be positively related to network centrality.

H6(d): Work-group tenure will have a stronger effect on network centrality than organizational tenure and job tenure.

Four hypotheses were tested related to tenure (see Step 2 of the regression analyses). All preliminary assumptions were satisfied. The overall model for F-indeg centrality explained 12.4% of the variance in F-indeg scores, $F(4, 107) = 3.80$, $p = .01$. For B-indeg centrality the model explained 11.5% of the variance in B-indeg scores, $F(4, 107) = 3.49$, $p = .01$. For L-betw-cen, the model explained 8.7% of the variance in L-betw-cen scores, $F(4, 95) = 2.27$, $p = .07$. Org-ten was not a significant predictor of network centrality, however, in any of the models; whereas both Grp-ten and Job-ten were significant predictors in each of the models, when controlling for age. For F-indeg centrality, Grp-ten recorded a higher beta value (beta = .36, $p < .001$) compared to Job-ten (beta = -.25, $p = .02$), showing that group tenure had a greater effect on network centrality than job tenure or organizational tenure. However, for B-indeg centrality this effect was the converse, and Job-ten recorded a higher beta value (beta = -.29, $p = .01$) compared with Grp-ten (beta = .25, $p = .02$). Although the size of the effect could be seen to differ across different types of centrality, it was interesting that in all cases the effect for job tenure on network centrality was negative, showing that whilst longer work-group tenure was associated with higher network centrality, lower job tenure was associated with higher network centrality. The explanation for this is unclear from the quantitative data, suggesting that this relationship would benefit from further exploration within Phase 3.

When other variables were entered into the model in the third step, however, the effects of tenure were reduced. Grp-ten became the only tenure variable to remain a significant predictor of levels of Freemans's in-degree centrality. It did not, however continue to predict levels of Bonacich's in-degree centrality and betweenness centrality. In contrast, for Bonacich's power centrality, Org-ten and Job-ten were significant predictors, whilst Grp-ten was no longer significant. Org-ten had not been a significant predictor of centrality previously in step 2, and became so in this model only. This shows that for (B-indeg) *power* centrality (how connected one is to well-connected others) high levels of organizational tenure improved centrality, whereas for high levels of job tenure this had the opposite effect.

Together, these findings showed that the positive relationship between organizational tenure and network centrality was not significant at the .05 level. H.6a was not therefore supported. Overall, H.6(b) can be supported, because work-group tenure was positively related to F-indeg network centrality and to B-indeg and L-bet-cen, without additional variables. However, when the effect of Grp-ten was included alongside other variables such as ISK and

RJC, the effect of Grp-ten was reduced; and it only remained significant as a predictor of F-indeg centrality.

H6(c) is not supported. Although job tenure was significantly related to network centrality, the direction of the relationship was found to be negative, such that high levels of job tenure were predictive of low levels of network centrality.

H6(d) is supported for F-indeg centrality; showing that it is a person's experience in the work-group that is most predictive of their basic in-degree network centrality. However, for power centrality (B-indeg), the beta values indicate that, overall, an actor's job and organizational tenure were more predictive of centrality.

5.4.2 H7: Intention to share knowledge

H7(a): ISK will be positively related to network centrality.

H7(b): WKL will moderate the relationship between ISK and network centrality.

5.4.2.1 ISK and network homophily

The first hypothesis H7(a) was supported by the hierarchical regression model, previously outlined, where ISK was found to be a significant predictor of all three types of network centrality. An alternative way to consider hypothesis H7(a) was to test for homophily in the network (i.e., the extent to which actors with high or low ISK had positive ties to socially similar others. A new variable was created based on whether an actor's score for this variable was above or below the mean average score for this variable (1 = $\leq\overline{X}$, and 2 = $>\overline{X}$). When this new variable was plotted in crude binary form in Figure 5.15, it could be seen that in line with the regression analyses presented previously, there was a high density of *blue* actors in the centre of each network imagine (i.e., showing that actors who scored higher than average for this variable had higher degree centrality in the network).

In order to test whether such actors were statistically more likely to associate with similar others, the ego-alter similarity of actors in the network were calculated using E-I indexes (Krackhardt & Stern, 1988). An E-I index measures the extent to which an ego is similar to their alters based on their attitude to ISK. This test enabled the principle of homophily (i.e., that actors have a tendency to have positive ties to socially similar others) to be tested, by comparing the ties and non-ties of each ego to their alters[31] (ties to similar others and non-similar others are compared to the number of non-ties to similar and non-similar others).

[31] *For a particular attribute (e.g., ISK), the E-I index is calculated as the sum of ties of group members to outsiders (dissimilar others), subtracting the number of ties to other group members (similar others), and divided by the total number of ties (Hanneman & Riddle, 2005). An attribute needs to be dichotomous (e.g., high or low) to perform this test.*

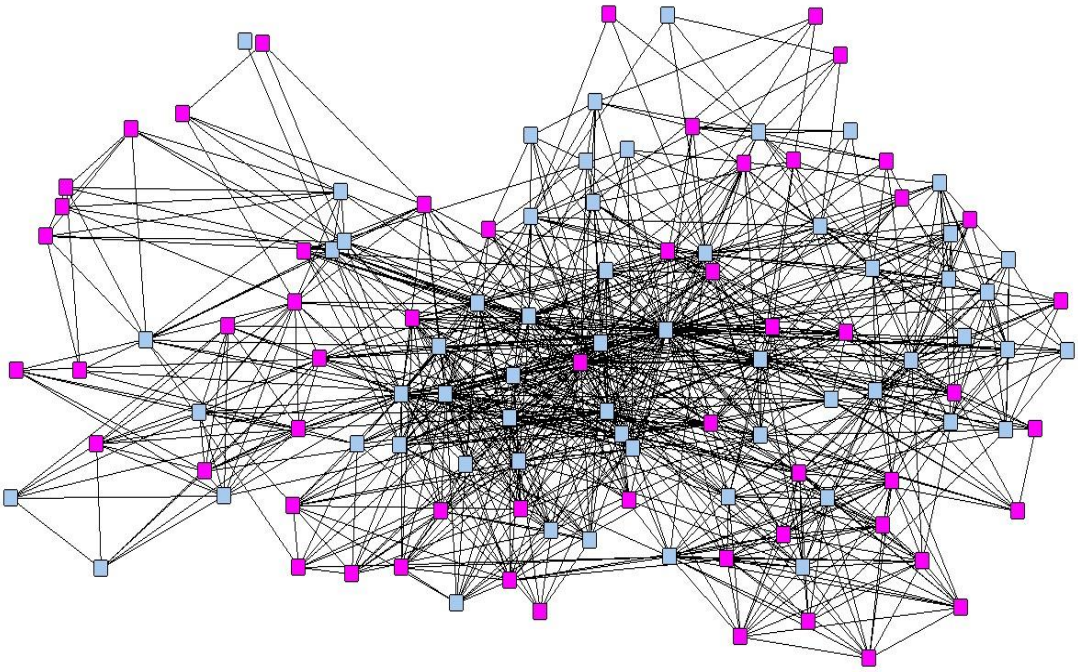


Figure 5.15: The general advice network, with actors colour-coded according to high or low ISK

NB: High ISK = blue, low ISK = pink

For the ISK attribute, the overall number of internal ties (998, 54.1%) and external ties (848, 45.9%) yielded an E-I index of -0.08 (compared with the expected E-I value of 0.008). The permutation-based sampling distribution (across 5000 permutations) showed that for this attribute the tendency towards internal connections is significant at the $p < .05$ level. This suggests that individuals with a higher intention to share knowledge were more likely to connect to others colleagues with a similar attitudinal disposition. These findings add further support for H7(a), highlighting the relationship between ISK and the characteristics of an actor's social network, and providing evidence to suggest that this actor attribute was associated with the attributes of an actor's alters (i.e., there was a contagion effect, though the causality of this was not clear from this cross-sectional dataset).

5.4.2.2 ISK and WKL

The correlation matrix displayed in Table 5.1 showed very small, non-significant Pearson's correlations between perceived WKL and the network characteristics, including betweenness centrality. Moreover, when entered into the multiple regression model alongside other predictor variables (presented in Table 5.8), WKL was not found to be a significant predictor of degree centrality. In order to test H7(b), which predicted that WKL would moderate the relationship between ISK and network centrality moderated multiple regression was

performed to assess the ability of ISK and WKL to predict values of *F-indeg*, *B-indeg* and *L-betw-cen*. The Hayes *PROCESS* macro was used to undertake this analysis in SPSS, based on its advantages over the traditionally applied, Baron and Kenny (1986) approach (e.g., see Hayes, 2009 and Field, 2013 for further discussion). As before, preliminary assumptions were satisfied (Field, 2013), and to avoid multicollinearity with the interaction term, the predictor and moderator variables were centred (Aiken & West, 1991). The findings of this model are presented in Table 5.8.

Overall, the models were found to explain a significant proportion of the variance in network centrality scores: 16.4% of the variance in F-indeg scores, $F(3, 111) = 5.44$, $p < .001$; 15.7% of the variance in B-indeg scores, $F(3, 111) = 6.02$, $p < .001$; and 21.5% of the variance in L-betw-cen scores, $F(3, 98) = 6.47$, $p < .001$). A significant interaction effect for WKL and ISK on network centrality scores was not found overall. However, exploration of the confidence intervals suggested possible moderation at mean and high values of WKL for F-indeg and L-betw-cen [F-indeg: mean $b = 3.29$, 95% CI (1.39, 5.19), $t = 3.43$, $p < .01$; high $b = 4.87$, 95% CI (2.01, 7.73), $t = 3.38$, $p < .01$. L-betw-cen: mean $b = 1.17$, 95% CI (.37, 1.98), $t = 1.58$, $p < .01$; high $b = 1.39$ 95% CI (.55, 2.23), $t = 3.27$, $p < .01$)]. For B-indeg centrality, examination of the confidence intervals suggests that there is a conditional effect of ISK on B-indeg at three levels of workload: low: $b = 510.03$, 95% CI (22.66, 997.41), $t = 2.07$, $p = .04$; mean $b = 768.61$, 95% CI (368.17, 1169.05), $t = 3.80$, $p < .01$; high $b = 1027.18$, 95% CI (410.05, 1644.31), $t = 3.30$, $p < .01$). Whilst it is clear that there is not a significant moderation effect overall, it is possible that there is a more complex moderation effect, such as a curvilinear relationship or 'U' curve, and that this explains possible so called 'zones of significance' (Hayes, 2015) within the data, which would not be uncovered through linear moderation analysis of this kind. The role of workload is therefore explored further in the qualitative analyses.

Table 5.8 displays the results of this hierarchical moderated multiple regression analysis.

Step and predictor	F-indeg	B-indeg	L_betw_cen
Step 1			
Constant	10.45**	1834.27**	4.19**
	(9.36, 11.55)	(1582.46, 2086.08)	(3.86, 4.52)
ISK	3.29**	768.61**	1.17**
	(1.39, 5.19)	(368.17, 1169.05)	(.37, 1.98)
WKL	1.38	314.15	.35
	(-.25, 3.00)	(-58.23, 686.52)	(-.06, .77)
Step 2			
ISK x WKL	2.17	354.95	.30
	(-.30, 4.64)	-174.64, 884.55)	(-.63, 1.23)
Total R^2 *at Step 1*	.164**	.157**	.215**
ΔR^2 *at Step 2*	.028	.014	.006

Table 5.8: Moderated regression results examining the contribution of ISK and WKL in in-degree centrality scores (Freeman, Bonacich, and Betweenness)

NB: The standardised beta coefficients presented are those derived at the second step, along with overall confidence intervals which are shown in brackets.
**p < .05, two-tailed. **p < .01, two-tailed.*

5.4.3 H8: Relational job crafting

H8(a): RJC will be positively related to network centrality.

H8(b): WKL will moderate the relationship between RJC and network centrality

The hierarchical regression model reported previously (Table 5.7), showed that RJC was not significantly related to network centrality, when controlling for the effects of ISK, tenure and WKL.

Using the same process as outlined for ISK, RJC scores were converted to a dichotomous variable (high/low) and plotted in Figure 5.16, where visual inspection suggested that actors with higher RJC appeared to have higher centrality in the network. However, in this case, the overall number of internal ties (857, 52.2%) and external ties (989, 47.8%) yielded an

E-I index of -0.04. The permutation-based sampling distribution (across 5000 permutations) shows that the tendency towards internal connections is not significant at the $p < .05$ level, indicating that actors show no preference in connecting to others in the network based on their RJC behaviours. This suggests that the RJC behaviours of actors occurred independently of the RJC behaviours of their alters.

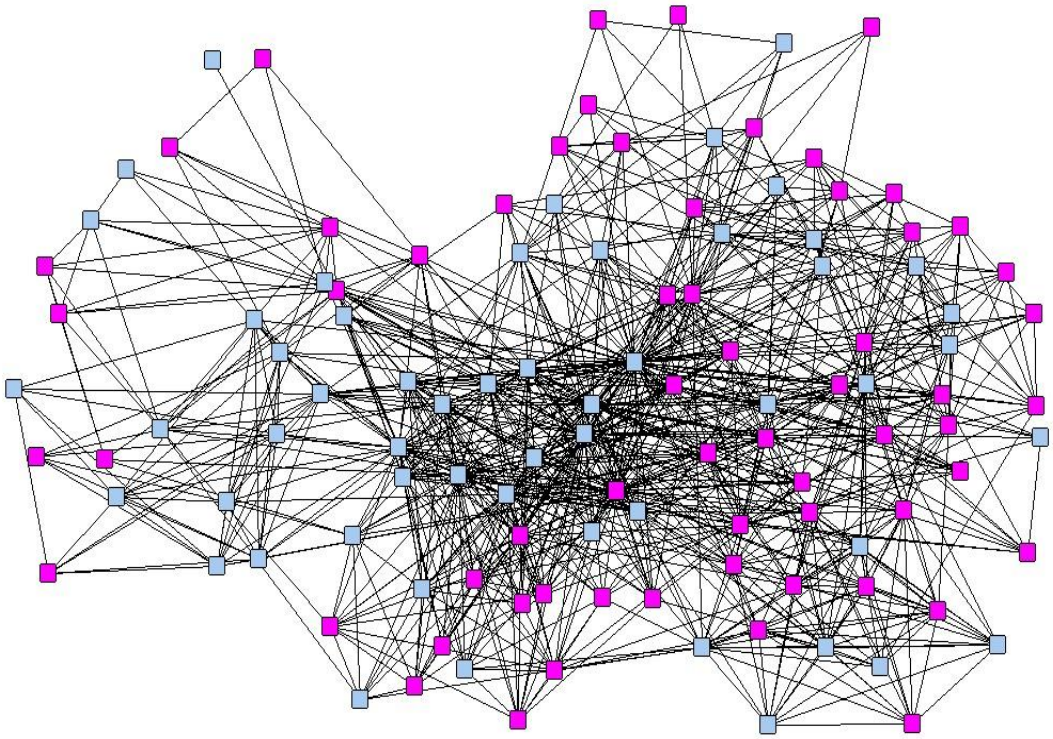


Figure 5.16: The general advice network, with actors colour-coded according to their high or low RJC behaviours

NB: High RJC = blue, low RJC = pink

5.4.3 1 RJC and workload

The possibility that workload (WKL) played a moderating role in the prediction of degree centrality was tested in a moderated multiple regression model. H8(b) predicted that WKL would moderate the relationship between RJC and network centrality. Moderated multiple regressions were therefore performed to assess the ability of RJC and WKL to predict levels of F-indeg, B-indeg and L-betw-cen, thereby testing H8(b). The Hayes *PROCESS* macro was again used (Hayes, 2015). As before, all preliminary assumptions were satisfied (Field, 2013) and the predictor and moderator variables were centred (Aiken & West, 1991). The findings of this model are presented in Table 5.9.

Step and predictor	F-indeg	B-indeg	L-betw-cen
Step 1			
Constant	10.54**	1848.75**	4.22**
	(9.39, 11.68)	(1586.74, 2110.77)	(3.88, 4.56)
RJC	1.42*	363.75**	.47*
	(.19, 2.66)	(77.61, 649.88)	(.15, .80)
WKL	1.40	323.75	.32
	(-.69, 3.48)	(-157.09, 804.60)	(-.25, .88)
Step 2			
RJC x WKL	.050	-4.82	-.311
	(-2.00, 2.10)	(-484.31, 474.66)	(-.90, .28)
Total R^2 *at Step 1*	.080*	.093**	.107**
ΔR^2 *at Step 2*	.000	.000	.014

Table 5.9: Moderated regression results examining the contribution of RJC and WKL in in-degree centrality scores (Freeman, Bonacich, and Betweenness).

NB: The standardised beta coefficients presented are those derived at the second step.
**p < .05, **p < .01, two-tailed.*

Overall, the models were found to explain a significant proportion of the variance in network centrality scores: 8% of the variance in F-indeg scores, $F(3, 111) = 2.92$, $p = .04$; 9.3% of the variance in B-indeg scores, $F(3, 111) = 3.72$, $p = .01$; and 10.7% of the variance in L-betw-cen scores, $F(3, 98) = 5.57$, $p < .001$. Interestingly, in each model RJC was the only significant predictor, and recorded a considerably higher beta value in each case, compared to that of WKL (see Table 5.9). It was notable that when other predictors were removed from the model, RJC became a significant predictor of each of the centrality variables, lending some support for H8(a); as higher RJC was associated with higher B-indeg, F-indeg and Betw-cen in these models.

Nevertheless, WKL was not significantly related to RJC or network centrality, showing that a person's perceived workload was unrelated to both network centrality, and RJC behaviours. The interaction effect between workload and RJC was non-significant. However,

exploration of the confidence intervals suggested possible moderation at low and mean values of workload for B-indeg and L-betw-cen: [B-indeg: low b = 367.26, 95% CI (3.24, 731.29), t = 2.00, p = .05; mean b = 3.63.75, 95% CI (77.61, 649.88), t = 2.52, p =.01; L-betw-cen: low b = .70 (.25, 1.14), t = 3.09, p < .01; mean b = .47, (.15, .80), t = 2.92, p < .01]; and for mean levels of F-indeg: [mean b = 1.43, 95% CI (.19, 2.66), t = 2.29, p = .02]. Again, it is unclear why the overall moderation effect is non-significant, whilst there do appear to be 'zones of significance' (Hayes, 2015) within the dataset. The reasons underpinning this are not immediately clear, but there are a number of possible explanations for this kind of effect. For instance, it is possible that the relationship is curvilinear or that there are different theoretical mechanisms underpinning the effect at different levels of the moderator. The role of workload is therefore explored further in Chapter 6.

5.5 RQ2 results summary: To what extent are advice networks organically developed by employees?

The results provide some indication that network characteristics are influenced by attitudinal differences between nodes, as well as other individual characteristics. The results presented in this section have shown that:

- Tenure predicts network centrality, but the effect was only significant for work-group tenure and job tenure. Organizational tenure did not significantly predict any of the network centrality measures tested. The relationship between job tenure and network centrality was significant but unexpectedly, the direction was negative. The possible reasons for this are explored further in Phase 3. In all cases, these effects held when age was entered as a control variable in the analysis. When other predictor variables were entered into the model, the effect size reduced for some types of centrality. For F-indeg, Grp-ten became the biggest tenure predictor, whereas for B-indeg centrality, Job-ten was a greater predictor; and Org-ten became a significant predictor for the first time.
  H6(a) is supported for B-indeg only.
  H6(b) is supported.
  H6(c) is not supported.
  H6(d) is supported for F-indeg centrality only.

- ISK positively predicts network centrality, such that high intentions to share knowledge were associated with high levels of advice behaviours. There was also evidence of contagion in the network, as actors with high ISK were found to connect preferentially to alters with high ISK (and vice versa); though the causality of this relationship is unclear from this dataset. The role of workload was inconclusive at this stage. The interaction effect between ISK and workload was found to be non-significant. However, the

confidence intervals recorded for medium and high levels of workload suggest possible moderation. This is explored further Phase 3.

H7(a) is supported.

H7(b) is partially supported based on 95% CIs.

- Individually, RJC significantly and positively correlated with each of the network centrality variables, showing that high RJC was associated with high network centrality. However, when added to a multiple regression alongside other variables, the effect of RJC became non-significant as a predictor of network centrality. Visual inspection of the network indicated that actors with high levels of RJC tended to occupy more central positions in the network. However, no evidence of contagion or homophily in the network was found, suggesting that such dispositions are not socially spread. The interaction effect between relational job crafting and workload was found to be non-significant. However, the confidence intervals recorded within this analysis suggest possible moderation at some levels of workload; though this effect was inconsistent across different types of network centrality. The role of workload is explored in greater depth through Phase 3, where the nature and role of job crafting behaviours are also examined.

  H8(a) is partially supported based on 95% CIs

  H8(b) is partially supported.

5.6 RQ3: How do advice networks influence the design and development of jobs?

In order to answer the hypotheses nested in RQ3 [H9(a) and H9(b)], two different types of analyses were performed. Multivariate analyses were used to measure the strength of the whole-network relationship between job satisfaction and career satisfaction, and to explore the possibility that network centrality moderates this relationship. Egonet analysis was also undertaken in relation to RQ3, as this enabled particular network cases to be explored in more depth, focusing on both the actors and their alters, and their related characteristics. These analytical directions were inductively driven as the network images were descriptively explored. The management team became a key focus in this part of the analysis, and these interests informed some of the questions asked in the Phase 3 interviews.

5.6.1 H9: Career satisfaction

H9(a): Job satisfaction at T1 will be positively related to career satisfaction at T2.

H9(b): Network centrality (T1) will moderate the relationship between job satisfaction (T1) and career satisfaction (T2, such that the relationship is strongest for individuals with high network centrality).

Inspection of the correlation matrix revealed a significant positive relationship between job satisfaction at T1, and subsequent career satisfaction at T2 (r = .45, p < .01). In order to test for an interaction between Jsat and network centrality in Csat scores, moderated regression analysis was performed using the Hayes PROCESS macro (Hayes, 2015). As before, all preliminary assumptions were satisfied, and to avoid problematic multicollinearity with the interaction term, the predictor and moderator variables were centred (Aiken & West, 1991). No control variables were included in this model, given the low correlations between demographic variables and Csat, and the absence of theoretical justification (Becker et al., 2016). In step 1, Jsat was added to the model, to test its ability to predict levels of Csat [H9(a)]. The interaction term for the combined effect of Jsat and each of the network centrality types, was then added in Step 2. The results of the moderated multiple regression models are described in Table 5.10, and show that for F-indeg centrality (Model 1) the overall model explained 25.3% of the variance in Csat scores, F(3, 54) = 12.95, p < .001. For B-indeg centrality (Model 2) the overall model explained 28.1% of the variance in Csat scores, F(3, 54) = 17.17, p < .001. For L-betw-cen (Model 3) the overall model explained 23.3% of the variance in Csat scores, F(3, 50) = 6.96, p < .001. Nevertheless, Jsat was the only significant predictor in each of these models. This shows that the interaction between Jsat and network centrality was not significant in predicting Csat overall.

Nevertheless, inspection of the 95% confidence intervals suggests that there is a conditional effect of Jsat on Csat at mean and high levels of F-indeg and B-indeg network centrality. At the mean value of F-indeg centrality, there was a significant positive relationship between Jsat and Csat, b = .63, 95% CI [.36, .90], t = 4.66, p < .001. The same effect was found at the mean value of B-indeg centrality, b = .59, 95% CI [.33, .84], t = 4.63, p < .001. When F-indeg and B-indeg centrality were high, there was also a significant positive relationship between Jsat and Csat (F-indeg: b = .87, 95% CI [.38, 1.36], t = 3.58, p < .001; B-indeg: b = .82, 95% CI [.43, 1.20], t = 4.28, p < .001). These findings suggest that a moderating effect of network centrality on the relationship between Jsat and Csat is possible, but unclear from this dataset. It is possible that a non-significant interaction effect was found because the centrality data used to test for this effect was taken from the first time point, as T2 network data was not available, and because the sample size is too small to uncover an effect. It is also possible that a moderating effect is more intricate than can be deduced through a linear model (e.g., a curvilinear relationship). These relationships are therefore explored further in Phase 3.

Step and predictor	Csat (Model 1)	Csat (Model 2)	Csat (Model 3)
Step 1			
Constant	2.18**	2.18**	2.22**
Jsat	.63**	.59**	.64**
F-indeg	.02	-	-
B-indeg	-	.00	-
L-betw-cen	-	-	.00
Step 2 (Model 1)			
Jsat X F-indeg	.04	-	-
Total R^2	.253**	-	-
ΔR^2 at Step 2	.02	-	-
Step 2 (Model 2)			
Jsat X B-indeg	-	.00	-
Total R^2	-	.281**	-
ΔR^2 at Step 2	-	.02	-
Step 2 (Model 3)			
Jsat X L-betw-cen	-	-	.00
Total R^2	-	-	.233**
ΔR^2 at Step 2	-	-	.01

Table 5.10: Moderated regression results examining the contribution of Jsat and centrality in Csat scores (Freeman, Bonacich and Betweenness)

*NB: The standardised beta coefficients presented are those derived at the second step. *p<.05, **p<.001 two-tailed.*

5.6.2 Egonet analyses

The egonets of key actors in the network were explored to enable a stratified sample of interviewees to be invited to participate in Phase 3. Individualised egonet profiles were then compiled prior to their Phase 3 interview, on the basis of these analyses, to provide each participant with their own personalised results report. In the following section, however, the egonets of Group G (the Management team) were analysed, given the strategic influence this sub-group could have on the *top-down* job designs of other members of The Group. Some interesting findings emerged from this in relation to the Management Group's advice seeking preferences and tie patterns, as presented below. Further analysis of these egonets is presented from a qualitative perspective in Chapter 6.

It was clear from the results presented in relation to RQ1 that managers held disproportionately high levels of degree centrality in the network. This was important, because the distribution of network centrality is wide (SDs of around 7 or higher in the overall network), revealing that in the overall advice network there are great inequalities in power and influence (i.e., akin to star networks for some actors). This put some actors (particularly in the management team) at a structural network advantage, because they have greater opportunity to influence the views of other Group members, than those on the network's periphery.

Greater scrutiny of the Management team revealed two further points of particular interest. First, K-core[32] analysis reveals that three distinct subgroups could be found in the Management team. Figure 5.17 indicates that there were three main k-core sub-groups (denoted as red, blue or black nodes) within the Management Team, who displayed similarities in their tie patterns to each other. The nature and implications of these k-cores are further explored in Phase 3, as these ties appeared to represent differences in advice behaviours based on location. K-core 1 included all members of the management team from UK Site 1, k-core 2 included the additional members from the USA, and k-core 3 adds the only member of the group from Germany. Within this sub-network, the first k-core was most densely connected, with fewer connecting ties to outer edges.

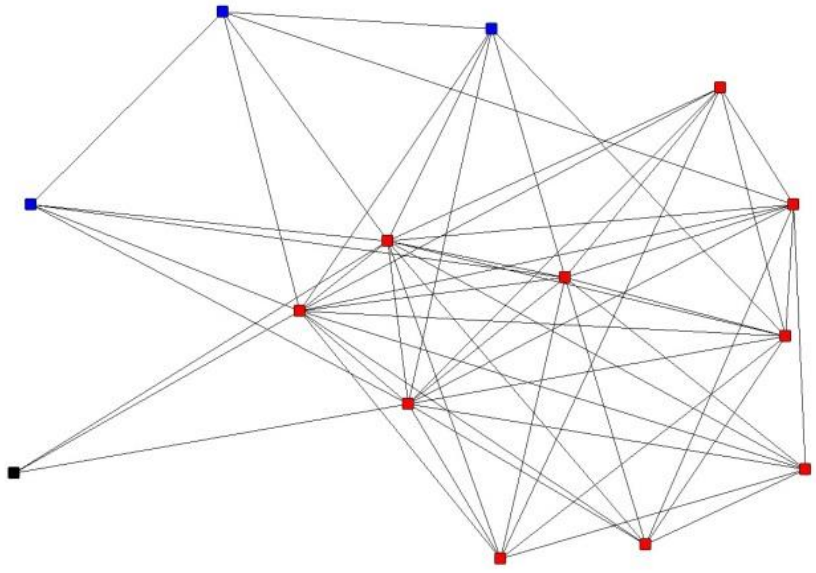


Figure 5.17: Visual representation of the 3 k-cores within the Management team

NB: Colours indicate k-cores

[32] A k-core is a maximal connected subgraph within a graph, such that all vertices have a degree of at least *k* (Prell, 2012)

Secondly, although the whole-network analysis of career satisfaction did not find actors to connect preferentially to alters with similar career satisfaction[33], the E-I indexes of several actors of importance (with high Bonacich power centrality scores) in the network did demonstrate homophily on this attribute. The Group's Leader (P8, based at UK Site 1), for instance, was of particular interest (their egonet is depicted in Figure 5.18). In this egonet six distinct components[34] could be found. It can be seen when this egonet is plotted to display the career satisfaction of those actors two years later, in the most central component (coloured red), there are nine actors with high career satisfaction compared to only three actors on the periphery of this component, with low career satisfaction. These nine actors also had higher levels of eigenvector centrality at T1 (node size increases with centrality). Here, the Leader's E-I index of -.28 indicates a clear preference for homophily, indicating that in this subset of the data those actors in his egonet could expect higher career satisfaction at the second time point.

The nature of egonet ties were explored in detail for each participant within Phase 3 of the research.

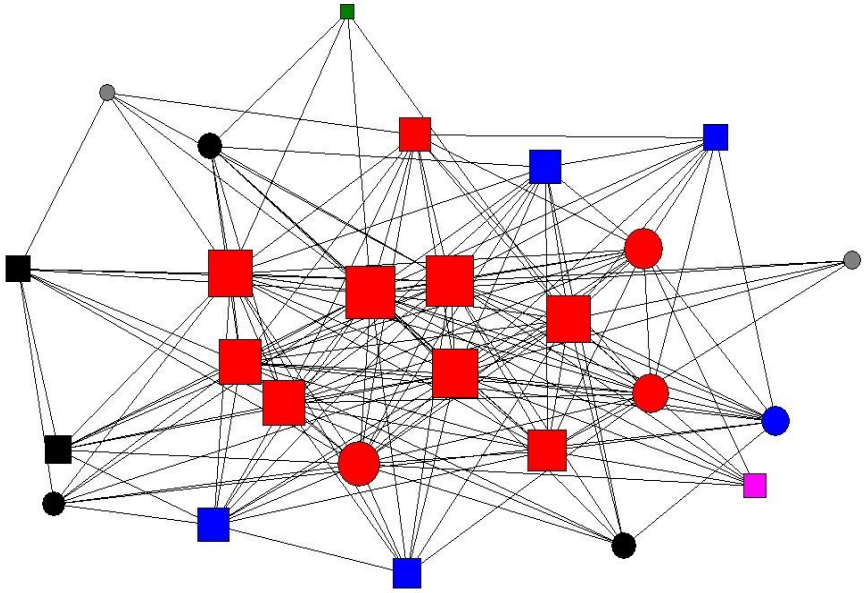


Figure 5.18: P8's overall advice egonet.

NB: Colours indicate k-cores, squares indicate that actor reported high subsequent Csat (at T2), whereas circles indicate low Csat at T2

[33] The overall number of internal ties (328, 51.9%) and external ties (304, 48.1%) yielded an E-I index of -.038. The permutation-based sampling distribution (across 5000 permutations) shows that the slight tendency towards internal connections (homophily) is not significant at the $p<.05$ level, indicating that actors show no preference in connecting to others in the network on the basis of their career satisfaction.

[34] An egonet component is a subgroup of nodes that are all connected to each other by at least one tie path (Borgatti et al., 2013)

5.7 RQ3: Summary of the results

The key findings in relation to RQ3 are summarised as follows:

- This section has tested two hypotheses. On the basis of these findings, **H9(a) is supported**. The reported confidence intervals provide **partial support for H9(b)**, though this effect requires further investigation with more complete T2 data and network data from multiple time points. Collectively these network results suggest that there is a positive, significant relationship between job satisfaction at T1 and career satisfaction at T2, and that this *may* be moderated by network centrality. Nevertheless, it seems likely on the basis of the theoretical arguments presented earlier in this thesis, that the nature of these advice networks and their role in job design and development is more iterative and nuanced than a linear model of this kind will allow.

- It seems that the management group might play an interesting role in the development of the network. The results suggest that the career satisfaction of actors and their egos are unrelated, suggesting that scores on this variable are not contagious (i.e., you do not share similar career satisfaction to your immediate alters). Nevertheless, this test was based on a small and incomplete sample. When the egonets of influential individuals in the Management Team were explored, it was apparent that there is homophily in career satisfaction of the Management Team, and within the Group Leader's egonet. The possible implications in terms of the creation of in-groups and out-groups, and the associated implications for job design decisions are explored further through Phase 3.

5.8 Conclusions from the quantitative results

A number of conclusions can be drawn from the quantitative data. First, it is clear that both top-down and bottom-up processes contribute to the development of organizational networks. A number of key, organizational design features were found to relate to the characteristics of the organizational network, including the organization's formal hierarchy, the location to which members were assigned, the projects they worked on, and the roles that they undertake. However, these top-down characteristics, though clearly significant, do not explain all of the variance in informal networks that was found in this study. In addition, it is clear from this data that both ISK and tenure play important roles in the shaping of networks. It is also clear from the quantitative data that an actor's ISK has, at least to some extent, a social basis, as the results of this data show that actors with a high ISK also generally have higher network centrality. The intricacies of these characteristics are explored further in the *qualitative* work (Phase 3), where actors' experiences in the network, and their egonets are explored in more detail. These findings show how organizational networks are a product of both top-down and bottom-up factors.

RQ3 also yielded interesting findings. It is clear that job satisfaction at T1 and career satisfaction at T2 are strongly correlated, though it was surprising to see that network centrality did not play a clearer role in this process. It is possible that the predictivity of the model was limited to some extent by shortcomings in the data – such as a low response rate of the T2 study, because it is possible that some of the dyadic patterns required to demonstrate ego-alter similarity are absent, thus weakening the strength of true patterns. The testing of this model may also have been limited by the absence of multiple network measurements, particularly, if we can expect advice networks to be iterative and dynamic.

Certainly, it seems likely that these relationships are more nuanced than can be deduced through the linear approach, and this comes through in the findings related to the management team, where it can be seen that there are strong components of dense connectivity; and, associated with this, homophily in career satisfaction in individual egonets at T2. The implications of such tie patterns for the evolution of job designs; as well as for the development and maintenance of in-groups and out-groups (and their consequences for job design) are investigated further in Phase 3, where actors' individualised experiences of connectivity within this network are explored.

Chapter 6: Qualitative results

This chapter reports the key findings from Phase 3. It outlines the individualised experiences, beliefs and perceptions of network members, focusing in particular, on how and why the reported advice networks have developed, and the factors influencing their advice behaviours, choices and decisions. The chapter is organized in three sections, which summarise the key insights that can be drawn from Phase 3 in relation to each of the study's research questions, over and above those insights highlighted by the quantitative research.

6.1 Distinguishing between top-down and bottom-up advice networks

The qualitative analyses refine the quantitative insights provided in Chapter 5. In presenting the results, the thematic analyses suggest that a conceptual distinction can be made between networks originating in *top-down* structures, referred to hereafter as *top-down networks*, and *bottom-up networks* that have emerged more organically, often as a result of personal preferences (hereafter described as *bottom-up networks*). Although participants reported that some of their networks reflected *top-down* structures put in place by the organization, *all* participants discussed how their advice connections had developed in ways that were organic and not prescribed. In coding extracts, two distinct types of *bottom-up* network were found, which had been developed to serve different purposes (*involuntarily* initiated bottom-up networks, and *voluntarily* initiated bottom-up networks). These are explored in section 6.3. The factors underpinning the development of each network type are also described, along with consideration as to why some individuals are selected as advisors over others.

6.2 RQ1: To what extent are advice networks a product of organizational design?

6.2.1 Top-down networks

In some cases, individuals reported having networks that were *generated* entirely by top-down organizational structures. Factors such as work location, organizational processes and hierarchies, project affiliation, job role and work-group allocation were all reported to affect a person's decision about who to *seek* and *share* advice with (see Figure 6.1).

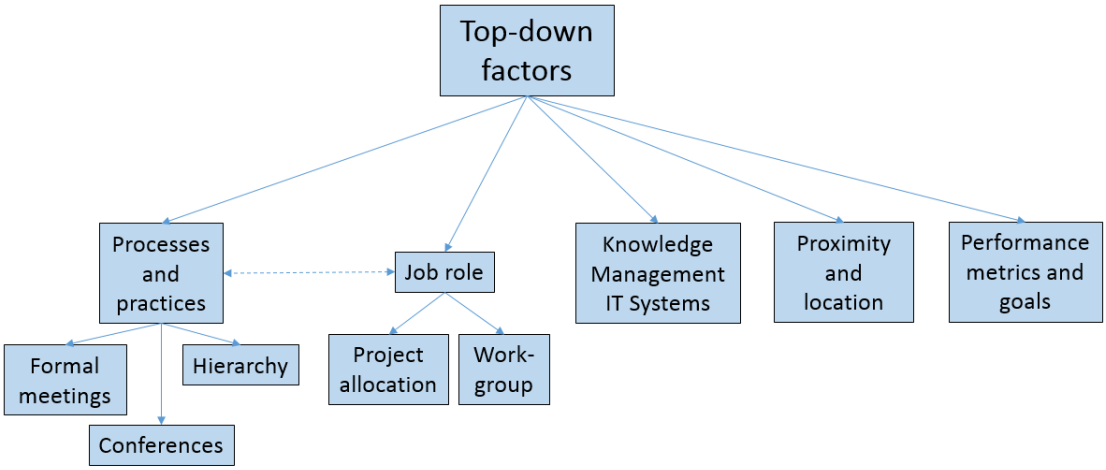


Figure 6.1: Top-down factors leading to the creation of networks

Such organizational structures played an important role in shaping a person's decisions about *whom* to speak to in The Group, and/or *what* to speak to them about. These factors are outlined in the following sub-sections.

6.2.1.1 Job role

All 16 participants suggested that the role they or another colleague held, led them to either provide or seek advice from another colleague in The Group. There were 104 separate references to job role in the data, highlighting the importance of this factor. For instance, asked whether a person with a connection or series of connections in the network was there as a result of their personal characteristics (e.g., approachability or that person's proactivity), participants routinely made reference to the person's role, making it clear that in some cases large networks are, *"understandable; he's doing his job"* (P1, Mid-Grade Engineer). Some networks simply emerge as a by-product:

> *"I think it's inherent in his role… if he's managing the X project he's managing that pot of money, then everybody who has a little bit of that pot of money reports directly to him."* (P12, Mid-Grade Engineer [female])

Moreover, nine participants noted that a change in job role or project could trigger changes in their advice networks, because they would become *"dependent on other people"* (P3, Senior Project Manager). Just as some participants explained that high tie number could be attributed to their role, several explained how the nature of their role and work were the reason they had *lower* tie numbers often because their day-to-day activities required them to build networks with people *outside* of The Group. Asked whether it was desirable to build stronger advice networks within The Group, one participant noted:

> *"I see no reason to… the majority of our contact will be with the end-users in the customer areas outside, so its gunna be [X, Y, and Z] type persons and not members of [The Group]."* (P4, Mid-Grade Engineer).

The interviews made clear that for most individuals, their work tasks necessitated advice behaviours with particular, specified colleagues; and so, in this sense, the network was *generated* by their job role. Indeed, the data shows that role affected advice behaviours to some extent, irrespective of the type of role they were in, because of the everyday dependencies designed into most roles through the coordination of work tasks.

Some of the individuals reported as key brokers in the *quantitative* results were found to be pivotal because in their role they had specialist knowledge or technical skill:

> *"In the case of [X], he's kind of a computer expert. So when I need to know something about computer systems… [X] is the expert in that area."* (P1, Mid-Grade Engineer)

In other cases, for instance in the case of supporting administrators, they were reported as the target advisor because they were *gatekeeping* in some way, or were responsible for authorising particular activities:

> *"If they want to book a quiet room they've got to come to a secretary. So there's lots of links for just very unimportant miniscule day to day reasons."* (P13, Secretary)

Similarly, P9 appeared from the Phase 2 network analyses to be more central than any other individual in the network, with a betweenness centrality index 5 times higher than the next highest colleague. However, when discussed during the interviews, the nine participants who knew P9 considered that his role in The Group was in large part the explanation for this centrality:

> *"In his [P9's] role, I'm not surprised that he's got such a large number of incoming and outgoing ties because part of his role is to draw together all of the business type stuff and all that. He's bound to have contact with lots of people, and he's bound to be asking lots of people for information"* (P15, Sub-Group Leader)

Moreover, the broader discussions on top-down, role-based connections showed that these were usually characterised by a particular *type* of advice:

> *"Whilst he's looking after the [X] work, I've got to report to him for the work package that I'm looking after… ALL of the people that have got work packages on the [X] project have got to report directly to him, and don't have choice who they speak to over*

> *it…. Where people look after pots of money or are central to a particular design method or something, I think you'll always find they have lots of people [coming to them] for information."* (P12, Mid-Grade Engineer [female])

The extract above explains that a key reason underpinning P3's (Senior Project Manager) high network centrality, is that a fundamental aspect of their role is to collate information about ongoing projects, and make recommendations about how to allocate resources and funding across The Group. This was an important emergent finding, because it showed that in such cases top-down networks could effectively override personal characteristics and preferences. Moreover, some individuals could *appear* to have highly centralised network positions, thereby giving the *impression* of personal importance in The Group, when it was actually their *role*, and not personal preference, that had generated this network position. The *type* of advice was therefore an important element to distinguish, as network diagrams alone can misleadingly imply that others are *choosing* to connect to them. This concept is returned to throughout this chapter.

In all of these instances, it was clear that networks enabled people to complete their work. The organization had prescribed (top-down) the collaboration processes so that some network connections were a clear product of organizational design, whereby organizational processes and structures ensured that it was clear whom a person needed to speak to.

6.2.1.2 Processes and practices

Work processes and practices were also identified as important determinants of organizational networks. Extracts coded as *processes and practices* included references to organizational charts and hierarchies, formalising chains of command; or references to organizational policy or process, such as the explicit or implicit *rules* about chains of command or process; including some of the formal meetings in place to enhance knowledge management. It can be seen that the networks created through *processes and practices* were closely related to those created through *roles* for some participants. For instance, as P14 (Junior Engineer) noted, *"If someone wants to use a system, then they contact the person in charge of it"*. This helps develop further insights into the Phase 2 findings – those people in secretarial roles, for instance, are typically more centralised, because of processes inherent in, or associated with, their job role. In this way, *role* and *process* appear to collectively help determine a person's network. This relationship was more pronounced for certain types of advice, such as *data gathering*, *gathering information* and *authorisation*, where people reported there to be clear advice pathways determining the appropriate advisor. Moreover, the centrality of some projects and work tasks meant that some individuals and sub-groups were *prone* to becoming more centralised in The Group, overall:

> *"I: So why do you think [Group D] is more central? Is there something about them?*
>
> *P: I think it is the tool which is being shaped and is widely used, and the [tool] is very well accepted in [the organization]… and has been used by designers. Some people have to have some contact with the [tool's] team."* (P14, Junior Engineer)

Certainly, processes and practices were cited as explanations of how some individuals and sub-groups had, over time, become more centralised and important in the network, and how this top-down cycle of process generation and implementation could perpetuate over time, leading to a network in which some (e.g., particular offices or work-groups) might be more centralised, and therefore higher in social capital, than others. This cycle has implications for RQ3 which are considered later.

In some roles, top-down networks were considered to be desirable, as they enabled efficiencies in communication processes and would avoid the network collapsing every time a person left the organization:

> *"I'm a reasonable fan of pyramids, because they reflect the organization and you can take the person out and the pyramid doesn't fall over. You can replace people."* (P16, Senior Engineer)

Hierarchies and formal networks were interestingly identified as mechanisms for both *causing* and also *preventing* overload. Some argued that top-down processes were desirable because they enabled network management:

> *"You need some sort of pyramid structure here... cause a lot of young people come and talk to me, but whilst I'm talking to them I'm not doing something else."* (P16, Senior Engineer)

However, others recognised that the development of processes could *create* role overload, by inadvertently creating bureaucracy or bottlenecks, so that other individuals were unable to intervene to help lighten the burden. For instance, referring to a colleague's high centrality, one colleague argued:

> *"I mean one of the proformas he sent me, I must have called him a dozen times because I was like 'this isn't working right'; or I'd submit it and he'd come back to me to say there's something wrong with it."* (P6, Junior Project Manager [female])

Another type of working practice that was found to influence advice networks was the presence of formally arranged meetings. Individuals referred to several different types of

formally organized meeting (conferences, face-to-face meetings, link calls, IT technologies) and recognised that these typically led to the development and/or maintenance of networks.

> *"P: So what I do, is that we actually have a daily global link call.*
>
> *I: Oh right, wow. So how does that work?*
>
> *P: Well people dial in from every site, yeah? So what we do, is we have it at half past two, so it means that the Americans can dial in and the guys in Canada as well.*
>
> *I: Right, and does that work quite well?*
>
> *P: Definitely, I recon overall we got about 75% attendance rate."* (P11, Mid-Grade Engineer)

Amongst the responses, such meetings were credited with initiating connections between people who shared mutual work interests, encouraging advice behaviours within work-groups, fostering better collaboration opportunities, and initiating communities of practice or interest groups.

However, one participant, in describing the attempts by the organization to manage advice behaviours, showed how some of the working practices that influenced and generated networks (top-down) were more implicit:

> *"This is one of our diseases… we kind of generate this desperate meetings thing and if we don't do that we generate huge cascades of email because I just need to share something with this Fellow and I keep trying to phone him and after a while I stopped phoning people because they're hardly ever there, therefore I resort to email and you get these enormous conversations going on; emails – ENORMOUS conversations going on, and like a five minute conversation has now become a two week email exchange. JUST PHONE 'EM UP! But the trouble is, you always think there's always half a dozen people who you think ought to know what you are saying – but they're not interested because they've got their own problems to deal with."* (P8, Group Director)

What is clear from the above extract, and from the other interviews, is that although some processes are explicit (e.g., organizational charts and meetings), some work practices – such as copying lots of people into emails are *implicit*, and reflect the *cultural norms* of the organization. A number of interviewees described such norms and were clear that they did not consider them to be desirable.

6.2.1.3 Proximity and location

Another factor that can be thought of as a feature of the organizational *design* is the physical proximity of the individuals involved in the advice behaviours. Members of The Group were located across a number of countries (and continents), and across several UK sites, in two cities; and the physical proximity of participants was found to play an important role in a person's choice of advisor:

> *"I: To what extent does the physical location that you're in dictate who you can, kind of, seek advice from and share knowledge?*
>
> *P: I'm ashamed to say it actually does tend to make a reasonable amount of difference"* (P15, Sub-Group Leader)

It is interesting that a person should feel *ashamed* to seek advice based on convenience of proximity; though it does suggest an awareness that this might not be the ideal basis for choosing an advisor. It was also curious that participants distinguished between three categories of *proximity* in their responses: the country in which they worked, their site, and whether they were co-located within the workspace (e.g., on the same floor or row of the open-plan office).

Participants commonly described their connections to others as being a product of their seating arrangements. Often this was coincidental, as the organization had intentionally seated together individuals working on the same projects. In other words, irrespective of the seating arrangements, these connections would necessarily emerge (e.g., because processes and roles necessitated it). On other occasions, it was the co-location that had led to the connection arising.

> *"I: How have you got these connections?*
>
> *P: Because I'm sitting there in my group and we talk sometimes.*
>
> *I: So do they work on the same projects as you?*
>
> *P: Oh yes, yes. Um, now I'm working with [X] too, so they're all working with me.*
>
> *I: …And do you see these people socially as well?*
>
> *P: Yes."* (P14, Junior Engineer)

As is clear from this extract, and from other interviews, the organization's choices regarding seating arrangements and geographical proximity were often responsible for generating (or at least *nudging* – Thaler & Sunstein, 2008) the networks that developed within the group.

Geographical location and physical proximity were more significant facilitators of some types of advice than others. For instance, where a single individual was responsible for authorising an activity, or was known to have specialist knowledge or expertise, participants reported being willing to transcend geographical or physical boundaries of proximity:

> *I: So, you would, even if you weren't sat next to him, you'd have to make the effort to speak to him?*
>
> *P: I would, yeah."* (P11, Mid-Grade Engineer)

As with job role, for *authorisation* the organizational process negated any influence that location might play, because the only way to get work done was to apply their top-down network. However, where role or process were less prescribed, and advice could be sought from more than one person, the, *"Convenience and proximity"* (P1, Mid-Grade Engineer), of potential advisors was noted by more than half of participants as shaping their choice of advisor:

> *"I: If you weren't physically based here doing the job would you still go to those people?*
> *P: Probably not, no."* (P10, Mid-Grade Engineer)

Participants placed high value on face-to-face communications, and recognised that changes in seating plans (e.g., following workspace reorganization) could lead to changes in the frequency of advice behaviours:

> *"I don't speak to [P19, Sub-Group Leader] very often at all now, whereas he used to sit opposite me."* (P6, Junior Project Manager [female])

An obvious organizational implication would be to recommend co-location, where possible, amongst individuals whom you wish to collaborate. One participant, however, noted that co-location could stifle creativity, and suggested that sitting apart could facilitate innovation in the design process:

> *"One of the fun things… is that different sites are allowed to do different things with their software. In [the UK] security issues tend to impact very heavily on anything creative that you want to do with the internet, whereas somewhere like [the USA] have got a bit more of a free reign on what they do and they try and push some of their ideas into the UK. So having it [collaboration] across different sites does give very different slants on how methods come about, because one site might think of it in one direction, and another site may do it totally differently."* (P12, Mid-Grade Engineer [female])

However, international locations were considered a barrier for two primary reasons: (1) international laws, and (2) time differences. P1 explained how international laws affected The Group's connectivity and engagement:

> *"I can't be closely connected, at least on technical things, to the UK. We can discuss philosophy and that sort of thing, but we can't get specific on components. Any time that I do get involved in a conversation like that, I risk problems with the law, so I try to avoid it, just so that there's no appearance of impropriety. Those are kind of the reasons, I guess, that I stand out as being not very well connected."* (P1, Mid-Grade Engineer)

Time differences were cited as a barrier to effective advice behaviours, because of the need for quick decision-making in a fast-paced environment:

> *"Globalisation is incredibly hard. One way is to just move the UK days until – I don't know, whatever the [USA] day is – so that we all work the same day; because I would often argue that I'm at my most effective working globally when I'm sat at home at 10 o'clock at doing emails to guys in [the USA]."* (P16, Senior Engineer)

The quantitative data showed how one site had become heavily centralised in The Group's network overall. The reasons for this and the ways that this dominance impacted on individuals' job designs were explored through the interviews, and are reported in relation to RQ3. However, a more nuanced consequence of this dominance was that participants perceived this to have created an *in-group* of this sub-group, which combined with the apparent over-dominance of Group A in the network (based almost entirely at UK Site 1) was recognised as a barrier to advice behaviours by a number of individuals:

> *"P: I would say, yeah, people from these departments probably talk to themselves a lot… [Project X] is fundamentally run out of [UK Site 1]. If I was based in [UK Site 1], I'd most probably know a lot more information about how decisions were made, than what I do sitting in [UK Site 2].*
>
> *I: And does that have a negative impact on your work?*
>
> *P: Yeah, I'd say it has an impact."* (P11, Mid-Grade Engineer)

6.2.1.4 Knowledge management IT systems

Participants recognised that the presence and absence of some networks were influenced, even determined, by the organization's information technology and capture systems. Participants suggested that knowledge management (KM) systems enabled them to search for

particular expertise or projects and more readily uncover names of potential advisors. Some interviewees believed that systems were well developed and that there were sufficient opportunities for knowledge capture. It was also suggested that these knowledge management systems were continually improving, enabling increasingly effective and efficient advice behaviours:

> *"Typically within [the work-group] we've got email, phone, we've got WebEx, obviously depending on the type of issue we might actually meet up, either I might go to [UK Site 1] or [the USA], and also we use forum passes as well. We've got large amounts of data, 5meg, 10meg, we might store them on Drop Box, then everyone's got them on drop box, so that helps really. What we were fighting in the past, because everyone was sending like 2, 3, 4, 5, meg emails around, and in no time at all my inbox gets full up. So now, [The Group] have got a spot on drop box, and then we've actually split it down on separate sites as well, so each capability team will have its own site as well"* (P11, Mid-Grade Engineer).

However, KM and capture technologies were identified as a barrier to advice behaviours by others, who suggested that despite the variety, systems were not well enough refined, so people did not know how to usefully utilise them in their work. Relatedly, 15 of the 16 interviewees claimed that *knowing who to go to* was at the heart of their advice choices. Where it was unclear who they should connect with (particularly, if an advisor was likely based overseas), participants suggested this could perpetuate isolation:

> *"Because we don't have a lot to do with them, it's hard to understand whether we really need to."* (P10, Mid-Grade Engineer)

6.2.1.5 Performance metrics and goals

Highlighted by almost all participants was that the performance metrics (objectives) and goals assigned to individuals and groups, played a role in guiding job and work performance, and in turn had an effect on participants' behaviours. Individuals reported readily seeking and sharing advice where they could see a direct link to immediate work outcomes, and their delivery against performance metrics (e.g., where they had a technical problem requiring a solution). However, where individuals did not feel advice behaviours were rewarded through their performance metrics (i.e., where advice behaviours benefitted a greater-good, such as improving the overall quality of the department's outputs), they were less inclined to engage in them:

> *"I guess the reason I think that it's a low priority for [the organization] in general is I'm required to account for every minute of my day, but the company makes no*

> *allowance for any time that I spend giving advice to others. And so it must not be a high priority with the company, I guess is my interpretation of that… We have objectives and some of the objectives do include things like sharing knowledge, but it's only words. I mean, there's no budget, as I said, for doing that. There's nothing objective about that sort of criteria. So there's no way that you can get a grade other than a subjective opinion. If I double the amount of time I spend answering questions for other people, somehow I doubt that that doubles my grade on that objective."* (P1, Mid-Grade Engineer)

Others were even more direct about this:

> *"If I want a pay rise next year I've got to... be managed by my objectives, period."* (P4, Mid-Grade Engineer)

Individuals reported needing to demonstrate short-term performance gains (against their objectives) from their work activities, or could not justify the effort:

> *"I don't expect any result of working with [person X] to be two or more years away in terms of benefits for the customer, so it has to take a relatively low priority."* (P5, Junior Engineer)

Asked whether they would be more inclined to engage in advice behaviours that sought to promote better KM practices in The Group if they had a clear remit in their objectives to do so, individuals were more receptive:

> *"You would do that. You would apportion some of your time; manage your time to enable you to have those better connections. If it's not in the objectives now it just won't get looked at."* (P4, Mid-Grade Engineer)

Participants reported being guided by the *timesheet* system operated in the department, which provided another form of metric that they were required to work to (i.e., the charging of work activities to budget codes). On listening to the interviews, it seemed to me that this was possibly indicative of the organization's efficiency culture, and their key strategic focus on performance.

Whilst participants agreed that performance objectives shaped the activities they undertook in their work, it was clear that some individuals were able to influence their objectives, at least to some extent. It was unclear from the data whether this was a product of seniority or of role, but four individuals expressed involvement in the setting of their objectives, and noted that if they were particularly interested in advice behaviours they might be able to include an objective to facilitate this:

> *"I have a say in what my objectives are. They are the ins and outs of you. What I do is I say 'this is what I think I should be doing'…"* (P15, Sub-Group Leader)

One participant suggested that a fundamental reason why advice behaviours were not considered a priority amongst many employees was because objectives were not conducive to *team* behaviours. Instead, they argued that individually-assigned objectives led to individuals ignoring advice (and citizenship) behaviours, focussing only on what they needed to achieve in order to secure their pay-rise:

> *"To be honest I don't care whether [P3, Senior Project Manager] fails in everything he tries to do, I really don't, because it has no impact on me usually, and that's part of the problem. It's an incredibly selfish thing to do, but that's what the system forces us to do, the system forces us to behave as individuals not as a team."* (P2, Sub-Group Leader)

Another member of the Management subgroup recognised this problem, suggesting that a counter to this would be for Management to stipulate (top-down) the network that a person should create and mobilise in order to get their work done:

> *"What I want to do is to take each of the people in my first line and write down what their objectives are on a diagram and then do the connections between those, so I can say: 'Listen, on that one you need to talk to [P3, Senior Project Manager] or whoever, and [P19, Sub-Group Leader], On that one you need to talk to [P15, Sub-Group Leader]', just there on a page."* (P8, Group Director)

Participants reported that they were unlikely to actively seek new connections if they could successfully complete their work without having to do so. However, several interviewees expressed concern at the suggestion that others did not see advice behaviours as necessary to complete their work:

> *"At one time I would have said 'well yes, the objectives, they're the direction of travel', but we've also got the company values, so if I spend half the year doing the company values – the knowledge, the talking to people – that's fine, I'm still being effective in my job and influencing more people, and giving the company better value than if I just sit down and meet my objectives."* (P16, Senior Engineer)

However, the same participant also noted that he *did* have a budget to charge advice behaviours to. It is possible that this accounts for the difference in attitude:

> *"One of the functions of [my role] is to be that repository to just talk, you know; and one of the things that's happened to [people in my role] in the last year or so, is that we*

now have a charge on that… But others don't have access to that." (P16, Senior Engineer)

Collectively these findings show that performance goals and metrics stipulated by the organization affect the advice behaviours employees engage in. They can be shaped favourably, so that individuals are engaged in organizationally advantageous behaviours. However, in some cases they are inadvertently shaped in a less desirable direction, so that they prevent individuals from proactively driving new initiatives or finding out about work being undertaken elsewhere. It was apparent that in these time-pressed organizational environments, individuals built networks that mapped closely onto everyday work problems, and were keen to behave in ways that enabled them to maximally perform against their objectives. It seems possible that these top-down structures also shaped views about the *zones of acceptance* (Hornung et al., 2010) for job crafting.

6.2.2 Section summary:

In terms of RQ1, the qualitative data suggest that the advice networks present in this organization are, at least to some extent, a product of organizational design factors, such as location (site and location proximity, and seating arrangements), role design, project assignment, and associated processes; and that some result directly from organizational charts, which clarify hierarchies and responsibilities within the organization. Both the qualitative and quantitative data found that such structures, which were inherent in the job designs that people were provided with on entry to this organization, shaped initial networks by, for instance, providing leads to key others, or by showing people who they *should* or *might* go to for information or advice.

6.3 RQ2: To what extent are advice networks organically developed by employees?

Some of the advice networks found in the focal group were not obvious reflections of organizational structures. Instead, individuals reported developing these connections organically. *Networking behaviours* (the active building of a network) were reported by The Group. Where an organic connection was identified, interviewees were asked about the nature of the connection, including how and why they believed they had developed. A number of factors were found to influence the instigation of organic connections, as displayed in Figure 6.2. Fundamentally, it became clear from the transcripts that it would be important to differentiate between two types of organic networks:

1. Networks that had been *involuntarily* instigated by individuals**,** and;
2. Networks that had been *voluntarily* instigated by individuals**.**

Networks could be thought of as *involuntarily* instigated where they were developed in order to fulfil a particular role or complete a work task, but where some degree of *choice* was available. This might include, for instance, occasions where developing a network was considered to be part of the job role, but where the job holder had the autonomy to decide *who* they wish to include in their network (i.e., the catalyst for developing the connection was involuntary). In contrast, networks could be thought of as *voluntarily* instigated where they were developed independently and autonomously, without seeking permission or approval from a source of authority, or where the building of a network, and the individuals who comprised the network, were not prescribed or stipulated as part of the job holder's role description. In this section of the results, these two categories are explored, with a particular focus on how and why such categories had arisen in this network.

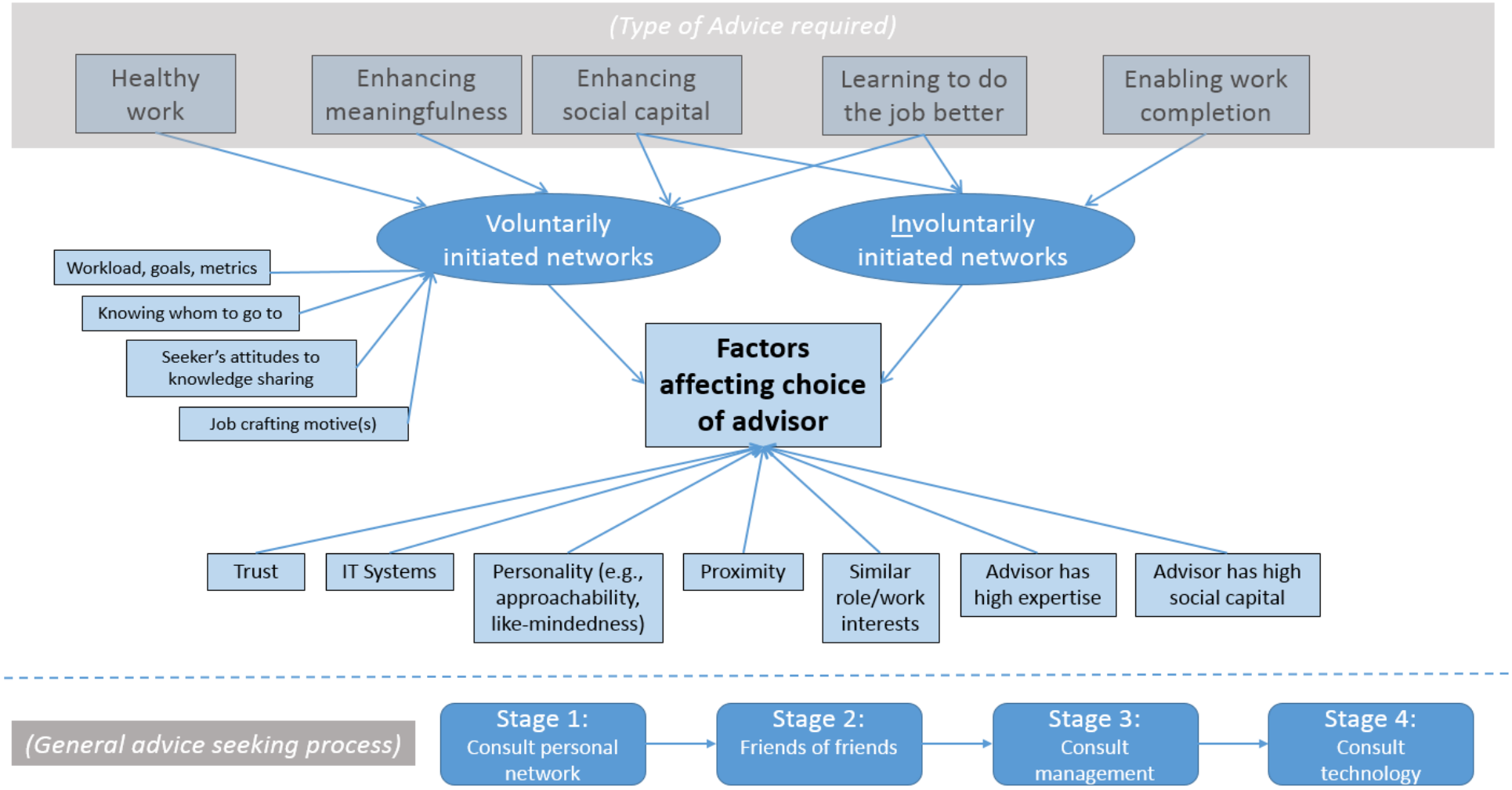


Figure 6.2: Factors affecting the development of organic, bottom-up networks

6.3.1 Involuntarily instigated networks (IIN):

Most participants provided examples of involuntarily initiated networks (IINs), in which the building of an advice network was a job-role requirement, but the network itself (i.e., the people to be included in it), was *not* prescribed. Instead, individuals were approached at the discretion of the role-holder. This included instances where a participant must achieve an objective by working with others; but these *others* were unspecified. This was considered subtly different to having the network *generated* by the role (the kind of top-down network referred to in RQ1) – for instance, where you are told who these colleagues and their roles will be. It was noted in these instances, that the role holder needed to be motivated to connect with other people, in order to select appropriate network connections, so personal characteristics such as proactivity and approachability were considered a pre-requisite to assuming the role in these cases. There was considerable discussion about this in relation to P9's centrality. One participant suggested that:

> *"It's not explicitly one or the other [role or personality] but I would think it would be very difficult to fulfil the role adequately if he didn't build and maintain the network… He's got to have the determination to go and make new contacts."* (P8, Group Director)

Unlike those role-driven networks described in relation to RQ1, P9's (Senior Project Manager) network could not be accounted for *entirely* by role. The suggestion here was that some roles lend themselves to particular personal characteristics. Notably, these characteristics were also important precursors of *voluntarily* initiated network connections (VINs), as will be subsequently explained.

Involuntarily initiated networks often served the purpose of enabling effective job completion. However, it was also noted that these connections were necessary to enable learning (e.g., from other areas of the business), and to foster strategic thinking across The Group. Whereas a secretary might, for instance, be able to maintain a network because people would report information or seek authorisation via them (i.e., whether or not they were considered the *preferred* person), it was suggested that some advisors in IINs were selected because the seeker considered that they would help them to do their job *better*. That is, they could do the basic job functions without this network, but that the network was a vehicle that enabled them to do it more efficiently and/or effectively.

6.3.2 Voluntarily instigated networks (VIN)

When participants were shown diagrams of their egonets within The Group, they were asked how and why they believed these connections had arisen. It was clear that some networks had been developed or maintained entirely voluntarily, and with little obvious resemblance to

the current organizational characteristics and practices – e.g., location, work-group, and reporting structures:

> *"I speak to a lot of females but it generally isn't about work, it will be more of a social thing. So I'm really close to [X] but that's more to do with outside of work. If we do talk about work, it's not so much the work that we're doing it might be career stuff instead."* (P6 – Junior Project Manager [female])

Many such connections had been developed amongst *peers* (e.g., another female co-worker, as above). Connections were developed for a range of reasons (outlined subsequently); the immediate completion of work was not always the primary function. Instead, connections were founded on respect for the advisor – e.g., because that person was considered a role model for their job or career path. Participants reported developing VINs through a number of activities:

> *"[I] find the opportunities in various things; through strategies, for example involving more of the business globally, [organizational] businesses, internal conferences, international conferences, communicating well with people outside of [The Group] … that sort of thing."* (P5, Junior Engineer)

Sometimes the VINs grew from coincidental work patterns – *"We did sort of knock about in the same meetings occasionally"* (P8, Group Director). Unlike IINs, these kinds of networking behaviours were interpreted as a form of relational job crafting, in line with Wrzesniewski and Dutton's (2001) definition which includes relational activities that are proactive, voluntary, and discretionary. Thematic analysis revealed that VINs were related to other types of job crafting, as follows.

6.3.2.1 Job crafting

All three of Wrzesniewski and Dutton's (2001) job crafting facets (relational, cognitive and physical) could be identified in the thematic analysis, and were categorised as separate sub-themes in the template.

6.3.2.1.1 Relational job crafting

The VINs that existed within the group were identified as having been crafted by individuals, because participants reported voluntarily changing the nature or number of the relationships they held (in line with Wrzesniewski & Dutton's 2001 definition of the concept). Relational job crafting was common amongst participants, with 21 references across 13 participants. Most commonly, such behaviours were targeted towards a work activity:

> *"Now I'm doing [my job task] in a much broader way. So it's meant that, a) I've had to broaden the technical sphere, and the sort of people that I interact with."* (P3, Senior Project Manager)

However, VINs were also reported for leisure reasons, as in the example given previously (i.e., "*I speak to a lot of females but it generally isn't about work, it will be more of a social thing",* P6, Junior Project Manager [female]). Also notable was that some individuals had actively, physically crafted their jobs to *reduce* the number of connections they needed to maintain:

> *"Well, I specifically asked if I could be put in a quieter place because I was being distracted too much by the conversations around me."* (P1 Mid-Grade Engineer)

It was suggested by two participants that some, *"Analysts that are that focused, tend not to be peoplely people"* (P6, Junior Project Manager [female]), and so would be inclined to craft their way into more specialist technical roles to avoid the need for excessive social interactions. This connection between immediate job crafting behaviours and subsequent career development and progression was apparent in a number of interviews.

6.3.2.1.2 Cognitive job crafting

Examples of cognitive job crafting were found in the transcripts of 10 participants; however, some participants appeared to find it difficult to think of examples of cognitive crafting when asked directly to do so. In the coded examples, participants would often reflect on how they ensured their work aligned with their values – a typical example of cognitive crafting can be seen in this extract from the interview with P1 (Mid-Grade Engineer), as they described the reason why they now worked so hard to disseminate their work across other parts of the business (outside of The Group):

> *"I guess I've always been a believer that the more disciplines you can at least be conversant with, the more valuable you'll be to the company because you can see how things fit together, and that's very important."* (P1, Mid-Grade Engineer)

Although this participant did not identify with the concept of cognitive crafting, this example can be seen to reflect Wrzesniewski and Dutton's (2001) definition (changing the way they think about their role or what is important in it).

6.3.2.1.3 Physical job crafting

Participants also referred to engaging in activities that could be considered *physical* crafting, whereby they changed the nature or number of activities they were involved with. For individuals with less job autonomy, physical crafting meant putting in more effort or time into a particular assigned activity:

> *"I'll try and do it in a little bit more detail than the job warrants, or maybe I'll just try and do that, you know, rather than something else down the pile that maybe should get done a bit sooner."* (P13, Secretary)

In contrast, participants with more job autonomy reported, for instance, taking on additional roles that did not necessarily align with objectives; or they would try to find ways to remove or minimise disliked activities from their job:

> *"I'm hoping to pass the job on to somebody else soon."* (P12, Mid-Grade Engineer [female])

Other participants reported subtle and incremental physical job crafting:

> *"I don't think it tends to be completely throw everything away and completely reinvent the wheel, it tends to be much more tactical adjustments modifications here and there."* (P9, Senior Project Manager)

6.3.2.1.4 Motives for engaging in job crafting behaviours

Some participants reported crafting their roles and work simply to enable them to do their day job more effectively or efficiently. For some people this meant crafting the role to enable them to do higher quality work (i.e., improve job performance), for instance, by consulting more widely on issues before making decisions. For others, this meant crafting their job to enable them to better deliver against work goals or metrics; for instance by minimising or even cutting out activities (such as consultation) if they considered them a barrier to this.

Some participants reported crafting to find meaningfulness, either to help them *make sense* of what they were doing, or because they *enjoyed* the activity. Some believed speaking to particular others was an important thing to do. Interviewees from Group C, for instance, reported proactively brokering *customer* relationships, rather than relationships with Group members. Similarly, some participants reported voluntarily disseminating information, just because they believed it was the *right* thing to do. Meaningfulness was the key motive for some participants (in line with Wrzesniewski and Dutton's job crafting propositions), as crafting either helped them *enjoy* or *make sense* of work. For others, their crafting helped them build visibility, in the hope that this would lead to increased opportunities or promotion.

Importantly, several participants explained that they crafted their role in order to manage their workload. For instance, P15 (Sub-Group Leader) explained that he was deliberately careful in how many activities he took on, so that he could be free to engage in more interesting activities if and when they occurred:

> *"I've managed my career, my workload, so effectively, that I've actually got time NOT to be busy, if you know what I mean… I mean I'm always busy, but sometimes you don't want to be that busy that you don't have time to think… And if someone comes along with something interesting and asks for help, I've got the flexibility to say 'yes I can help'."* (P15, Sub-Group Leader)

Also notable was that some individuals who did not score highly on the Phase 2 job crafting measure (e.g., P1, P10, P15), reported engaging in activities that could be clearly identified as job crafting when interviewed. This suggests that some participants did not *recognise* they were engaging in crafting behaviours until they were asked to reflect on it. Although these participants seemed less aware of their crafting behaviours, the activity and their motive for doing so could be inferred from the extracts in which these behaviours were reported.

In summary, participants reported eight different motives for engaging in job crafting: (1) to better deliver against goals and metrics; (2) to develop their social capital; (3) being proactive and diligent; (4) to make their work experience more meaningful; (5) to make their work experience more enjoyable; (6) to help manage their workplace demands; (7) to improve their job performance; and (8) to improve their career development.

6.3.2.1.5 Interplay between the facets of job crafting

Although crafting examples were found to be underpinned by different motives, there was clear evidence of interplay between the three facets of job crafting, although the causal direction of this was unclear, and appeared iterative. For instance, some participants explained how they had changed their views about what was important or necessary since meeting a particular person, and had changed the nature of their role as a result (i.e., relational crafting had led to cognitive or physical crafting):

> *"[Person X] coming along has given us a different angle, he says 'why are you doing this', "you haven't asked anybody why they need your tools"… So I think that's been useful, it hasn't necessarily changed what we do but it has given a whole new view on why we do, and the dawning realisation that we can do all the upfront stuff, the research and the capability acquisition and the coding but that we're absolutely awful at handing it over to businesses to use... So that's where that customer support idea came from that we're implementing."* (P8, Group Director)

In another example P7 (Mid-Grade Engineer) explained how cognitive change had led to physical and relational crafting:

> *"I mean the role accountability is the same, but I have more in view to also get into the field of [X], more actively involved, and that gave rise to [me organizing] some meeting with the mentioned people over here in the [focal group] area."* (P7, Mid-Grade Engineer)

The pattern of interplay were complex and varied across extracts, and individuals struggled to identify which aspect came first. Moreover, the inter-relationships between crafting facets showed that motives for job crafting were routinely underpinned by network behaviours. This data shows that advice behaviours can serve a broader range of purposes than those suggested by Cross et al. (2001).

6.3.2.2 Factors affecting VIN behaviours

The process of advice seeking was highlighted by interviewees, where a range of factors were found to affect the instigation of new network connections. Some of these were similar to those affecting IIN preferences.

Workload, goals and metrics

Workload was not cited as a barrier to employees *providing* specialist technical knowledge (e.g., where an engineer needed a code to progress in developing a solution):

> *"If somebody needs you to know the knowledge you supply it to them, I don't really see workload being a barrier to it."* (P10, Mid-Grade Engineer)

However, a person's workload was cited as a barrier to *initiating* (voluntarily or involuntarily) organic networks, as individuals reported lower inclination to engage in such behaviours voluntarily if they felt that it was going to add to their workload, unless there was an obvious performance gain to be made. Workload was closely related to the second factor: *goals and metrics*. The organization's strategy of focussing employees' performance through objectives was cited as a primary catalyst for organic advice behaviours. Although overload was not reported to be especially high in this sample (as measured in Phase 2, where no respondents reported being *constantly overloaded*), it was clear that the organization's performance-related pay policy had established a culture in which individuals *managed* their workloads to enable them to deliver on objectives:

> *"Well this may be a little bit emotive…but I didn't meet all of my deadlines last year, my objectives. I missed about 25% of them apparently, and as a consequence I didn't get a pay rise for this year and my bonus was reduced accordingly as well… We've got to meet the deadlines!! And if you play the game a little bit then you're able to."* (P4, Mid-Grade Engineer)

Knowing whom to go to

A number of participants reported that the primary factor driving their choice of advisor, was whether or not they knew who the right person to go to would be: *"I can't go to who I don't know"* (P8, Group Director). Some individuals were well placed (often resulting from long organizational tenures) to know the *experts* in the organization. However, others reported knowing less about who might be able to help them.

Attitudes towards advice behaviours and the sharing of knowledge

In Phase 2, a person's intention to share knowledge was measured as a strength of feeling (i.e., the extent to which they agreed or disagreed that it was important and a priority). In the interviews, the underpinning reasons were considered. Participants reported a range of views on the usefulness and desirability of organic networks within The Group. Some participants strongly believed that advice behaviours were a necessary precursor to high quality work:

> *"When you're designing a component it is not only, you're not just designing mechanically, so what the other groups are doing there is important."* (P14, Junior Engineer)

Others were unconvinced of the need for sharing knowledge, because, *"The opportunities for cross-fertilisation between disciplines are not obvious"* (P5, Junior Engineer). These views provided explanations as to why a person would, or would not, choose to proactively seek advice from others in The Group.

Role was cited as a contingency that influenced one's attitude to sharing knowledge. Several members of the management team suggested that it would not be a good use of time for people in senior, technical roles to be investing in new network development:

> *"Would you really want to disturb them by getting them involved in stuff they are not interested in?"* (P15, Sub-Group Leader)

Type of advice required

As noted previously, the type of advice was also considered a fundamental determinant of VINs, for reasons previously explained.

6.3.2.3 Factors affecting the choice of individual

Where there were multiple advisors to choose between (for instance, because two possible advisors held parallel roles, or had similar levels of expertise), participants reported using multiple selection criteria to choose between people. Some criteria were based around a

combination of work-related factors such as tenure, previously held job roles or interactions with a person, and perceived expertise in a given area. Some factors were unrelated to the work itself, and instead driven by personal preferences, such as (1) the convenience of contacting the advisor, (2) the advisor's personal characteristics, such as approachability, (3) positive previous encounters with the advisor, (4) considering the advisor to be like-minded in values or vision, and (5) the length of time they had known the advisor (for instance, P11 [Mid-Grade Engineer] spoke of seeking advice from *"the old boys network"*).

Personal characteristics

Individuals consistently reported that their choice of *go to* person was influenced by the advisor's personal characteristics.

a) Like-mindedness and approachability

Irrespective of their own seniority in the organization, half of the participants made reference to seeking validation and problem solving advice from, *"People I view as peers"* (P3, Senior Project Manager). Seven participants reported seeking advice from *"the people who I think see the world the same as me"* (P3). This preference seemed to be driven by principles of homophily, but it was clear that the underpinning rationale was that people found it *easier* to work with like-minded people:

> *"We know how the other one thinks, so it's just easier to get the message across"* (P13, Secretary)

Interestingly, although participants discussed freely seeking information from colleagues with similar views to them, individuals did *not* report actively seeking out individuals who would challenge their ideas or viewpoints:

> *"I go and talk to the person whose opinion I value, and almost the converse too. I will avoid people whose opinion I don't value."* (P16, Senior Engineer)

Where a person had stayed in contact with another individual over time (despite role changes), they only reported favourable reasons (e.g., support).

Personality was frequently cited as an influencing determinant of whom to seek advice from. When probed, it was apparent that *approachability* was key:

> *"There are lots of people that I would have considered experts … but I tend to go to people that I'm pretty sure will be willing and able to give me a few moments."* (P1, Mid-Grade Engineer)

Nevertheless, participants did not usually report targeting an advisor *solely* on grounds of approachability, relevant expertise was also required.

b) Trust – integrity and expertise

A number of participants reported seeking advice from particular *"trusted colleagues"* (P8, Group Director). Participants differentiated between trust in one's integrity, and trust in their expertise, knowledge or competence – e.g., *"[person X] is one of the people that I trust the most in terms of fluid flow and CFD programs and so forth… I go to him first"* (P1, Mid-Grade Engineer). Often a chosen target would reportedly fall into both categories:

> *"Well, it probably is more about what I know they know; but it is also if I know that if I've dealt with that person before and I know that I can trust them."* (P9, Senior Project Manager)

This was recognised by some such advisors:

> *"I think I'm kind of regarded within my field, as the kind of person who knows most about it. And that close to heart, I have a conscience."* (P15, Sub-Group Leader)

Trust in competence was also important – sufficient *expertise* was noted by 13 participants, and with 41 references made to it, could be identified as a strong theme in the interview transcripts. However, three participants specifically reported seeking advice from people that they considered to have high social capital or who had the capacity to *"get things done"* (P8, Group Director), irrespective of their perceived competence – *"I think respect doesn't come into it. It's the power that they have"* (P2, Sub-Group Leader).

Participants reported choosing individuals that they had a previous relationship with, either because they had worked with them before, or because they knew that person had experience of similar challenges. In particular, having met an advisor face-to-face increased the trust placed in a person, and the likelihood of connection:

> *"I'm quite happy to pick up the phone and talk with anyone anywhere and I'll actively do that, provided you've done the face-to-face."* (P5, Junior Engineer)

Convenience

As with IINs, a key factor affecting advice choices was the convenience of, and ease of access to, that advice:

> *"I tend to go and speak to the people that are around me first before going and seeking knowledge further afield"* (P12, Mid-Grade Engineer [female])

6.3.3 The advice seeking process

With 15 references by eight different participants, the interview analyses provided fascinating insights into the cognitions underpinning the advice seeking process, showing this to be a strong theme in the template. In particular, the process was contingent on the type of advice being sought, and there was frequently interplay between top-down and bottom-up network systems. Once a person was committed to seeking advice, the process of advice seeking appeared to be the same irrespective of whether the advice was being sought voluntarily or involuntarily. However, their *persistence* in seeking advice also seemed to depend on the type of advice being sought. This is further outlined below.

6.3.3.1 Interplay between top-down and bottom-up networks

The analyses revealed examples of interplay between the networks originating in top-down structures (through organizational design factors) and those with organic origins, for almost all participants. Many connections that were categorised as interplay were initially created through top-down structures, but had led to longer-standing connections, that had outlived the original purpose – *"I'll usually phone [person X] because I've known her for years, you know"* (P13, Secretary). One participant reported that the trigger for organic network development was often being appointed to a new role, or beginning a new project (i.e., a top-down change).

Participants reported selecting the chosen advisors for similar reasons to those already reported: (1) They and the contact were like-minded in vision or work attitude; (2) the contact was approachable; (3) the contact was in a similar role to them; (4) they shared similar work interests (e.g., technical); (5) the contact had a high degree of social capital; (6) the contact had high levels of expertise.

Granovetter's (1973) *strength of weak ties* hypothesis appeared to be borne out in these interviews – i.e., that individuals benefitted from having *weak ties* which they could return to infrequently, because such ties were useful sources of innovation in their network. It was reported that network connections would be stored (remembered) following an initial introduction, and could remain unused for some time, before being utilised to help develop new ideas and agendas:

> *"Sometimes you come together to come up with an overall solution, and you think, 'oh that chap seems smart', you know, so you tag on to them, and then later they come and ask you questions as well … and relationships get established that way."* (P15, Sub-Group Leader)

6.3.3.2 Type of advice

Whether a person mobilised their top-down or bottom-up network, or elements of both, depended on the type of advice required. Examples of advice serving the full range of Cross et al's (2001) advice types were reported (problem-solving/validation/general guidance/data gathering/authorisation); though notably, the data analysis revealed connections that were developed or utilised for a much wider range of advice types, and these categories were found to be overlapping.

In the template, the types of advice offered were placed into one of five broad categories of advice type. The *enabling work completion* code was used to describe examples where a social connection enabled work to be completed (and conversely, where they would not be able to adequately complete their work without their colleague's input). In other words, the purpose of the relationship was transactional and mechanistic, akin to colleagues being parts of a jigsaw – all pieces are required, and are equally dependent. Such connections were particularly important where participants experienced high task or role interdependence.

In the *learning to do the job better* category, a connection enabled the job incumbent to do their job *better*. These ties were not simply transactional, because here, a person *could* complete their work without specifically interacting with others. The connection was transformational, because connecting with others enabled the job incumbent to benefit cognitively, perhaps by helping them to learn new skills, or gain new knowledge. In other words the relationship enabled them to do the job *better*. These two categories (*enabling work completion* and *learning to do the job better*) appeared to occur both separately, but clearly overlapped.

Where extracts were coded as *enhancing meaningfulness*, individuals had suggested that they benefitted motivationally from the connection. For instance, the interaction led to their job tasks feeling more meaningful, and/or motivated them to re-engage with their work; or it encouraged them to engage in job-related, pro-social behaviour (such as giving up their time to share advice with others).

Data were categorised as *enhancing social capital* where individuals reported being motivated to develop a connection because it would enhance their own social capital in the organization. For instance, they considered that the connection would position them well within their department, by helping them better access important others, or would, for instance, help them to negotiate a better *I-deal* (Hornung et al., 2008), a new job role (e.g., promotion), or simply get ideas passed to a higher authority. In this way, such connections have a more strategic function than those coded within the *enhancing meaningfulness* category.

Finally, connections were considered to fall within the *healthy work* category where they helped the job incumbent to manage their work demands (i.e., provides an individual with a *resource* –Bakker & Demerouti, 2007), and promoted healthy work. Here, social interactions appeared to have arisen in order to help individuals either reframe work they were finding unpleasant or stressful (cognitively coping); or by enabling them to physically cope (e.g., the connection was provided through the organizational structures, in order to reduces demands).

The categories, though interestingly distinct, clearly overlapped – for instance, connections that were motivating and enhanced meaningfulness were also often drawn upon because they simultaneously enabled the advice seeker to work through an immediate work problem. Moreover, the beneficiaries of the advice often overlapped, such that the tie might simultaneously benefit an individual and their work-group. Nevertheless, it was interesting that within these advice categories, at least 11 sub-relationships could be identified, as outlined in Table 6.1, showing that the relationships met a range of needs for job incumbents.

As outlined in relation to RQ1, for procedural types of advice such as authorisation, participants reported going to the person whose role it was to provide it. They reported that usually in these cases, it was clear whom advice should be sought from, and where they were unsure they would utilise the organization's knowledge capture systems (e.g., searching a directory) to seek out the most relevant advisor. These transactional types of advice (categorised here as relationships *enabling work completion*) were often determined by organizational structures, as previously outlined. However, interviewees reported favouring the mobilisation of organic networks – often reflecting preferences for others with particular personal characteristics – where there were multiple advisors to choose between, and for types of advice that were *value*-based; i.e., less procedural or factual, and underpinned by a degree of trust in the quality of the advice. For instance, when advice enabled the validation of an idea, talking through a problem and/or getting advice on possible solutions, participants reported an iterative process in order to obtain satisfactory advice; based on a set of value judgements that enabled them to select preferred, *"trusted colleagues"* (P8, Group Director).

The interviews revealed that people distinguished between different types of advice in their advice seeking thought (cognitive) processes, which appeared to determine their persistence in obtaining such advice. For instance, if gathering data essential to *enabling work completion*, people would ensure they found the *right* person – even if this meant contacting someone not personally known to them, or someone that was physically located elsewhere in the world. They would usually persist with this until they obtained satisfactory advice. However, where the advice was considered a *nice to have* and would serve the purpose of learning, maintaining wellbeing, or developing strategic ideas, interviewees appeared to use

their local, organic networks first; and the effort put into this process appeared to depend on the seeker's personal characteristics (such as their beliefs about the value of knowledge sharing).

Enabling work completion Relationship 1: Tie provides general guidance to enable task completion. Relationship 2: Tie enables the gathering of work-related information. Relationship 3: Tie enables decisions to be authorised.
Learning to do the job better Relationship 4: Tie enables a person to learn new skills, competences or knowledge from their interactions.
Enhancing meaningfulness Relationship 5: Tie enables the *job incumbent* to reconsider the meaning of their work and potentially what is important in their work. Relationship 6: Tie enables a *group* to collectively reconsider the meaning of their work (i.e., collaborative craft)
Enhancing social capital Relationship 7: Advice is sought to help validate an idea or solution (validation) Relationship 8: Tie helps a person or group to build their social capital, as they associate themselves with important others (social power) Relationship 9: Tie helps a person to think about career (or role) development.
Healthy work Relationship 10: Tie helps an individual with psychological coping (resource: cognitive) Relationship 11: Tie enables job incumbent to physically share the load (resource: delegation)

Table 6.1: Types of advice

6.3.3.3 Process

From the interview analyses, four stages of the advice seeking process were identified when utilising organic networks, in which the interplay between the top-down and bottom-up networks people held was apparent:

Stage 1 - People consulted their personal network. This occurred when gathering information, seeking general guidance, problem solving, and validating ideas, if advice could not be sourced top-down. People did not report distinguishing between their personal network *within* The Group and the wider organization; rather they indiscriminately called upon whomever they considered the most appropriate advisor.

Stage 2 – The personal network was widened to include *friends of friends*. If the personal network could not resolve the enquiry, someone from within the personal network provided an introduction (serving as a broker) to one of their contacts, in order to help:

> *"If I had a problem I'd ask [my superiors] depending on who was sat there, if neither of them could help me they would more than likely point me in the direction of someone else that I could speak to and then I would contact them. If they were completely stumped then I would go up the [management] hierarchy and ask accordingly."* (P5, Junior Engineer)

Stage 3 – The individual would turn to those higher in the management structure for guidance and brokerage to other possible contacts in The Group. When specifically seeking authorisation or *buy in* for an idea, individuals reported approaching more senior colleagues first:

> *"If you're trying to get something accepted, or bought off, or changed, then the higher in the company you can get support from, the more likely it is going to happen".* (P10, Mid-Grade Engineer)

Stage 4 – Individuals reported consulting with technology and systems such as databases and intranets at various points when seeking knowledge, either to source information directly, or to identify suitable advisors. There were examples of people using the intranet, and sharing file stores in order to gather information or documentation. These searches were often unsuccessful, with people reporting access and capability restrictions and limitations. When a search was unsuccessful, participants initiated stages 1 to 3 of the process.

6.3.4 Section summary

In terms of RQ2, the data presented here has shown that in addition to the organizational structures described in the first section and demonstrated in Chapter 5, a person's network is also a product of organic factors and processes, which do not always directly result from organizational designs. The qualitative findings add to this knowledge base in a number of ways. First, it was clear that some such networks had been initiated voluntarily, whereas others, though organic in origin, had been initiated involuntarily, usually as a result of job role

requirements. Where networks were initiated voluntarily, these were considered to be of high value to participants, because they were underpinned by a degree of trust in the advisor. VINs were less easily *replaced* than formally derived connections for this reason.

In line with the Phase 2 findings, the qualitative data showed that participants differed in their intentions to share knowledge and in the extent to which they engaged in proactive, job crafting behaviours. Examples of all three forms of job crafting outlined by Wrzesniewski and Dutton (2001) could be found, as well as clear evidence of interplay between them. The qualitative data contextualised these findings. It was apparent that some participants were more proactive at developing organic connections than others, with some individuals having voluntarily initiated (or relationally crafted) connections, as a result of their workplace attitude and belief systems, as well as their perceived workload.

The interviews also added some insight into the cognitive processes underpinning advice seeking. A range of factors were found to affect a person's choices about who to seek advice from, and under what circumstances; and it was clear that this process involved a sequence of processes. Fundamentally, this process was affected by the type of advice being sought; and the data revealed a wider range of advice types than presented by Cross and colleagues (2001). The advice seeking process was found to be iterative and affected by the perceived quality of technological, knowledge management services. The data presented in this section also provides insight into the advice choices people make when developing organic networks, highlighting the criteria people used to choose between advisors. The data suggests that homophily (I approach someone who I believe is *similar to me*) and convenience were both pivotal determinants.

In cases where an individual had the autonomy to choose the people they included in their network, the factors affecting a person's choice of advisor were very similar to those employed in the top-down networks where they had two or more individuals to choose between. This has important implications, because it begins to explain why some (and not all) people in similar roles reported experiencing overload by their network connections (i.e., because once people found a *good* connection, they would return to them). Moreover, the connections individuals pursued and developed were found to shape a person's subsequent attitudes about the completion of tasks, and also their future connections. Section 6.4 explores these dynamics in more detail.

6.4 RQ3: How do advice networks influence the design and development of jobs?

The interplay between top-down and bottom-up networks has already been discussed in relation RQ2 where it was shown that a combination of both factors affect a person's choice of advisor. Whereas RQs 1 and 2 considered the nature of advice behaviours in the network, as

well as the factors affecting this process, RQ3 is concerned with the *consequences* of these advice networks in terms of the design and development of jobs, and the dynamic network evolution process through which these developments occur. Two particular themes were found to drive the process of network evolution, as summarised in Figure 6.3, below, and which are further outlined within this section.

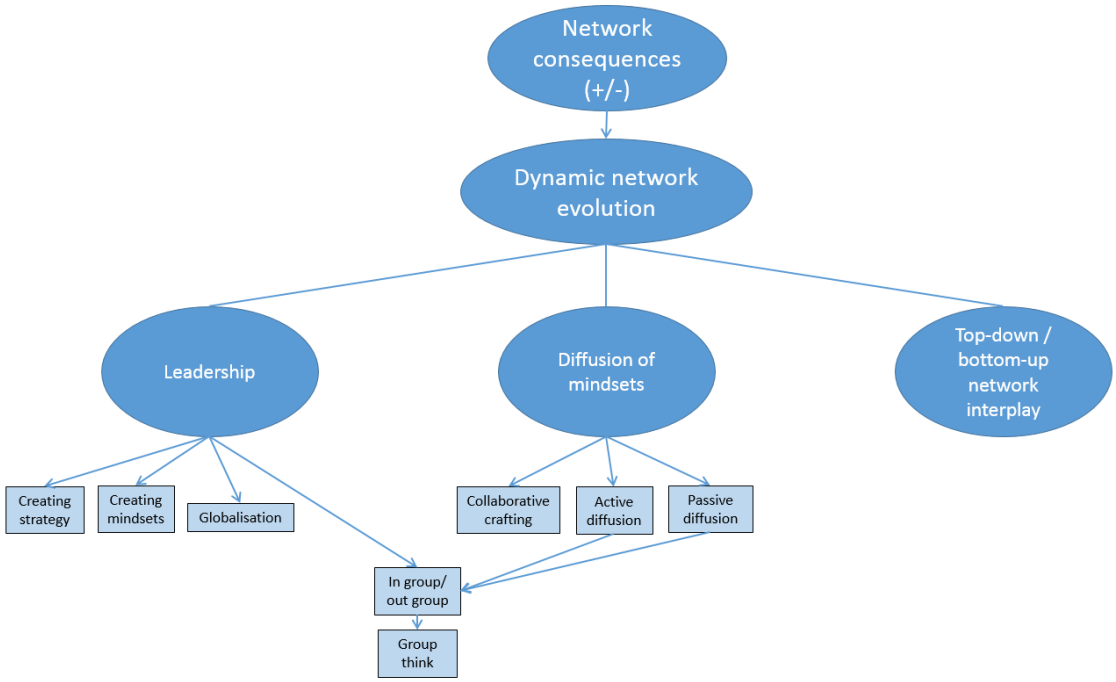


Figure 6.3: Themes pertinent to the process of network evolution

6.4.1 Consequences of networks

The networks that employees had developed were reported to have positive and negative consequences for both the individuals involved in them, and for the organization; and these were important as these consequences were found to affect the subsequent (often implicit) choices in the evolution process. The consequences outlined by participants are summarised in Table 6.2.

Participants reported a number of positive outcomes resulting from their organic network development. For instance, a number of people reported feeling positively motivated in their work because of connections they had made within their organically developed network:

> *"He's shaped what I've actually landed up doing now, because… it was him that wanted optimisation within the [X] groups and he was one of the first people to bring it into the company – and lo and behold look what I'm working in umpteen years later!"* (P12, Mid-Grade Engineer [female])

	Positive outcomes	Negative outcomes
Individuals	• Helps seekers build social capital (visibility) • Seekers feel more valuable and able to contribute • Seekers feel positively motivated • Seekers cope better with work demands • Seekers can complete assigned work more efficiently and effectively • Enables seekers to learn new things	• Advisors can feel overloaded • Overloaded advisors can feel inefficient in other parts of their work • Seekers can feel demotivated if network building is not recognised and/or rewarded
Organizations	• Can lead to more efficient work processes • Can lead to innovation • Can spread the load • Can bridge structural holes	• Can create bottlenecks • People circumvent organizational structures/hierarchies • For some procedural roles VINs are not desirable and could be problematic (i.e., where trying to standardise and not innovate) • Work does not get done because individuals are overloaded • Duplication of work/ideas (where there are a lack of networks) • Over-dominance of one group

Table 6.2: The consequences of organic network development for individuals (seekers and advisors) and organizations

Some people, as in the previous extract, reported feeling that their career had been enhanced as a result of the social capital in their network; others were reportedly more visible within the organization as a result of their organic network connections. VINs could help individuals do their prescribed role more effectively and efficiently (as described in relation to RQ2), and this in turn could lead to new networks being developed, as well as new opportunities arising for them. For the organization, organic networks were reported to lead to

innovation (e.g., new strategies for the department, or ideas about how to tackle a particular problem).

> *"[Person X] hasn't necessarily changed what we do, but has given a whole new view on why we do what we do… That's where the customer support idea came from"* (P8, Group Director)

For both individuals and organizations there were also negative consequences to organic networks developing. Participants reported returning to *good* sources of advice on multiple occasions. The seekers of advice often considered this as timesaving, which helped them do their work more efficiently. However, some advisors with high betweenness centrality in the network (such as P8, Group Director; P9, Senior Project Manager; and P3, Senior Project Manager) felt overloaded by such advice behaviours, and reported that time spent *giving* advice affected their own job performance. These highly centralised individuals also believed that it could prevent efficient knowledge transfer to other Group members, because they were overwhelmed by the number of connections they were trying to maintain. It was, however, agreed that for some roles organic network building was both useful and important, leading to innovation and cross-fertilisation of ideas amongst The Group (e.g., P16, Senior Engineer). Organic network building was also problematic in some procedural job roles which required that certain tasks were undertaken, and processes followed. It was argued in these instances VINs were not desirable, as job incumbents were required to perform standardised operations, rather than innovate new ones. Similarly, for some more technical roles, large networks and *physical* crafting (changing tasks or developing new relationships) were not viewed as desirable by either the individuals performing those roles, or the management.

6.4.2 Advice networks and the design of jobs.

The interview dialogues revealed that these network outcomes could play a role in the evolution of advice networks within The Group; and that this could influence the design and development of participants' jobs in several ways. First, there was evidence that the *mindsets* that individuals in the networks held were influenced by their connections to others. In outlining the significance of this, it is useful to recap on some important findings from the quantitative data, as these conversations and questions were explored in the interviews. First, UK Site 1 was overrepresented relative to its population size, in the top 20% of connected individuals (if all locations were presumed to be of equal value). Second, some sub-groups (e.g., Group A and Group G) were over-represented in the top 20% of connected individuals, relative to their respective population sizes. These factors were recognised by interviewees, who routinely used terms such as "[UK Site 1]-centric", to illustrate the over-domination by this particular location:

> *"Everything is [UK Site 1]-centric, all the key guys, the leaders are [UK Site 1] based and the guys on the others sites must all feel, must resent that to a degree."* (P3, Senior Project Manager)

Two individuals spoke explicitly about the over-dominance of Group A, whilst others spoke about the difficulties that some of the newer sub-groups had with integrating with the wider department because of the historical legacy and dominance of the original sub-groups and sites:

> *"I think that is more a history thing because I was in [Group X] before I was in this role… so a) we know each other better than the other groups, so they probably feel able to come to me more, and they have a need because some of the projects that I started while I was in there are still going on."* (P3, Senior Project Manager)

6.4.2.1 Shared mindsets

Amongst interviewees with strong reciprocal dyadic connections (as reported in the quantitative results), there was some evidence of shared mindsets within their egonets, in terms of, for instance, their scores on attitudinal variables such as ISK. In some cases this presented as dyads holding similar or distinctive views or attitudes on an issue, such as the desirability of a particular strategic initiative, which differed markedly from the other interviewees. In other instances, shared mindsets manifested as dyads or egonets adopting the use of similar, distinctive terminology to each other that was not well used by others in The Group. Within the interview transcripts, mindset similarity was identified particularly amongst Participants 8 (Group Director) and 19 (Sub-Group Leader), Participants 4 (Mid-Grade Engineer) and 2 (Sub-Group Leader), and Participants 9 (Senior Project Manager) and 3 (Senior Project Manager), who all shared strong dyadic connections.

For instance, one strong reciprocal dyad appeared to share strong views on the desirability of knowledge sharing across the subgroups that comprised The Group. It could be seen from their transcripts that Participants 8 (Group Director) and 19 (Sub-Group Leader) not only agreed that this behaviour was entirely desirable (i.e., they shared the *direction* of their attitudes), they also gave very similar rationales as to why it was desirable (i.e., shared attitudinal *content*), which were not found in the rationales given by others. These reasons were not given by any other interviewees, who were each asked about this in their interview, and in fact the desirability of Group-wide knowledge sharing was strongly challenged by key others in the wider network (outside of this egonet):

> *"Some of the things that we do are incredibly bureaucratic, and, so much convoluted conversation with so many players, it's just a pointless exercise, it's just never going to work. And the other thing was that you'd expect to see, you'd have intuitive feel for*

> *which groups you'd be contacting more than others, which is roughly borne out by what you see [in the quantitative network data from Phase 2]."* (P2, Sub-Group Leader)

On this, and other strategic matters, *in-groups* (who shared mindsets) and *out-groups* (who opposed or ignored this mindset) were revealed through the analysis. This was particularly apparent amongst the Management sub-group.

Shared mindsets were also identified when interviewees were asked about the desirability of the globalisation strategy. Although this particular issue was discussed on 25 occasions in the interviews, and referred to by nine different participants, views on the desirability and definition of globalisation differed, particularly across more senior members. It was notable that individuals within the same egonets (i.e., those who shared connections and reciprocated ties), and in particular, some dyadic connections, used similar language. For instance, Ps. 9 and 3 (both Senior Project Managers) spoke several times about what it meant to be *"truly"* global. The term *truly* was found 14 times in the transcripts, and only twice was it not used in the context of globalisation strategy. It was also a phrase that was only used by Management sub-group interviewees.

In contrast, those outside of the Director's egonet or *inner circle* often questioned the desirability of globalisation:

> *"P: I think we're an international company not a global company in the sense that we have people in different countries but we do not operate globally. There are independences on each other and you know they may say, use the words, 'global integration' and 'global reach' and 'global working' but we don't actually do it at all. It's just a myth… I don't think we need to."* (P2, Sub-Group Leader)

Others considered diversity to be a by-product of globalisation that should be nurtured rather than discouraged – demonstrated by the previously presented extract in which the participant reported how different sites provide sources of learning, *"because one site might think of it in one direction and another site may do it totally differently"* (P12, Mid-Grade Engineer).

The high level of network cohesion found in Group C during Phase 2 was also reflected in the strength of shared attitudes and visions that participants from this sub-group demonstrated when interviewed. Group C interviewees all reported a strong view that relationship building *outside* of The Group, were more important than relationship building *within* it:

> *"I think that it's vitally important that [Group C's] prime connections are with their customers in the business and if that means we have less connectivity with other [sub]-groups then so be it."* (P4, Mid-Grade Engineer).

Interviewees from outside Group C, disagreed with this view, and suggested that Group C would benefit from stronger relationships with The Group. This was an example of an *in-group, out-group* difference in mindset.

6.4.2.2 Diffusion of mindsets

The presence of shared mindsets indicated that at some point mindsets were transferred between people in the network. This transference appeared to fall into two categories: active and passive diffusion.

6.4.2.2.1 Active diffusion:

In some instances, participants reported deliberately trying to change the views of other people, and trying to actively recruit others to their own mindsets:

> *"It was a case of actually trying to convince the person that is actually leading this group to actually take some interest in this particular thing."* (P12, Mid-Grade Engineer [female])

Or, they recognised that their own views had been shaped or changed by the views of actions of individuals from within the group:

> *"I think in our group, [P2] has drawn this analogy, and I think he's absolutely right…"* (P4, Mid-Grade Engineer)

Four participants reported actively trying to change mindsets by seeking *buy in* from others on initiatives that they believed would benefit The Group. None of the individuals who used this term were from the Management sub-group – although those in the management group reported using similar tactics (e.g., approaching *"movers and shakers"*, P8 [Group Director]; getting a *"lobby group together"*, [P2, Sub-Group Leader]).

6.4.2.2.2 Passive diffusion:

In other cases, the process of diffusion was more nuanced, and whilst it was clear that individuals shared similar mindsets, they did not necessarily realise this, perhaps indicating that contagion happened more subliminally. In some of these instances, dyads used shared terminology, as in the earlier example, and this terminology *(*e.g., *"truly global"*), differentiated them from others. In other examples of passive diffusion, interviewees reported very similar ideas (e.g., about the pressures facing The Group), even explaining ideas using similar language.

6.4.2.3 Collaborative crafting

Many of the crafting initiatives reported by participants were the product of *collaboration* – for instance, where individuals spoke about how they had worked with others to *"get a lobby group together"* (P2, Sub-Group Leader), or where they had worked with others and developed *buy in* on an idea. Collaborative crafting was not limited to relational crafting; it was a feature of all crafting types. For instance, participants spoke about how their work with others had led to them thinking about things differently (e.g., *"I think in our group, [P2, Sub-Group Leader] has drawn this analogy, and I think he's absolutely right…",* [P4, Mid-Grade Engineer]) which was categorised as *collaborative*, *cognitive* crafting. The facets of crafting were interrelated in the collaborative crafting process.

There was some evidence that the process of diffusion could lead to collaborative crafting behaviours *within* sub-groups – for instance, *"[person X] has made us think differently…"* (P8, Group Director); and as a result, the sub-groups would go on to collaboratively craft new strategic directions for The Group. Interestingly, there was evidence that a number of core strategies within The Group (overall) had been collaboratively crafted by The Group's Leader, and his egonet of *"trusted colleagues"*, with new ideas having shaped existing cognitions, relations, and views on the importance of key tasks, amongst the leadership team.

6.4.2.4 Groupthink and reinforcement

It was possible to examine an individual's out-degree advice ties for a particular advice type, and build their egonet (personal network). By exploring the egonets of the Management sub-group (Group G), it was possible to see the number of direct ties each manager had, and the work-groups and locations they belonged to. These findings have already been explained in the Phase 2 results. The interviews complemented this picture by enabling exploration of why these connections existed. Indeed, it was apparent that mindsets could be self-perpetuated, as individuals tended to seek advice from like-minded others. Examination of Figures 6.4 and 6.5, for instance, show how P2 (Sub-Group Leader in the Management team), with consistently opposing views to The Group's Director on key strategic ideas, was not part of the Director's out-degree egonet for either problem solving or validation. In fact, no members of Group C (generally considered by other sub-group members as the *out*-group), were represented in this out-degree egonet.

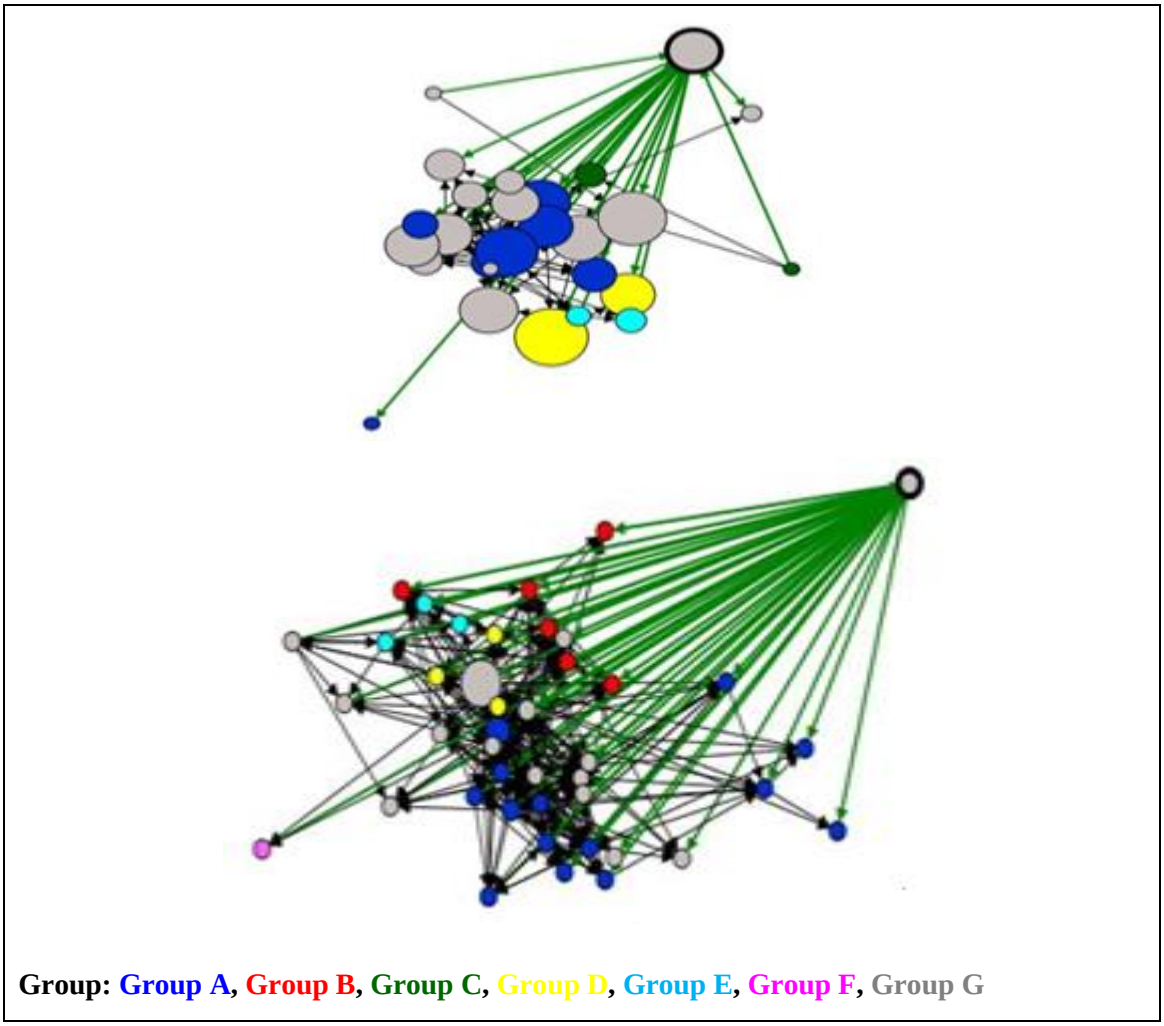
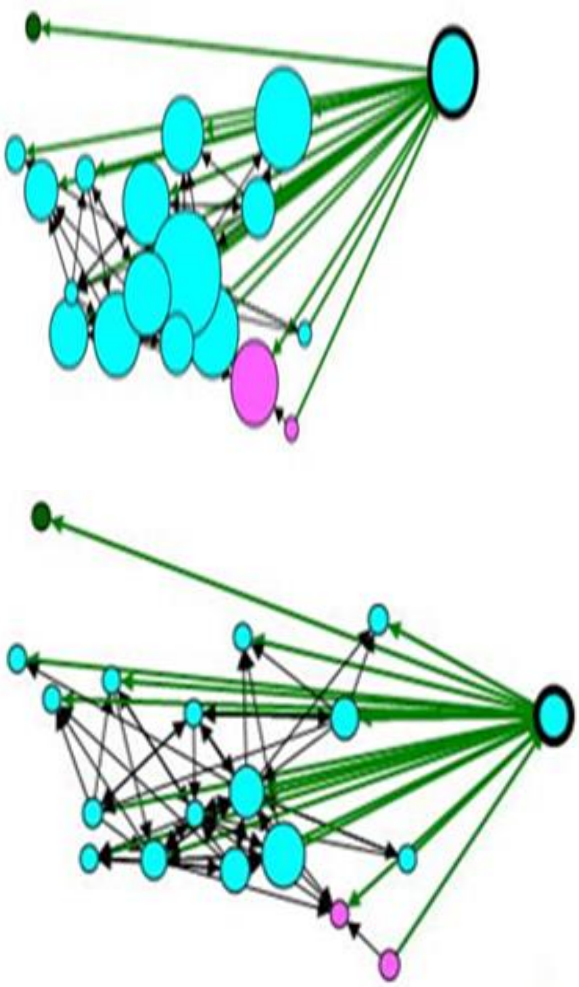


Figure 6.4: P8's in-degree (top) and out-degree (bottom) egonets for validation, with nodes coloured according to sub-group membership

NB: Green ties indicate direct connection, node size indicates the strength of the connection

It could also be seen that certain groups were over-represented in this egonet (e.g., all others were from Groups A, B or G), whilst sub-groups C and F, were barely represented at all. The same principle applied to location, where it could be seen that the vast majority of P8's problem-solving egonet were based at the main UK site. This is important, because it suggests that the opportunities for divergent debate were reduced, and ideas were potentially biased in favour of the needs of the dominant groups and sites. This could also explain why some sub-groups had become more centralised in the overall network overall than others.



Location: UK Site 1, UK Site 2, Germany, USA

Figure 6.5: P8's in-degree (top) and out-degree (bottom) egonets for problem-solving, with nodes coded according to location

NB: Green ties indicate direct connection, node size indicates the strength of the connection

6.4.2.5 The role of leadership

Finally, leadership emerged as a strong theme in the interview analyses. It was apparent that the top-down strategies that so clearly influenced the jobs designed by the organization and the advice behaviours in the network, were developed primarily by the sub-group leaders. This was clear as early as the scoping interviews when P19 (Sub-Group Leader) remarked:

> *"I was having conversations with [X] about task and you soon get into having to talk about, well, people's development in terms of should this person be doing this type of job next or what they should be moving onto as part of – because the issue of getting the job done and trying to continually develop people and expose them to different things or consolidate experience obviously becomes very intertwined."*

These kinds of conversations were examples of how this manager-subordinate relationship could lead to the brokering of I-deals (Hornung et al, 2008) in the organization, as this manager went on to explain how he would then consciously design team members' work activities to enable individual job incumbents to reap developmental benefit from their work tasks:

> *"It was giving [person X] some variety and broadening that he was after and some more job interest, and also helping [person Y] out."*

6.4.2.5.1 Influence on the crafting behaviours of subordinates

Leaders were able to influence the crafting behaviours and advice networks of their subordinates, by influencing their performance metrics (cf the discussion on pages 141-144, where individuals reported that if sharing advice or developing VINs would yield performance gains, they would consider engaging in such activities). In addition, whilst most people who reported job crafting considered this in favourable terms, a notable few reported that their crafting behaviours were demotivating, because their crafting activities were not positively rewarded by The Group's Management:

> *"I'm a bit frustrated about this, that my connection that I have maintained with industrial peers from other companies has never been measured and yet it has been consistent and beneficial to the company, in that it helps us bring in a system … and that's not bloody well being measured; and yet I'm doing more of that perhaps than a lot of other people!"* (P4, Mid-Grade Engineer)

The leadership and their mindsets had the capacity to influence the advice behaviours of Group members. Moreover, individuals in senior roles (e.g., leadership positions) were able to actively craft their own *performance objectives*, to enable them to work on activities they considered to be interesting or motivating.

6.4.2.5.2 In-groups and out-groups

Since leaders were involved in the design of future strategy, leaders had opportunities to design better collaboration pathways between the sub groups. Instead, the egonets of leaders in the sub-groups were all over-dominated by connections to Group A, who in turn shared the highest number of connections to the Management sub-group. The presence of in-groups and out-groups (Tajfel, 1979) in the Management sub-group is of significance, in light of the data on passive and active diffusion, as the data suggest that this could become self-perpetuating (e.g., individuals seek advice from Group A, so Group A gives an opinion and a new strategy is collaboratively crafted on this basis. Group C and others are entirely ignored in this process so become further distant as an *out-group*). Indeed, as the Phase 2 data have shown, some sub-

groups seem to have higher levels of social capital (influence) than others, which might be expected, if viewed in this way.

6.4.3 Section summary

In terms of RQ3, these findings provide some interesting insights into the ways that jobs are designed, and then develop over time. It is clear from the data presented in this section that the connections that individuals have to others in the network influence the mindsets they hold. Sometimes individuals are aware of these influences and actively involve themselves in the influencing of others. Sometimes this diffusion happens more passively or subliminally, and people do not appear to recognise that their mindset has been shaped by someone else. Considered in light of the Phase 2 data, the interview data highlight the different advice behaviours at play in the development of networks and jobs, and how the consequences of these impact on a person's subsequent views and choices. They show that what people consider to be important in their job, and their attitudes to key organizational strategies (such as the intention to share knowledge – highlighted as a correlate of network centrality in Phase 2 or globalisation), appear to be influenced by their relationships with others. This is important because a person's ideas about what matters and is important to their job appears to shape their workplace behaviours (e.g., job crafting activities). Being part of an *in*-group appeared to lead to a job incumbent being awarded favourable opportunities, whilst being part of an *out*-group was demotivating for job incumbents, who felt that their views did not fit in and that job crafting activities were not recognised or rewarded. Such participants reported views indicative of low job and career satisfaction.

Also highlighted by these findings was that some of the work being undertaken in the group had been collaboratively crafted by a collection of individuals, and was not solely a product of lone individuals. Leaders played a key role in the shaping of mindsets, because they were in a position where they could be involved in the top-down design of strategies and goals, which could then shape the organic networks and crafting behaviours that were undertaken by others. In the Discussion chapter that follows, the quantitative and qualitative findings are drawn together in order to consider the theoretical and practical implications of this research.

Chapter 7: Discussion

Collectively, the findings of this research demonstrate the factors that affect the design and development of advice networks in organizations, and how these are a product of both top-down organizational design structures, as well as more organic factors and personal preferences. They highlight the value that individuals derive from relationships and personal patterns of network connectivity during work completion. The analyses also describe how these networks, over time, affect the mindsets and attitudes of Group members, and how these mindsets can be collaboratively developed and shaped, through social interactions and the development of longer-term relationships. Table 7.1 summarises the conclusions that are drawn on the basis of the hypotheses tested in this research. Following this, the theoretical implications of this research are considered.

RQ1: To what extent are advice networks a product of organizational design (top-down)?	Chain of command	H1(a): The chain of command (formal hierarchy) will be positively related to informal network position (as reported by participants). H1(b): The strength of this association will be contingent on the type of advice being sought, and will be strongest for authorisation.	Supported. Supported.
	Work-group proximity	H2: Work-group proximity will be positively related to tie strength, such that participants will report higher numbers of connections to the other members of their own work-group, than they will to members of other work-groups.	Supported.
	Project proximity	H3: Project proximity will be positively related to tie strength, such that ties between participants will cluster according to projects that they share an affiliation with (i.e., projects they have worked on together).	Supported.

	Location proximity	H4: Location proximity will be positively related to tie strength such that participants will report higher numbers of ties to colleagues located at their site than to colleagues located at other sites.	Partially supported.
	Role similarity	H5: Job role similarity will be associated with tie pattern similarity.	Partially supported.
RQ2: To what extent are advice networks organically developed by employees (bottom-up)?	Tenure (org. and job)	H6(a): Organizational tenure will be positively related to network centrality. H6(b): Work-group tenure will be positively related to network centrality. H6(c): Job tenure will be positively related to network centrality. H6(d): Work-group tenure will have a stronger effect on network centrality than organizational tenure and job tenure.	Supported for B-indeg only. Supported. Not supported. Supported for F-indeg centrality only.
	Intention to share knowledge	H7(a): Intention to share knowledge (ISK) will be positively related to network centrality. H7(b): Workload will moderate the relationship between ISK and network centrality.	Supported. Partially supported based on 95% CIs.
	Relational job crafting	H8(a): Relational job crafting (RJC) will be positively related to network centrality.	Partially supported based on Pearson's correlations.

		H8(b): Workload will moderate the relationship between RJC and network centrality.	Partially supported based on the 95% CIs.
RQ3: How do advice networks influence the design and development of jobs?	Career satisfaction	H9(a): Job satisfaction at T1 will be positively related to career satisfaction at T2. H9(b): Network centrality (T1) will moderate the relationship between job satisfaction (T1) and career satisfaction (T2), such that the relationship is strongest for individuals with high network centrality.	Supported. Partially supported based on 95% CIs.

Table 7.1: Research questions and hypotheses tested in this research, with conclusions

The findings have implications for a number of literatures, but in particular, the findings collectively demonstrate incremental ways in which jobs evolve and emerge, as a product of the interactions that people have with their colleagues; and the shaping role that leaders and colleagues appear to play in this process.

7.1 Theoretical implications of this research

The findings of this research show how the design of jobs can be underpinned by social processes, which are incremental, dynamic, and a product of interplay between top-down organizational design factors, and more organic, bottom-up factors, based on attitudes and personal preferences. In order to consolidate the findings at a high level, two related models are offered in this discussion, which are presented in two diagrams. The first diagram (Figure 7.1) consolidates the findings relating to the advice seeking process. It considers the types of advice reported, and how both top-down and bottom-up factors appear to affect the advice choices that people make in order to both complete and shape their work. This is outlined in detail in the first part of this chapter. The second model (Figure 7.2) puts this advice process into a broader context. By *zooming out*, it provides an illustration of the consequences of advice behaviours, how these lead to the creation of advice networks, and how these in turn, affect the way that work is designed and developed over time. This model highlights both the dynamic and iterative

nature of this process. This discussion will present each of these models in turn, and will consider the implications of the research findings for individuals, organizations and theories of job design.

7.1.1 Advice behaviours

The results of this research provide new insights into the advice behaviours that exist in the workplace. These are illustrated in Figure 7.1, which aims to summarise the advice seeking process according to the results of this research.

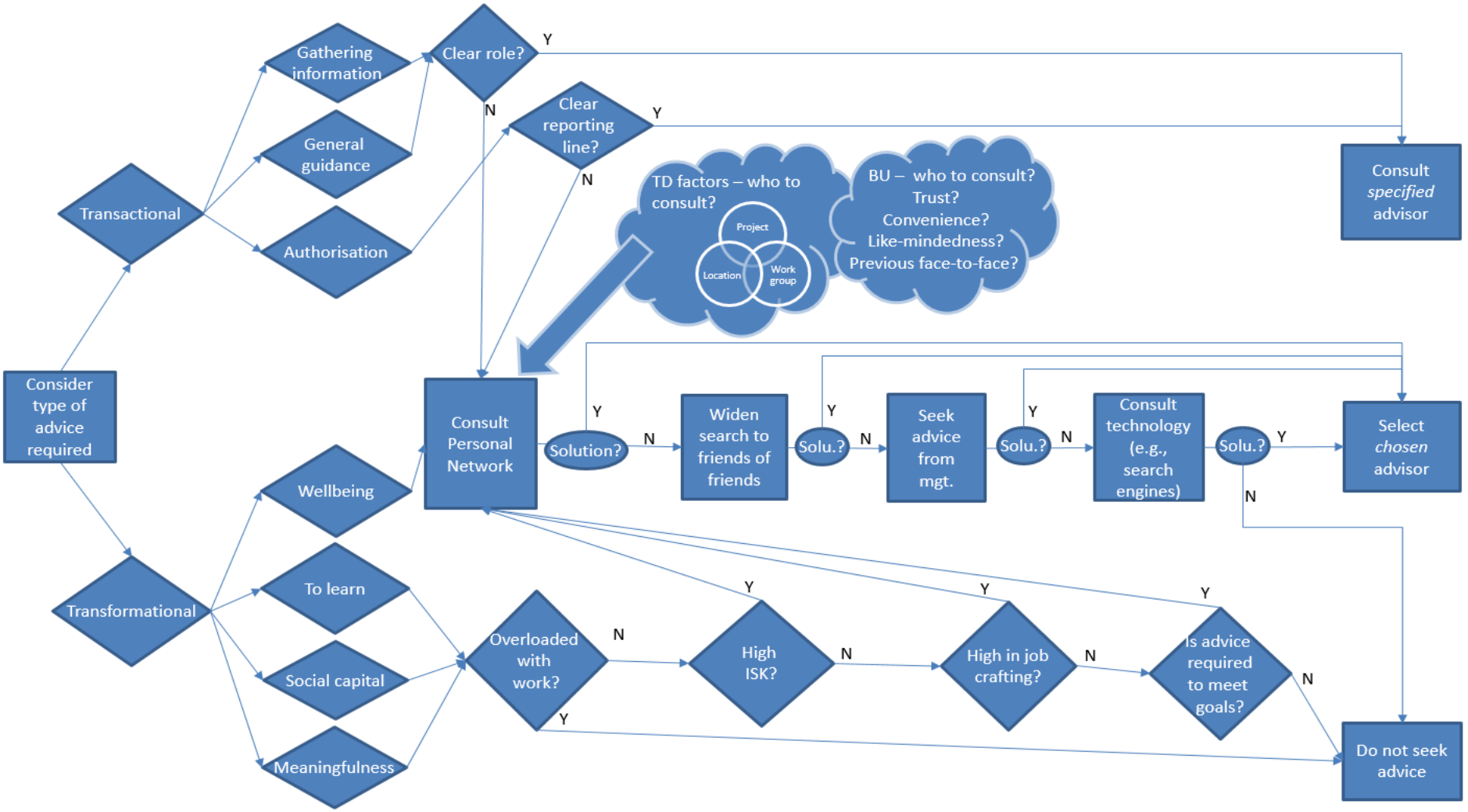


Figure 7.1: The process of advice seeking, based on the (qualitative and quantitative) findings of this research

Figure 7.1 homes in on the process of advice seeking and some of the cognitive triggers that appear to instigate this process. In so doing, it highlights how advice networks are developed in order to support the completion and development of work, and consolidates the findings in relation to RQs 1 and 2. This flow chart is at a task level rather than solely a variable level, and so presents advice behaviours at a different level of abstraction to the models more typical in psychology.

As outlined in Chapter 6, one of the key findings of this research is that different network connections exist to serve different purposes. The results of this research show that the presence or absence of a connection to another actor is, to a large extent, contingent on the type of advice being sought, and the functional value that a seeker attributes to the advice potential of the available advisors. These perceptions appear to be important, because the seeker's evaluation of this can be seen to shape a person's choice of advisor as well as the persistence with which they seek advice. The findings are consolidated in the first part of Figure 7.1, where a person at the outset can be seen to consider the type of advice they require. Seven types of advice are outlined in the model, which each serve a different purpose. The first three advice types (*gathering information*, *general guidance* and *authorisation*) are found in Cross and Sproull's (2004) advice typology, but are separated out in this diagram as the research has shown that the gateways for advice seeking behaviours differed slightly for each. However, collectively these three types are considered to be subsumed by the broader *enabling work completion* advice function, as outlined previously in Chapter 6. The five overarching functions of advice uncovered by this research are:

1. *Enabling work completion* – The connection enables one to complete their job tasks.
2. *Learning to do the job better* – The connection helps one learn to do their job better.
3. *Enhancing meaningfulness* – The connection enhances meaningfulness.
4. *Enhancing social capital* – The connection enhances social capital.
5. *Healthy work* – The connection facilitates healthy work.

It is clear from the research findings that networks can be formal or informal, and can develop for reasons ranging from community building and managing information, to networks that aim to amplify information or ideas (e.g., giving new or novel ideas a platform that can support their dissemination), or which help people work more effectively or efficiently (e.g., Cross & Sproull, 2004). In other cases networks simply bring people together to provide resource to support the undertaking of work. In this way, the findings of the current research corroborate those from other studies and domains (e.g., Cross et al., 2001). Moreover, whilst there is overlap in these categories with those provided by Cross and Sproull (2004), who have also suggested that five types of advice are important to the completion of work, the categories

from this research differ in some notable ways. First, it seemed important to differentiate between advice types that are transactional and transformational. *Transactional* advice is considered a necessary precursor to work completion. In Cross and Sproull's terms it would include *gathering information*, and some instances of *authorisation* (where work cannot be completed without sign off, but does not necessarily enhance the seeker's social capital) and *general guidance* (where the person cannot complete the work without some help).

Transformational advice, on the other hand, is considered to be advice that changes the way an advisor thinks about their work and what is important to them. This advice can help a seeker to learn new skills or knowledge, might enhance their motivation or wellbeing by helping them to think through (even re-evaluate) what's important to them or to the job. In some cases the advice connection provides a strategic advantage to the seeker – for instance, helping them become more *visible* to important others, enabling them perhaps to showcase their competence, or providing developmental work opportunities. The research found that people actively sought advice for all of these reasons; and within these functional umbrellas the purpose of the advice could be further broken down, manifesting as one of a number of relationships, as outlined previously in Chapter 6 (see Table 6.1). Together these categories develop the prior work of Cross and Sproull (2004) and others, by highlighting the importance of a broader range of advice types in the completion and development of work. The implications of this will be further discussed in relation to the second model.

Moreover, these findings are notable because this research shows that the cognitive processes that seekers then go through are altered by their appraisal of advice type. For instance, the data uncovered through this research suggest that it is possible to *design* networks at least in part, through the creation of top-down organizational structures, such as location (designing workspaces, site development, and seating arrangements); through careful consideration of role designs, project assignment, and associated processes; and through the development of organizational charts, which clarify hierarchies and responsibilities within the organization. Both the quantitative and qualitative research phases found that such structures, which are inherent in the job designs that people are provided with from this organization, shape initial networks by, for instance, providing leads to key others, or by showing people who they *should* or *might* go to for information or advice. Knowing who to go to because their role was clearly defined, meant that in many cases, transactional advice was sought on the basis of such organizational design – in some instances, these structures were the basis upon which future networks were developed. This is represented in the top half of the process flow shown in Figure 7.1.

Transformational advice types, on the other hand, are more greatly influenced by organic choices, with personal preferences playing an equal (if not greater) role in determining advice behaviours than organizational structures. These behavioural triggers are elucidated in greater detail in the paragraphs that follow. To select an appropriate advisor for any type of transformational advice, the seeker would usually consult their personal network. In these cases, and as outlined in Chapter 6, they would then go through a staged process, in terms of deciding which advisor to choose. These choices were first affected by personal preferences (e.g., about favoured personal characteristics of the advisor, their proximity, and in some cases top-down factors would also be considered). Summarising results presented in Chapter 6, Figure 7.1 shows how participants reported widening their search to friends of friends, management, and technological searches, if a solution could not be reached at each point. Notably, participants did not differentiate between advisors from their network in The Group and the wider organization in these searches; suggesting that organic networks are not restricted in this way. However, it was interesting that the *persistence* of the search for advice *did* seem to be affected by the type of advice being sought. Where a person reported feeling overwhelmed or unhappy they would immediately seek advice irrespective of whether they valued knowledge sharing, or were proactive in their job crafting behaviours and whether or not they felt overloaded in their work. Nevertheless, there were few instances of these behaviours in the data, so this function may require further exploration to confirm the consistency of this mechanism.

For other types of transformational advice, however, the decision to seek advice at all was determined foremost by whether or not the seeker felt overloaded. At times where they did experience overload they reported choosing not to seek advice at all, because although such action was *nice to have*, it was not essential for work completion. Where overload was not experienced, the choice of whether to seek this type of advice or not was dependent on whether they personally had high ISK, high RJC and in cases where they did not, the deciding trigger was often whether or not the advice was perceived to be required in order to achieve their goals or not. It is unclear from the quantitative findings the extent to which the concepts of ISK and RJC are distinct from one another, as they seemed to share variance – indeed it makes intuitive sense that these concepts are related, as they might both be expected to be underpinned by a degree of proactivity. Nevertheless, the qualitative findings reaffirm the importance of a favourable attitude towards the sharing of knowledge in the process of organic network development.

This uncovering of the advice seeking process is an important addition to the existing research-base in this area, because it shows how the *type* of advice being sought plays an important moderating role in the practical choices made by individuals in relation to their networks. Moreover, it shows how a person's organic network development depends on the

value that they derive from the connections. The size and strength of these organic networks, and thus the access a person has to high quality connections (which the prior research shows to be related to a range of positive organizational outcomes including productivity and work efficiency – e.g., Cummings & Cross, 2003; Burkhardt & Brass, 1990) are clearly affected by their beliefs and values.

It was also interesting that the size of a job incumbent's organic network differed substantially between participants. Some people had small, dense, cohesive networks, where a small number of individuals fulfilled each advice function; whilst others had broader, more far-reaching networks, where they connected to different individuals for different purposes. There exists a strong body of literature on the optimal size of advice networks (research grounded in Granovetter's [1973] strength of weak ties theory and Burt's [1992] structural holes theory, for instance). However, it seems likely that each of the networks represented in the process model would require different frequencies of connection in order to be effective lines of communication, and it might be expected that such networks would be of different sizes. For instance, to complete task related work an effective network might benefit from having efficient cliques within task dependent groups, and a central core of boundary-spanning individuals to bridge departments; whereas an advice type centred around innovation is likely (according to Granovetter's 1973 theory) to benefit from having weak ties who can provide contrasts in innovation. These ideas would benefit from further research.

It was also fascinating in this case study that people reported that the type of advice required and the metrics they were working to moderate the effects of location. Previously, Allen (1977) had shown how communication increased as a function of spatial proximity; but the findings from this research suggest that this effect depends on the type of advice being sought and whether or not communicating is considered essential in order to complete the work. In this research, organizational metrics were seen to determine how far an individual was prepared to transcend organizational boundaries (e.g., physical location, work team or project boundaries) in their search for advice. For some types of advice (e.g., where a specified individual is known to the seeker and where there are no others who could help), individuals were willing to transcend physical organizational boundaries. For instance, some participants in this research reported being willing to liaise as required across the business, in order to harness high quality advice (e.g., for effective work completion, and occasionally for learning). For other types of advice (e.g., meaningfulness, social capital and healthy work) advice was sought from others on the basis of personal preferences, personal characteristics and belief systems, and a preference for homophily (seeking advice from someone *like you*). These findings were quite striking in the dataset, and shows just how important organizational metrics are as drivers of

behaviours, thus underlying the importance of applying socio-technical principles to job design, to ensure that such metrics align with organizational goals (Clegg, 2000).

7.1.2 Reconceptualising *social* job design

By delineating the different types of advice connection in a network, these findings also have important implications for job design theorists grappling with the notion of *social* job design. They suggest that the categorization of *transactional* and *transformational* connections put forward in the literature review does not go far enough in terms of explaining how advice connections influence and shape the design and development of jobs. This assertion is important, because currently theories of job design imply, rather than specify, social mechanisms (see Grant & Parker, 2009). This means that existing theories of *social* job design are underspecified and unable to adequately explain the social behaviours that influence the development or emergence of job designs. It also means that any research in this area runs the risk of conflating social mechanisms, thereby reducing the potential for predicition.

In the advice seeking process model outlined above, it is assumed that the beneficiary of the social connection is the job incumbent. However, the findings of this research also make a broader contribution to the conceptualisation of social job design. This is because most existing studies do not explicitly differentiate between beneficiaries, though these may be implied. Primarily, studies that have considered *social* job design characteristics have tended to presume the job incumbent is the beneficiary (e.g., because they learn new skills, gain new knowledge or adapt the meaningfulness of their work – e.g., Demerouti & Bakker, 2011; Wrzesniewski & Dutton, 2001;); though other studies, for instance in relation to the so-called *dark side* of job crafting, and collaborative crafting have conceptualised the beneficiaries of social interactions at the work-group or organizational level (e.g., McClelland et al, 2014; Tims et al, 2015). By undertaking a network approach in this research, this has enabled both organizational and egonet (individual) levels of advice behaviours to be explored; and consequently, has shown that advice behaviours have relational consequences for a range of stakeholders – co-workers, leaders, job incumbents, team members. Moreover, the findings highlight some of the consequences that can emerge as a result of interactions within networks that transcend such units of analysis.

Interestingly, the five functions of advice identified through this research and highlighted within the advice seeking process model (see Figure 7.1), can be mapped generally to the work design framework proposed by Campion and colleagues (Campion & Berger, 1990 – see pages 36-37; Campion & Thayer, 1985). This framework was primarily intended to show how different historical directions in job design research have led to today's knowledge bank about desirable job design features. The ease with which the different functions of advice

behaviour can be mapped to these research directions, however, reinforces the importance of taking a holistic approach to the design of jobs in the workplace. Specifically, Campion and Berger's framework describes: mechanistic characteristics, which focus on enhancing efficiency (i.e., function 1), cognitive characteristics which focus on reducing cognitive demands, or in this case, aid learning (function 2), motivational characteristics which are intended to enhance job satisfaction and motivation, and reduce turnover (functions 3 and 4), and bio-mechanical characteristics intended to reduce physical ill-health, and improve wellbeing (function 5). Like in Campion et al's framework, there could be overlap in advice types, beyond those identified in the process model. Nevertheless, the delineation of different social mechanisms is an important move forward for job design theorists for two reasons. First, as outlined already, researchers have to date, tended to assume the presence of particular mechanisms in their theorising, or have conflated them, which as previously noted could initiate misleading conclusions. Second, even where the evidence base is clear about the social mechanisms underpinning job design, our theoretical models are not sophisticated enough to deal with this social complexity and its consequences.

In the interests of clarity, it is proposed that the advice functions uncovered through this research can be mapped to existing areas of job design research where such a function is implied or tested, as follows:

For Function 1 (effective work completion), the existing research base most relevant to this function, seems to be that derived from studies of job simplification (work originating in the ideas of Taylor, 1911, as cited in Parker, 2014), where *social* job design is understood only in the context of designing production lines and other interdependent work team roles. The literature most relevant to this function includes, for instance, the body of work around job design in teams, and task interdependence, in which individuals are reliant on others in order to successfully complete work. Some of the research from the knowledge management literature, which provides guiding principles on the design of networks for organizational efficiency (e.g., Cross & Sproull, 2004) also sit well here.

For Function 2 (to learn to do the job better), some of the existing literature underpinning this function stems from social learning, and training. The current research adds to this perspective by showing that people do not necessarily, however, choose their role models based on formal hierarchies or processes. Rather, they base decisions about who to approach for such purposes on their personal attitudes and preferences.

Function 3 (meaningfulness) underpins a number of dominant job design theories (e.g., the JCM, theories of job crafting), and aligns most centrally with the organizational psychology

models of job design that dominate North American research (e.g., Grant & Parker, 2009; Berg et al., 2010; Leana et al., 2009; Morgeson & Humphrey, 2006).

In contrast, the mechanism underpinning Function 4 (enhancing social capital), can be found within much of the work within social network (methodological) research, where the development of social capital is viewed as a central mechanism in network development. The research evidence around networks and career development also seems to sit well with this category, as a number of such studies have proposed that networking behaviours serve the primary purpose of improving social power (e.g., Barton, 2001) – a number of authors provide tips for networking on this basis (e.g., Forret & Dougherty, 2004).

Finally, for Function 5 (wellbeing) the existing literature that best underpins this mechanism relates to the *Job-Demands-Control* (Karasek, 1979) and *Job-Demands-Resources-(Support)* models (Bakker & Demerouti, 2007), as social interactions in this case are thought to help individuals to reframe or cope with work that they find unpleasant or stressful. It seems likely that connections could enable the design of work that facilitates the sharing of workloads (reduces demands), or otherwise enhance individuals' wellbeing (provides resources). Although relationships at work have long been understood to impact on psychological health and wellbeing across occupations (e.g., see Johnson, Cooper, Cartright, Donald, Taylor, & Millet, 2005) this research demonstrates how individuals' wellbeing networks can play a role in the development (and maintenance) of healthy work environments.

In some cases it is possible to see how functions overlap (e.g., for instance, 3 and 4 could overlap where an individual is both developing a network to enhance the meaningfulness of a job, and social capital builds as a by-product). This idea of overlap reinforces the findings of authors such as Cross and Sproull (2004), who found that considerable overlap can exist across network types, such that connecting with an advisor for one type of advice increases the likelihood that this advisor will be sought for other types of advice in the future. These findings which were also replicated in this research are not displayed in the process model for illustrative simplicity. However, research to further refine understanding of the interrelationships between advice functions could be insightful, as it is likely that these mechanisms operate both separately and in tandem with each other, depending on the context and individual. The typology of advice functions highlighted by this research could provide a framework for organizing future approaches to social job design research.

7.1.3 Top-down versus bottom-up job design

Finally, the process model outlined in Figure 7.1, highlights how a person's advice network arises as both a consequence of top-down and bottom-up influences, and how once a connection is established (irrespective of whether its origin lies in the TD or BU) it becomes

part of a *stock* of connections that can be drawn on subsequently in the event of other types of advice being required. These findings have implications for job design research. As has been outlined in the literature review, contemporary theorising recognises that job design is a product of both top-down and bottom-up influences (e.g., Clegg & Spencer, 2007), built on *job landscapes* (Berg et al., 2013). This research contributes to this domain by showing that social networks are also a product of such influences, and moreover (as will be outlined in relation to the second model in Figure 7.2), that the transformational properties of these networks help play a role in the way that jobs then develop.

Job design could conceivably operate through a network in a number of ways. Jobs could be designed *within* a prescribed network (i.e., a person seeks/shares advice in patterns that reflect top-down structures such as hierarchies, project groups and locations). Jobs could be designed *through* a network (i.e., bottom-up), in which a person might seek/share advice with the contacts that they consider best able to address a particular question, or meet their personal needs. Such connections might then transform their views, leading to the *development* of jobs. In this conceptualisation, the network that enables and/or facilitates work completion is *only* established organically and does not reflect prescribed organizational structures. Finally job design might operate both within *and* through a network; that is networks could be developed through a combination of top-down and bottom-up factors, in which an individual might sometimes seek or share advice in accordance with protocols or hierarchies, and at other times draw on their wider personal network, or switch between network types without awareness of doing so. The results of this case study suggest that the latter conceptualisation best represents the ways in which employees sought advice in this network, and that the interaction across these units of analysis led, over time, to job development.

In summary, this research has shown that the interplay that exists between formal and organic processes, is in many ways contingent on the type of advice sought. Figure 7.1 shows how the initial decision to connect or not is derived from a series of complex cognitions, and that the process of choosing the *best* advisor is also complex and individualised. The findings in this area reignite the very early ideas of Salancik and Pfeffer (1978) about the ways that people socially process information, and how they use these interpretations to shape future interactions. Capturing and consolidating these implicit and personal choices through future research would be a possible next step in the mapping of the advice seeking process. This could rejuvenate SIP theory for application in the contemporary workplace.

7.1.4 The dynamism of job design

In addition to Figure 7.1, which has highlighted how networks are mobilised in order to complete and develop work; the second model (outlined in Figure 7.2) positions this process

within a more macro conceptualisation of job design and development, in order to show how such networks are developed and sustained over time.

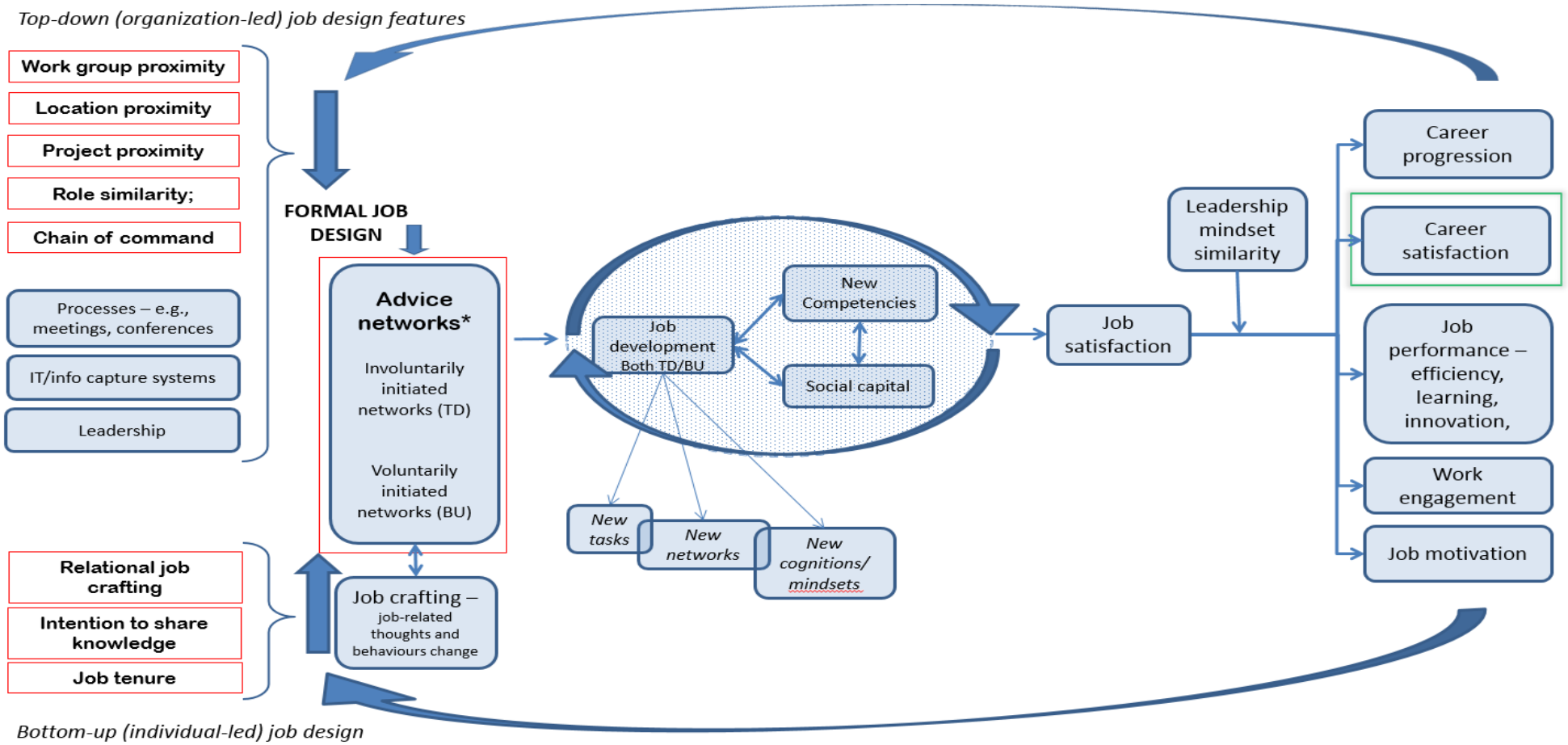


Figure 7.2: The proposed interplay between advice networks and job design
NB: Red boxes indicate that the insight was derived from the quantitative data, blue boxes indicate a qualitative theme, and green indicates quantitative data collected at a second time point.

The collective findings of this research add weight to the earlier arguments that job design is more than a simple, discrete process occurring at particular time points; and as such, traditional job design models such as the JCM (Hackman & Oldham, 1976; Parker et al., 2001) do not sufficiently represent this process. This is because the findings from this research suggest that job design can also occur through dynamic and iterative processes, and as a result of micro-level decisions, and belief systems that develop over time – a view more in line with the model proposed by Clegg and Spencer (2007). The results of this research further add to this knowledge base by showing that social networks play a clear part in this role development, in particular, through the creation of shared attitudinal dispositions between dyads and components in networks, the dynamics of leader-follower relationships, and through incremental collaborative and individual job crafting patterns.

The strength of each of these relationships, and the precise role that networks play in this process and in associated outputs such as job and career satisfaction is not clear from the qualitative findings. However, these findings do provide compelling evidence of the dynamism inherent in job design, and the role that social networks appear to play in this process. Two particular findings of this research in relation to the development of job designs over time, are of particular interest to current job design theorising, as follows.

7.1.5 Job design and career satisfaction

First, the results highlight the relationship between network development, job design and subsequent career satisfaction. It has been known for some time that the relationships we develop in the workplace play an important role in helping people to develop their careers (Barton, 2001, Forret & Dougherty, 2004). However, it has largely been assumed that such networks help people to develop high levels of social capital – the inference being that knowing the *right people*, or the right *number* of people will result in improved career success and satisfaction. Such models crudely test hypotheses based on a simple social capital explanation of the underlying process (Salancik, 1995) – for example, that networking helps people to ensure they meet *the right* people and that this positively influences their career over a period of time, by enhancing their social capital.

The findings of this research suggest that there may be a more complex explanation for this relationship, however, and position job development as a possible, additional mechanism. In prior research, the networks that help people to complete their work, and the networks that help people nurture a career, appear to have been studied in isolation of each other. The mechanism proposed in this discussion is that the changes that people make to their jobs through formal role assignment, crafting and the like, results in changes to their networks, and in turn the new networks help them to further change their jobs. Thus, career progression is not

only the product of acquiring social capital (although one might expect that this still occurs), but is also a result of more intricate interplay between job design and incremental network development. Based on this research data, it seems plausible to envisage a scenario where a cyclical model of job design, such as Clegg and Spencer's (2007) representation, is extended to incorporate career progression somewhere within the cycle, and that networks play a role in driving this sequence.

Consolidating the findings uncovered across the research phases, the model that follows (Figure 7.2) illustrates the ways that advice networks appear to contribute to the design and development of jobs, and subsequent careers. It is proposed that at the entry to the model a job design is developed by an organization (top-down). This job design is determined by a number of organizational design features, including the work-group that the job incumbent is allocated to, the projects they are asked to work on, the location they are asked to work at, the processes that are in place which shape the job latitude and responsibilities. Embedded in a social organizational context, this job design will be loaded with organizational structures that collectively contribute to the development of a formal network of necessary contacts, required to enable and/or facilitate job completion.

Nevertheless, operating in tandem with this formal network, it appears that within that *job landscape* (Wrzesniewski & Dutton, 2001), the job incumbent will adapt and add to their advice network based on their own attitudinal or personal preferences. For instance, their choice of advisors will be shaped by their appraisals of previous interactions, their workload, their tenure in the job and work-group, and also their belief systems, such as their intention to share knowledge, or their preference for job crafting. These factors, along with the related crafting activities affect the network that the person develops in the organization. The cognitive processes underpinning these advice choices are previously explained (see Figure 7.1), but collectively they contribute to the existence and maintenance of a network. It seems that once connections in that network are established, job holders do not differentiate between formal and informally derived connections.

The results from this research support the idea that over time this network development leads to a cycle of *job* development. Rather than the development of social capital being the sole mechanism of job and career development, this research suggests that this cycle is more closely aligned with the model proposed by Clegg and Spencer (2007), in which job and career opportunities are in greater part the result of interactions between the job incumbent and their social network. As the network develops, the opportunities available to the job incumbent also develop. This may include opportunities to engage in new tasks, new ways of thinking (cognitions), and new mindsets (for instance the development of new ideas about what matters

in the job). These new mindsets are particularly important, because they appear to be able to shape future job choices. Some of these opportunities will be crafted (bottom-up, led by the individual), and others may be opportunities offered by the organization (top-down - for instance where an individual performs well and so is trusted with greater responsibility). There can be interplay throughout this process – for instance, a person might meet a new colleague, and this might shape their cognitions, which might then motivate them to engage in a new activity; but this cycle can occur in a different order. Indeed, there may be multiple such cycles. However, over time, it is suggested that this process enables the job incumbent to develop new competencies, and as a by-product of this cycle, they acquire increasing levels of social capital. This social capital is itself important, as it can provide further opportunities for job development.

Finally, it is proposed that these cycles of job development are what lead to the range of outcomes that are outlined in Figure 7.2. However, importantly, it is proposed that the relationship between the job development cycle and these outcomes is moderated by the extent to which a job holder shares a congruent mindset with their Leader. Where there is leader-job-holder congruence, job developments can lead to a range of positive outcomes – e.g., more cohesive work-groups, improved job performance and engagement, and ultimately improved career satisfaction and progression (in turn, feeding back to the start of the cycle). However, where the job developments are incongruent with the line manager's mindset, these outcomes can be less positive. It is suggested that this is because such development is occurring outside of the *zone of acceptance* (Hornung et al, 2008), and so is not encouraged or accepted as being legitimate. The moderating role of leadership is important, and suggests that the outcomes of this job development cycle are far reaching, with both positive and negative consequences for both individuals and organizations, as previously outlined in Chapter 6.

It should be clarified that this model is presented in an attempt to fuse the qualitative and quantitative findings of this research. Red boxes show that the insight follows from the quantitative data collected in Phase 2, and blue boxes highlight that the insights are based on Phase 3 (qualitative) findings. Boxes coloured green derive from quantitative data collected in Phase 4. Where multiple coloured boxes are present this indicates that the findings derive from multiple research phases. Clearly, at this stage, this model involves a degree of speculation about likely processes, based on informed consolidation of the available research evidence and literature. For instance, the quantitative data did not find support for job satisfaction as a mediator in the tested model. It is however, included in the model below, because of the insights derived from the qualitative phase, which suggested that the precise mechanism for job satisfaction may be more transient and dynamic than specified in a linear model. Further

research is required to explore these mechanisms empirically, in new contexts and with new samples.

7.1.6 The role of leadership dynamics in job (re-)design

The case study also highlighted the central role that leadership dynamics play in the development of jobs over time. Not only do leaders play a formal role in job development by, for instance, deciding what projects people work on, and what their role responsibilities are, deciding on performance metrics and in some cases, even choosing where people sit; this research has also shown how leaders play an important role in shaping the organic crafting behaviours of employees, through more complex patterns of leader-member exchange (LMX, see Graen et al, 1982).

The case study also shows how the network position of subordinates and their connectivity to leaders in the network can play a role in the development of their jobs. In this research, those close to the leader could be seen to share more similar attitudes than those on the periphery of the network; however, it was also evident in this research that the process of diffusion could be two-sided, with subordinates also influencing their leader's choices and mindsets. Similarities in views (homophily) were associated with stronger network ties, and greater reciprocation in dyadic ties, as individuals reported preferring to seek advice from alters that they believed shared similar views and characteristics to themselves.

Though not explored in the quantitative research phase, leadership emerged as a strong theme in the qualitative study, showing how mindsets can be diffused across network members; and also in demonstrating the possible consequences of such transmission. The role of leadership is significant here for at least two reasons:

7.1.6.1 Collaborative job crafting, self-serving bias, and group-think

First, the collaborative crafting behaviours described in the results were shown to be particularly important amongst the Management sub-group, because of the overall power held by the roles of these individuals, and because these individuals played such an important role in collaboratively crafting the strategic future for the overall group. Leaders were seen to play a crucial role in the development of jobs; but whom a leader chooses to seek advice from (as well as whom they do not choose to seek advice from) in this case affected the emerging strategy of the department. For instance, in this environment, leaders could be seen to set the boundaries of work, decide who sits where, oversee the development of processes and practices, and make decisions about the goals and metrics that people perform to. The importance of these factors on the shaping of the wider organizational system are plenty, and in relation to the development of advice networks, have already been outlined in relation to RQ1. Thus, the data show that where members of the *in-group* consulted only from within that group or seek/share information with

friends to the exclusion of all others, this could impact on the morale and attitudes of those individual leaders who had not been included; and also their sub-group members, who reported similar attitudes to their *out-group* leader on key issues (in line with the propositions of Social Identity Theory – Tajfel, 1979). Collective out-groups could also be seen to be isolated in terms of the projects they were assigned to work on. On the other hand, the value of being on the inside of such a group are demonstrated by the finding that with just two exceptions, insiders of the Director's egonet experienced *high* levels of career satisfaction two years later.

Of course, the risks of group-think (Janis, 1972) are not restricted to relationships between leaders and subordinates, but stand for all components and cliques within a network. There were also examples of group-think amongst peer groups in the qualitative phase, whereby participants reported seeking advice from colleagues who they knew would provide friendly feedback, potentially at the expense of hearing other ideas and views. Where this behaviour is not recognised or monitored, it presents a clear risk of creating in/out-groups, and the possibility of group-think. As such, these repeated patterns of exchange have the potential to stifle innovation if one only ever goes back to people that reinforce the same view of the world, and show how in such situations organic networks might be usefully *nudged* by organizations d*esigning* situations that encourage/require outsider input.

7.1.6.2 Leadership and job crafting

The second reason why leadership is significant is that, in this study interviewees who shared reciprocal advice seeking ties to their leader could be seen to hold similar views about what was important and advantageous strategically, and reported crafting behaviours that could be seen to be in line with the same strategic vision described by the leader. It is possible that as crafting offers an opportunity for individuals to enhance meaningfulness in their jobs, individuals who were already based within the same *in*-groups as their leader, or who report similar views to leaders, may report either fewer instances of job crafting (because their day job is so closely aligned to providing personal meaningfulness). In contrast, *out*-group members, who share different views of the world in terms of what is important and meaningful, might report higher levels of job crafting and, where their crafting activities are divergent to their leaders' mindsets, they might find these de-motivating (if and when they are not rewarded).

Of course, if a leader only surrounds themselves with *friends* who reinforce their existing views, they will potentially find it more difficult to develop effective strategies, structures and to galvanise energy amongst group members, than they would if their networks were open and inclusive. Clearly, by continually returning to certain individuals, groups or locations the patterns of group-think will be reinforced further, and as such will continue also to gain further social capital amongst the group – perpetuating the view that there is a single

'right' way, thus stifling innovation in the process. It is proposed that further research is undertaken to better understand how the principles of homophily that were found so clearly in this research, influence the processes and consequences of collaborative job crafting for leaders and subordinates.

Some of the theoretical implications of these leadership dynamics for job design research have been discussed earlier in section 7.1.6, but a further point to note is that such dynamics have not yet been consolidated in contemporary job design theory. In the model of dynamic job design proposed in Figure 7.2, leadership would be expected to play a central role in the top half of the diagram (under the umbrella *top-down organization led job design*), playing a key part in shaping the job and subsequent career progression of the job incumbent. This model proposal extends some of the principles outlined in the Clegg and Spencer (2007) model (see Figure 3.1 in Chapter 3) which highlights the role that a manager plays in role development (through trust in the job holder and the offering of greater responsibility). It also aims to consolidate existing ideas on *I-deals* (see Hornung et al., 2008), by recognising the joint role that both leaders and job incumbents can play in the development of a job. In this case study, for instance, where *unauthorised* crafting behaviours occurred in the leader's egonet, these could form a basis for forming *legitimate* "I-deals" (Hornung et al., 2008), in which the desired responsibilities were able to become part of the job holder's formal job role; provided these were within the *zone of acceptance* (Hornung et al., 2010).

Although the existing body of research on LMX provides understanding of a number of these interactions, as well as the role of networks in LMX processes (e.g., Carter et al., 2015), the relational and interactional role of leadership in job crafting (both individual and collaborative) is not currently well understood, and as such, it is suggested that the testing of this model within a future research agenda would be a fruitful line of enquiry. Certainly, it would be interesting to study with a larger sample, and over time, the ways in which networks provide a vehicle for subliminal and direct influence, and the potential part this plays in the crafting of longer term roles (and careers).

7.1.7 Implications for job crafting theory

A number of the findings uncovered through this research provide further support for Wrzesniewski and Dutton's (2001) theory of job crafting and their proposed facets. However, this research provides several further insights into this phenomenon. First, the qualitative data uncovered evidence to suggest that although some crafting behaviours were enacted actively and consciously, at times the interactions that appeared to influence the evolution of job designs occurred seemingly unconsciously. Given the proactive and discretionary nature of job crafting behaviours, it was expected that individuals who reported higher levels of job crafting would

find themselves more central in the network, than those who did not demonstrate high levels of job crafting. This relationship between job crafting and network centrality was tested and confirmed, showing that higher levels of job crafting are associated with higher levels of structural power and leverage in the network, putting such individuals in an advantageous position compared to colleagues. Nevertheless, it was particularly interesting to see that people were not always aware that their behaviours had been influenced by their interactions.

This raises interesting questions for job crafting theory, as job crafting behaviours are generally considered to represent proactive, discretionary behaviours, and it has been widely assumed that crafting activities would occur consciously and deliberately. The causal connection between relational crafting and career development is therefore unclear. Managers, for instance, reported higher levels of relational crafting than non-managers did – a finding that is in line with those reported in other papers (e.g., Wrzesniewski & Dutton, 2001), whose authors have previously argued that crafting is easier to engage in for managers as their roles are generally more autonomous. However, this study adds to this evidence base, as in the current research, managers also had higher network centrality. It was not however clear owing to the cross-sectional design of this part of the study, whether the centrality had *caused* them to become managers, or whether centrality was a consequence of being a manager. This question would be of interest in future research. Some of the examples reported in the qualitative research phase also raise the possibility that job crafting behaviours might occur unconsciously, and without deliberate intention.

Second, it was clear that the network connections that people have result in interaction between the different facets of job crafting, suggesting that these facets do not occur in isolation of each other. For instance, the factor analysis performed in preparation for the main quantitative analyses found that although three facets of crafting could be extracted, these were highly correlated, indicating that those who reported relational crafting, also tended to report cognitive and physical crafting (and vice versa). It is noted that this scale has only been tested in this single study, and so has not been subjected to a full test of reliability and validity; thus conclusions at this stage are made with caution. Nevertheless, one possible explanation for this finding is that it reflects a genuine lack of differentiation between the different facets of job crafting; perhaps indicating that one undertakes multiple types of crafting simultaneously. Certainly, the qualitative data showed that it was common for an individual to report a crafting initiative that began with one type of crafting but also incorporated elements of the other types, or which led to the other types of crafting occurring. A range of examples were found, to support this proposition; though it was noted that participants' reports did not provide a clear pattern to the *sequence* of this interplay. For instance, on several occasions participants who had made a proactive physical change to a task they were involved in reported this leading to them

also changing the way that they thought about the value of their work, and perhaps also then speaking to other people as a result. This study therefore provides evidence to suggest that multiple dimensions of job crafting might operate simultaneously, and in conjunction with one another. Should this be the case, this challenges the original notion of job crafting proposed by Wrzesniewski and Dutton (2001), who advocated an integrated model of job crafting but with three conceptually distinct dimensions. Little prior research has been undertaken to demonstrate the interplay between such facets, though these research findings indicate a potentially fertile line of future enquiry.

Third, this research has reinforced that job crafting can also have negative consequences for behaviour. Other research has previously demonstrated such effects (e.g., the *dark side* of crafting – Demerouti, 2015), the consequences of crafting outside so called *zones of acceptance* (Hornung et al., 2010), and the negative consequences that crafting can bring to dependent colleagues (Tims et al., 2015). This research adds to this knowledge base. In the qualitative phase, it was shown that where crafting initiatives were considered to be out of kilter with the strategic views of their manager, their efforts were not always believed to be appreciated, which meant that although crafting behaviours increased the *meaningfulness* of the work, they also led to reduced morale and motivation. From a quantitative network perspective, low scores on job crafting were associated with lower overall network centrality, suggesting that such individuals could be seen to be part of a structured *out*-group.

Fourth, this research did not find workload to play a significant, moderating role in the relationship between job crafting and network centrality, as might have been expected according to the J-DR model (Demerouti & Bakker, 2011). Although European research into job crafting has been dominated by studies that have demonstrated the role that job crafting plays in moderating the relationship between job demands and the experience of work stress (e.g., Tims et al., 2011), these consequences have not been consolidated, or considered within a broader social context. In this research, both positive and negative consequences of job crafting were uncovered, and the relational consequences of job crafting, were demonstrated at both the individual and organizational levels (cf. Figure 6.3, in Chapter 6). However, this research did not find consistent evidence in support of such a mechanism. For some participants job crafting behaviours were deliberately performed in order to reduce or control work demands. For others, job crafting behaviours were undertaken despite leading to an increase in workload. These inconsistent findings require further exploration through quasi-experimental studies which would enable the competitive testing of alternative hypotheses.

Fifth, the qualitative phase unveiled interesting distinctions in the categorisation of job crafting behaviours, as the thematic analysis revealed a distinction between *involuntary*

networking behaviours that are required as part of some jobs, and *voluntary* networking behaviours which are undertaken with a range of motivations by some people in the network (to differing extents). It is suggested that involuntary network development occurs as part of a job role, and though it may appear to fall within Wrzesniewski & Dutton's (2001) original conceptualisation of job crafting (*"increasing or changing the number or range of people one speaks to in order to complete work"*), this is not truly job crafting, because such behaviour is part of an existing job role. *Voluntary* or discretionary networking behaviours on the other hand, refer to the building of connections that do not *need* to exist in order for a person to complete their work, but which exist in any case. In other words, although everyone *has* a network of some kind (and some will have to galvanise connections in order to do their job), it appears that only some people voluntarily mobilise their network *beyond* job parameters, in order to enact change either in other people and the wider organization, or in their own role.

Finally, like Tims et al. (2012) who have argued for an alternative conceptual model of the motivations for job crafting (to incorporate changes that people might make to their roles in order to increase their structural job resources, increase their social job resources, increase their challenging job demands or decrease their hindering job demands); the thematic analysis undertaken during the qualitative phase uncovered a range of motives for job crafting. Though the motive of reducing demands was found amongst this population, it is suggested that the motivations for job crafting uncovered in this study (outlined in Chapter 6 and summarised again in Table 7.2), cannot be meaningfully reduced to the four distinct dimensions suggested by Tims et al. (2012), though there is overlap with these categories. In this research, for instance, several interviewees described examples of engaging in job crafting which had no direct benefit to themselves at all, and thus were categorised as pro-social or citizenship crafting behaviours. Whilst these might have the inadvertent consequence of also increasing structural or social job resources, this was not reported to be the motivation for engaging in job crafting behaviours. Moreover, a number of participants reported engaging in physical job crafting initiatives that unintentionally *increased* their hindering job demands (e.g., brokering a relationship between colleagues, knowing it would increase their hindering job demands, because they felt that by introducing colleagues to others it would ultimately achieve a better performance outcome for The Group). It is suggested that altruistic instances of job crafting are not currently explained or accounted for in the JD-R models of job crafting, which instead view job crafting as being driven by a need to manage demands and provide resources (i.e., self-driven). It is hoped that these findings can be considered to offer a complementary perspective which might be integrated in future research.

Motivation to job craft (current study)	**Motivation to craft (Tims et al., 2012)**	**Motivation to craft (Wrzesniewski & Dutton, 2001)**
To improve job task performance	-	Positive self-image
To be a *good citizen*	-	Need for human connection to others
To make work experience feel more meaningful	Increasing challenging job demands	Need for control over job and work meaningfulness
To make work experience feel more enjoyable	Decreasing hindering job demands Increasing challenging job demands Increasing social job resources	Need for control over job and work meaningfulness
To help manage their workplace demands	Decreasing hindering job demands Increasing social job resources	-
To improve career advancement	Increasing challenging job demands Increasing structural job resources Increasing social job resources	Positive self-image

Table 7.2: The motivations to job craft uncovered by the current research, mapped against the four dimensions (motivations) for crafting outlined by Tims et al. (2012) and the three motivations for crafting offered by Wrzesniewski and Dutton (2001)

Chapter 8: Conclusions

The findings presented in this thesis offer implications for two domains. First, they provide insights into the cognitive triggers that underpin the process of advice seeking, along with a new typological framework for categorising advice types. Second, they offer implications for contemporary job design theorists, highlighting the important role that networks play in the design and development of jobs, as well as the influence that this appears to have on the development of a job over time and a longer term career, and the important role that leaders seem to play in this process. In summary, these findings add to the existing knowledge base by providing insights into:

- The cognitive factors that influence a person's choices relating to their advice seeking behaviours, and the process of advice seeking.
- The range of possible *social* advice mechanisms that affect the tie patterns found in organizational networks – a typological framework is developed based on the research findings.
- The range of formal top-down and bottom-up factors involved in network development and maintenance, and their relationship with advice behaviours.
- The relationship between social networks and the job crafting process.
- The influential role that leaders play in the design and subsequent development of jobs and careers.
- The role that a person's social network can play in the evolution of their job, and related career development.

Collectively these findings highlight the pivotal role that relationships and advice play not only in the completion of work, but also the development of work and associated jobs. In so doing, they enable a more holistic conceptualisation of *social job design* to be considered, and generate new directions of research for contemporary job design theorists.

8.1 Limitations

8.1.1 Reflections on the *mixed methods* research approach

This thesis has sought to take a mixed methods approach to the exploration of the social networks involved in job design. It does not propose that either the qualitative or quantitative aspect of the work is most important; rather it advocates that neither perspective alone paints a complete picture of the networks involved in the job design process, nor a complete picture of the factors that affect it. Each provides a different lens worthy of exploration and discussion. For instance, the questionnaire undertaken in Phase 2 has enabled a visual image of the connections within the network to be created, and has enabled comparison across different types

of tie to be explored and measured. That said, there are a number of instances where findings remain unclear based on this questionnaire alone. For instance, the reasons for *isolates* and *central* individuals are not clear based solely on the quantitative measurement of the network in this phase alone, but become much clearer following the Phase 3 interviews, when further contextual information is provided. Without the qualitative narrative, for instance, it might be concluded (incorrectly) that particular individuals are not well integrated and should be; whereas upon qualitative exploration, it is evident that a person's core network is appropriate to their role, or is incomplete (e.g., where a particular client base is outside of the measured boundary).

It is also noted that the descriptive elements of the quantitative phase, made for a range of interesting and noteworthy *inductive* lines of enquiry, by raising new questions about the network and advice behaviours, and by demonstrating surprising cliques and substructures, which would not be highlighted purely within a traditional deductive analytic approach. Moreover, the qualitative study has enabled a number of further questions to be raised – for instance, about the validity of self-report as a measure of job crafting, and about the role of workload as both a barrier and facilitator of network development. Above all, the qualitative phase has enabled a wider range of advice functions to be uncovered. All of these findings have benefited from a mixed method research design.

8.1.2 Bounded network

It might be argued that a limitation of this research is that the questions asked related only to connections within the focal population, thereby negating the importance of connections to personal (non-work related) connections, and relationships with people in the wider organization or indeed outside the organization. Clearly, given the earlier arguments that connections are embedded in a wider social system, this is a relevant criticism. This matter was considered at length prior to the Phase 2 questionnaire, and is addressed in two ways in the research. First, such connections are explored in the qualitative phase (so although not measured quantitatively, they are represented in the findings). Second, a bounded network was considered advantageous in other ways, for instance, by enabling a true response rate to be calculated, and by improving the robustness of the network centrality and structure scores (Borgatti et al., 2013; Scott, 2013).

It might be argued that the research would have benefitted from a greater number of interviewees, though it is noted that others have shown that beyond 12 interviews, data saturation can be found (e.g., Guest, Bunce & Johnson, 2006). Moreover, such access was not possible in this organization.

8.1.3 Longitudinal research design

Though the measurement of career satisfaction and career progression two years after the original network questionnaire was administered represents an attempt to ensure a longitudinal research design, it is recognised that this is limited by the fact that this variable was not measured also at the first time-point. Unfortunately, due to changes in leadership and organizational climate in the supporting organization, it was not possible to re-administer the full network questionnaire at Time-2, and this represented a methodological compromise. The relationship between degree centrality and career *progression* was not significant; though this might be expected given the low numbers of career progressions reported within this timeframe overall, and that within the career trajectory of most people in this particular organization, this is a relatively short time-frame. Future research might explore these relationships over a longer period of time, where the number of career progressions might be expected to be closer to a normal distribution, and thus more representative of a typical career trajectory. The cross-sectional nature of many of the tested hypotheses is a fair limitation of this data.

8.1.4 Generalizability and transferability

Questions might be raised about the generalizability of the findings uncovered in this study. Though a number of statistical tests were performed during the analysis to ensure that the sample of engineers studied in this research provided a large and representative enough sample to enable some statistical analyses to be performed, it could be argued that the sample (as representatives of engineers in the global population) was low. To be explicit, this thesis does not make claims about the generalizability of the network patterns or experiences reported in the qualitative findings, beyond the population studied. Indeed social network analysis generally claims to study *populations* rather than samples (Hanneman & Riddle, 2005), because it is argued that there is no logical reason to expect that any two social networks should look the same, but instead, each network examines a population, that is loaded with context.

What this thesis does claim to show, is that the networks that people develop within their organizations *can* affect the design and development of jobs, and that there are associated consequences of this behaviour for the roles and career trajectories of employees. It claims to show that as a result of the attention and rigor attached to the research design (e.g., procedural rigor, sampling representativeness, interpretative rigor, and reflexive approach to data analysis), the findings of this case study are likely to be transferrable to similar populations in similar organizations (Cassell & Symon, 2011). Such networks are not currently well understood in relation to the literature on job design, nor are they accounted for by current job design theories. Though the specific mechanisms through which these networks operate inevitably require further exploration, this thesis has demonstrated that in this particular organizational context there is evidence that jobs have been, and continue to be, designed not only by organizations

and job incumbents; but also as a product of the social connections that job holders have within their social (organizational) networks. Further research would now be beneficial to test whether these processes play out in this way in larger samples and to better understand the more general mechanisms involved in this process.

8.2 Implications for practice

> *"I've always had this view; the thing with organizations is, however you cut it, you fracture some things and make worse, and you strengthen other things, so there's never a perfect organization. What you need to do is recognise the weaknesses of your organization and try to make sure you mitigate those as much as possible."* (P3, Senior Project Manager)

It is possible to reach a range of conclusions, based on the arguments presented in this thesis. One view of organizational networks is that they make demands of people and that they help create overload, especially for those in senior managerial positions or in particular job roles. The qualitative findings show that this can be the case in individual circumstances, for a range of reasons, which have been explored previously. Interestingly however, in the network questionnaire there was no *statistical* support for a general link between workload and network size. This implies that the relationship only exists for some people.

Another view is that social networks are a personal (and thereby become an *organization's*) asset because they help employees to get their jobs done more effectively and efficiently. Again, there is evidence of this connection in the qualitative data; though the relationship between networks and job performance was not tested quantitatively. Nevertheless, there is evidence from Phase 2 that with longer service in The Group, they develop more contacts and links across the organization, drawing on previous relationships to address new problems. These networks provide access to knowledge, expertise, problem-solving capabilities, political and persuasive power amongst other things. In this view, networks are a key part of an organization's practice and capability.

A third perspective is that the role and importance of such networks, in quite short time, will not be a contested issue. Younger employees in an organization will be bringing an awareness of, and commitment to organizational networking tools that will be part of who they are, how they live, and how they will wish to work. Social networking tools will be part of the fabric of life and work, as routinely accepted as older innovations such as word processing. It is perhaps worth stressing that the above views are not mutually exclusive; indeed one might hold all three at the same time.

A fourth view is that social networks are not something that organizations have chosen to manage explicitly in the past. As has been demonstrated in this research, networks can evolve bottom-up and are influenced by social proximity, convenience and job role, but they are part of the hidden organization, reflecting the informal side of how things just *get done* in practice. Historically in most organizations the formal organization structures and processes have been managed, but the informal networks that arise alongside have received little attention. One might argue that this is a mistake. But this does not mean that attempts to improve organizational networks should be managerially driven in a top-down way – in fact it is proposed that the opposite should be the case, as will be outlined shortly.

Reflecting the interpretations above, I will conclude this thesis by making several inter-related recommendations for practitioners working in this area. In large measure these focus on the process of change and improvement but also include some examples of specific actions that may contribute to improvements.

8.2.1 To what extent can and should organizations aspire to *manage* networks?

A first question to consider is the extent to which organizations can be expected to, or in fact are *able* to manage the informal networks that exist within their organizations? The findings from this research indicate that for some types of advice seeking (e.g., authorisation) it is quite possible to design structures that facilitate, even generate networks. For instance, the quantitative findings indicate that where an organization wishes to more effectively manage the *transactional* connections that exist (or do not exist) between employees or groups, they can do this to some extent through work design. For instance, in circumstances where the organization or a manager wish to generate a network, the findings suggest that this could be achieved by creating an interdependence between people through their role design. Within this research, participants reported transcending physical boundaries and technological restrictions where the connection was essential to enable them to complete their work. Of course, such connections do not represent the *informal* networks in operation within the organization, but show how organizations can, through role (re)design, generate advice seeking/sharing patterns for some types of advice. Creating role interdependence might be useful for organizations in some circumstances. Moreover, where the organization wishes to force conversations to happen between people, this might necessitate the creation of processes, and/or team (rather than individual-level) performance metrics (Searle & Ball, 2003). However, there are limitations to taking this approach too literally, and it is recommended that such an approach is only implemented in accordance with the socio-technical change principles advocated by Clegg (2000) and outlined in Davis et al. (2014) and Hughes et al. (2017). In particular this means involving the employees themselves in the process to ensure it is *pulled* and owned by such users, and ensuring that the process is genuinely necessary, the risk being that where it is not, it

will instead create bottlenecks, overload and inefficiency. Nevertheless, this may be beneficial for certain types of role.

Although the network might be *managed* for certain types of advice behaviour through the (re)design of organizational structures, the findings suggest that this can also be achieved with a *lighter* approach, simply involving improved exposure can *nudge* individuals towards the building of relationships (see Thaler & Sunstein, 2008, for more on nudge theory). In other words, it seems possible on the basis of these findings to encourage closer working relationships or consultation to occur between particular individuals, by simply creating the opportunities for them to meet and get to know one another, for instance by assigning individuals to particular work-groups, teams, projects, locations, by altering seating arrangements or encouraging people to attend particular meetings. This is because, the data suggest that for certain types of advice, people choose to connect primarily to people that they work alongside. A number of employees reported that the origins of current, strong relationships were in the co-attendance of meetings, working together previously (even if their roles had never been interdependent), or because they simply sat close to one-another. For instance, individuals reported being more likely to seek problem-solving advice or general guidance advice, and being asked for advice of this kind, by individuals that they deemed to be convenient to access, or in close physical proximity.

However, personal characteristics were also key influencers of the choice of connection, and *like-mindedness* as well as whether a person appeared knowledgeable or sufficiently *expert* were also key factors in choosing advisors. This suggests that people do make individualised and proactive choices about who they wish to seek/share advice with on more *transformational* types of advice seeking (i.e., when they could go to a number of people, but choose one person in particular), and are unlikely to be *controlled* in this respect by organizational design. However, the findings suggest that such behaviours are nudged by work design choices (e.g., where a person is located, or whether they are likely to be at the same meetings). An organization might therefore enhance the process of advice seeking/sharing, by co-locating individuals who seem like they might be like-minded, or those who would benefit from knowing more about each other's work. Conversely, the organization might decide that to deliver against a strategy (for instance a remit to improve advice seeking/sharing across a global group), it is beneficial to mix up groups. This is likely to yield both immediate benefits (e.g., more efficient and effective working), but also longer-term benefits as people broaden their organizational network and personal directory of contacts (in accordance with the theory of the *strength of weak ties* – Granovetter, 1973, 1974, 1982).

The findings also suggest that for some types of advice, such as gathering information or authorisation, individuals are willing to transcend physical barriers such as location, and will

find ways to share/seek advice in order to complete their work tasks. In such cases knowing *who* they ought to seek advice from or share it with was a more influential factor in whether they sought/shared advice appropriately. In global organizations such as the focal organization in this research, this may have implications for the improvement of technological knowledge capture systems (e.g., databases and directories). Clearly individuals can only access advice from people where they know they exist!

8.2.2 Measuring social networks in organizations

As outlined above, though it is not impossible, *nudging* through design appears to be less straightforward for connections that provide functions such as enabling a job holder to validate an idea or provide emotional support, because of the clear preferences that people have about who they choose to connect to and why. These choices can be quite personal, and it is proposed that it is not desirable for an organization to manage these choices entirely. It is therefore recommended that organizations should take an individual approach to networks whereby any member of an organization can monitor and understand his/her network and use this for self-development purposes. This builds on the view that our social networks are an asset that each of us can use to help get the job done more effectively, and that individuals can be trusted to monitor, interpret and manage their own networks to make themselves more effective. This requires that individuals are given the tools and the opportunity to monitor their own networks. This might also be a strategy that enables the network overload reported by some people during the qualitative phase, to be managed more effectively. For instance, if a manager wishes to delegate relationships and finds that they are unintendedly a broker of a relationship, two managers with a mutual connection might wish to bring three delegates with them, providing an introduction and network foundation, and then opting out of future conversations. In this way, an organization can encourage networks that reduce overload amongst senior employees, and ensure that there is contingency in the network and reduced vulnerability in cases where, for instance, an individual unexpectedly leaves the organization.

8.2.3 The role of social interaction in the design of jobs

Another practical implication that this research has identified is the role that colleagues, and in particular, leaders and managers play in the shaping of people's networks and roles. This research has highlighted how *group-think* (Janis, 1972) can be reinforced through the social networks that people develop, which could have worrying consequences. The research has shown how managers have an important role in agenda setting, and that people who craft within the parameters of this agenda may have more positive experiences of doing so. The research has also shown how those individuals who are connected to influential network brokers have more positive career outcomes. There are many unanswered questions about this process at this stage, though it raises at least three practical considerations:

1. Organizations need to recognise the social role of job design – that they do not complete their work in isolation, but that individual job roles, strategies and projects are a product of co-design and social influence. Our social networks play a key role in this process.

2. Leaders themselves need to be made aware of their own biases (this is particularly important in hierarchical organizations, where the leader makes the majority of decisions). By better monitoring their own personal networks, leaders might have improved awareness of the limitations of their networks, and might more actively seek advice from outside their *inner circles*. It seems important that leaders are at least made aware of their influence in this regard, and are encouraged to self-monitor their own networks to ensure that they seek and share advice equally amongst their subordinates and work-groups, and are encouraged to seek advice from people beyond their inner-circle when making decisions to ensure that particular groups or individuals are not able to domineer. Leaders may also be able to use this knowledge to better support the development of their teams (e.g., identifying individuals who might be too peripheral in the network, or who have become too powerful in their brokerage potential).

3. There are implications for employees who are engaged in crafting. If the relationship between network position and career satisfaction holds with larger samples (further research will be required here), then it suggests that individuals can better improve their job and career satisfaction by ensuring that their crafting is within the organization's *zone of acceptance* (Hornung et al., 2008); and that make efforts to relationally craft their network position to ensure high eigenvector centrality. It may be possible to incentivise individuals to engage in this process by more explicitly outlining the apparent relationship between network position and career-progression/satisfaction.

8.2.4 Understanding *job crafting*

Finally, it was clear during the interviews that few employees in this employee sample identified immediately with the concept of job crafting. It is not clear why this was the case, but certainly, the breadth of job crafting activities uncovered during the conversations within Phase 3, did not appear to reflect the low levels of job crafting uncovered by the Phase 2 questionnaire. What is clear from the qualitative data is that job crafting initiatives do occur within this work environment, even if job incumbents themselves are unaware of doing them until probed at interview. As outlined in the results of this thesis, organizations and individuals experience a range of benefits as a result of crafting initiatives, many of which are relational and involve a person mobilising their social network in some way (e.g., speaking to someone new [relational crafting] which leads to a person thinking differently about their work [cognitive crafting] and perhaps opting to take on a new challenge or task as a result [physical crafting]).

One implication is that organizations, and more personally, individuals, would benefit by raising awareness of job crafting across organizations. By so doing, leaders will be able to engage in more open discussion of job crafting, which can be expected to enhance meaningfulness, efficiency and effectiveness within an organization. Raised awareness amongst leaders might also enable them to better design *job landscapes* (Berg et al., 2013) that foster motivation amongst job incumbents, and which also enable job-person fit to be enhanced (Parker, 2014) for instance at the recruitment selection stage of employment. In other words, this is a hidden opportunity for leaders to learn about what motivates their employees. By better understanding relational crafting and the motives for doing so, individuals will also be able to better able to understand and manage advice seeking requests – for instance, by building in structures that help group members to recognise other sources, or help encourage people (e.g., leaders) to meet other relevant others who may provide opposing views to them.

8.3 Concluding thoughts

Social networks cannot be understood or improved unless they are somehow measured. There is often speculation in organizations about the connectivity that exists, but as this research has found, this can often be based on a person's perceptions (perhaps related to their position in the network) rather than the experiences of an overall group. A number of participants in this study reported being *surprised* at how central they were in the network (or not!), and the extent of connectivity across work-groups. It is suggested that an organization can benefit from better understanding the patterns of connectivity between individuals and across work-groups. By measuring and monitoring networks in this way, an organization could use this information as part of its diagnostic armoury, to better understand emerging or existing risks (e.g., bottlenecks, cliques), learn from examples of good practice within the organization, and to inform their contingency planning in the event that someone leaves the organization. Measuring networks routinely as a part of the organization's 'health checks' would enable better benchmarking of improvements, and enable them to better capitalise strategically on their networking strengths/assets, which may be diverse and far-reaching.

For job incumbents, information on their personal network can be a useful development exercise, and (so long as it is used ethically) provides an opportunity for individuals to work with their manager to ensure that any relational crafting they have undertaken (or wish to undertake) is understood more explicitly and appreciated, and that it is within the organization's *zone of acceptance* for job crafting (Hornung et al., 2010). This is important, as in this research, people who provided examples of crafting that were considered to be *outside* of the *zone of acceptance* reported experiencing less satisfaction with their job crafting initiatives, and felt less satisfied with their jobs and subsequent careers.

In conclusion, this thesis advocates a view that organizational networks are part of our assets, though which we get the job done. Whilst they may create more work for individuals in certain circumstances, they are just as likely, on many other occasions to help us get the job done more effectively, and provide a vehicle to drive the development of jobs in ways that are simultaneously beneficial for both the organizations and individuals involved. It is hoped that the case study presented in this thesis provides both a new perspective to some existing job design problems, whilst simultaneously triggering some exciting new avenues for academic enquiry.

References

"Advice". (2017*).* In *Oxford English dictionary online*, Retrieved from http://www.oed.com.

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions.* Thousand Oaks, CA: Sage.

Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin*, *84*(5), 888.

Alarcon, G. M. (2011). A meta-analysis of burnout with job demands, resources, and attitudes. *Journal of Vocational Behavior*, *79*(2), 549-562.

Alexopoulos, A. N. & Buckley, F. (2013). What Trust Matters When. *Group and Organization Management, 38*(3), 361-391.

Allen, T. J. (1977). *Managing the Flow of Technology.* Cambridge, MA: MIT Press.

Ambrose, M. L., & Kulik, C. T. (1999). Old friends, new faces: Motivation research in the 1990s. *Journal of Management*, *25*(3), 231-292.

American Psychological Association. (2002). Ethical principles of psychologists and code of conduct. *American Psychologist, 57,* 1060–1073.

American Psychological Association. (2017). *Ethical principles of psychologists and code of conduct.* American Psychological Association, Washington, USA.

Amis, J. M. & Silk, M. L. (2008). The Philosophy and Politics of Quality in Qualitative Organizational Research. *Organizational Research Methods, 11*(3), 456-480.

Andres, H. P. (2002). A comparison of face-to-face and virtual software development teams. *Team Performance Management: An International Journal*, *8*(1/2), 39-48.

Arnold, J. (2011). Career concepts in the 21st century. *The Psychologist*, *24*(2), 106 - 109.

Arnold, J. and Cohen, L. (2008). The psychology of careers in industrial-organizational settings: a critical but appreciative analysis. *International Review of Industrial and Organizational Psychology*, *23*, 1-44.

Ashforth, B. E., & Saks, A. M. (1995). Work-role transitions: A longitudinal examination of the Nicholson model. *Journal of Occupational and Organizational Psychology, 68,* 157-175.

Ashkenas, R., Ulrich, D., Jick, T., & Kerr, S. (2015). *The boundaryless organization: Breaking the chains of organizational structure.* 2nd edition. San Francisco, CA: John Wiley & Sons.

Attride-Stirling, J. (2001). Thematic networks: an analytic tool for qualitative research. *Qualitative Research, 1*(3), 385-405.

Austin, J. R. (2003). Transactive memory in organizational groups: the effects of content, consensus, specialization, and accuracy on group performance. *Journal of Applied Psychology, 88*(5), 866.

Baird, L., & Henderson, J. C. (2001). The knowledge engine: How to create fast cycles of knowledge-to-performance and performance-to-knowledge. San Francisco: Berrett-Koehler Publishers.

Bakker, A. B., & Bal, M. P. (2010). Weekly work engagement and performance: A study among starting teachers. *Journal of Occupational and Organizational Psychology, 83*(1), 189-206.

Bakker, A. B., & Demerouti, E. (2007). The job demands-resources model: State of the art. *Journal of Managerial Psychology, 22*(3), 309-328.

Bakker, A. B., Demerouti, E., & Verbeke, W. (2004). Using the job demands-resources model to predict burnout and performance. *Human Resource Management, 43*(1), 83-104.

Bakshy, E., Rosenn, I., Marlow, C., & Adamic, L. (2012). The role of social networks in information diffusion. *Proceedings of ACM WWW (April 16-20, 2012, Lyon, France).*

Bansal, P. & Corley, K. (2011). From the editors. The coming of age for qualitative research: Embracing the diversity of qualitative methods. *Academy of Management Journal, 54,* 233–237.

Barley, S. R. (1986) Technicians in the workplace: Ethnographic evidence for bringing work into organization studies. *Administrative Science Quarterly, 41(3),* 404-441.

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173.

Barry, B., & Fulmer, I. (2004). The Medium and the Message: The Adaptive Use of Communication Media in Dyadic Influence. *The Academy of Management Review, 29*(2), 272-292.

Bartol, K. M., Martin, D. C. (1998) *Management*. New York: McGraw Hill College.

Barton, K. (2001). *Connecting with success: How to build a mentoring network to fast-forward your career.* Palo Alto, CA: Davies-Black.

BBC (2011a). *How Facebook changed the world: The Arab Spring.* Aired on 5th September, 2011, BBC 2. Retrieved from: http://www.bbc.co.uk/programmes/b014grsr

BBC (2011b). Phone hacking scandal: who's linked to who? *BBC News UK,* 13th September 2011. Retrieved from: http://www.bbc.co.uk/news/uk-14846456

Beaumont, L. C., Bolton, L. E., McKay, A., & Hughes, H. P. N. (2014). Rethinking service design: a socio-technical approach to the development of business models. In *Product Development in the Socio-sphere* (pp. 121-141). Springer International Publishing.

Becker, T.E., (2004). Building networks in organizations: a closer look at motivation and behavior. *Paper presented at the Academy of Management Annual Meeting, New Orleans, August.*

Becker, T. E., Atinc, G., Breaugh, J. A., Carlson, K. D., Edwards, J. R., & Spector, P. E. (2016). Statistical control in correlational studies: 10 essential recommendations for organizational researchers. *Journal of Organizational Behavior*, *37*(2), 157-167.

Berg, J. M., Dutton, J. E., & Wrzesniewski, A. (2013). Job crafting and meaningful work. In B. J. Dik, Z. S. Byrne & M. F. Steger (Eds.), *Purpose and meaning in the workplace* (pp. 81-104). Washington, DC: American Psychological Association.

Berg, J. M., Wrzesniewski, A. & Dutton, J. E. (2010). Perceiving and responding to challenges in job crafting at different ranks: When pro-activity requires adaptivity. *Journal of Organizational Behavior*, *31*(2-3), 158-186.

Berger, P. L. & Luckman, T. (1987). *The social construction of reality.* England: Penguin Books.

Bird, J. O. & Ross, C. T. F. (2012). *Mechanical engineering principles.* Oxon: Routledge.

Black, J. S., & Ashford, S. J. (1995). Fitting in or making jobs fit: factors affecting mode of adjustment for new hires. *Human Relations, 48,* 421-437.

Blanchard, B. S., & Fabrycky, W. J. (1990). *Systems engineering and analysis (5th edition).* Harlow, UK: Pearson Education Limited

Blau, G. J., & Katerberg, R. (1982). Toward enhancing research with the social information processing approach to job design. *Academy of Management Review, 7*(4), 543-550.

Bock, G. W., Zmud, R. W., Kim, Y. G., & Lee, J. N. (2005). Behavioral intention formation in knowledge sharing: Examining the roles of extrinsic motivators, social-psychological forces, and organizational climate. *MIS Quarterly*, 87-111.

Boies, K., & Howell, J. M. (2006). Leader–member exchange in teams: An examination of the interaction between relationship differentiation and mean LMX in explaining team-level outcomes. *The Leadership Quarterly*, *17*(3), 246-257.

Bonaccio S., & Dalal R. S. (2006) Advice taking and decision-making: An integrative literature review, and implications for the organizational sciences. *Organizational Behavior and Human Decision Processes, 101,* 127-151.

Bonacich, P. (1987). Power and centrality: A family of measures. *American Journal of Sociology*, *92*(5), 1170-1182.

Bond, R., & Smith, P. B. (1996). Culture and conformity: A meta-analysis of studies using Asch's (1952b, 1956) line judgment task. *Psychological Bulletin*, *119*(1), 111.

Borgatti, S. P., Carley, K. M., & Krackhardt, D. (2006). On the robustness of centrality measures under conditions of imperfect data. *Social Networks*, *28*(2), 124-136.

Borgatti, S. & Cross, R. (2003). A Relational View of Information Seeking and Learning in Social Networks. *Management Science, 49,* 432-445.

Borgatti, S. P., & Everett, M. G. (1992). Notions of position in social network analysis. *Sociological Methodology*, 22, 1-35.

Borgatti, S. P., Everett, M. G. and Freeman, L. C. (2002). *Ucinet for Windows: Software for Social Network Analysis.* Harvard, MA: Analytic Technologies.

Borgatti, S. P., Everett, M. G., & Johnson, J. C. (2013). *Analyzing social networks*. SAGE Publications Limited.

Bourdieu, P. (1997). The Forms of Capital. In A. Halsey, H. Lauder, P. Brown & A. Stuart Wells (Eds.) *Education: Culture, Economy and Society.* Oxford: Oxford University Press.

Brass, D. J. (1981). Structural relationships, job characteristics, and worker satisfaction and performance. *Administrative Science Quarterly, 26,* 331-348.

Brass, D. J. (1985). Men's and women's networks: A study of interaction patterns and influence in an organization. *Academy of Management Journal, 28,* 327-343.

Brass, D. J. (2012). A social network perspective on organizational psychology. In S.W.J. Kozlowski (Ed). *The Oxford handbook of organizational psychology* (pp.667-695). New York, NY: Oxford University Press.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101.

Brayfield, A. H., & Rothe, H. F. (1951). An index of job satisfaction. *Journal of Applied Psychology*, *35*(5), 307.

Brieger, R.L. (2004). The analysis of social networks (pp.505-526). In M. Hardy & A. Bryman. *Handbook of Data Analysis.* London: Sage Publications.

British Psychological Society (2009). *Code of Ethics and Conduct.* Leicester, British Psychological Society.

British Psychological Society. (2014). *Code of Human Research Ethics.* Leicester, British Psychological Society.

Bucciarelli, L. L. (1996). *Designing Engineers.* Cambridge, MA: The MIT Press

Burkhardt, M.E., & Brass, D.J. (1990). Changing patterns or patterns of change: The effect of a change in technology on social network structure and power. *Administrative Science Quarterly, 35,* 104-127.

Burt, R. S. (1986). A note on sociometric order in the general social survey network data. *Social Networks*, *8*(2), 149-189.

Burt, R. S. (1987). A note on missing network data in the general social survey. *Social Networks*, *9*(1), 63-73.

Burt, R. S. (1992). *Structural holes - The social structure of competition*. Cambridge, MA: Harvard University Press.

Burt, R. S. (2004). Structural holes and good ideas. *American Journal of Sociology, 110,* 349-399.

Burt, R. S. (2005). *Brokerage and closure: An introduction to social capital.* Oxford: Oxford University Press.

Burt, R. S., Jannotta, J. E., & Mahoney, J. T. (1998). Personality correlates of structural holes. *Social Networks*, *20*(1), 63-87.

Butler Jr, J. K. (1991). Toward understanding and measuring conditions of trust: Evolution of a conditions of trust inventory. *Journal of Management*, *17*(3), 643-663.

Campbell, J. R. (1996). Early identification of mathematics talent has long-term positive consequences for career contributions. *International Journal of Educational Research*, *25*(6), 497-522.

Campion, M. A., & Berger, C. J. (1990). Conceptual integration and empirical test of job design and compensation relationships. *Personnel Psychology*, *43*(3), 525-553.

Campion, M. A., Medsker, G. J., & Higgs, A. C. (1993). Relations between work-group characteristics and effectiveness: Implications for designing effective work-groups. *Personnel Psychology*, *46*(4), 823-847.

Campion, M. A., & Thayer, P. W. (1985). Development and field evaluation of an interdisciplinary measure of job design. *Journal of Applied Psychology*, *70*(1), 29.

Caplan, R. D. (1971). *Organizational stress and individual strain: A social-psychological study of risk factors in coronary heart disease among administrators, engineers, and scientists.* USA: NASA Case Files.

Caplan, R. D., Cobb, S., French Jr, J. R. P., Harrison, RV, Pinneau, SR Jr.(1975). *Job demands and worker health: Main effects and occupational differences.* Washington, DC: US Government Printing Office.

Caplan, R. D., & Jones, K. W. (1975). Effects of work load, role ambiguity, and type A personality on anxiety, depression, and heart rate. *Journal of Applied Psychology*, *60*(6), 713.

Carter, D. R., DeChurch, L. A., Braun, M. T., & Contractor, N. S. (2015). Social network approaches to leadership: An integrative conceptual review. *Journal of Applied Psychology*, *100*(3), 597.

Cassell, C. M. and Symon, G. (2011). Assessing ‘good’ qualitative research in the work psychology field: A narrative analysis, *Journal of Occupational and Organizational Psychology*, *84*(4), 633-50.

Challenger, R., Leach, D. J., Stride, C. B., & Clegg, C. W. (2012). A new model of job design: Initial evidence and implications for future research. *Human Factors and Ergonomics in Manufacturing & Service Industries*, *22*(3), 197-212.

Cherns, A. (1987). Principles of sociotechnical design revisted. *Human Relations*, *40*(3), 153-161.

Christakis, N. A., & Fowler, J. H. (2009). *Connected: The surprising power of our social networks and how they shape our lives.* NY: Little, Brown and Company.

Cingano, F., & Rosolia, A. (2012). People I know: job search and social networks. *Journal of Labor Economics*, *30*(2), 291-332.

Clarke, V., & Kitzinger, C. (2004). Lesbian and gay parents on talk shows: resistance or collusion in heterosexism?. *Qualitative Research in Psychology*, *1*(3), 195-217.

Clausen, T., Tufte, P., & Borg, V. (2014). Why are they leaving? Causes of actual turnover in the Danish eldercare services. *Journal of Nursing Management*, *22*(5), 583-592.

Clegg, C. W. (1984). The derivation of job designs. *Journal of Organizational Behavior*, *5*(2), 131-146.

Clegg, C. W. (2000). Sociotechnical principles for system design. *Applied Ergonomics*, *31*(5), 463-477.

Clegg, C. W., Robinson, M. A., Davis, M. C., Bolton, L. E., Pieniazek, R. L., & McKay, A. (2017). Applying organizational psychology as a design science: A method for predicting malfunctions in socio-technical systems (PreMiSTS). *Design Science*, *3*.

Clegg, C.W., & Spencer, C. (2007). A circular and dynamic model of the process of job design. *Journal of Occupational and Organizational Psychology*, *80*(2), 321-339.

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*(1), 155.

Cohen, S. G., & Bailey, D. E. (1997). What makes teams work: Group effectiveness research from the shop floor to the executive suite. *Journal of Management*, *23*(3), 239-290.

Constant, D., Kiesler, S., & Sproull, L. (1994). What's Mine Is Ours, or Is It? A Study of Attitudes about Information Sharing. *Information Systems Research, 5,* 400-421.

Cook, R. D., & Weisberg, S. (1982). *Residuals and influence in regression*. New York: Chapman and Hall.

Cordery, J. (2013). Collaborative crafting. *Paper presented at the 74th meeting of the Academy of Management, Philadelphia, Pennsylvania, USA (1 – 5 August).*

Cordery, J. L., Mueller, W. S., & Smith, L. M. (1991). Attitudinal and behavioral effects of autonomous group working: A longitudinal field study. *Academy of Management Journal, 34*(2), 464-476.

Costa, A. C. (2003). Work team trust and effectiveness. *Personnel Review, 32*(5), 605-622.

Costenbader, E., & Valente, T. W. (2003). The stability of centrality measures when networks are sampled. *Social Networks, 25*(4), 283-307.

Cox, T., Griffiths, A., & Leka, S. (2005). Work Organization and Work-Related Stress. *Occupational Hygiene* (3rd ed), 421-432.

Cross, R. & Baird, L. (2000). Technology is not enough: Improving performance by building organizational memory. *Sloan Management Review, 41*(3), 41-54.

Cross, R., Borgatti, S. P., & Parker, A. (2001b). Beyond answers: dimensions of the advice network. *Social Networks, 23*(3), 215-235.

Cross, R., Borgatti, S. & Parker, A. (2002). Making invisible work visible: Using social network analysis to support human networks. *California Management Review, 44*(2), 25-46.

Cross, R., Cowen, A., Vertucci, L. & Thomas, R. (2009). Leading in a connected world: How effective leaders drive results through networks. *Organizational Dynamics 38*(2), 93-105.

Cross, R., Davenport, T. & Cantrell, S. (2003). The social side of high performance. *Sloan Management Review, 45*(1), 20-24.

Cross, R., Ehrlich, K., Dawson, R. & Helferich, J. (2008). Managing collaboration: Improving team effectiveness with a network perspective. *California Management Review, 50*(4), 78-99.

Cross, R., Ernst, C. & Pasmore, W. (2013). A bridge too far? How boundary spanning networks drive organizational change and effectiveness. *Organizational Dynamics, 42*(4), 81-91.

Cross, R. & Funk, F. (1997). Leveraging intellect in small business: Infrastructure to support today's knowledge worker. *Journal of Small Business Strategy, 8*(1), 15-34.

Cross, R. & Parker, A. (2004). *The hidden power of social networks: Understanding how work really gets done in organizations.* Harvard: Harvard Business School Press.

Cross, R., Parker, A., Prusak, L & Borgatti, S. (2001a). Knowing what we know: Supporting knowledge creation and sharing in social networks. *Organizational Dynamics 3*(2), 100-120.

Cross, R. & Sproull, L. (2004). More than an answer: Information relationships for actionable knowledge. *Organization Science, 15*(4), 446-462.

Cross, R., Thomas, R., Dutra, A. & Newberry, C. (2007). Using network analysis to build a new business. *Organizational Dynamics, 36,* 345-362

Cross, R., Thomas, R. & Light, D. (2009). How "who you know" affects what you decide. *Sloan Management Review, 50*(2), 35-42.

Crossley, N., Bellotti, E., Edwards, G., Everett, M. G., Koskinen, J., & Tranmer, M. (2015). *Social network analysis for egonets: Social network analysis for actor-centred networks*. Manchester: Sage.

Cummings, J. N. (2004). Work groups, structural diversity, and knowledge sharing in a global organization. *Management science*, *50*(3), 352-364.

Cummings, J. N. & Cross, R. (2003). Structural properties of work-groups and their consequences for performance. *Social Networks, 25*(3), 197-210.

Daft, R. L., & Weick, K. E. (1984). Toward a model of organizations as interpretation systems. *Academy of Management Review*, *9*(2), 284-295.

Daniels, K., Glover, J., Beesley, N., Wimalasiri, V., Cohen, L., Cheyne, A., & Hislop, D. (2013). Utilizing job resources: Qualitative evidence of the roles of job control and social support in problem solving. *Work & Stress*, *27*(2), 200-221.

Davenport, T. H., & Prusak, L. (1998). *Working knowledge: How organizations manage what they know*. Oxford: Oxford University Press.

Davis, M. C., Challenger, R., Jayewardene, D. N. W., & Clegg, C. W. (2014). Advancing socio-technical systems thinking: A call for bravery. *Applied Ergonomics, 45*(2, Part A), 171-180.

Davis, M. C., Leach, D. J., & Clegg, C. W. (2011). 6 The Physical Environment of the Office: Contemporary and Emerging Issues. *International review of industrial and organizational psychology*, *26*(1), 193-237.

DeChurch, L. A., & Marks, M. A. (2006). Leadership in multiteam systems. *Journal of Applied Psychology*, *91*(2), 311.

De Jonge, J., & Schaufeli, W. B. (1998). Job characteristics and employee well-being: A test of Warr's Vitamin Model in health care workers using structural equation modelling. *Journal of Organizational Behavior*, 387-407.

De Lange, A. H., Taris, T. W., Kompier, M. A., Houtman, I. L., & Bongers, P. M. (2003). "The very best of the millennium": longitudinal research and the demand-control-(support) model. *Journal of Occupational Health Psychology*, *8*(4), 282.

Demerouti, E., & Bakker, A. B. (2011). The job demands-resources model: Challenges for future research. *SA Journal of Industrial Psychology*, *37*(2), 01-09.

Demerouti, E., Bakker, A. B., & Gevers, J. M. (2015). Job crafting and extra-role behavior: The role of work engagement and flourishing. *Journal of Vocational Behavior*, *91*, 87-96.

De Meyer, A. (1991). Tech talk: How managers are stimulating global R&D communication. *MIT Sloan Management Review*, *32*(3), 49.

De Nooy, W., Mrvar, A., & Batagelj, V. (2011). *Exploratory social network analysis with Pajek* (Vol. 27). Cambridge, UK: Cambridge University Press.

De Waard, D. (1996). *The measurement of drivers' mental workload*. Netherlands: Groningen University, Traffic Research Center.

Dierdorff, E. C., & Morgeson, F. P. (2013). Getting what the occupation gives: Exploring multilevel links between work design and occupational values. *Personnel Psychology*, *66*(3), 687-721.

Dietz, T., & Henry, A.D. (2008). Context and the commons. *Proceedings of the National Academy of Sciences*, *105*(36), 13189-13190.

Donald, I., Taylor, P., Johnson, S., Cooper, C., Cartwright, S., & Robertson, S. (2005). Work environments, stress, and productivity: An examination using ASSET. *International Journal of Stress Management*, *12*(4), 409.

Donlan, W. (1985). The social groups of dark age Greece. *Classical Philology*, *80*(4), 293-308.

Douglas, J. D. (1976). *Investigative Social Research.* Beverly Hills, Cal: Sage

Drury, M. E., & Robinson, M. A. (2011). The development of an integrated methodological design for examining work tasks and their relationship with job-level outcomes. Abstract

presented at the *British Psychological Society (BPS) Division of Occupational Psychology Annual Conference,* Stratford, UK, 12–14 January.

Duarte, N. T., Goodson, J. R., & Klich, N. R. (1993). How do I like thee? Let me appraise the ways. *Journal of Organizational Behavior, 14*(3), 239-249.

Dunham, R. B., & Smith, F. J. (1979). *Organizational surveys: An internal assessment of organizational health*. NY: Scott Foresman.

Easterby-Smith, Golden-Biddle, K. & Locke, K. (2008). Working With Pluralism. Determining Quality in Qualitative Research. *Organizational Research Methods, 11*(3), 419-429.

Eden, C., & Huxham, C. (1996). Action research for management research. *British Journal of Management*, *7*(1), 75-86.

Edwards, G. (2010). *Mixed-Method Approaches to Social Network Analysis.* UK: ESRC National Centre for Research Methods.

Elliot, C. and Deasley P. (2007). *Creating systems that work: principles of engineering systems for the 21st century.* London: Royal Academy of Engineering.

Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, *62*(1), 107-115.

Epitropaki, O., & Martin, R. (1999). The impact of relational demography on the quality of leader-member exchanges and employees' work attitudes and well-being. *Journal of Occupational and Organizational Psychology*, *72*(2), 237-240.

Ericsson, K. A. (2006). The influence of experience and deliberate practice on the development of superior expert performance. In K. A. Ericsson, N. Charness, P. Feltovich, and R. R. Hoffman, R. R. (Eds.). *Cambridge handbook of expertise and expert performance* (pp. 685-706). Cambridge, UK: Cambridge University Press.

Evans, P., & Bartolome, F. (1980). *Must success cost so much?* London: Grant McIntyre.

Faragher, E. B., Cass, M., & Cooper, C. L. (2005). The relationship between job satisfaction and health: a meta-analysis. *Occupational and Environmental Medicine*, *62*(2), 105-112.

Feigenbaum, E. A. (1979). Themes and case studies of knowledge engineering. *Expert Systems in the Micro-Electronic Age*, 3-25.

Field, A. (2013). *Discovering statistics using IBM SPSS statistics* (4th ed). London: Sage.

Fleming, Q. W. and Koppelman, J. M. (1996). Integrated project development teams: another fad ... or a permanent change? *International Journal of Project Management, 14*(3), 163-168.

Forret, M. L., & Dougherty, T. W. (2004). Networking behaviors and career outcomes: differences for men and women. *Journal of Organizational Behavior, 25*(3), 419-437.

Frazer, E., & Lacey, N. (1993). *The politics of community: A feminist critique of the liberal-communitarian debate* (pp. 78-88). Hemel Hempstead: Harvester Wheatsheaf.

Fredrickson, J. W. (1986). The strategic decision process and organizational structure. *Academy of Management Review, 11*(2), 280-297.

Frese, M., Kring, W., Soose, A., & Zempel, J. (1996). Personal initiative at work: Differences between East and West Germany. *Academy of Management Journal, 39*(1), 37-63.

Fricke, M. (2009). The knowledge pyramid: a critique of the DIKW hierarchy. *Journal of Information Science, 35(*2), 131-142.

Fried, Y., Cummings, A. & Oldham, G. (1998). Training. In Poole, M., Warner, M. (Eds), *IEBM Encyclopaedia of Human Resource Management.* London: Thomson

Garrett, D. & Hodkinson, P. (1998). Can There Be Criteria for Selecting Research Criteria? – a hermeneutical analysis of an inescapable dilemma. *Qualitative Inquiry, 4,* 515-539.

Garvin, D. (2000). *Learning in Action: A guide to putting the learning organization to work.* Boston: Harvard Business School Press.

George, G. (2016). Management Research in AMJ: Celebrating Impact While Striving for More. *Academy of Management Journal, 59*(6), 1869-1877.

Gerhart, B., Wright, P. M., Mahan, G. C., & Snell, S. A. (2000). Measurement error in research on human resources and firm performance: how much error is there and how does it influence effect size estimates? *Personnel Psychology, 53*(4), 803-834.

Gerstner, C. R., & Day, D. V. (1997). Meta-Analytic review of leader–member exchange theory: Correlates and construct issues. *Journal of Applied Psychology, 82*(6), 827-844.

Gibbert, M., & Krause, H. (2002). *Practice exchange in a best practice marketplace: Knowledge management case book.* Chicago: Siemens best practices.

Gillespie, N. A., & Mann, L. (2004). Transformational leadership and shared values: The building blocks of trust. *Journal of Managerial Psychology, 19*(6), 588-607.

Goh, S. C. (2002). Managing effective knowledge transfer: an integrative framework and some practical implications. *Journal of Knowledge Management, 6*(1), 23-30.

Goh, S. K., & Sandhu, M. S. (2013). Knowledge sharing among Malaysian academics: Influence of affective commitment and trust. *The Electronic Journal of Knowledge Management, 11*(1), 38-48.

Gold, A. H., Malhotra, A. & Segars, A. H. (2001). Knowledge management: An organizational capabilities perspective. *Journal of Management Information Systems 18(1),* 185-214.

Gopher, D., & Braune, R. (1984). On the psychophysics of workload: Why bother with subjective measures?. *Human Factors*, *26*(5), 519-532.

Graen, G., Novak, M. A., & Sommerkamp, P. (1982). The effects of leader—member exchange and job design on productivity and satisfaction: Testing a dual attachment model. *Organizational Behavior and Human Performance*, *30*(1), 109-131.

Graen, G. B., & Uhl-Bien, M. (1995). Relationship-based approach to leadership: Development of leader-member exchange (LMX) theory of leadership over 25 years: Applying a multi-level multi-domain perspective. *The Leadership Quarterly*, *6*(2), 219-247.

Granovetter, M.S. (1982). The strength of weak lies: A network theory revisited. In P.V. Marsden & N. Lin (Eds.), *Social Structure and Network Analysis (pp. 105-130).* Beverly Hills. CA: Sage.

Granovetter, M.S. (1974). *Getting a Job: A Study of Contacts and Careers.* Cambridge, Mass.: Harvard University Press.

Granovetter, M.S. (1973). The strength of weak ties. *American Journal of Sociology, 6,* 1360-1380.

Grant, A. M. (2007). Relational job design and the motivation to make a prosocial difference. *Academy of Management Review, 32*(2), 393-417.

Grant, A. M., Fried, Y., Parker, S. K., & Frese, M. (2010). Putting job design in context: Introduction to the special issue. *Journal of Organizational Behavior, 31*(2-3), 145-157.

Grant, A. M., & Parker, S. K. (2009). Redesigning work design theories: the rise of relational and proactive perspectives. *The Academy of Management Annals, 3*(1), 317-375.

Greenhaus, J. H., Parasuraman, S., & Wormley, W. M. (1990). Effects of race on organizational experiences, job performance evaluations, and career outcomes. *Academy of Management Journal, 33,* 64-86.

Guba E. and Lincoln Y. (1994). Competing paradigms in qualitative research. In Handbook of Qualitative Research (Denzin N. & Lincoln Y., eds), Sage, Thousand Oaks, CA, pp. 105–117, cited in Bryman A. (2001) *Social Research Methods.* Oxford: Oxford University Press.

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods, 18*(1), 59-82.

Guzzo, R. A. & Dickson, M. W. (1996). Teams in organizations: Recent research on performance and effectiveness. *Annual Review of Psychology, 47,* 307-338.

Hackman, J. R. 1987. The design of work teams. J. W. Lorsch, ed. Handbook of Organizational Behavior. Prentice-Hall, Englewood Cliffs, NJ, 67–102.

Hackman, J. R., & Lawler, E. E. (1971). Employee reactions to job characteristics. *Journal of Applied Psychology*, *55*(3), 259.

Hackman, J. R., & Oldham, G. R. (1976). Motivation through the design of work: Test of a theory. *Organizational Behavior and Human Performance*, *16*(2), 250-279.

Hage, J., Aiken, M., & Marrett, C. B. (1971). Organization structure and communications. *American Sociological Review,* 25, 860-871.

Hall, D. T. (1996). *The career is dead. Long live the career: A relational approach to careers.* San Francisco: Jossey-Bass.

Hammersley, M. (2008). Troubles with triangulation. *Advances in Mixed Methods Research*, 22-36.

Hanneman, R. A. & Riddle, M. (2005). *Introduction to Social Network Methods.* Riverside, CA: University of California, Riverside.

Hansen, M. T. (2002). Knowledge networks: explaining effective knowledge sharing in multiunit companies. *Organization Science, 13*(3), 232-248.

Harrison, D. A., & Humphrey, S. E. (2010). Designing for diversity or diversity for design? Tasks, interdependence, and within-unit differences at work. *Journal of Organizational Behavior, 31*(2-3), 328-337.

Hayes, A. F. (2015). An index and test of linear moderated mediation. *Multivariate Behavioral Research*, *50*(1), 1-22.

Hedges, L. V., & Pigott, T. D. (2004). The power of statistical tests for moderators in meta-analysis. *Psychological Methods*, *9*(4), 426.

Henderson, D. J., Liden, R. C., Glibkowski, B. C., & Chaudhry, A. (2009). LMX differentiation: A multilevel review and examination of its antecedents and outcomes. *The Leadership Quarterly*, *20*(4), 517-534.

Hill, S. G., Iavecchia, H. P., Byers, J. C., Bittner Jr, A. C., Zaklade, A. L., & Christ, R. E. (1992). Comparison of four subjective workload rating scales. *Human Factors*, *34*(4), 429-439.

Hinds, P., & Kiesler, S. (1995). Communication across boundaries: Work, structure, and use of communication technologies in a large organization. *Organization Science*, *6*(4), 373-393.

Hodgkinson, G. P., & Healey, M. P. (2008). Cognition in organizations. *Annual Review of Psychology*, *59*, 387-417.

Hofman, J., Dries, N., & Pepermans, R. (2008). The career satisfaction scale: Response bias among men and women. *Journal of Vocational Behavior*, *73*, 397-403.

Hoppe, B. & Reinelt, C. (2010). Social network analysis and the evaluation of leadership networks. *The Leadership Quarterly, 21*, 600-619.

Hornung, S., Rousseau, D. M., & Glaser, J. (2008). Creating flexible work arrangements through idiosyncratic deals. *Journal of Applied Psychology*, *93*(3), 655.

Hornung, S., Rousseau, D. M., Glaser, J., Angerer, P., & Weigl, M. (2010). Beyond top-down and bottom-up work redesign: Customizing job content through idiosyncratic deals. *Journal of Organizational Behavior*, *31*(2-3), 187-215.

Horton, N. J., & Kleinman, K. P. (2007). Much ado about nothing: A comparison of missing data methods and software to fit incomplete data regression models. *The American Statistician, 61*(1), 79–90.

Howitt, D., & Cramer, D. (2007). *Introduction to research methods in psychology*. NY: Pearson Education.

Hsu, C. L., & Lin, J. C. C. (2008). Acceptance of blog usage: The roles of technology acceptance, social influence and knowledge sharing motivation. *Information & Management, 45*(1), 65-74.

Huczynski, A., & Buchanan, D. A. (2010). *Organizational Behaviour*. NY: Prentice Hall.

Hughes, H. P. N., Clegg, C. W., Bolton, L. E., & Machon, L. C. (2017). Systems scenarios: a tool for facilitating the socio-technical design of work systems. *Ergonomics*, 1-17.

Hughes, H. P. N., Clegg, C. W., Robinson, M. A., & Crowder, R. M. (2012). Agent-based modelling and simulation: The potential contribution to organizational psychology. *Journal of Occupational and Organizational Psychology, 85*(3), 487-502.

Huisman, M. (2009). Imputation of missing network data: Some simple procedures. *Journal of Social Structure, 10*(1), 1-29.

Huisman, M., & Steglich, C. (2008). Treatment of non-response in longitudinal network studies. *Social Networks, 30*(4), 297-308.

Humphrey, S. E., Nahrgang, J. D., & Morgeson, F. P. (2007). Integrating motivational, social, and contextual work design features: a meta-analytic summary and theoretical extension of the work design literature. *Journal of Applied Psychology, 92*(5), 1332-1356.

Hutcheson, G. D., & Sofroniou, N. (1999). *The multivariate social scientist: Introductory statistics using generalized linear models*. London: Sage.

Huynh, T. D., Jennings, N. R., & Shadbolt, N. R. (2006). An integrated trust and reputation model for open multi-agent systems. *Autonomous Agents and Multi-Agent Systems, 13*(2), 119-154.

Ilgen, D. R., Hollenbeck, J. R., Johnson, M., & Jundt, D. (2005). Teams in organizations: From input-process-output models to IMOI models. *Annual Review of Psychology, 56*, 517-543.

Ilies, R., Nahrgang, J. D., & Morgeson, F. P. (2007). Leader-member exchange and citizenship behaviors: a meta-analysis. *Journal of Applied Psychology, 92*(1), 269-277.

Inkpen, A. C., & Tsang, E. W. (2005). Social capital, networks, and knowledge transfer. *Academy of Management Review, 30*(1), 146-165.

Jacobides, M. G. (2007). The inherent limits of organizational structure and the unfulfilled role of hierarchy: Lessons from a near-war. *Organization Science, 18*(3), 455-477.

Jaikumar, R., & Bohn, R. E. (1986). *The development of intelligent systems for industrial use: A conceptual framework*. Jai Press.

Janis, I. L. (1971). Groupthink. *Psychology Today*, *5*(6), 43-46.

Johnson, P., Buehring, A., Cassell, C. & Symon, G. (2006). Evaluating qualitative management research: Towards a contingent criteriology. *International Journal of Management Reviews*, *8*(3), 131-156.

Johnson, S., Cooper, C., Cartwright, S., Donald, I., Taylor, P., & Millet, C. (2005). The experience of work-related stress across occupations. *Journal of Managerial Psychology*, *20*(2), 178-187.

Jones, G.R. & George, J.M. (1998). The experience and evolution of trust: implications for cooperation and teamwork *Academy of Management Review*, *23*(3), 531-546.

Judge, T. A., Bono, J. E., & Locke, E. A. (2000). Personality and job satisfaction: The mediating role of job characteristics. *Journal of Applied Psychology*, *85*(2), 237.

Judge, T. A., Boudreau, J. W., & Bretz, R. D. (1994). Job and life attitudes of male executives. *Journal of Applied Psychology*, *79*(5), 767.

Juillerat, T. L. (2010). Friends, not foes?: Work design and formalization in the modern work context. *Journal of Organizational Behavior*, *31*(2-3), 216-239.

Kalyuga, S., Ayres, P., Chandler, P., & Sweller, J. (2003). The expertise reversal effect. *Educational Psychologist*, *38*(1), 23-31.

Kang, S. C., Morris, S. S., & Snell, S. A. (2007). Relational archetypes, organizational learning, and value creation: Extending the human resource architecture. *Academy of Management Review*, *32*(1), 236-256.

Karasek Jr, R. A. (1979). Job demands, job decision latitude, and mental strain: Implications for job redesign. *Administrative Science Quarterly*, *24*, 285-308.

Katz, D., & Kahn, R.L. (1978). *The Social Psychology of Organizations (2nd ed.).* New York: Wiley.

Kilduff, M., & Brass, D.J. (2010). Job design: A social network perspective. *Journal of Organizational Behavior*, *31*(2-3), 309-318.

King, N. (2012). Doing template analysis. In G. Symon and C. M. Cassell (eds.) *Qualitative organizational research: core methods and key challenges.* London, Sage.

Knapp, S., & VandeCreek, L. (2003). An overview of the major changes in the 2002 APA Ethics Code. *Professional Psychology: Research and Practice, 34*(3), 301.

Knoke, D., & Yang, S. (2008). *Social network analysis* (Vol. 154). NY: Sage.

Kossinets, G. (2006). Effects of missing data in social networks. *Social Networks, 28*(3), 247-268.

Krackhardt, D. & Hanson, J. R. (1993). Informal networks: The company behind the chart. *Harvard Business Review, 71*(4), 104-111.

Krackhardt, D., & Stern, R. N. (1988). Informal networks and organizational crises: An experimental simulation. *Social Psychology Quarterly, 51*(2), 123-140.

Kulik, C. T., Oldham, G. R., & Hackman, J. R. (1987). Work design as an approach to person-environment fit. *Journal of Vocational Behavior, 31*(3), 278-296.

Lakoff, G. (1987). *Women, Fire, and Dangerous Things: What Categories Reveal about the Mind.* Chicago: University of Chicago Press.

Langan-Fox, J., Wirth, A., Code, S., Langfield-Smith, K., & Wirth, A. (2001). Analyzing shared and team mental models. *International Journal of Industrial Ergonomics, 28*(2), 99-112.

Laumann, E. O., Marsden, P. V., & Prensky, D. (1989). The Boundary Specification Problem in Network Analysis *Research Methods in Social Network Analysis* (pp. 61-87). Fairfax, VA: George Mason University Press

Leach, D. & Searle, B. (2009). *A new scale of job crafting.* Unpublished

Leana, C. Appelbaum, E. & Shevchuk, I. (2009). Work process and quality of care in early childhood education: The role of job crafting. *Academy of Management Journal, 24,* 413-434.

Leavitt, H. J. (1951). Some effects of certain communication patterns on group performance. *The Journal of Abnormal and Social Psychology, 46*(1), 38.

Lee, P., Gillespie, N., Mann, L., & Wearing, A. (2010). Leadership and trust: Their effect on knowledge sharing and team performance. *Management Learning, 41*(4) 473–491.

Leech, N. L., & Onwuegbuzie, A. J. (2009). A typology of mixed methods research designs. *Quality & Quantity, 43*(2), 265-275.

Lefkowitz, J. (2003). *Ethics and values in industrial-organizational psychology*. Chicago: Psychology Press.

Lelkes, Y., Krosnick, J. A., Marx, D. M., Judd, C. M., & Park, B. (2012). Complete anonymity compromises the accuracy of self-reports. *Journal of Experimental Social Psychology, 48,* 1291–1299.

LePine, J. A., Erez, A., & Johnson, D. E. (2002). The nature and dimensionality of organizational citizenship behavior: a critical review and meta-analysis. *Journal of Applied Psychology, 87*(1), 52-65.

LePine, J. A., Piccolo, R. F., Jackson, C. L., Mathieu, J. E. and Saul, J. R. (2008). A meta-analysis of teamwork processes: Tests of a multidimensional model and relationships with team effectiveness criteria. *Personnel Psychology, 61,* 273–307.

Leseure, M. J., & Brookes, N. J. (2001). Micro knowledge management: A job design framework. In R. Rajkumar (Ed.), *Industrial Knowledge Management* (pp. 163-177). Springer London.

Loury, L. D. (2006). Some contacts are more equal than others: Informal networks, job tenure, and wages. *Journal of Labor Economics*, *24*(2), 299-318.

Lyons, P. (2008). The crafting of jobs and individual differences. *Journal of Business and Psychology, 23,* 25-36.

Macy, B. A., & Izumi, H. (1993). Organizational change, design, and work innovation: a meta-analysis of 131 North American field studies—1961–1991. *Research in Organizational Change and Development*, *7*, 235-313.

Malby, R., & Mervyn, K. (2012). *Summary from the literature to inform the Health Foundation Questions. The Health Foundation Networks Programme.* Leeds: Centre for Innovation in Health Management, University of Leeds.

Marin, A., & Wellman, H. C. (2011). Social Network Analysis: An Introduction. In J. Scott & P. J. Carrington (Eds.), *The Sage Handbook of Social Network Analysis* (pp. 11-25). Thousand Oaks, CA: Sage Publications

Marks, M. A., DeChurch, L. A., Mathieu, J. E., Panzer, F. J., & Alonso, A. (2005). Teamwork in multiteam systems. *Journal of Applied Psychology, 90,* 964−971

Marks, M. A., Mathieu, J. E., & Zaccaro, S. J. (2001). A temporally based framework and taxonomy of team processes. *Academy of Management Review, 26*(3), 356−376

Mathieu, J. E., Heffner, T. S., Goodwin, G. F., Salas, E. & Cannon-Bowers, J. A. (2000). The influence of shared mental models on team process and effectiveness. *Journal of Applied Psychology, 85,* 273-283.

Mathieu, J. E., Tannenbaum, S. I., Donsbach, J. S., & Alliger, G. M. (2013). Achieving optimal team composition for success. *Developing and enhancing high-performance teams: Evidence-based practices and advice. San Francisco: Jossey-Bass*.

Maynard, M. T., Gilson, L. L., & Mathieu, J. E. (2012). Empowerment—fad or fab? A multilevel review of the past two decades of research. *Journal of Management*, *38*(4), 1231-1281.

McClelland, G. P., Leach, D. J., Clegg, C. W., & McGowan, I. (2014). Collaborative crafting in call centre teams. *Journal of Occupational and Organizational Psychology*, *87*(3), 464-486.

McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology*, *27*(1), 415-444.

Medhat, S. S. & Rook, J. L. (1997). Concurrent engineering processes and techniques for the agile manufacturing enterprise. *IIE Conference Publication, 435,* 9-14.

Medved, M. I., & Brockmeier, J. (2004). Making sense of traumatic experiences: Telling your life with fragile X syndrome. *Qualitative Health Research*, *14*(6), 741-759.

Menard, S. (2000). Coefficients of determination for multiple logistic regression analysis. *The American Statistician*, *54*(1), 17-24.

Miles, C. C. & Snow, R. E. (1986). Organizations: new concepts for new forms. *California Management Review, 28*(2), 68-73.

Miles, C. C., and Snow, R. E. (1995). The new network firm: A spherical structure built on a human investment philosophy. *Organizational Dynamics, 23*(4), 5–20.

Miles, J., & Shevlin, M. (2001). *Applying regression and correlation: A guide for students and researchers*. London: Sage.

Miles, M. B., & Huberman, A. M. (1994). Qualitative data analysis: A sourcebook. *Beverly Hills: Sage Publications*.

Milkman, K.L., Chugh, D., & Bazerman, M.H. (2009). How can decision making be improved? *Perspectives on Psychological Science, 4*(4), 379-383.

Mitchell, J. C. (1969). *The concept and use of social networks*. Dallas: Bobbs-Merrill.

Mizruchi, M. S., & Stearns, L. B. (2001). Getting deals done: The use of social networks in bank decision making. *American Journal of Sociology, 66,* 647-671.

Moldoveanu, M. C., & Baum, J. A. (2011). "I Think You Think I Think You're Lying": The Interactive Epistemology of Trust in Social Networks. *Management Science*, *57*(2), 393-412.

Mooradian, T., Renzl, B., & Matzler, K. (2006). Who trusts? Personality, trust and knowledge sharing. *Management Learning*, *37*(4), 523-540.

Moray, N. (1979). Models and measures of mental workload (pp. 13-21). USA: Springer.

Morgan, G. (2006). *Images of Organization*. Thousand Oaks, CA.: Sage Publications.

Morgeson, F. P., & Campion, M. A. (2003). Work design. In W. Borman, D. Ilgenn, R. Klimoski (Eds). *Handbook of psychology*: Industrial and Organizational Psychology. (Vol 12, pp.423-252). Hoboken NJ: Wiley.

Morgeson, F. P., & Humphrey, S. E. (2006). The Work Design Questionnaire (WDQ): developing and validating a comprehensive measure for assessing job design and the nature of work. *Journal of Applied Psychology*, *91*(6), 1321.

Mullen, B., Johnson, C., & Salas, E. (1991). Effects of communication network structure: Components of positional centrality. *Social Networks, 13,* 169-186.

Myers, R. H. (1990). Classical and Modern Regression with Applications (2nd Ed). Boston, PWS-Kent.

Nebus, J. (2006). Building collegial information networks: A theory of advice network generation. *Academy of Management Review*, *31*(3), 615-637.

Nicholson, N. (1984). A theory of work role transitions. *Administrative Science Quarterly, 29,* 172-191.

Nicholson, N., & West, M. A. (1988). *Managerial job change: Men and women in transition.* Cambridge: Cambridge University Press.

Nielsen, K., & Abildgaard, J. S. (2012). The development and validation of a job crafting measure for use with blue-collar workers. *Work & Stress, 26*(4), 365-384.

North, M. J., & Macal, C. M. (2007). *Managing business complexity: Discovering strategic solutions with agent-based modeling and simulation.* New York, Oxford University Press.

Oldham, G. R., & Hackman, J. R. (2010). Not what it was and not what it will be: the future of job design research. *Journal of Organizational Behavior, 31,* 463-479.

Ottens, M., Franssen, M., Kroes, P. and van de Poel, I. (2005). 8.1.1 Systems engineering of socio-technical systems. *INCOSE International Symposium, 15,* 1122–1130.

Pace, R. W. (1983). *Organizational communication, foundations for human resource development.* London, Prentice Hall.

Pahl, G., & Beitz, W. (1996). Translated by K. Wallace (Ed.), *Engineering design: A systematic approach (2nd ed.).* London: Springer.

Parker, S.K. (1998). Enhancing role breadth self-efficacy: The roles of job enrichment and other organizational interventions. *Journal of Applied Psychology, 83,* 835-852.

Parker, S. K. (2014). Beyond motivation: Job and work design for development, health, ambidexterity, and more. *Annual Review of Psychology, 65,* 661-691.

Parker, S. K. (2015). Job Design. *Wiley Encyclopedia of Management. 5,* 1–5.

Parker, S., & Wall, T. D. (1998). *Job and work design: Organizing work to promote well-being and effectiveness* (Vol. 4). London: Sage.

Parker, S. K., Wall, T. D., & Cordery, J. L. (2001). Future work design research and practice: Towards an elaborated model of work design. *Journal of Occupational and Organizational psychology*, *74*(4), 413-440.

Parker, S. K., Wall, T. D., & Jackson, P. R. (1997). "That's not my job": Developing flexible employee work orientations. *Academy of Management Journal*, *40*(4), 899-929.

Parker, S. K., & Sprigg, C. A. (1999). Minimizing strain and maximizing learning: the role of job demands, job control, and proactive personality. *Journal of Applied Psychology*, *84*(6), 925.

Parsaei, H. R., & Sullivan, W. G. (2012). *Concurrent engineering: Contemporary issues and modern design tools.* Dordrecht, Springer science and business media.

Patrashkova-Volzdoska, R. R., McComb, S. A., Green, S. G., & Compton, D. (2003). Examining a curvilinear relationship between communication frequency and team

performance in cross-functional project teams. *IEEE Transactions on Engineering Management, 50(3),* 262-269.

Patton, M. Q. (2005). *Qualitative research*. UK, John Wiley & Sons, Ltd.

Petrou, P., Demerouti, E., Peeters, M. C., Schaufeli, W. B., & Hetland, J. (2012). Crafting a job on a daily basis: Contextual correlates and the link to work engagement. *Journal of Organizational Behavior*, *33*(8), 1120-1141.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879.

Pollock, T.G., Whitbread, R.C., & Contractor, N. (2000). Social information processing and job characteristics: A simultaneous test of two theories with implications for job satisfaction. *Human Communication Research, 26,* 292-330.

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. *Multivariate Behavioral Research*, *42*(1), 185-227.

Prell, C. (2012). *Social network analysis: History, theory and methodology*. UK, Sage.

Pugh, D. S., Hickson, D. J., Hinings, C. R., & Turner, C. (1968). Dimensions of organization structure. *Administrative Science Quarterly*, 65-105.

QSR International Pty Ltd. (2012). *NVivo qualitative data analysis software.* Version 10, 2012.

Reagans, R., & McEvily, B. (2003). Network structure and knowledge transfer: The effects of cohesion and range. *Administrative Science Quarterly, 48*(2), 240-267.

Reinhardt, W., Schmidt, B., Sloep, P. and Drachsler, H. (2011). Knowledge worker roles and actions—Results of two empirical studies. *Knowledge Process Management, 18,* 150–174.

Riessman, C. K. (1994). *Qualitative studies in social work research*. UK: Sage Publications.

Robinson, M. A. (2010). An empirical analysis of engineers' information behaviors. *Journal of the American Society for information Science and technology, 61*(4), 640-658.

Robinson, M. A. (2012). How design engineers spend their time: Job content and task satisfaction. *Design Studies, 33(4),* 391–425.

Robinson, M. A. (2016). Quantitative research principles and methods for human-focused research in engineering design. In P. Cash, T. Stanković, & Štorga, M. (Eds.), *Experimental design research: Exploring complex design activity* (pp. 41–64). Cham, Switzerland: Springer.

Robinson, M. A. & Jackson, H. P. N. (2007). *HIPARSYS Work Package 3 (WP3): Framework outlining variables, definitions, and research methods to be employed.* Leeds, UK: Technology Strategy Board.

Rodan, S., & Galunic, C. (2004). More than network structure: How knowledge heterogeneity influences managerial performance and innovativeness. *Strategic Management Journal*, *25*(6), 541-562.

Rogelberg, S. G., & Stanton, J. M. (2007). Introduction: Understanding and dealing with organizational survey nonresponse. *Organizational Research Methods, 10*(2), 195-209.

Roulston, K. (2001). Data analysis and 'theorizing as ideology'. *Qualitative Research, 1*(3), 279-302.

Rousseau, D. M. (1998). The 'problem' of the psychological contract considered. *Journal of Organizational Behavior, 19,* 665-671.

Rousseau, D. M., Ho, V. T., & Greenberg, J. (2006). I-deals: Idiosyncratic terms in employment relationships. *Academy of Management Review, 31*(4), 977-994.

Ruggles, R. (1998). The state of the notion: Knowledge management in practice. *California Management Review, 40*(3), 80-89.

Salancik, G. R. (1995). WANTED: A Good Network Theory of Organization. *Administrative Science Quarterly, 40*(2), 345-349.

Salancik, G. R., & Pfeffer, J. (1978). A social information processing approach to job attitudes and task design. *Administrative Science Quarterly*, 224-253.

Salas, E., Cooke, N. J., & Rosen, M. A. (2008). On teams, teamwork, and team performance: Discoveries and developments. *Human Factors*, *50*(3), 540-547.

Salas, E., Stagl, K. C., & Burke, S. (2004). 25 years of team effectiveness in organisations: research themes and emerging needs, pp. 47-91. In Cooper, CL. and Robertson I.T. (eds.) *International Review of Industrial and Organisational Psychology Volume 19.* London: John Wiley & Sons Ltd.

Scarpello, V., & Campbell, J. P. (1983). Job satisfaction: Are all the parts there?. *Personnel Psychology*, *36*(3), 577-600.

Schafer, J. L., & Graham, J. W. (2002). Missing data: our view of the state of the art. *Psychological Methods*, *7*(2), 147.

Scott, J. (2013). *Social Network Analysis* (3rd ed.). London: Sage Publications.

Seale, C. (1999). Quality in qualitative research. *Qualitative Inquiry*, *5*(4), 465-478.

Searle, R. H., & Ball, K. S. (2003). Supporting innovation through HR policy: evidence from the UK. *Creativity and Innovation Management*, *12*(1), 50-62.

Searle, R., Den Hartog, D. N., Weibel, A., Gillespie, N., Six, F., Hatzakis, T., & Skinner, D. (2011). Trust in the employer: The role of high-involvement work practices and procedural justice in European organizations. *The International Journal of Human Resource Management*, *22*(05), 1069-1092.

Shaw, M. E. (1964). Communication networks. *Advances in Experimental Social Psychology*, *1*, 111-147.

Shepherd, C. (2008). *Exploring knowledge sharing networks in <company name redacted>*. UK, University of Leeds.

Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods*, *7*(4), 422-445.

Sims, H. P., Szilagyi, A. D., & Keller, R. T. (1976). The measurement of job characteristics. *Academy of Management Journal*, *19*(2), 195-212.

Škerlavaj, M., Dimovski, V., & Desouza, K. C. (2010). Patterns and structures of intra-organizational learning networks within a knowledge-intensive organization. *Journal of Information Technology*, *25(2)*, 189-204.

Slemp, G. R., & Vella-Brodrick, D. A. (2014). Optimising employee mental health: the relationship between intrinsic need satisfaction, job crafting, and employee well-being. *Journal of Happiness Studies*, *15*(4), 957-977.

Smith, L. M. (1990). Ethics in qualitative field research: An individual perspective. *Qualitative Inquiry in Education: The Continuing Debate*, 258-276.

Smith, K.G., Smith, K.A., Olian, J.D., Sims (Jnr), H.P., O'Bannon, D.P.O, & Scully, J.A. (1994). Top management team demography and process: The role of social integration and communication. *Administrative Science Quarterly*, *39*(3), 412-439.

Smith, M., & Bourke, S. (1992). Teacher stress: Examining a model based on context, workload, and satisfaction. *Teaching and Teacher Education*, *8*(1), 31-46.

Spector, P. E. (1992). A consideration of the validity and meaning of self-report measures of job conditions. *International Review of Industrial and Organizational Psychology West Sussex, England: John Wiley*, 123.

Sproull, L. & Kiesler, S. (1991). *Connections: New ways of working in the networked organization.* Cambridge, MA: MIT Press

Stork, D., & Richards, W. D. (1992). Nonrespondents in communication network studies problems and possibilities. *Group & Organization Management*, *17*(2), 193-209.

Symon, G. & Cassell, C. M. (2012) Assessing qualitative research. In G. Symon and C. M. Cassell (eds.) *Qualitative organizational research: core methods and key challenges.* London: Sage.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics (5th ed.).* Boston: Allyn and Bacon.

Tajfel, H. (1979). Individuals and groups in social psychology. *British Journal of Clinical Psychology*, *18*(2), 183-190.

Tashakkori, A., & Teddlie, C. (Eds.). (2010). *Sage handbook of mixed methods in social & behavioral research*. London: Sage.

Tattersall, A. J., & Foord, P. S. (1996). An experimental evaluation of instantaneous self-assessment as a measure of workload. *Ergonomics*, *39*(5), 740-748.

Thaler R. H., & Sunstein C. R. (2008). *Nudge: Improving decisions about health, wealth, and happiness.* New Haven, CT. Yale University Press.

Thorngate, W. (1976). " In General" vs." It Depends": Some Comments of the Gergen-Schlenker Debate. *Personality and Social Psychology Bulletin*, *2*(4), 404-410.

Tichy, N. M., Tushman, M. L., & Fombrun, C. (1979). Social network analysis for organizations. *Academy of Management Review*, *4*(4), 507-519.

Tims, M., & Bakker, A. B. (2010). Job crafting: Towards a new model of individual job redesign. *SA Journal of Industrial Psychology*, *36*(2), 1-9.

Tims, M., Bakker, A. B., & Derks, D. (2012). Development and validation of the job crafting scale. *Journal of Vocational Behavior*, *80*(1), 173-186.

Tims, M., Bakker, A. B., & Derks, D. (2015). Examining Job Crafting from an Interpersonal Perspective: Is Employee Job Crafting Related to the Well-Being of Colleagues? *Applied Psychology*, *64*(4), 727-753.

Tims, M., Bakker, A. B., Derks, D., & van Rhenen, W. (2013). Job crafting at the team and individual level: Implications for work engagement and performance. *Group & Organization Management*, *38*(4), 427-454.

Tomarken, A. J. & Waller, N. G. (2005). Structural equation modeling: Strengths, limitations and misconceptions. *Annual Review of Clinical Psychology, 1,* 31-65

Torraco, R. J. (2005). Work design theory: A review and critique with implications for human resource development. *Human Resource Development Quarterly, 16*(1), 85-109.

Totterdell, P., Holman, D., & Hukin, A. (2008). Social networkers: Measuring and examining individual differences in propensity to connect with others. *Social Networks*, *30*(4), 283-296.

Totterdell, P., Niven, K., & Holman, D. (2010). Our emotional neighborhoods. *The Psychologist*, 23, 474-477.

Trist, E. L., & Bamforth, K. W. (1951). Some social and psychological consequences of the Longwall Method of coal-getting: An examination of the psychological situation and defences of a work-group in relation to the social structure and technological content of the work system. *Human Relations*, *4*(1), 3-38.

Turner, A. N., & Lawrence, P. R. (1965). *Industrial jobs and the worker: An investigation of response to task attributes*. Harvard University, Division of Research, Graduate School of Business Administration.

Tushman, M.L. (1977). Special boundary roles in the innovation process. *Administrative Science Quarterly, 22*(4), 587-605.

Tushman, M.L., Lakhani, K. & Lifshitz-Assaf, H. (2012). Open innovation and organizational design. *Journal of Organizational Design, 1*(1), 24-27.

Tsai, W. & Ghoshal, S. (1998). Social capital and value creation: The role of intrafirm networks. *The Academy of Management Journal, 41*(4), 464-476.

Unsworth, K., Yeo, G., & Beck, J. (2014). Multiple goals: A review and derivation of general principles. *Journal of Organizational Behavior*, *35*(8), 1064-1078.

Uzzi, B. (1996). The sources and consequences of embeddedness for the economic performance of organizations. *American Sociological Review, 61(4),* 674-698.

Uzzi, B. (1997). Social structure and competition in interfirm networks: The paradox of embeddedness. *Administrative Science Quarterly, 42(1),* 35-67.

Van den Bulte, C., & Moenaert, R. K. (1998). The effects of R&D team co-location on communication patterns among R&D, marketing, and manufacturing. *Management Science*, *44*(11-part-2), S1-S18.

Van Knippenberg, D., & Schippers, M. C. (2007). Work-group diversity. *Annual Review of Psychology*, *58*, 515-541.

Vecchio, R. P. (1982). A further test of leadership effects due to between-group variation and within-group variation. *Journal of Applied Psychology*, *67*(2), 200.

Vinkenburg, C.J., & Weber, T. (2012). Managerial career patterns: A review of the empirical evidence. *Journal of Vocational Behaviour, 80,* 592-607.

Wageman, R. (1995). Interdependence and group effectiveness. *Administrative Science Quarterly*, *40,* 145-180.

Waldron, M. B., Jelinek, W., Owen, D., & Waldron, K. J. (1987). A study of visual recall differences between experts and naive designers. In *International Conference of Engineering Design (ICED August, 1987)*.

Wallach, M. A., Kogan, N., & Bem, D. J. (1964). Diffusion of responsibility and level of risk taking in groups. *The Journal of Abnormal and Social Psychology*, *68*(3), 263.

Wang, S., & Noe, R. A. (2010). Knowledge sharing: A review and directions for future research. *Human Resource Management Review*, *20*(2), 115-131.

Wanous, J. P., Reichers, A. E., & Hudy, M. J. (1997). Overall job satisfaction: How good are single-item measures? *Journal of Applied Psychology, 82,* 247– 252.

Ward, M. D., Hoff, P. D., & Lofdahl, C. L. (2003). *Identifying international networks: Latent spaces and imputation*. Retrieved from:

https://www.researchgate.net/profile/Michael_Ward12/publication/237440562_Identifying_International_Networks_Latent_Spaces_and_Imputation/links/0046352d055410a170000000.pdf

Wasserman, S., & Faust, K. (1994). *Social network analysis: Methods and applications* (Vol. 8). UK: Cambridge university press.

Watts, D. J. (2004). The "new" science of networks. *Annual Review of Sociology*, *30*, 243-270.

Wegner, D. M. (1997). When the antidote is the poison: Ironic mental control processes. *Psychological Science, 8(3),* 148-150.

Wegner, D. M., Erber, R., & Raymond, P. (1991). Transactive memory in close relationships. *Journal of Personality and Social Psychology*, *61*(6), 923.

West, M., Borrill, C. A., & Unsworth, K. L. (1998). Team effectiveness in organizations. In: *International review of industrial and organizational psychology,* pp. 1-48. Chichester: John Wiley.

White, D. R., & Reitz, K. P. (1983). Graph and semigroup homomorphisms on networks of relations. *Social Networks*, *5*(2), 193-234.

Wierwille, W. W., & Eggemeier, F. T. (1993). Recommendations for mental workload measurement in a test and evaluation environment. *Human Factors*, *35*(2), 263-281.

Willis, R. H. (1965). Conformity, independence, and anticonformity. *Human Relations*, *18*(4), 373-388.

Wright, G., & Ayton, P. (1987). Eliciting and modelling expert knowledge. *Decision Support Systems*, *3*(1), 13-26.

Wrzesniewski, A., & Dutton, J. E. (2001). Crafting a job: revisioning employees as active crafters of their work. *Academy of Management Review*, *26*(2), 179-201.

Xanthopoulou, D., Bakker, A. B., Demerouti, E., & Schaufeli, W. B. (2009). Reciprocal relationships between job resources, personal resources, and work engagement. *Journal of Vocational Behavior*, *74*(3), 235-244.

Yeh, Y. Y., & Wickens, C. D. (1988). Dissociation of performance and subjective measures of workload. *Human Factors*, *30*(1), 111-120.

Yuan, Y. C., Fulk, J., Monge, P. R., & Contractor, N. (2010). Expertise directory development, shared task interdependence, and strength of communication network ties as multilevel

predictors of expertise exchange in transactive memory work-groups. *Communication Research*, *37*(1), 20-47.

Zalesny, M. D., & Farace, R. V. (1987). Traditional versus open offices: A comparison of sociotechnical, social relations, and symbolic meaning perspectives. *Academy of Management Journal*, *30*(2), 240-259.

Zech, S. T., & Gabbay, M. (2016). Social Network Analysis in the Study of Terrorism and Insurgency: From Organization to Politics. *International Studies Review, 18*(2), 214-243.

Zhang, Z. & Peterson, S. J. (2011). Advice networks in teams: The role of transformational leadership and members' core self-evaluations. *Journal of Applied Psychology, 96*(5), 1004-1017.

Zhao, X., Lynch, J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research*, *37*(2), 197-206.

Appendix A: Phase 2 cover letter and questionnaire (off-line version)

Cover letter:

NB: Some details are redacted to maintain confidentiality.

Dear colleague,

This questionnaire forms part of a research project which is being conducted in collaboration with the University of Leeds. The overall objective of the study is to understand, and help to improve, the advice seeking networks between colleagues who will be working together as part of the [redacted] group. This questionnaire represents the 1st phase of the project. You will also receive a follow-up questionnaire after the new [redacted] structure has been more formally established.

Your contribution
By completing this questionnaire you are helping to build up an accurate picture of advice seeking and sharing between colleagues in the [redacted] community. Sharing information is a constant challenge in an organization like ours with such a variety of functions and locations, but it is also critical to achieving our mission and vision. We would like to understand the informal networks and collaboration patterns in the company and ask that you complete the following network questionnaire. This questionnaire will provide insights into how our colleagues interact with one another and identify areas where we can work together more effectively and better leverage our relationships and abilities. Organizational network analysis has already been applied successfully to explore knowledge sharing within [redacted] as part of the recent [redacted] project.

The questionnaire should take less than 30 minutes to complete, and is completed electronically. The questionnaires will be returned directly to researchers at the University of Leeds, where the data will be independently analysed. All researchers involved in this work are bound by a professional code of practice, and all information that you provide will be completely confidential. No-one within [redacted] will ever have access to your individual data, and all data presented back to [redacted] will be based on collective or demographically organised answers, not individual responses. A report summarising the results of the research will be available to participants. Simply select the box at the end of the questionnaire if you would like to receive a copy.

Please follow the instructions provided at the top of the following page to complete the questionnaire, and return it no later than XXX.

Thank you in advance for supporting the research.

[redacted], Head of [redacted]

Questionnaire:

The following document outlines the Phase 2 questionnaire, in terms of the phrasing of the questions and the order in which they were asked. The questionnaire was converted into an online format for dissemination. Information on each of the scales included is provided in the main thesis document, and full references for these are provided in the reference list.

In completing this questionnaire:

- Please complete the questionnaire for your current role in [redacted].
- Please complete all of the questions and answer giving your first reaction.

Some questions may appear to be similar or unexpected. These are not accidental and have been found to be an accurate way of obtaining the views of participants.

Section 1 – Background information

To analyse the data, we need some background information so that we can compare responses across groups. Where appropriate, select from the drop-down menu, or click on the appropriate box to indicate your choice.

1.1 Which site are you located at? (DROP-DOWN OPTIONS - [redacted], UK; [redacted], UK; [redacted], Germany; [redacted], UK; [redacted] (All other sites), UK; [redacted], [redacted], USA; Other - please specify)

1.2 How old are you? (years) (OPEN QUESTION)

1.3 What is your gender? (M/F)

1.4 Which, if any, of these projects are you currently working on? (DROP DOWN LIST of 19 projects FROM SAP; Other)

1.5 What is your job title? (e.g. [redacted], [redacted]) (OPEN QUESTION)

1.6 What is your grade? (e.g. [redacted], [redacted]) (DROP DOWN LIST; Other)

1.7 Are you a manager? (I am not a manager; I am a project manager; I am a line manager (i.e. manage people); I manage both projects and people)

1.8 Are you a contractor? (YES/NO)

1.9 How long have you worked for [redacted]? (years) (OPEN QUESTION)

1.10 How long have you been a member of [The Group], or one of the previous [redacted] teams? (years) (OPEN QUESTION)

1.11 How long have you been in your current organizational role? Please answer in years. (OPEN QUESTION)

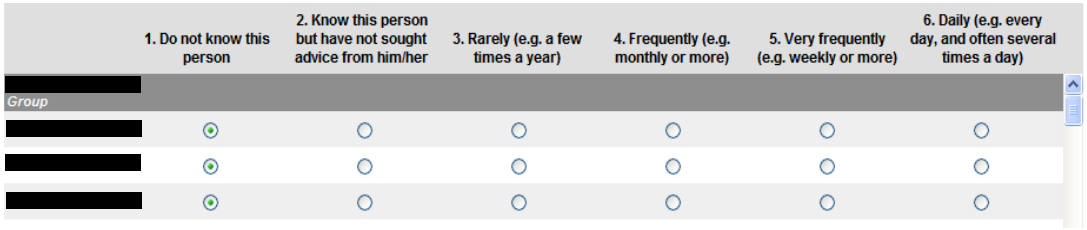
1.12 How many hours do you spend working for [the organization] in a typical week? (hours, minutes) (OPEN QUESTION)

Section 2 – Your advice network

This section is concerned with understanding whom you have turned to for advice on work-related matters over the past month. This could be via any medium of communication (e.g. conversations, e-mails, business meetings, phone calls etc).

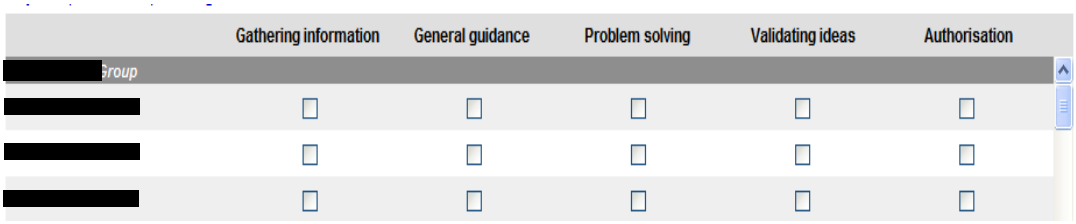
2.1 Over the past 6 months, how frequently have you sought advice from each of the following people to get your work done?

Please scroll through the complete list of names, which are grouped by [sub-group].



2.2. For those people in your network, what type of advice do you seek? (Please check all that apply)

NB. The list was filtered according to the previous question. The respondent was only asked to answer for the people they identified as having sought advice from 'frequently', 'very frequently', or 'daily'. For most people this is likely to be a list of 5-15 people.



Section 3 – Workload

This section is concerned with your workload. Please tick the appropriate box to indicate your choice.

To what extent:		Rarely or never	Occasionally	Often	Very often	Constantly
3.1	Do you find yourself going from one urgent task/problem to another?					
3.2	Do you feel overwhelmed by the amount of work that you have to do?					
3.3	Do you find work piles up faster than you can complete it?					
3.4	Do you work extra hours, over and above your contracted hours, in order to keep up with your workload?					
3.5	Do you find yourself making errors as a result of your workload?					

3.6	Do you take work home to do at the weekend?
3.7	Do you find yourself missing deadlines because of your workload?
3.8	Are you under constant pressure at work?

(WORKLOAD)

Section 4 – Attitudes towards knowledge sharing

This section is concerned with your attitudes towards sharing knowledge with colleagues on work-related matters. Please check the appropriate box to indicate your choice.

To what extent do you agree that these statements characterise you:	Strongly disagree	Moderately disagree	Neither agree nor disagree	Moderately agree	Strongly agree
4.1	I intend to share knowledge with colleagues					
4.2	I will try to share knowledge with colleagues					
4.3	I will definitely share knowledge with colleagues					

(INTENTION TO SHARE KNOWLEDGE)

4.4	Sharing knowledge with colleagues is a high priority for me compared to my other commitments at work					
4.5	Sharing knowledge is absolutely essential in my job					
4.6	Sharing knowledge takes precedence over my other commitments at work					

(KNOWLEDGE SHARING AS A PRIORITY)

4.7	There are always opportunities for me to share knowledge with colleagues					
4.8	Our knowledge management systems provide opportunities to share knowledge with colleagues					
4.9	There are always opportunities for me to share knowledge with the people that need it					

(OPPORTUNITIES TO SHARE KNOWLEDGE)

Section 5 – Recent changes to your job (e.g. roles, responsibilities, tasks)

This section is concerned with recent changes to your job, including tasks, roles and responsibilities. Please check the appropriate box to indicate your choice.

During the past six months, to what extent have **you voluntarily**:

		Not at all	Just a little	A moderate amount	Quite a lot	A great deal
5.1	Changed the range of people (i.e. number of different positions, seniority levels etc.) you talk to in the course of your work?					
5.2	Changed the number of different skills you use in your work?					
5.3	Changed your views about what your job is all about?					
5.4	Changed the number of people you regularly talk to as part of your work?					
5.5	Changed your views about the value of your work?					
5.6	Changed the number of different work problems you try to solve?					
5.7	Changed the variety of work tasks you perform?					
5.8	Changed the number of people you interact with in the course of your work?					
5.9	Changed your ideas about how your various work tasks fit together?					
5.10	Changed the amount you collaborate with others to get your work done?					
5.11	Changed the number of work tasks you perform?					
5.12	Changed how you see your work activities (e.g., importance of your work tasks)?					
5.13	Changed the variety of people you associate with at work?					
5.14	Changed how you think about your part in the bigger picture at work?					
5.15	Changed the kind of work tasks you do?					

(JOB CRAFTING)

For each one of the following statements, please indicate how well it describes you:

		Not at all true	A little true	Moderately true	Quite true	Very true
5.16	I am constantly on the lookout for new ways to improve my work.					
5.17	If I see something I don't like, I fix it.					
5.18	I am always looking for better ways to do things.					
5.19	I am great at turning problems into opportunities.					

(PROACTIVITY – measured for organizational purposes)

Section 6 – Your performance

This section is concerned with your job performance. Please check the appropriate box to indicate your choice.

To what extent do you agree that:

		Strongly disagree	Moderately disagree	Neither agree nor disagree	Moderately agree	Strongly agree
6.1	I like to look back on the day's work with a sense of a job well done (IJM)					
6.2	My opinion of myself goes down when I do my job badly (IJM)					
6.3	I take a pride in doing my job as well as I can (IJM)					
6.4	I feel unhappy when my work is not up to my usual standard (IJM)					
6.5	I feel fairly satisfied with my present job (JS)					
6.6	I find real enjoyment in my work (JS)					
6.7	Most days I am enthusiastic about my work (JS)					

(JOB SATISFACTION [JS]; AND INTRINSIC JOB MOTIVATION [IJM] – measured for organizational purposes)

To what extent do you agree that		Never	Almost never, a few times a year	Rarely, once a month or less	Sometimes, a few times a month	Often, once a	Very often, a few times a week.	Always, every day
6.8	I am willing to really push myself to reach challenging work goals.							
6.9	I am enthusiastic about providing a high quality product or service.							
6.10	I am determined to be complete and thorough in all my job duties.							

(JOB ENGAGEMENT – measured for organizational purposes)

6.11 Would you like to receive a copy of the research summary report? (YES/NO)

Appendix B: Phase 1 interview schedule

Background information	• My brief on network analysis and the project (refer to objectives and prelim. plan):
	• Links with related research in the organization– two different use cases, but as a method this may be able to tell us things about: knowledge sharing/capture and managing socio-technical systems design (in terms of how to get from the 'as is' to the 'to be' scenarios)
	• At this stage, just trying to talk to key stakeholders to help understand advice seeking behaviours and networks in The Group.
	• To maximize use of time, also want to ask some background questions about the 'XX project' (title redacted)
	• Want to leave with an understanding of needs:
	  ○ What do The Group/organization want/ need from this research?
	  ○ What immediate questions would they like answering?

	IN TERMS OF THE GROUP:
Transformation	• What is The Group? • Overall, what do you think The Group is attempting to transform? (What existed before it?) • Are the changes taking place in phases, over time? What steps are there likely to be?
Ownership	• Who 'owns' the implementation of the proposed new Group structure? (e.g., is there a sponsor who is accountable for the overall success/failure?)

Impacts	• What impact do you think a new Group structure will have on the organization and its processes?
	  ○ What will be the impact on users in your area in terms of their roles and day to day work?
	  ○ Differences in cost, quality or time to do the job?
	  ○ Will it affect the way *you* do your work?
	  ○ How is effectiveness of this network/ team structure measured? Customers?

Customers	• Who are the Group's main customers? • In practice, who will have the largest say in the day-to-day activities of The Group?

Actors –
 	
Participants:
	• How will The Group be organised?
	  ○ What are the roles within The Group?
	  ○ How will work be allocated within The Group?
	  ○ Will there be an effect on people's workloads?
	• Who are the participants?
	• Who do the participants work with? / Where do they fit within the system and the system changes? (the 'intervention')
	• How have the participants been selected/ identified? (ethics)
	• Is there a parallel 'control' comparison, who are not undergoing these changes/ are undergoing changes at a later date? (sister groups within the organization in other parts of the world, and/or parallel teams in the UK)
	• Who are the key stakeholders?
	• How do they relate to the project?/ Where do they fit? Customers?

Stakeholders:	• Why are they important? • Multiple teams/ sub-teams involved? • Organizational charts (past, present and future)? • Any other relevant background information? • How does the overall Group structure affect its various sub-teams? • Where do [redacted] and [redacted] teams fit in with this structure (if at all)? (names redacted).

Management of change	• What, if any, communication have employees received so far about The Group?
	  o Has both the 'big picture' and a more devolved picture been explained (how The Group will affect your job/department)?
	• Have employees had the opportunity to contribute to the design of The Group?
	  o If so, what have they had an influence on to date?
	  o Could anything else have been done to involve employees in the design process?
	  o Do you feel your own level of involvement has been sufficient?
	• Overall, how well has the implementation of the The Group been managed so far?
	  o What has been done well?
	  o What, if any, problems have there been?
	• How could the implementation of The Group be improved in the future?

Environmental constraints	• What, if any, barriers (e.g., organizational? cultural? political?) are there to the successful introduction of the methods The Group? • For you, what would count as a successful/failed implementation? • What are the key outputs of the group?

Knowledge Sharing	• There would seem to be two types of network within this group (within-team and between team):
	  o To what extent do you think people within and between these teams share similar 'mental models' (understanding) of what the team is trying to achieve?
	  o Do you envisage that advice seeking and knowledge sharing behaviours in these two groups will be different?
	  o What would you like the network analysis to show?
	• Do you think the introduction of the new Group structure will change who people approach for advice on work related matters in the future?
	  o If so, what changes do you envisage?
	• To what extent do you think informal social networks will be important in facilitating knowledge sharing within The Group?
	• Which colleagues do you typically approach for advice on work related matters?
	• What are the main factors influencing who you approach for advice on work related matters?
	• Can you think of a colleague(s) in the organization who is particularly effective at seeking and sharing advice or knowledge with others?
	  o If so, what is it about them that makes them so effective?
	• How significant a priority is knowledge sharing compared with your other work activities?
	• Do you feel that you have sufficient time to share knowledge effectively with The Group colleagues that you need to?

Support for knowledge sharing	• Are there any initiatives to support knowledge sharing within the organization?
	• What, if any, tools or technologies do you use to share knowledge with colleagues? (specialist tools/databases?)
	• What, if any, incentives are there for sharing knowledge with colleagues?
	• To what extent are you encouraged by your colleagues to share knowledge?
	• Are you currently encouraged to share knowledge with specific colleagues?
	  ○ If so, who?
	  ○ How effective are you at achieving this?
	  ○ Will the people you are encouraged to share knowledge with change with the introduction of The Group?
	• What, if anything, could be done to help ensure successful knowledge sharing within The Group?
	• What, if anything, could be done to help ensure successful knowledge sharing networks between The Group and other areas of the business its members needs to liaise with?

Communication Paths	• Which communication media are most frequently used to share knowledge within the various teams? (email, telephone, face-to-face, fax, video-link, other?) • How is knowledge captured during/following communication? • Where are team members located (countries/ sites/ buildings/ departments)? • Is everyone on the team of equivalent seniority?
Have I missed anything?	• Are there any documents that we don't have? • Anything to add?

Appendix C: Phase 1 interview template analysis (final version)

1. **Goals**
    a) Strategy and mission
    b) Personal goals
    c) Speed, cost, quality

2. **People**
    a) Training
    b) Organizational tenure
    c) 'Engineers'
    d) Responsibilities

3. **Processes and practices**
    a) New organizational structure

4. **Technology**
    a) KM systems
    b) Webex
        i. Time zones
    c) International differences

5. **Infrastructure**
    a) Office move (co-locating)

6. **Culture**
    a) Innovation vs standardisation
    b) High workloads
    c) Attitudes to knowledge sharing
    d) On-time delivery at all costs

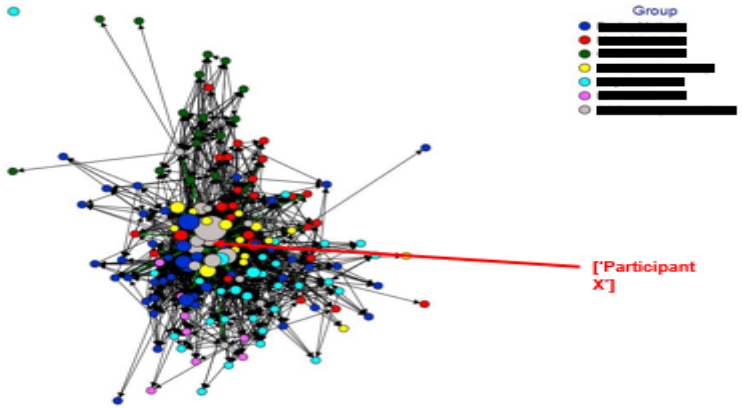
Appendix D: Phase 3 pre-interview report exemplar, displaying the personal network profile for Participant X

This exemplar serves as a pictorial illustration of what participants were provided with in the pre-interview report. It does not provide any additional information or data regarding the research itself.

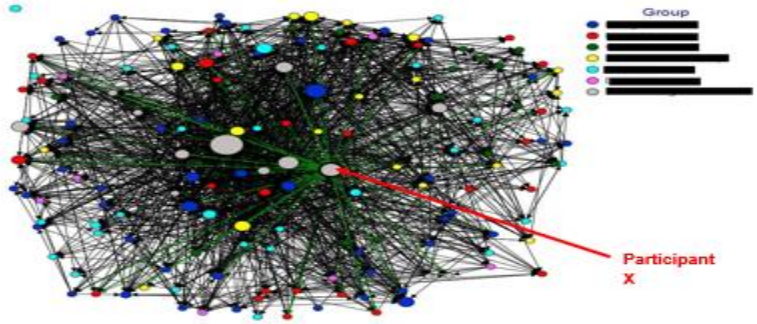
Participant X's network in relation to other [redacted] network examples:

Name	Incoming Ties	Outgoing Ties	Betweenness	Structural Hole
[redacted]	30	103	5,341	90
[redacted]	26	19	842	17
Participant X	29	45	1,283	36
[redacted]	22	38	773	32
[redacted]	15	8	51	9
[redacted] mean	10.2	10.2	173	9.8

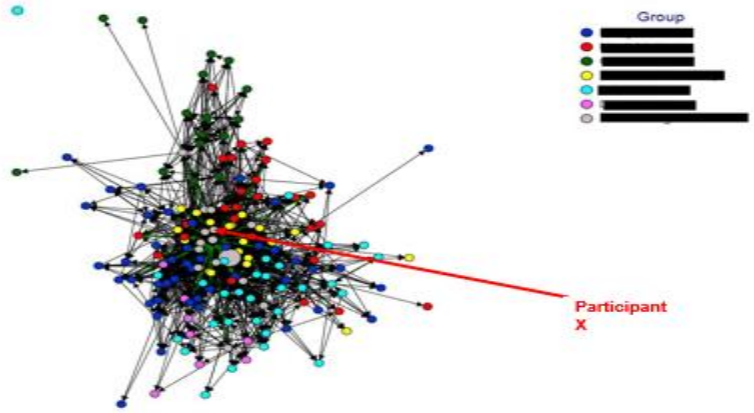
'Participant X' within The Group's advice seeking network (incoming ties):



Participant X within The Group's advice seeking network (when the centre of the network is magnified):



Participant X as a 'broker' within the network:



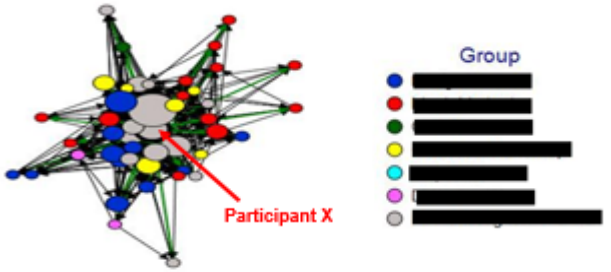
Participant X's outgoing ties (i.e., people Participant X seeks information from frequently or more often):

Frequently (e.g., monthly or more)	Very frequently (e.g., weekly or more)	Daily (every day, often several times)
[redacted]	[redacted]	[redacted]

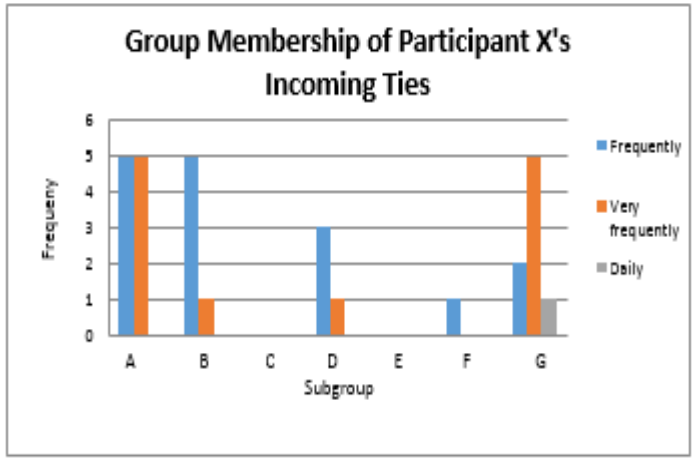
Participant X's less frequent outgoing ties:

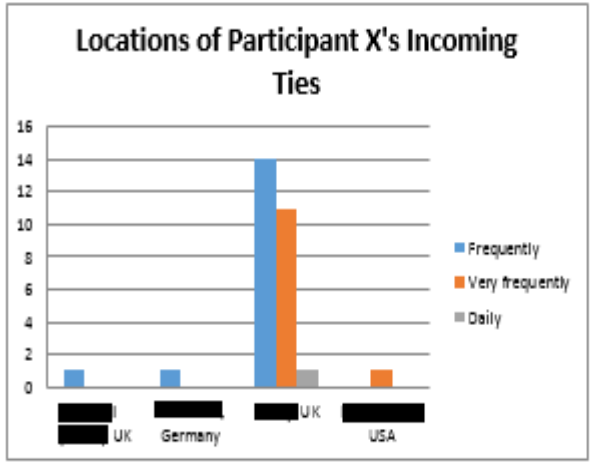
Rarely (e.g., a few times a year)		
[redacted]	[redacted]	[redacted]

People at close proximity in Participant X's incoming ties network:

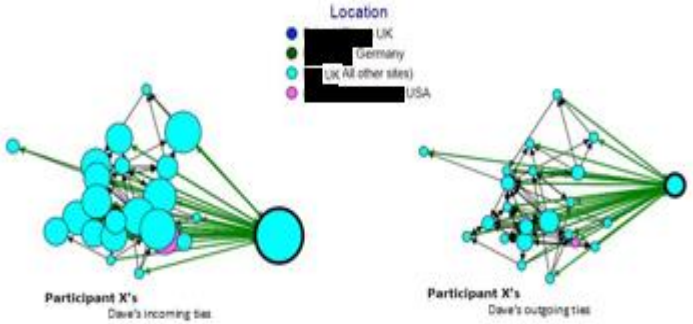


The profile of Participant X's direct incoming ties (i.e., the people who seek information from Participant X frequently or more often):

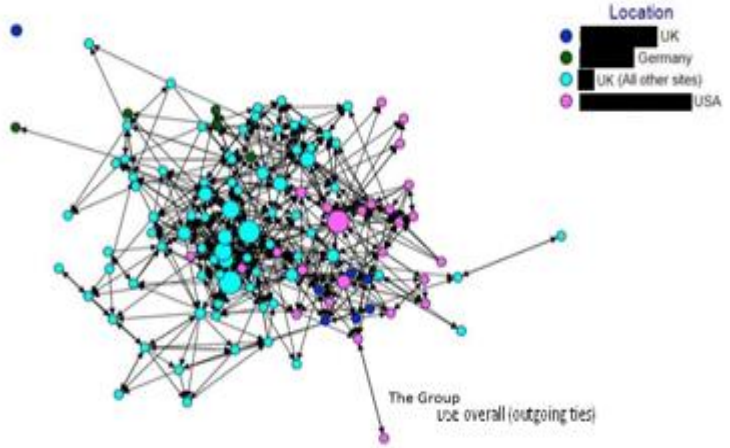




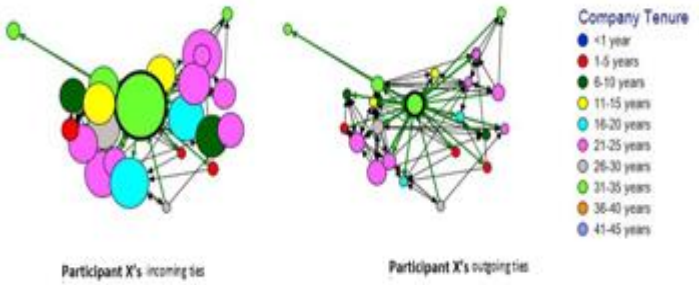
Participant X's problem solving network, by location:



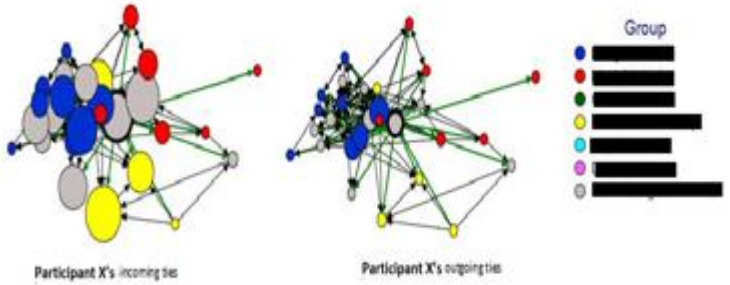
(The Group's problem solving network overall as a comparison):



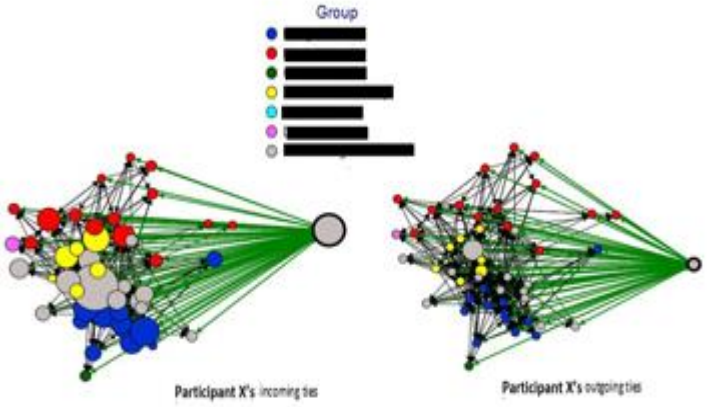
Participant X's problem solving network, by company tenure:



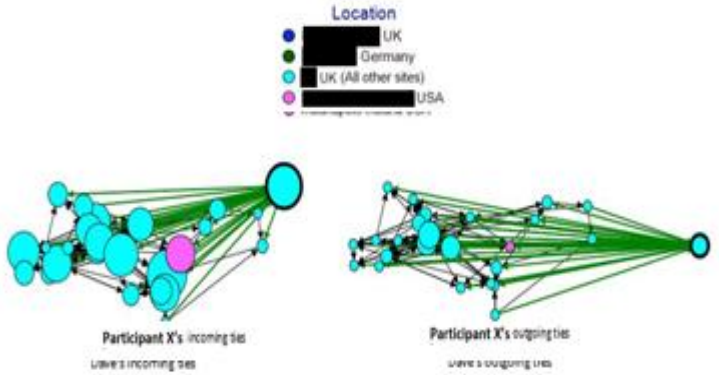
Participant X's network for validating ideas, by group:



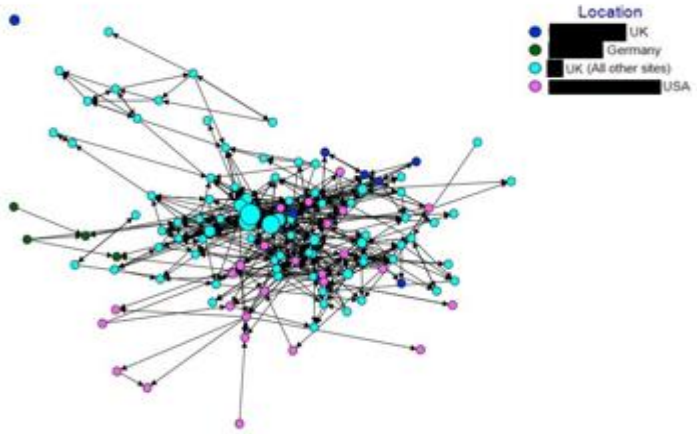
Participant X's network for gathering information, by group:



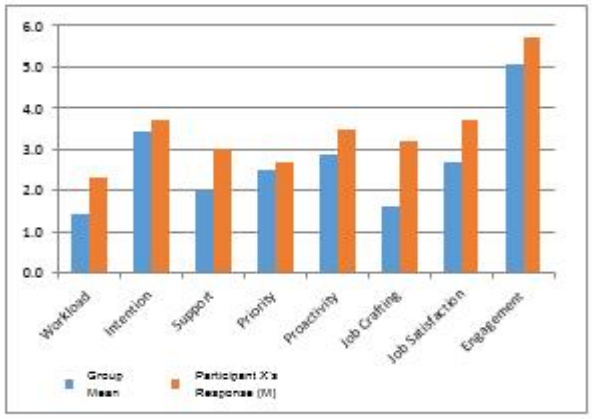
Participant X's network for validating ideas, by location:



'Validation' network in The Group, by location (based on outgoing ties):



Participant X's responses compared with The Group average (mean):



Appendix E: Phase 3 interview schedule

Thoughts on the *overall Group's* network?	1. Thoughts on the network? Surprised? Possible explanations for findings? 2. How desirable is network in their view? What's interesting from an organizational point of view? 3. Which groups do they consider to be important/less important/not important to them in order to meet their own personal work objectives? 4. Are there other groups that are integral to The Group that have not been captured here?
***Interviewees'* personal network**	1. Why does it look that way? 2. How do they know person X,Y, Z (senders/receivers in their network)? Look at the strongest/weakest connections – long/short history with this person? 3. How have the networks that currently exist in their network become established? What is the history of the key relationships? 4. For key brokers/high network scorers – Why do they think they score so highly? Why do others think this is the case? What is it about them that cannot be sought from others? 5. How have they met the people they network with (especially those in different sub-groups to them)? e.g., Meetings? Social functions? 'Smoking corner'? Lunch groups? 'Reply to all' functions in emails? 6. Are there central people in their network who are not represented in the diagram because they're outside of 'The Group' (i.e., the network boundary)? 7. How do they go about seeking information/ advice? (i.e. process) a. e.g., How do they typically go about (e.g.) solving a problem? b. Where do they get problem solving information from? c. Why do they go to certain people and not others? d. How do they choose who to gain information from? (e.g., Choose the most appropriate person for the question? Person closest in physical proximity? Go through other contacts? Choose the most senior person? Are there formal processes to go through or is this informal?) e. Are those receivers generally inside or outside of the bounded Group?

	8. Is there anyone who they would like more frequent/ better quality access to? Who? Why? 9. Do they see anyone in particular as a good role model/mentor for networking/advice seeking? Who? 10. To what extent has their network changed since the questionnaire?
Other avenues to follow-up	1. To what extent do processes/goals/metrics inhibit/facilitate advice seeking/sharing networks? 2. How does it link with roles/responsibilities and the way a work/jobs are designed in The Group? 3. Have they experienced changes to the nature of their job in the last year? How recently? What have the nature of these changes been? 4. Thinking about recent work that they are involved in – have any changes been voluntary or assigned? (i.e., is crafting something that people do, but is not captured in questionnaire?) 5. Workload – how does it affect high crafters/ low crafters and networks? 6. To what extent do the key network brokers report feeling overloaded? 7. To what extent do peripheral people *want* to become more central? What are the barriers? Are they peripheral to the overall Group network, but central *within* their group? If so, why? 8. What is their opinion on why does relational crafting correlate with network size? 9. What is their opinion on why attitudes toward knowledge sharing correlate with network size?

Appendix F: Phase 3 initial template analysis

1) **'Top-down' networks**
    i. Organizational structures generate networks
        1. Work Design
            i. Projects
            ii. Teams
            iii. Location
            iv. Process
            v. Role
    ii. Organizational structures shape/nudge networks
        1. Who to speak to
        2. What to speak about

2) **'Bottom-up' networks**
    i. Role-driven networks
    ii. Voluntarily initiated (crafted) networks
        1. Job crafting
            1. Physical crafting
            2. Cognitive crafting
            3. Relational crafting
            4. Interplay between facets of crafting
                i. Crafting 'mindsets'
                    1. How essential is knowledge sharing?
                    2. How desirable is globalisation?
                ii. Contagion
                    1. Passive contagion
                        a. Individuals within egonets sharing mindsets
                    2. Active contagion
                        a. Recruiting people to their mindsets
            5. Social capital
            6. Job performance
            7. Competence
            8. Crafting and subsequent 'career'
            9. Motivation for crafting

Appendix G: Phase 3 final template analysis

1. 'Top down' networks

- e) Organizational structures *generate* networks
  - i. Project assignment
  - ii. Work group
  - iii. Location proximity
  - iv. Process
    - A) Formal meetings
    - B) Conferences
    - C) Hierarchy
  - v. Role
  - vi. Knowledge management IT systems
  - vii. Performance metrics and goals
- f) Organizational structures *shape/nudge* networks
  - i. *Who* to speak to
  - ii. *What* to speak about

2. 'Bottom up' networks

- g) Role-driven networks (involuntarily initiated)
  - i. Type of advice
- b) Voluntarily initiated (crafted) networks
- c) Factors affecting initiation of VINs
  - i. Workload, goals, metrics
  - ii. Knowing who to go to
  - iii. Seeker's attitudes to knowledge sharing
- d) Job crafting
  - i. Physical crafting
  - ii. Cognitive crafting
  - iii. Relational crafting
  - iv. Interplay between facets of crafting
    - A) Social capital
    - B) Job performance
    - C) Competence
  - v. Crafting and subsequent 'career'
  - vi. Motivations for crafting

3. Advice seeking process

- e) Type of advice
- f) Factors affecting choice of advisor
  - i. Trust
  - ii. IT systems
  - iii. 'Personality'
  - iv. Convenience/ physical proximity
  - v. Similarity of role/ work interests
  - vi. Advisor has high experience
  - vii. Advisor has high social capital
- g) Staged process of advice seeking
  - i. Top down – bottom up interplay

4. Dynamic network evolution

- h) Leadership
  - i. Creating strategy
  - ii. In-group/ out-group
    - A) Groupthink
  - iii. Creating mindsets
  - iv. Globalisation
- i) Diffusion of mindsets
  - i. Collaborative crafting
  - ii. Active diffusion
  - iii. Passive diffusion
- j) Top-down bottom-up interplay

Appendix H: Phase 4 cover letter and questionnaire measures

Dear colleague,

I contacted you two years ago, to ask you to complete a questionnaire on advice seeking/sharing behaviours. I am extremely grateful for your participation, and am now asking you to continue your involvement in the research, by answering the small number of questions detailed below, **by return email**.

At the University of Leeds we are working with [redacted] to develop support for knowledge management, and I am hoping to use the information that you provide to better understand how knowledge sharing relates to career development and career satisfaction. These will be used to help support career development initiatives for [redacted] employees.

As always, your responses with be treated with absolute confidentiality. The data you provide will only be seen by researchers at the University of Leeds (not [redacted] employees), and only **anonymised, aggregated** information will be fed back to [redacted].

Thank you for your continued involvement in the research.

Helen Hughes

Please indicate the number of career rewards of the following kinds you have received <u>since July 2010</u> (please indicate all that are applicable):

Grade change due to promotion (e.g., the [redacted] career progression progress)
0 1 2 3 4

Grade change due to a new role (at higher grade)
0 1 2 3 4

Self-initiated 'sideways' moves/secondments (i.e., same grade)
0 1 2 3 4

A recognition activity (e.g., a lunch voucher)
0 1 2 3 4

Other
0 1 2 3 4

2. ***Please indicate to what extent you agree or disagree with each of the following statements:***

a)	I am satisfied with the **success I have achieved** in my career.	Strongly disagree	Moderately disagree	Neither agree nor disagree	Moderately agree	Strongly agree
b)	I am satisfied with the **progress** I have made towards meeting my **overall career goals.**	Strongly disagree	Moderately disagree	Neither agree nor disagree	Moderately agree	Strongly agree
c)	I am satisfied with the **progress** I have made towards my **goals for income.**	Strongly disagree	Moderately disagree	Neither agree nor disagree	Moderately agree	Strongly agree
d)	I am satisfied with the **progress** I have made towards meeting my **goals for advancement.**	Strongly disagree	Moderately disagree	Neither agree nor disagree	Moderately agree	Strongly agree
e)	I am satisfied with the **progress** I have made towards meeting my **goals for the development of new skills.**	Strongly disagree	Moderately disagree	Neither agree nor disagree	Moderately agree	Strongly agree