Asymmetry in task dependence among team members
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Humans are social by nature and like many other animals we tend to gather around in groups consisting of, for instance, family or friends. What makes us unique is the way we creatively interact with each other when we are in groups. This ingenious interplay often takes place in work teams where it has led, and continues to lead, to an ever-increasing amount of new products and technologies. Furthermore, many of us spend a large part of the day (and in fact our lives) working in these work teams, and the circumstances in them can significantly influence our well-being, health, and happiness (e.g., Sonnentag, 1996). Consequently, work teams represent one of the more essential groups to which we belong and gaining a deeper understanding of them does not only provide us with more insight into uniquely human qualities, but could also lead to more tangible results such as increased well-being of the members of the team or improved team performance.

It might therefore come as no surprise that many researchers and practitioners have shared an interest into the functioning of groups at the workplace. One of the more important theories used to gain a deeper understanding of the functioning of work teams, is interdependence theory (e.g., Thibaut & Kelley, 1959). This theory is of great importance because it deals with a fundamental feature of work teams, namely the fact that team members are dependent upon each other (i.e., are interdependent; Lewin, 1948). As will be discussed below, this interdependence can be based on several sources, such as the distribution of skills and resources within the team or the way goals and rewards are provided to the team members (e.g.,
The cumulative knowledge from the many studies and reviews regarding interdependence theory (e.g., Johnson & Johnson, 1989; Rusbult, 2000; Van Lange, 2000; Van der Vegt, Emans, & Van de Vliert, 2005; Van der Vegt & Van de Vliert, 2002; Wageman, 1995, 2001) provide firm evidence that interdependence significantly influences essential team processes and outcomes such as, helping (e.g., Wageman & Baker, 1997), trust (e.g., Alge, Wiethoff, & Klein, 2003), affective reactions (e.g., Van der Vegt, Emans, & Van de Vliert, 2001), and team performance (e.g., Saavedra Earley, & Vandyne, 1993).

Although many aspects of interdependence are already well understood, we will argue that most prior studies have overlooked a vital aspect of interdependence, namely the possibility that differences or asymmetries in dependence can exist between individuals. These asymmetries in dependence occur when a team member (A) is more dependent on another team member (B) to complete his or her task, than B is dependent on A (e.g., Blau, 1964; Kelley & Thibaut, 1978). As will be explained in more detail in the following chapters, investigating these asymmetries in task dependence is essential because they are associated with differences in power (e.g., Emerson, 1962). Since the powerful might use their power to their own advantage, asymmetry in task dependence might be detrimental for team processes and outcomes. Although some indirect evidence from studies regarding interpersonal (e.g., Rusbult & Van Lange, 2003) and inter-organizational relationships (e.g., Casciaro & Piskorski, 2005) supports this expectation, to date no study has actually investigated the effects of asymmetry in task dependence in work teams. The current thesis aims to contribute to interdependence theory and research by investigating the scarcely studied relationships between asymmetries in task dependence and various important organizational psychological variables, such as interpersonal helping and trust, affective reactions and team learning and performance. Below, we will first discuss the theoretical and methodological foundations of this topic, after which we will develop the conceptual framework and introduce the empirical studies that were conducted to test the hypotheses derived from our framework.

FOUNDATIONS

Theoretical foundations
The importance of the concept of interdependence for the organizational sciences was probably first noticed by Kurt Lewin (1948). He argued that a defining feature of a group is the fact that the group members are interdependent, which means that the outcomes which individual group
members strive to attain are affected by the actions of other team members (e.g., Johnson & Johnson, 1989). Interdependence theory states that team members will be motivated to cooperate with each other when they perceive such interdependence (Johnson, 2003). Deutsch (1949) extended Lewin's research by showing that not only various amounts of positive interdependence can exist, as described above, but that there also might be situations that are characterized by negative interdependence. This negative interdependence occurs when individuals perceive that they have to compete with their fellow team members to attain valued outcomes. Consequently, the importance of interdependence theory lies in the fact that it uses a core feature of teams to describe when, and to what extent, team members will cooperate or compete with each other.

Many researchers have used and extended Lewin's ideas and have investigated the effects of interdependence (e.g., Thibaut & Kelley, 1959; Thomas, 1957). However, because these early studies operationalized the concept of interdependence in different ways and at different levels, it was difficult to compare their findings. Scholars such as Johnson and Johnson (1989) and Wageman (1995) realized that these inconsistencies posed a serious problem to the advancement of interdependence theory and therefore reviewed the available literature. These and other authors (e.g., Saavedra et al., 1993; Shea & Guzzo, 1987) concluded from their analyses that there are two basic forms of interdependence, namely task and outcome interdependence. This basic distinction is still made in the most recent reviews (e.g., Van der Vegt & Van de Vliert, 2005).

**Task interdependence.** The members of a team are task interdependent when they must share materials, information, or expertise in order to achieve the desired output or performance (e.g., Cummings, 1978; Susman, 1976). As such, task interdependence can be viewed as rooted in the jobs of the team members and can be considered a structural feature of the instrumental relations between team members. Additionally, the reoccurring interactions between the members of a team might take on an institutionalized nature over time and thereby lead to more task interdependence (cf. Brass & Burkhardt, 1993; Van der Vegt et al., 2005). Generally speaking, task interdependence can be expected to be higher when the tasks become more difficult and when the team members need more support and assistance from each other to perform their jobs. Low task interdependence exists, for instance, between call-center employees who normally perform relatively simple tasks that can be successfully completed without the assistance of fellow team members. On the other hand, managers or engineers working on complex projects need to exchange knowledge and resources with their fellow team members in order to successfully complete
their tasks and therefore generally experience high levels of task interdependence.

Many studies have assumed that task interdependence is an attribute of the entire team and subsequently expected that all team members would respond similarly to task interdependence (e.g., Campion, Papper, & Medsker, 1993; Jehn, 1995; Rousseau, 1977, 1978; Saavedra et al., 1993; Van de Ven, Delbecq, & Koenig, 1976). Other studies have highlighted that in many situations task interdependence may vary across the members of a team (e.g., Van der Vegt, Emans, & Van de Vliert, 2000, 2001) because individuals with comparable jobs may focus on different (aspects of the) tasks (e.g., Kiggundu, 1983; Pearce & Gregersen, 1991). Furthermore, as the study of Olson, Walker, Ruekert, and Bonner (2001) has indicated, the level of task interdependence may change over time. These authors investigated product development projects and found that the total frequency of interaction and information exchange increased as the project matured. Consequently, existing evidence indicates that task interdependence does not only vary between groups, but also within groups and over time. As will be discussed later on, we will extend this current knowledge by investigating if task interdependence might also vary across the intrateam relationships of team members.

Outcome interdependence. A second dimension of interdependence that is distinguished in interdependence theory is the degree of outcome interdependence. Outcome interdependence is the extent to which significant consequences of work are contingent on the collective performance of tasks (Wageman, 2001; Van der Vegt et al., 2005). Outcome interdependence can be divided into three different sub-dimensions, namely reward interdependence (Wageman & Baker, 1997; Shea & Guzzo, 1987), goal interdependence (e.g., Deutsch, 1973; Thomas, 1957), and feedback interdependence (e.g., Campion et al., 1973; Saavedra et al., 1993). What these three sub-dimensions have in common is that they signal to the team members how, and to what extent, valued outcomes can be achieved. The difference between these three sub-dimensions lies in their projection into the future.

More specifically, reward interdependence determines how ultimate outcomes can be achieved, because it indicates what payments or benefits team members receive for their joint performance. These rewards can be both financial and non-financial in nature, such as for instance a bonus, a promotion, or an award. Goal interdependence reflects the joint purpose and mission of a group (Perrow, 1961) and signals to the team members what objectives they should complete as a team to obtain valued rewards. Feedback interdependence indicates to what extent the team members receive
information on the actual state of the group relative to a reference value or standard (cf. Algera, 1990). High feedback interdependence can thus be argued to provide the team members with information about how far their group currently is in achieving its goals and rewards, while low feedback interdependence provides team members with information how far they are with achieving their own goals and rewards. As Weldon and Weingart (1993) have observed, these three dimensions of outcome interdependence can be expected to have rather similar effects in work teams.

However, it should be noted that Weldon and Weingart (1993) assumed that the different dimensions of interdependence are all of the same type and are all provided at the same level. This would be the case if, for instance, the rewards, goals, and feedback are provided to the team as a whole. Under these circumstances all three dimensions consistently signal to every team member that valued outcomes can only be achieved by working together. However, if for instance, the type and level of feedback interdependence is changed so that it provides individual team members with strong incentives for achieving high individual performance, this consistency between the three dimensions would be broken. Under these circumstances, feedback interdependence signals to team members that they should work independently or even compete with each other, while the goals and overall rewards indicate that cooperation is required. As will be discussed further in Chapter 4, it is therefore important to specify the type and level of outcome interdependence precisely, which is something that has often been neglected in prior research.

**Congruence hypothesis.** The amount of outcome interdependence can vary independently from the amount of task interdependence (and vice versa), and task and outcome interdependence should therefore be viewed as independent constructs. For example, as mentioned above, the task interdependence between call-center employees is normally very low since each individual can perform his or her duties without any assistance from the other employees. When these team members are only rewarded for their individual performance, for instance, for the number of successful calls they themselves made within a week, the level of outcome interdependence is very low. On the other hand, the team members could experience high levels of outcome interdependence if the management decided to provide bonuses to the team as a whole for reaching a certain number of calls a week as a team.

The currently available evidence indicates that this latter decision would be ill advised, since many studies have confirmed the so-called "congruence hypothesis". This hypothesis states that positive outcomes are most likely when the degrees of task and outcome interdependence are congruent with each other, such that low task interdependence is coupled with low outcome
interdependence and high task interdependence with high outcome interdependence (Saavedra et al., 1993; Thomas, 1957). Congruent situations clearly signal to the team members how they should approach their jobs. More specifically, situations characterized by low task interdependence and low outcome interdependence indicate that there is neutral or even negative interdependence and consequently focus the team members on obtaining a good individual performance. On the other hand, high task interdependence and high outcome interdependence unambiguously indicate positive interdependence and thus focuses the team members on expending cooperative efforts to obtain high group performance.

Conversely, when task and outcome interdependence are incongruent the course of action is likely to be less clear to the team members. For instance when task interdependence is low and outcome interdependence high, team members might mistakenly focus on coordinating their actions with their colleagues, even though no coordination is required. Additionally, when task interdependence is high and outcome interdependence low, team members might erroneously focus on obtaining individual benefit when collaborative efforts are required. Because such mistakes are less likely when both the task and outcome interdependence provide the same cues, the congruence hypothesis states that team processes and performance will be better under congruent conditions. This expectation has received considerable support from both experimental (e.g., Saavedra et al., 1993; Wageman & Baker, 1998) and field studies (Wageman, 1995; Van der Vegt, Emans, & Van de Vliert, 1999; Van der Vegt et al., 2001). Consequently, prior research indicates that there is an important interaction effect between the different dimensions of interdependence theory. As we will discuss in Chapters 3 and 4, this interaction provided us with a strong incentive to investigate if there are interaction effects between the often overlooked possibility of asymmetry in task dependence and the other more extensively studied dimensions of interdependence theory, namely task interdependence and outcome interdependence.

Asymmetry in dependence. In contrast to the abundance of research regarding task and outcome interdependence, and their joint influence on shaping positive or negative interdependence, stands the amount of attention paid to another aspect of interdependence theory, namely the possibility that two individuals might differ in their task dependence on each other (Kelly & Thibaut, 1978; Lawler & Bacharach, 1987). These asymmetries in task dependence can be expected to be present in most work teams due to differences in the formal or informal resources controlled by group members as a function of different roles, tenures, or natural endowments (e.g., intelligence or charisma; cf. Ragins & Sundstrom, 1989). Because asymmetries
in dependence are often based on differences in resources needed to complete tasks we will focus on asymmetries in task dependence. We expect that investigating the effects of such asymmetries in task dependence is very important given their association with differences in power. As we will elaborate in Chapter 2, it can be expected that the more task dependent team member will try to accommodate to the wishes of the less dependent, and therefore more powerful person, in order to secure an adequate flow of resources. The more powerful persons, on the other hand, are less vulnerable, because their power enables them to exit the relationship at lower costs than their more dependent partners (Cook & Emerson, 1978; Giebels, De Dreu, & Van de Vliert, 2000). Based on the above reasoning our general expectation is that asymmetries in task dependence would frustrate interpersonal processes. To investigate this general expectation we conducted three field studies.

A MULTILEVEL MODEL OF ASYMMETRY

In order to provide an overview of the three empirical studies, and to expose their interrelatedness, a conceptual model is depicted in Figure 1.1. As can be seen in this figure, each study addresses a different level of analysis and this strategy enabled us to gain more insight into both the specific relational mechanisms associated with asymmetries in task dependence as well as its overall effects on team processes and performance. Below, we will first explain the different levels of analysis after which we will introduce the specific research questions and briefly explain the reasons for choosing each particular research design.
One of the strengths of the present dissertation is the investigation of the effects of our core variable (asymmetries in task dependence) at various levels of analyses. The highest level we will use is the team level of analysis. At this level we will investigate if, and how, the total amount of asymmetry in task dependence within a team influences team processes and performance. The advantage of this level of analysis is that it can provide an overall picture of how asymmetries in task dependence can influence the functioning of whole work groups. However, a downside of this level is that it is impossible to investigate if differences between individuals in their asymmetries in task dependence are important for these individuals themselves and thus a certain level of detail is lacking at this level.

1 A brief explanation of multilevel theory is provided in Appendix 1.
Fortunately, this shortcoming can be amended by studying the effects of asymmetrical task dependence at the individual level of analysis. This level is subordinate to the team level, because, in multilevel theory terms (e.g., Snijders & Bosker, 1999), individuals are "nested" within their respective teams and as such two randomly chosen individuals from our sample could belong to the same team or to two totally different teams. The advantage of the individual level is that it allows us to see if employees react similarly or differently to varying degrees of asymmetries in task dependence and it therefore provides a more fine-grained insight compared to the team level of analysis.

The lowest, and most detailed, level of analysis we will use is the dyadic level. At this level we will investigate if there are differences in the perceptions of two team members concerning their relationship with each other. Dyadic level phenomena have often been overlooked in studies regarding work teams, despite the fact that they have been argued to be important (e.g., Kelley & Thibaut, 1978; Rusbult & Van Lange, 2003). Consequently, to investigate the effects of asymmetry in task dependence systematically we will first examine the basic mechanisms operating at the dyadic level.

**Study 1: Is asymmetry in task dependence (ab)used?**

As was mentioned above, asymmetries in task interdependence have been associated with differences in power between individuals (e.g., Emerson, 1962; Kelley & Thibaut, 1978). To account for the fact that "power is a property of the social relation [and] not an attribute of the actor" (Emerson, 1962: p. 32), we began our first study with an investigation at the scarcely researched dyadic level. The main goals of this first study were to see if asymmetries in task dependence can actually be measured in real life teams and to test if the proposed power perspective would be a suitable framework for understanding the influence of asymmetry in task dependence on interpersonal processes.

The specific details are reported in Chapter 2, but as means of an introduction we will provide a quick overview of our reasons for taking a power perspective. Power has traditionally been associated with (the potential for) abuse and many sociologically and politically oriented scholars, such as for instance Niccolò Machiavelli and Max Weber, have investigated this issue. In light of the topic and orientation of this thesis we will not discuss such sociological and political works, but mainly focus on psychological studies regarding power. The roots of this more psychological approach go as far back as the beginning of the 20th century when Ross (1921) formulated his law of personal exploitation, which states that the person who cares less has
the power to exploit the person who cares more (see also; Waller and Hill, 1951). Given the focus of this thesis on teamwork we will not draw from these earlier sources that are less related to teamwork. Our references will only go as far back as to the works of Thibaut and Kelley (1959) and Emerson (1962), because they were the first to explicitly associate the key aspect of teamwork (namely interdependence; Lewin, 1948) with differences in power. However, as the above indicates, it seems that regardless of exactly how far we go back in history, most theories indicate that asymmetries in power can potentially be detrimental for interpersonal relationships. Consequently, one of the main research questions of the first study was to inquire if these negative effects of asymmetries in task dependence would actually be observable in work teams and could significantly influence interpersonal relationships.

Study 2: Some room for optimism?
The second study expands on the first dyadic level study by investigating if asymmetries in task dependence can exert influence on the affective reactions of individual team members. As was mentioned above, investigating if asymmetries in task dependence might influence affective reactions is important, because affective reactions have been shown to significantly influence the health and well-being of team members (e.g., Sonnentag, 1996) as well as the productivity of the team as a whole (e.g., Ostroff, 1992).

Additionally, the second study investigates a boundary condition for the effects of asymmetrical task dependence by inquiring if some power disadvantaged team members are able to circumvent the negative consequences of their lack of power. Because prior research has shown that there are interaction effects between the different dimensions identified by interdependence theory, we decided to investigate if the amount of task interdependence might enable the power disadvantaged to convince the powerful to share their resources. We expected that high levels of task interdependence provide the power disadvantaged team members with resources to negotiate with (cf. Casciaro & Piskorski, 2005). Under these circumstances, both the power disadvantaged and the powerful have fewer alternatives for obtaining valued resources (i.e. they are both dependent) and as a result the cost for the powerful for abusing their power increases, because it could result in loosing the valued resources possessed by the power disadvantaged (cf. Gulati & Sytch, 2007). Consequently, we expected that it is

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2 Asymmetries in power can exist for legitimate reasons, such as between parent and child, teacher and student, or doctor and patient. However, despite being legitimate, these relationships hold the potential for power abuse.
less likely that the powerful will actively use their power advantage under such conditions. Furthermore, high task interdependence can also increase the interaction frequency between the powerful and power disadvantaged, because they need to exchange resources more frequently (e.g., Anderson & Williams, 1996). An increase in interaction frequency not only increases the opportunities for the power disadvantaged to convey their needs to the powerful, but it can also increase the ‘liking’ between the team members due to the ‘exposure effect’ (Bornstein, 1989). Hence, the general expectation for the second study is that higher levels of task interdependence enable the power disadvantaged to keep the powerful informed about, and motivated in, their needs.

**Study 3: Turning negative effects into positive ones**

In the third and final study of this thesis (reported in Chapter 4) we will investigate if and how asymmetries in task dependence influence team performance. Given the above discussions, it seemed logical to expect that asymmetries in task dependence are negatively related to team performance due to power abuse, lower interpersonal relations, and less positive affective reactions. Because no study to date has empirically investigated this issue, examining this unexplored relationship could in and of itself be a valuable contribution. However, we tried to be a bit more ambitious and therefore asked ourselves the question if there could be situations in which asymmetries in task dependence are positively related to team performance.

Although posing this question might seem counterintuitive given the prior discussions of the negative effects of asymmetries in task dependence, there are good theoretical reasons for expecting a positive effect in some situations. These reasons became clear to us by investigating the nature of asymmetry in task dependence, because in work teams asymmetries in task dependence often arise from the differences between team members in experience, tenure, formal or informal roles, specialization, charisma, etcetera (e.g Ragins & Sundstrom 1989). Past research has indicated that these sorts of differences can be an important input and impetus for intra-team learning and continuous improvement (King, 1998; Van der Vegt & Bunderson, 2005). Hence, as will be explained in more detail in Chapter 4, there are good reasons to expect that if the more powerful team members decide to share their resources with the less powerful team members, asymmetries in task dependence might be associated with more learning behaviors and a higher performance of the team.

It is this investigation of how teams can make use of their asymmetries in task dependence which is the main contribution of the third study. We will argue that when the amount and type of feedback focuses on
attaining group goals (instead of individual goals) asymmetries in task
dependence can have a positive effect on team learning behaviors and,
through team learning behaviors, on team performance outcomes.
Consequently, the third study extends the first two studies by investigating the
possible effects of asymmetry in task dependence at the team level and by
investigating how the amount and type of feedback might be used to
influence the consequences of asymmetries in task dependences. Because
managers can influence the amount and type of feedback they provide to
their team, we believe that this third study could be very beneficial to both
practitioners as well as researchers, and provides them with more options
besides changing the task interdependencies within a team.

CONCLUSIONS

To summarize the above, the reason for conducting the present dissertation
was to investigate the often overlooked aspect of asymmetry in task
dependence. More specifically, by drawing from theories regarding power
(e.g., Emerson, 1962) we expected that asymmetry in task dependence might
lead to negative outcomes if the powerful choose to (ab)use their power.
However, based on a recent study of asymmetry in dependence at the
organizational level (e.g., Casciaro & Piskorski, 2005) and on theories
regarding learning (e.g., King, 1998), we also found reasons to believe that the
possible negative effects of asymmetries in task dependence might sometimes
be avoided or even be turned into positive effects. In order to systematically
examine these ideas, we began by investigating if asymmetry in task
dependence could actually be measured in work teams and if a power
perspective would indeed be able to explain the findings. This first empirical
study is reported in the following chapter and lays the theoretical and
empirical basis for the subsequent two studies.