CHAPTER 6

CONCLUSIONS AND DISCUSSION

6.1 Introduction
This dissertation is positioned within the field of intra-organizational social network research, which aims to explain the behaviors and attitudes of individuals or groups of individuals within organizations using social networks as a theoretical lens (Kilduff & Brass, 2010). Therefore each chapter of this dissertation is interlarded with the central idea that individuals are connected through relations, and that this constellation of relations creates a network in which individuals are embedded. This embeddedness provides individuals with both opportunities and constraints which consequently influence their behaviors and attitudes.

As argued in the introduction and throughout all chapters, within the field of intra-organizational research there is an increasing need to understand processes of network change (Borgatti & Foster, 2003; Brass et al., 2004; Kilduff & Brass, 2010; Moliterno & Mahony, 2011). The main contribution of this dissertation lies in its examination of this central issue of network change, by using panel data on social networks collected within organizational settings. This dissertation consists of four studies within an organizational setting, three of them being longitudinal. Each chapter deals with a separate question of how studying networks longitudinally contributes to a better understanding of network processes. However, each chapter also focuses on distinct intra-organizational issues, and they are framed in such a way that these issues are central to it. Because of this specific framing of each chapter we will present summaries of the chapters separately, in Section 6.2. After the summaries, in Section 6.3, we will elaborate on three central themes that synthesize findings across the chapters. These themes are not only presented as discussion points, but more so as directions for future research.

6.2 Summaries of chapters
In de sub-sections below we will outline the main research question, the findings and the main contributions for each chapter.
6.2.1 Chapter 2

Chapter 2 deals with the general theoretical issue of network selection, which focuses on the following question: how do individuals create, break or maintain ties with others? Our main argument for using a longitudinal design here is that it captures the change process over time and thereby also the theoretical regularity across time. Cross-sectional analysis, on the other hand, would provide only a single ‘snapshot’ of these network change mechanisms, which leaves the possibility that findings are an idiosyncrasy of that moment, instead of a theoretical regularity.

In Chapter 2, the general theoretical issue of network selection was translated to an organizational context by examining advice networks at a department of a regional Dutch hospital specialized in physical and psychological rehabilitation. For this setting, we argued that advice networks are relevant as it has been shown that the way individuals seek out other colleagues for the retrieval of information is paramount to understanding organizational as well as individual performance. Our main questions were: to whom do individuals go to for advice over time within a professional work setting, and what types of information do they acquire from these other individuals? The main contribution in answering these questions is that we argued that individuals are motivated in different ways when they are in search of advice, and this differential search is determined by the type of advice that individual try to acquire. We showed that technical advice is instrumentally motivated in the sense that individuals prefer advisors that can help them ‘to get things done’ at work, i.e. supervisors, task interdependent colleagues and colleagues with similar work roles are important sources for technical advice. Also, we showed that social support advice is driven by ego-based motives, because then individuals prefer advisors with whom they have a personal relationship with, in our case friendships. Lastly, we found that political support advice is image-based motivated, because individuals tend to select advisors who have a high status or power position. In sum, this chapter showed that individuals use different search heuristics for different types of social relations.

6.2.2 Chapter 3

In this chapter we use longitudinal research to solve the issue of dual or reciprocal causal relationships. In Chapter 1, we described that social networks are both consequences and antecedents of individual attributes, and therefore it is highly plausible that social networks and individual attributes mutually reinforce one another. We argue that one can only
determine the relative importance of either causal effect by looking at them simultaneously using a longitudinal design.

In the specific case we explore within the context of a self-managing decentralized organization – a freshman class of the Royal Netherlands Naval College (in Dutch abbreviated as KIM) – how an informal hierarchical social order among individuals is enacted through networks of interpersonal monitoring and sanctioning behavior. We argue that an individual’s position in the group’s informal status hierarchy (both affect and competence based) determines the degree to which an individual controls others, or is targeted by others, but also that the degree to which an individual controls others, or is targeted by others, affects the individual’s status within the group over time. In other words, we argue that the informal control network and the social hierarchy are mutually reinforcing over time. Indeed, we found some evidence that informal control follows – or is determined by – the existing informal hierarchy with a group, but also that informal control is used to change individual positions within the informal hierarchy. Thus it indeed seems that informal control and informal hierarchy mutually influence one another over time. However, we found a stronger relation from status to informal control, than from informal control on status (see Chapter 3 for an extensive discussion of these findings).

6.2.3 Chapter 4
Just like in Chapter 3 we used a longitudinal research design to answer the main theoretical question of to what extent and how the causal relationship of social networks and individual attributes is recursive. Specifically, we are interested in the questions: when do individuals’ relationships determine individuals’ attributes (e.g. attitudes and behaviors), and when do these individuals’ attributes determine individuals’ relationships?

In search of an answer we took up the major discussion of homogeneity in friendship networks. Generally, it is understood that similarities among friends are a result of two different causal mechanisms: social selection and social influence processes. That is, befriended individuals are similar because they develop relationships with similar others (i.e. social selection), but also because they become similar through their relationships with others (i.e. social influence). In many cases both causal mechanisms are equally plausible, but in this chapter our main contributions is that we show that certain contingencies circumscribe when either of the two mechanisms of selection and influence are more plausible. Primarily, we find (qualitatively) that in a context with stronger organizational constraints – i.e. where individuals are expected to work together to fulfill the requirements of their jobs – influence
will be a stronger predictor of similarities between friends than selection. Thus, this study attempts not just to understand the processes that cause similarities among friends, but also to determine which contextual conditions make either selection or influence more likely to be the main underlying mechanism. The important point is that we demonstrate that the mutual causal relationships between networks and individuals’ attributes is not necessarily self-evident, but rather that it depends on the context and the type of individual attribute under examination. In our case the context was the same cohort of students at the Royal Netherlands Naval College as used in Chapter 3 and the individual attribute we focused on was (military) discipline.

6.2.4 Chapter 5
The last chapter differs from others, because it does not directly fall into the theme of the dynamics of intra-organizational networks. The similarity between Chapter 5 and other chapters is that this chapter also has a comparative character. In the first three chapters there is a comparison of effects through time, while the last chapter investigates effects of networks across multiple cases. By comparing multiple cases – four different organizations – we are able to determine the theoretical regularities across different organizational settings. The theoretical regularity we are interested in, just as in Chapter 4, is that of social homogeneity. In this particular case, we investigated social homogeneity in the levels of time stress experienced by the organizational members of the four organizations.

A central question among network studies that explain social homogeneity is: are actors similar because they have direct relationships (i.e. as a result of cohesion), or, because they have similar structural positions within the social network (i.e. as a result of structural equivalence)? We argue that this equivalence vs. cohesion distinction is not a question of either-or, but of the ways in which these mechanisms lead to social homogeneity. Thus, the purpose of this study is to investigate how structural equivalence and cohesion can be better discriminated, both theoretically and empirically. To separate contagion through structural equivalence and cohesions, we argued that structural equivalence creates interpersonal competition, and that competition mediates the relationship between structural equivalence and attitudinal similarity (of time stress between individuals). For cohesion we hypothesized that empathy, or degree of friendship, is a necessary condition for a relation to lead to attitudinal similarity. We indeed found support for the fact that cohesion is affective in nature, and in that way it is distinct from contagion through structural equivalence. We did, however, also found that feelings of interpersonal competition is not exclusive to structural equivalence,
which means that interpersonal competition does not theoretically differentiate cohesion from structural equivalence in our settings. We suggest that contagion through structural equivalence might need some further theoretical discussion and research.

6.3 Synthesis of the chapters and thoughts for future research

In this last section of the dissertation we set about to describe some of the synthesizing findings across all chapters that reveal some interesting discussion points for future research. We will discuss three: (1) Time and sequences in networks panel data, (2) Organizational contingency factors, and, (3) Multiplexity and endogeneity of networks.

6.3.1 Time and sequences in network panel data

In this dissertation all studies are based on panel analysis of quantitative outcomes (except Chapter 5). An important characteristic of this design is that between different observation points no sequence of change is observed. As argued in Chapters 1 and 2, to solve this issue we used a method (the actor-based model) based on the assumption of an underlying stochastic process in which unobserved changes may occur continuously over time. Thus we conceptually solve the problem of discrete time data by specifying a simulation model proceeding as if there is a sequences and timing of individual behavior (i.e. changing ties or attributes) between subsequent time points. In the actor-based model timing is fixed (i.e. one tie-change or attribute-change at a time) and sequences of change is largely arbitrary (i.e. actors are randomly assigned to change). The idea behind these principles is that the change process is decomposed into the smallest possible components, thereby using a parsimonious assumption set. In addition, these reasonable simplifying assumptions allow relative simple modeling (Snijders et al., 2010). However, one could easily think of other more restrictive and less parsimonious assumptions regarding the timing and sequences of changes between subsequent time points. For instance, now we assumed that one actor changes one tie at a time, but its is equally plausible that individuals change multiple ties at once or that multiple actors change ties at the same time. Also, in the actor-based model actors are randomly assigned in the sequence in which they change. However, one could also assume that change cascades through the network like a reaction chain. For instance, if a person ego changes his or her relations with alters, it is likely that the alters react to this change by changing their own ties. The fact remains however, that all of this is mere speculation, because panel data does not provide any information about the order in which ties are created and terminated between successive observations. To get more insight in this issue, we stress that it would be
valuable to collect more data on the event history of changing networks to get an idea of the timing and sequence of the moves within a network (e.g. Brandes, Lerner, & Snijders, 2009). With this information, the assumptions of the continuous-time simulation process could be validated and/or updated (Macy & Willer, 2002). Here lie some great opportunities to explore for future research.

Another important issue with panel data is the choice of the time scale (Zaheer, Albert, & Zaheer, 1999). The time scale refers to the choice of the timing (‘when’), the frequency (‘how often’) and the time lag (‘how long in between observation’) of the observations. First, with regard to the timing, we assumed that there is no temporal trend in the causal relationships between variables, i.e. the effects are non-periodic or time homogenous. We made this assumption, because there was no immediate theoretical reason to assume otherwise and also because time homogeneity is a model assumption of the actor-based model. The assumption of time homogeneity implies that there is no starting point or end point of a certain causal relationship. Thus there are no criteria for the researcher to determine the completeness of the time scale. For our research – like many other studies (Zaheer et al., 1999) – this implied that our choice of observation moments and their frequency were largely arbitrary and pragmatic. For instance, in the hospital department (Chapter 2) we chose a time – after summer break – when most people were available for filling out questionnaires, and we collected data at three waves because more waves were not accepted by the management of the organization. At the Royal Netherlands Naval College (KIM; Chapters 3 and 4), we also collected data on three waves, for the same reasons as with the hospital department. The choice of time points at the KIM, however, did coincide with starting and end points of periods within the training and education program. This may seems to square with our earlier assumption of time homogeneity, but our assumption of time homogeneity refers to relationships between variables (we did not find any results that contradict this). Because of the periodicity of the observation, we did find differences in the amount of change between successive observations: between time point 1 and 2 there was more change than between time point 2 and 3. This finding urges us to question why the network changes at a specific rate and how the rate of change differs between individuals (George & Jones, 2000). These questions were not addressed in this dissertation, but it seems a logical extension we should explore in future research. Particularly, because recently actor-based models were developed that are able to analyze and model rates of change (Snijders et al., 2010).

Furthermore, an issue with panel data is the choice of lag or window of time between observations. Ideally, theories should specify the causal interval that are necessary to find the
predicted effects, but realistically few theories do (Zaheer et al., 1999). In most instances, researchers choose a time lag based on past research or ‘gut feeling’, but this often means that the choice of lag is a possible minefield. On one hand, if a lag is too big effects may wear off, effects may be recursive, or other variables may come into play. Also, the chances of measurement decay increase the longer the time lag is. On the other hand, if a lag is too small, the effect may not be complete or change may be of minor importance due to measurement errors (Abbott, 2001). For this dissertation we based our choice of time lag on experience and prior research (notably the work by Van de Bunt, 1999), but also based on the mathematical assumptions of the actor-based model. This mathematical assumption is that the current state of the network (i.e. observation time point 1) determines probabilistically its future state (i.e. observation time point 2). Since the future state depends on the past, the model assumes that there is some continuity in the networks but also that change process is incremental. To check whether the chosen time lag fits this mathematical assumption, Snijders et al. (2010) propose that the value of the Jaccard index – a change ratio for successive network observations – should be higher than .3 (ranging from 0, complete change, to 1, no change). Here the shoe pinches though, because a researcher would like to be able to determine *a priori* what the change ratio is, but it is only possible to determine *a posteriori* what it really is. Being aware of this problem Snijders et al. (2010) pose that event-based networks (telephone calls, emails), which by nature have discontinuous change patterns, usually are unfit for actor-based models. One would expect that the change process of these networks are characterized by low levels of the Jaccard index. In this dissertation we fulfilled the mathematical assumption of a Jaccard index of >.3, except for Chapter 3. In this chapter we tested the dynamics of social control networks (i.e. behavioral sanctioning acts) and found a Jaccard index around .2. This suggests that the actor-based model might not have been the optimal method of choice. We are left, however, with the following question: to what degree is the assumption of incremental and continuous change violated by 1. the chosen time lag, 2. by the type of network, or, 3. both? More research is needed in order to determine which network data is suitable or unsuitable for actor-based models.

### 6.3.2 Organizational contingency factors

A recurring theme throughout the dissertation is the effect the organizational context has on social networks and its outcomes. For instance, in Chapter 2 we show that formal hierarchy, task interdependencies and the division of labor have strong effects on the formation of advice networks within a professional bureaucracy. Indeed, it is a well-established finding that the
organizational structure, both in its physical as well as formal manifestations, has a strong effect on the relations individuals form (Han, 1996; Shrader et al., 1989; Stevenson, 1990; Tichy & Fombrun, 1979). More often than not it has been shown that emergent informal social networks are substantially influenced by, and overlaid with, the formal features of the organizations (Stevenson, 1990; Han, 1996), particularly the vertical lines of power (Rank, 2008). But the formal structure of organizations not only creates the boundary conditions in which individuals can create relationships, on a higher level it also shapes the structure of the overall social network (Ibarra, Kilduff, & Tsai, 2005; Moliterno & Mahony, 2011). In a comparative study Shrader et al. (1989; p. 63) found that:

Smaller organizations made up of better educated staff applying non-routine technologies have denser, more cohesive, and less segmented networks consisting largely of symmetric or reciprocated ties. Moreover, a mechanistic structure in the “distributional” sense appears to coincide with the same patterning of organizing in the “network” sense. Vertically and horizontally differentiated organizations, we find, have networks that are less dense, are more clustered and segmented, and have a higher proportion of non-reciprocated ties. Heavily formalized organizations are similarly less closely connected or cohesive and more structured in terms of asymmetric communication flows and client exchanges.

The study by Shrader et al. (1989) systematically evaluates a contingency theory of organizational networks, and shows quite convincingly that different organization types produce different social network forms. Unfortunately, Shrader et al.’s comparative study was not followed up by more studies investigating relatively recent organizational forms, such as adhocracies and ‘network organization’ (Scott, 2003). The organizational network research field would benefit greatly from more comparative organizational network studies, particularly because by knowing how organizations shape social networks we will understand better why some network effects are more prominent in one organization than the other. For instance, if we would know that certain organization types produce dense and cohesive (i.e. not clustered) social network, we could argue and foresee that such organizations are not suitable to investigate Structural Hole Theory (Burt, 1992, 2005), because it is difficult for individuals to maintain or create an autonomous position within dense and cohesive networks (Burt, 2001). On the other hand, if an organization produces a sparse and clustered social network it would create many opportunities for individuals to bridge local and global structural holes. In other words, the organizational form creates a social network structure that
circumscribes the ‘freedom of action’ an individual has in the social networking arena (Moliterno & Mahony, 2011; Wong, 2008). However, the social network structure only provides the structural context of opportunities for further networking behavior, but the outcome of these behaviors is also determined by the – in network research often forgotten – context contingency of organizational culture (DiMaggio, 1992; Emirbayer & Goodwin, 1994). The most prominent cultural distinction that rises to the surface in network research is that of competition vs. cooperation (Kilduff & Brass, 2010). A competitive culture creates an environment that motivates individuals to use ties instrumentally, pursuing opportunities that benefit themselves, while a cooperative culture promotes using ties for public goods and benefits to the entire network (Ibarra et al., 2005). Several findings in this dissertation, support the idea that the organizational culture in combination with the structural context of opportunities (derived from the organizational form) determines how individuals behave. In Chapter 4 we argue that the socialization context of the military academy creates a cooperative environment, but we also find that the tight task interdependence and professional encapsulation of the military academy creates a dense and cohesive friendship network. This combination of a cohesive structural context of opportunities and a cooperative culture creates an environment in which individuals are stimulated to assimilate to one another, in our case with respect to levels of discipline. In contrast, in Chapter 5 we find that the adhocracy structure of a computer company also creates a dense and unclustered social network, but the organizational culture is different. In the computer company there are high levels of competition, which as noted above fosters individuating behaviors. Indeed, we found that within the computer company individuals are motivated to differentiate themselves from others whom they are directly tied to. Unfortunately, our speculations are limited to organizational forms that create dense and cohesive social networks, but one could also argue that cooperative and competitive cultures would lead to different behaviors for organizational forms that create a structural context of opportunities of sparse and clustered networks. For instance, it is a well-known effect that in competitive contexts where there are many opportunities for bridging ties – like in sparse and clustered networks – individuals will be motivated and have the opportunity to preserve autonomous positions (i.e. rich in structural holes) (Burt, 1992, 2001, 2005). These autonomous positions provides individuals with control and information benefits that may help them perform better or advance their careers. A cooperative culture with a sparse and clustered social network, however, would motivate individuals to behave in an entirely different manner. In such an organizational context
individual would strive to integrate clusters and connect otherwise unconnected individuals (cf. Obstfeld, 2005).

On a final note I would like to stress that the discussion above has not the pretension of being a contingency theory of organizational networks, but rather to stimulate future research to rediscover the field of organizational contingency theory for organizational network research (Kilduff & Brass, 2010).

6.3.3 Multiplexity and endogeneity of networks

For a fuller and more realistic understanding of social networks and their theoretical mechanisms, several scholars have urged to investigate multiple relations simultaneously (Friedkin, 1995, 2004; Ibarra & Andrews, 1993; Monge & Contractor, 2003; Wasserman & Faust, 1994). Following this suggestion, all studies in this dissertation use multiple networks to deal with the theoretical issues central to the chapters. None of the chapters, though, specifically deals with the issue of overlapping networks, so-called multiplexity or multistrandedness (Boissevain, 1974; Fischer, 1977; Verbrugge, 1979; Wheeldon, 1969). Some findings, however, provide some insights that may be useful for future research that aims to delve into multiplexity, a concept that deserves more attention in network research (Kilduff & Brass, 2010). But before we go into the latter discussion point, I would like to conceptually clarify the concept of multiplexity.

In its most commonly used definition a multiplex relation is multiplex to the extent that there is more than one type of relation (Cross et al., 2001). Burt (1983; p. 83), however, adds that relations are only multiplex if relational “…contents are substantively distinct to the extent that they are used by actors in a system in such a way as to be nonsubstitutable and differentially ambiguous”. Thus, networks that subsume or substitute other networks are not multiplex, but relations that fulfill different functions or occur in more domains are (Hite, 2003). As Boissevain (1974; p. 30) puts it, multiplex relationships overlap like ‘blades of a fan’. In Chapter 2 of this dissertation we found that five types of advice networks form a one-dimensional advice scale. This means that the higher an advice network is one scale, the more likely that it will fully contain another advice type lower on the scale. This would not qualify as a multiplex array of relations, because the content of the different ties is not multidimensional. Rather, one-dimensional yet overlapping multiple networks refer to the increasing depth or intensity of a single content network (Kapferer, 1969).

This brings us to the question of which distinct content domains do generally exist within intra-organizational network settings. Two broad content distinction have been found
to occur in most social networks; the distinction between good vs. bad, and between work vs. personal (Burt, 1983; 2001). On one hand the good vs. bad refers to the positive and negative evaluative distinction individuals make towards one another (e.g. hate, liking, love) (Homans, 1950). On the other hand, work vs. personal refers to the functional distinction in interactional activities towards others (e.g. speaking, giving, socializing, providing resources). Work relations are oriented towards objectives that fulfill job requirements, whereas personal relations are motivated by gratifications expected to foster social-well being (Blau, 1964; Lincoln & Miller, 1979; Podolny & Baron, 1997). Combining the two content distinction, there are four content types of relations: good personal relations (e.g. friendship and mentorship), bad personal relations (e.g. personal conflict and bullying), good work relations (e.g. advice and collaboration), and bad work relations (e.g. task conflict and hindrance). Almost any type of network investigated can be subsumed under these basic distinctions (Burt, 2001).

In Chapter 5 we focus on the multiplex relation of friendship combined with advice networks and argue that these relationships have differential effects in comparison to uniplex advice or friendship relations. Specifically we show and argue that social contagion only flows across multiplex networks in which work and personal spheres overlap. The way we looked at multiplexity in this chapter is rather limited, because it only considers two of the four possible content domains. Even though this is a common limitation when investigating multiplexity (e.g. Ibarra, 1992; Lincoln & Miller, 1979), we argue that there is much more research to be done on overlapping networks across other domains than good work and good personal relations (see for examples Labianca & Brass, 2006). Future research could explore questions such as: when does task conflict and friendship overlap? And what are the consequences of this type of multiplexity? (Ingram & Zhou, 2008). Generally, the research field would also benefit greatly from research that tries to classify content domains across organizations (see section 6.3.2).

Another interesting finding of our research is that by looking at the dynamics of networks over time, we also get some clue of the development of multiplexity (Minor, 1983). In Chapter 2 we find a one-dimensional advice network scale in which we see that the higher on the scale the advice is, the more evaluative and demanding (in terms of time and effort) it becomes. But we also find that higher on the scale another content dimension seems to become more prominent, i.e. the friendship network. This finding seems to suggest that multiplex relationships are created by undergoing certain developmental stages. It seems to indicate that uniplex work relationships develop through increasing interactional activities and
evaluative intensification into multiplex relationships of distinct work and personal ties. This raises some interesting new questions. Do multiplex relations in organizations originate from uniplex advice ties or is it also possible that they originate from friendship ties? Is there a differential effect of multiplex ties according to the developmental stages they went through? In other words, is there a difference between friends becoming co-workers, or co-workers becoming friends?

Finally, dynamic multiplexity research directly gives insight in the issue of the endogeneity of networks, or how certain networks processes and structures have influence on processes and structures of different networks. Thus multiplexity is the key to what Borgatti & Halgin (forthcoming) refer to as the grand network theory of networks. This seems to be a promising venue for future research, particularly since new methods have become available that are able to test the dynamics and endogeneity of multiple network (Snijders et al., 2010).