Faut-il réfléchir pour être performant en groupe? Les conditions de l'efficacité de la réflexivité

Is it necessary to think to be a successful team? Boundary conditions of the team reflexivity effects

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Par

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Faut-il réfléchir pour être performant en groupe ? Les conditions de l'efficacité de la réflexivité – Is it necessary to think to be a successful team? Boundary conditions of team reflexivity effects

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To err is human, to correct for it divine.
Orlitzky & Hirokawa, 2001.

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Table des matières

Figures

Tables

Abstract

In this dissertation I concentrate on some of the boundary conditions of reflexivity in teams. Research has shown that reflexivity (collectively reflecting on the teams' objectives, strategies, and processes and adapting them accordingly) can enhance team performance and innovation. This effect, however, may have boundary conditions.

Indeed, prior research has shown that the positive effects of reflexivity were often not straightforward, but depended on other variables. Given the many variables that moderate the relationship between reflexivity and team outcomes, it remains important to investigate under what conditions reflexivity really benefits teams. Therefore, I decided to study team reflexivity and take into account potential moderators, based on the assumption that reflexivity enhances performance and innovation if the reflection process is useful for the actual task or cooperation requirements.

This dissertation is composed of a conceptual part (Chapter 1, 2, 3) and an empirical part (chapter 4, 5, 6) that present three papers each testing a specific aspect of the relationship between reflexivity and team performance and innovation. In all of the papers, the hypotheses were tested with field studies and the variables were evaluated with self-report questionnaires.

A preliminary step in this dissertation was to validate the reflexivity scale for a French speaking sample. This first step enabled me to have an appropriate measure of reflexivity for the following next steps. The next steps represent the core project of this dissertation. The aim was first to test whether task reflexivity influences team performance and innovation more when teams need coordination because of task variety and when teams can implement the results of their reflection thanks to autonomy. And second, to test the relative importance of task reflexivity compared to transactive memory system, for team performance and innovation.

In the first paper (chapter 4), two studies were conducted with 80 teams (320 participants) to validate the French version of reflexivity scale. In study 1, exploratory factor analysis revealed 3 factors which partially confirm the 2 factor structure expected from the original study (Carter & West, 1998). Two items of the original task reflexivity scale loaded on a third factor named 'strategic reflexivity'. The three factor structure was replicated in study 2 with confirmatory factor analysis. Criterion validity is confirmed by correlations between reflexivity and team

performance. Task, social and strategic reflexivity correlate with different aspects of team and individual performance. From these studies, it was concluded that the French version of the reflexivity scale is reliable and appropriate for evaluating team reflexivity.

In the second paper (chapter 5), a study was conducted with 84 heterogeneous teams (334 participants) that performed a wide variety of tasks. First, I tested whether task reflexivity influences team performance more when teams need coordination because of task variety. Results indicated that task reflexivity improved team performance more when there was greater task variety. Second, I investigated whether the effects of task reflexivity on team innovation depend on the level of autonomy. Again, results showed that teams with greater autonomy benefited more from task reflexivity than teams with less autonomy. The results support my argument that task reflexivity benefits teams when teams perform non-routine tasks that may require more integration and coordination; and is most helpful when they are autonomous, and thus able to implement the results of their reflection.

In the third paper (chapter 6), I surveyed 101 teams (420 participants) to test the relationships between explicit coordination (task reflexivity) and implicit coordination (transactive memory system). Results show that task reflexivity fostered team innovation and team performance. Transactive memory systems enhanced not only team performance but also innovation. As expected, task reflexivity and transactive memory did interact. Task reflexivity only enhanced team performance in teams with a less well developed transactive memory system (as evidenced by low level of specialization). Similar results were found for team innovation. Task reflexivity fostered team innovation in teams with a less well developed TMS (as evidenced by specialization and coordination) but high task reflexivity also impacted team innovation for teams with a good transactive memory system (as evidenced by high specialization and coordination). These results support the argument that task reflexivity is most helpful when a team has a poor transactive memory system that may require a reflection on who knows what. Second, the results supports the argument that task reflexivity also benefits team innovation when a team is highly specialized and coordinated and thus explicit reflection with specialized, diverse well coordinated team members, increases innovation.

The primary contribution of this dissertation was to provide explanation for understanding the mixed results of task reflexivity on team performance. On one hand, this study highlights the

importance of both task characteristics and enabling conditions of the effects of reflexivity on team performance and innovation; and on the other hand the importance of studying the relationship among explicit and implicit coordination mechanism on team outcomes. Future research should further address reflexivity and its boundary conditions.

Keywords: team performance, reflexivity, task type, transactive memory system.

Introduction

Organizations widely rely on teamwork and prefer a team-based organizational structure (Clegg et al., 2002; Devine, Clayton, Philips, Dunford, & Melner, 1999; Waterson et al., 1999). Teams are now how jobs get done in organizations. A team-based structure is believed to enable organizations to face the requirements of a more and more dynamic environment because teams are adaptive and flexible. They are used at all hierarchical levels of an organization, from blue-collar workers organized in quality circles to executive committees involved in strategic decision making. Despite the variety of teams, they share the same characteristics:

> *"A team can be defined as (a) two or more individuals who (b) socially interact (face-to-face or, increasingly, virtually); (c) possess one or more common goals; (d) are brought together to perform organizationally relevant tasks; (e) exhibit interdependencies with respect to workflow, goals, and outcomes; (f) have different roles and responsibilities; and (g) are together embedded in an encompassing organizational system, with boundaries and linkages to the broader system context and task environment"* (Kozlowski & Ilgen, 2006, p. 79).

As a consequence of team-based working, many researches developed models of team performance and investigated factors that make teams more effective. A traditional framework to guide the study of team performance is an *Input-Process-Output* (IPO) model (Cohen & Bailey, 1997; Gladstein, 1984; Guzzo & Shea, 1992; Hackman, 1987; Hackman & Morris, 1975; McGrath, 1964; Sundstrom, McIntyre, Halfhill, & Richards, 2000). This conception emphasizes the central role of team processes. The IPO model claims that coordinating activities among team members (task-related processes) and insuring smooth collaboration between team members (social-related processes) while communicating relevant information are critical to achieve a high level of team performance. More recently, adaptation has been identified as another critical aspect of team performance (Arrow, McGrath, & Berdahl, 2000; Guzzo & Dickson, 1996; Ilgen, Hollenbeck, Johnson, & Jundt, 2005; Klimoskwi & Bell, 2003; Tannenbaum & Salas, 1996; Salas, Sims, & Burke, 2005). Indeed, adaptation is needed to face the dynamic environment.

Although evidence of the effectiveness of team work has been found in a large number of empirical studies (see West, Brodbeck, & Richter, 2004), teams also experienced failures, raising scepticism about the promising success of teamwork over individual work (Allen & Hecht, 2004). The question remains: what teams need to be fully effective? As I-P-O model suggests, the difference between an effective team and a less effective one lies in team processes and their adaptation to changes. Indeed, team-based working has raised many challenges for employees working in teams, especially the need for coordination. Coordination has largely proven to be influenced by shared understanding of the task (what has to be done and how) and of the team (who is good at what and how each member's actions go with each other) which further leads to improved team performance (Cannon-Bowers, Salas, & Converse, 1993; Klimoski & Mohammed, 1994; Moreland, 1999; Salas et al., 2005). At the same time, explicit reflection seems desirable. Indeed, teams also need to monitor progress towards goal accomplishment and to revise the way things are done to adapt functioning in accordance to environmental changes. However, adaptation can be difficult since teams have the tendency to rely on routines (Gersick & Hackman, 1990).

The concept of *reflexivity* addresses precisely this adaptation need by an explicit reflection in teams. Reflexivity has been suggested to be an overarching process that improves team performance and particularly team innovation (West, 1996, 2000, 2003). Team reflexivity refers to the extent to which team members collectively and overtly discuss their objectives, processes, develop strategies, and plan to adapt these aspects to current or anticipated endogenous or environmental circumstances, and make changes accordingly (*task reflexivity*), but also includes good conflict handling, social support, support for team member's growth, and a healthy social climate (*social reflexivity*) (Carter & West, 1998; Swift & West, 1998; West, 1996, 2000, 2003). Task reflexivity is believed to enable teams to develop optimal performance strategies, to detect deviation from expected results, and to adapt team functioning to changing demands; while social reflexivity enables teams to integrate divergent opinions and constructively deal with conflict.

Although many studies on reflexivity showed that task reflexivity positively influenced team performance and especially team innovation (Carter & West, 1998; Patterson et al., 2003; Schippers, Den Hartog, Koopman, & Wienk, 2003; Somech, 2006; Tjosvold, Hui, & Yu, 2003; Tjosvold, Tang, & West, 2004), this positive effect was often not straightforward, but depended on variables such as whether the reflexivity was done individually or as a group (Gurtner,

Tschan, Semmer, & Nägele, 2007); the timing of the reflexivity (Gevers, van Eerde, & Rutte, 2001); the presence of minority dissent (De Dreu, 2002), and cooperative outcome interdependence (De Dreu, 2007). Given the many variables that moderate the relationship between task reflexivity and team outcomes, it remains important to investigate under what conditions task reflexivity really benefits teams.

Objectives and overview of the doctoral thesis

One of the main advantages of teams is their adaptability to changing circumstances, which is believed to be greater, if teams engage in reflective processes. So, one could suppose that more reflection leads to better team performance, however, this is not so straight forward, as previous research has shown. Indeed, empirical evidence for the direct role of reflexivity in engendering team performance varies greatly from one study to another (Carter & West, 1998; De Dreu, 2002, 2007; Gevers et al., 2001; Gurtner et al., 2007; Schippers et al., 2003; Somech, 2006; Tjosvold et al., 2003; Tjosvold, Tang et al., 2004). Furthermore, others studies confirmed the difficulties of teams to stop and think (Hackman, Brousseau, & Weiss, 1976; Gersick & Hackman, 1990; Okhuysen, 2001; Weingart, 1992). It remains important to explore the possible causes of these inconsistencies. So the main question driving this dissertation is *under what circumstances should teams use reflexivity to improve team performance?* One explanation for mixed results could be the presence of moderators. I argue that the positive main effect of reflexivity is likely to happen but depends on boundary conditions. Although previous studies demonstrated that many variables moderate the relationship between task reflexivity and team outcomes, so far other important aspects such as task characteristics and how reflexivity combines with implicit coordination processes have been neglected.

The purpose in this dissertation is twofold: A first aim of this dissertation is to take a detailed look at the concept of reflexivity and how it is measured. Since data were collected in the French speaking part of Switzerland, I therefore validated the reflexivity questionnaire developed by Carter and West (1998) for a sample of French speaking employees. The second main objective is to study the link between task reflexivity and team performance, taking into account possible moderator variables which I propose might hinder or foster the impact of task reflexivity

on team performance: two task characteristics (task variety and autonomy) and one particular implicit coordination process, namely transactive memory.

This dissertation is structured as followed. *Chapter 1* begins by an overview of I-P-O models of team performance, which have been widely relied on to structure the relationships between variables and their influences on team performance. Then, a review of the literature on team reflexivity and arguments supporting the need for reflexivity in teams, as well as empirical evidence illustrating the mixed evidence of effects of reflexivity are presented (*Chapter 2*). A proposed model of team reflexivity and hypotheses are described in *Chapter 3*. In *Chapter 4*, I describe a field study aimed at validating the reflexivity scale (initially proposed by Carter and West, 1998) comprised of task and social reflexivity, for a French sample. Moreover the study also compares individual and team performance. In *chapter 5*, I describe an empirical study that addresses task characteristics as a boundary condition of the positive effect of task reflexivity on team performance. According to I-P-O models, the effectiveness of a team process may depend on the characteristics of the tasks the teams are performing (Gladstein, 1984; Gist, Locke, & Taylor, 1987). In this study, I investigated the moderating effect of task variety and task autonomy between task reflexivity and team performance. More specifically, I will argue that task reflexivity has a more beneficial influence on team performance when the team has higher levels of task variety, and that the relationship between reflexivity and team innovation is stronger if the team members have a high level of autonomy. In *chapter 6*, I report the results of a field study assessing the interaction between task reflexivity and transactive memory. A transactive memory system in a team is a shared awareness of who knows what (Moreland, 1999) and enables teams to organize the knowledge possessed by each team member and to make implicit adjustments in coordination to accommodate for these knowledge differences. To date, there are few attempts to investigate how reflexivity may combine with implicit coordination processes such as transactive memory. I will argue that task reflexivity and transactive memory interact in such a way that task reflexivity enhances more team performance and innovation in teams with a less well developed transactive memory system. Finally, in *chapter 7* results are summarized and theoretical and practical implications are discussed.

Chapter 1

Input-Process-Output models of team performance

This chapter is dedicated to the review of some of the major team performance models. There are a lot of studies dealing with team performance; I therefore choose to focus on general theoretical framework rather than detailing each specific variable included in team performance. For a review of specific processes see Kozlowski and Bell, 2003 and Salas, Sims, and Burke, 2005. The choice to include specific papers in this review was driven by their pertinence for providing guidance and structure to understanding how reflexivity may affect team performance.

Early research in social psychology on team performance suggested that teams encounter troubles such as coordination problems and motivation problems (Steiner, 1972), may develop social loafing (that is team members have the tendency to reduce their own individual effort when individual contributions cannot be evaluated, Karau & Williams, 1993), and are also likely to encounter groupthink that is teams have the tendency to act in a way that preserves team cohesion to the detriment of critical thinking, (Janis, 1982). Work and organizational psychology also recognizes that teams have trouble functioning optimally (Hackman, 1990, 1998, 2002; West, Hirst, Richter, & Shipton, 2004) and focus on the conditions that enable teams to develop to their potential and to achieve better performance. Acknowledging this observation, frameworks to study team performance were developed first by McGrath (1964) and expanded by Hackman and Morris (1975) who proposed a model which included Input-Process-Output type of variables. In this chapter, I first define what the three components of team performance are (input, process, output) and present traditional I-P-O models. Then, more attention will be given to more recent conceptualizations which emphasize the dynamic adaptation process in teams.

I. Traditional view of team performance: Input-Process-Output models of team performance

I-P-O models describe how inputs affect team performance through their effects on team processes. Based on Hackman (1987) and Hackman and Morris (1975), inputs include characteristics of team members, of the team, and of the organization. These are the resources of the team which are transformed into products by the processes of the team. Inputs are considered to be the principal causes of team processes. Team processes play a central role in the team performance model and represent all the actions teams display between time 1 and time 2 (Gladstein, 1984). Team processes include how team members coordinate actions, collaborate, and communicate. These processes foster or decrease the level of team performance.

The definition of team performance proposed by Hackman (1987), has been widely accepted and outlines three criteria of team performance. First, team performance represents the product of teams' performance related to the task (external criteria). The product the teams achieve in carrying out the task should match the team's standards for quantity and quality. Second, team performance also includes social and interpersonal dimensions (internal criteria). To be fully effective, the satisfaction of team members' needs as well as team member well-being have to be fulfilled. Finally, team viability is also an important criterion of team performance. Team viability is the capacity of team to continue to perform well together in the future and is contingent on the first two dimensions. To ensure team viability, the team has to achieve its objectives and satisfy the needs of team members, otherwise the future of the team is compromised, and team members may leave the team.

Hackman and Morris (1975, p. 2) suggested that *'the key to understand the group effectiveness problem is to be found in the on-going interaction process which takes place among group members while they are working on a task'*. In their views, team effectiveness depends on three main interaction processes: the amount of effort team members put into the task, the appropriate use of team task performance strategies, and how the knowledge and skills of team members are used. *Team members' efforts* may explain the difference between a highly effective team and a less effective one. Team members need to coordinate the activities of each team member but also need to increase the motivation members feel to expend effort. It is also

important that team members exchange and coordinate the *knowledge and skills* of each team member. Another proposed determinant to team effectiveness is the quality of *strategies* used to perform the task. There is no unique strategy which can be applied to every team task; rather the effectiveness of strategies depends on the team's task. When strategies are aligned with the task's demands then the team is effective.

Hackman and Morris (1975) proposed that the effect of team processes on team performance varies according to type of task. In an experimental study, Hackman, Brousseau, and Weiss (1976) compared the effect of an intervention, namely promoting open discussion of strategies, on team performance for a simple task and for a complex task. Results showed that explicit discussion about strategies promoted team performance, but only when the task required a certain degree of coordination and sharing among members. For simple tasks, the discussion about strategies did not foster team performance.

Others traditional models of team performance were designed based on the one proposed by Hackman. Gladstein (1984), also propose an I-P-O model for explaining team performance. She emphasized the role of team processes related to collaboration into interpersonal and task related aspects. Interpersonal related aspects include open communication, supportiveness, and the reduction of interpersonal conflict. Task related aspects include processes such as discussing strategies, weighing of individual's inputs according to knowledge and skills of the members, and management of the relationship of the team with external groups related to them. This model is particularly relevant for this dissertation because Gladstein suggested moderating effects of the team task such as task complexity, environmental uncertainty, and interdependence among team members, on the process-output relationship. She failed to empirically demonstrate this moderation and proposed that variance in the team task in her study was not sufficiently high to have an effect.

Gist, Locke, and Taylor (1987) presented an integrative model. Based on their review of studies done in each part of the I-P-O model, they proposed that input is composed of group structure (team size, member ability, personality, gender and race), group strategies, leadership style, and reward allocation to the team. Team processes refer to members' influence (how the presence and behavior of others fosters or hinders team performance), team development (team members go through different stages), and to how team decisions are made. Finally, based on

Gladstein (1984), they also outline the critical moderating role of the team's task characteristics between process and output.

The traditional I-P-O conceptual framework was often applied in empirical studies on team reflexivity. For instance, Schippers, Den Hartog, Koopman, and Wienk, (2003) examined how team diversity (input) impacts the level of reflexivity (process) and team task performance (output). Tjosvold, Tang, and West (2004) also applied the I-P-O model to study reflexivity, they investigated the influence of teams' goals (input) (cooperative, competitive, or independent) on reflexivity (process) and on the subsequent level of innovation (output). In this dissertation I also use an I-P-O model to study team reflexivity.

Although those traditional models offer a framework to organize variables, they also provide little insight into how team members regulate team processes toward goal attainment regarding (a) the effectiveness or ineffectiveness of previous functioning and (b) the dynamics of environment and task demands. In the next part, I will review models of team performance which take into account this need of adaptation.

II. A more dynamic view of team performance

In this study, I focus on teams existing within organizations. Some authors emphasize the fact that teams develop as a result of experience, that they lie within a context and that teams need to monitor, learn and adapt in order to be fully effective.

McGrath and colleagues' work on team performance (Arrow, McGrath, & Berdahl, 2000; McGrath, 1991; McGrath & Argote, 2001; McGrath, Arrow, & Berdahl, 2000; McGrath & Tschan, 2004) was the first to claim the need to study teams as complex, adaptive and dynamic systems. As a team performs its tasks, team members establish, enact, monitor, and modify their functioning, which was previously set up during a formation mode. Teams also adapt to events and to changes occurring in their environment, these adaptations help teams to learn from their experience.

McGrath and Tschan (2004) proposed an interesting description about how a team regulates their activities towards goal accomplishment paralleling action regulation theory. In their view, a team's actions take place at three levels: purpose, planning, and performance. At the

purpose level teams prepare for action by formulating goal and allocating resources. Purpose level is driven by knowledge and intentions. The planning level consists of structuring activities, and is driven by lore and logic. Performance level is the lowest level in this hierarchy, it consists of doing what was previously planned, monitoring these actions, and if needed modifying them. Within organizational learning literature, this lower level of regulation is characterized by a single loop learning (Argyris & Schön, 2002). Team performance also feeds back to the higher levels of action regulation. The results of team performance may lead teams to modify plans and revise strategies which are considered as double loop learning (Argyris & Schön, 2002). Performance also feeds back into the highest level of regulation, namely the purpose level. This may lead to triple loop learning that consists of questioning norms, purpose, and values (Nielsen, 1993). In a similar vein, the concept of reflexivity includes different levels of regulation which can vary from a low level of regulation qualified as shallow reflection, to a deep level qualified as deep reflection and going through a moderate level of reflection.

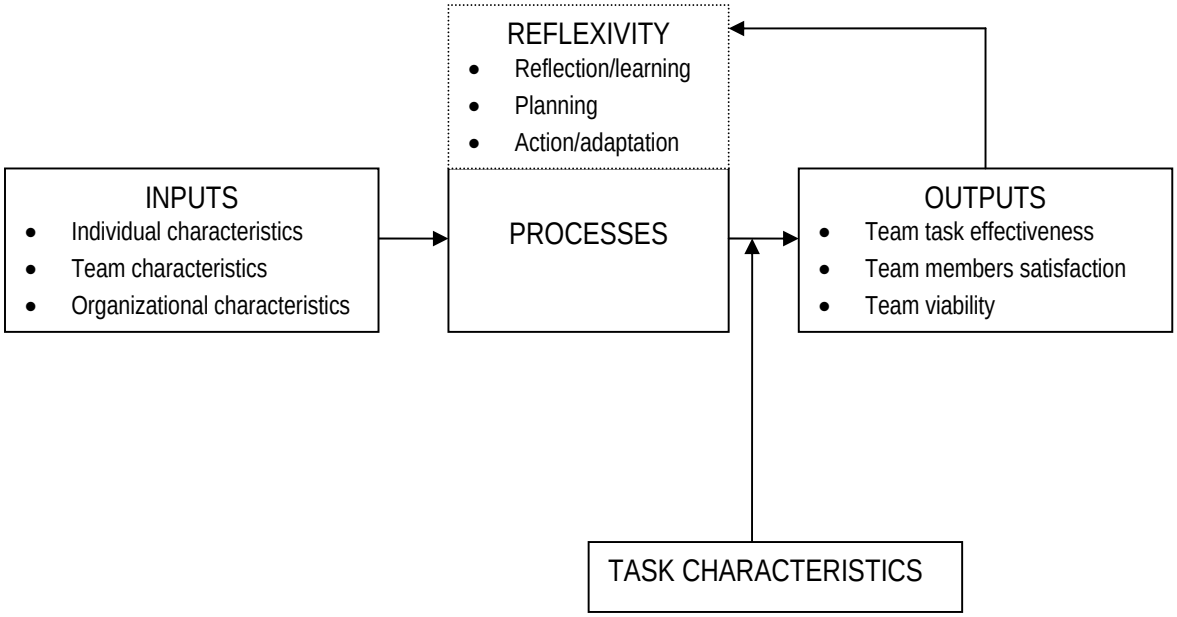
A more recent theoretical paper written by Marks, Mathieu, and Zaccaro (2001) proposed that the success of a team mainly depends on *'members' interdependent acts that convert inputs to outcomes through cognitive, verbal, and behavioural activities directed toward organizing taskwork to achieve collective goals'* (p. 357). Their framework captured the temporal dynamic of team performance. Team processes are a succession of several tasks or cyclical episodes starting with a goal to accomplish the tasks and finishing when the tasks are actually completed. Teams have an overarching goal that requires the accomplishment of subgoals. Within each episode, teams go first through a transition phase where the team analyzes the mission, specifies goals, and decides on strategies. For teams within organizations, there is usually a time dedicated to that type of activities, for instance during meetings. Once the team is agreed on how to get the job done, they enter into an action phase by implementing strategies, monitoring progress toward goals, ensuring they have the material resources needed, and providing support, coaching, or carrying out actions for other team members. Similar to McGrath and Tschan (2004), this conceptualization of team performance emphasizes the critical role of reflected regulation of actions for a good performance.

In a recent review of team performance, Ilgen, Hollenbeck, Johnson, and Jundt (2005), acknowledged the deficiency of traditional I-P-O models to capture the temporal and contextual dynamics of teams. This lack is especially salient when trying to understand teams in

organizations which evolve over time, adapt to task demand and to contextual changes. What is particularly interesting in their model and corresponds well to the reflexivity concept is that performance is conceived of as a cycle, that is outputs serve as an input for the next output, the results of the work of the team also feedback into their processes. They come to the conclusion that team performance is better captured by an Input-Mediator-Output-Input (IMOI) framework. To also address the temporal dynamics of teams, they organized their review of studies following a typical team's development which consists of several stages. The forming stage refers to the effect of inputs on mediational processes, the functioning stage refers to the impact of mediation processes on outputs, and the finishing stage refers to when output feedback becomes an input. During forming stage they identified trust, planning, and cognitive processes as critical variables. When the team is in its functioning stage, they emphasized the roles of bonding (affective feeling that team members hold toward each other and to the team), adaptation (behavioral action of readjusting actions due to recognition of deviations), and learning (cognitive process leading to changes in knowledge). Finally, output serve as an input for the next performance.

Based on this review of literature on team performance, I sum up the relationships between inputs, processes and outputs and propose where team reflexivity could fit into this framework. Figure 1 depicts the proposed framework to study team reflexivity. What is particularly important in this figure is first that task characteristics are proposed to moderate the relationship between team process (in this work reflexivity) and team outputs. This aspect will be addressed in chapter 3 and tested empirically in chapter 5. Note also that team reflexivity is here considered as part of the team processes but is somewhat distinct because reflexivity is also an overarching process which could have an effect on other team processes. Thus, team reflexivity could interact with other team processes. This possibility is addressed in chapter 3 and tested empirically in chapter 6. In the next chapter, team reflexivity process will be described in more detail.

Figure 1. Team reflexivity within Input Process Output model of team performance.



Chapter 2

Team reflexivity: a particular team process

The aim of this chapter is to review in more detail the concept of team reflexivity, describe how reflexivity exerts influence on team performance, and to explore related concepts. In this dissertation, task reflexivity refers to the extent to which team self-regulate their activities toward their goals on the other hand social reflexivity refers to the extent to which team deals with interpersonal relationships.

I. What is team reflexivity?

The concept of reflexivity has been used to describe the process of adapting actions through reflection. As such, teams as well as individuals or organizations may use reflexivity to evaluate their actions, analyze errors and success, plan alternatives strategies and try them.

At the individual level, research on expertise development found that deliberate practice is a critical aspect for success (Ericsson & Lehmann, 1996). Expert performance is not only the result of developing expertise but also the result of engaging in reflection on practice. To benefit from feedback and achieving exceptional performance, individuals have to screen deliberately what they did. Similarly, Schön (1983, 1987) talks about 'reflection in action' to capture how an individual can switch from action to cognition by consciously thinking, analyzing, and learning about their own actions. Reflexivity is also similar to the process described in action regulation theory (Frese & Zapf, 1994). Both conceptions represent a cycle of activities which stated that it is important to reflect on goal, generate plan, decide or act accordingly, then monitoring progress, and finally analyze feedback.

Reflection in action can be done at a higher level such as the organizational environment. At the organizational level, reflexivity is viewed as a learning cycle. Argyris and Schön (2002)

use the concept of double loop learning which emphasizes the role of reflection on governing values to arrive at better strategies. Organizational learning literature proposes that discussing tacit assumptions explicitly is particularly useful in complex and changing environments. This ability to self question and to learn from experience parallels the concept of team reflexivity.

Looking at reflexivity in team seems important because teams are the basic unit in organization and being reflexive in team may impact the wider organization as well as individual practice. The concept of team reflexivity that I based this dissertation on comes from the work done by West (1996, 2000, 2003). Team Reflexivity is described here by a work and organizational perspective and at team level. Team reflexivity is defined as:

'The extent to which group members overtly reflect upon the group's objectives, strategies and processes, and adapt them to current or anticipated endogenous or environmental circumstances' (West, 1996, p. 559).

West (1996, 2000, 2003) presented team reflexivity as a process combining three critical aspects: an exchange and reflection on information (including discussion of goals, strategies, processes, and past performance), an adaptation aspect (revising goals and processes, and changing strategies) and an implementation aspect (reflexivity process which will be discussed in more detail in section III under task reflexivity). But most of the empirical research on team reflexivity takes an outcome perspective by considering an increase in reflection, processing feedback information, or planning as an indication of team reflexivity. In that sense, team reflexivity is a quality that teams may or may not possess. Non-reflexive teams do not pay much attention to the appropriateness of team objectives, strategies, or changes in their environment; they have a tendency to react defensively to changes and fail to anticipate environmental changes.

The definition also depicts the domain of reflexivity. Team reflexivity can focus on goals, strategies, processes, organization and environment. Team reflexivity helps team members to clarify and develop appropriate goals which in turn foster team members' commitment to them, team members share the same vision of goals and focus their attention on achieving those goals. Other research has confirmed the importance of clear and shared goals for team performance (O'Leary-Kelly, Martocchio, & Frink, 1994; Weldon & Weingart, 1993).

Strategies and plans are needed to articulate these goals. Team reflexivity helps team to evaluate previous strategies and adapt them to changes in the environment. Adaptation of

strategies is also a critical part of team performance as described in the previous chapter (Hackman, 2002; Tschan, Semmer, Nägele, & Gurtner, 2000).

Reflexive teams pay attention to team processes. Team members reflect on coordination (how to combine knowledge, skills, and effort), communication (how team members should communicate between themselves), and collaboration (the way of managing interpersonal relation between team members). As mentioned in the previous chapter, team process is a critical ingredient of team performance and many researches investigated the benefit of such team processes for team performance (for a review see Kozlowski & Ilgen, 2006). Thus, reflecting, planning, and adapting them seem particularly relevant to improving team performance.

Arrow, McGrath, & Berdahl (2000) reminded us that teams are embedded in a larger context; they belong to a particular organization and evolve in a wider environment. Thus, West (1996, 2000, 2003) proposed that reflexivity should also be done on these wider levels. A wider reflection would include a reflection on the relationship between the team and their organizations (for instance, how the organization provides support to the team) but also how the team interacts with other teams. Paying attention to external activities in the organization or in the environment and developing effective strategies to manage the relationships with external entities have been shown to predict team performance (Ancona & Caldwell, 1992).

West (1996) distinguishes between task reflexivity, where the reflection focuses on task-related aspects, and social reflexivity, where the team reflects on its social functioning. But most of the empirical papers focus only on task reflexivity (under the name of reflexivity) and West in recent theoretical works does not separate social and task reflexivity and only speaks about ‘group task reflexivity’ (West, 2000, 2002, 2003). Despite the decline of research on social reflexivity, it addresses another important aspect of team performance, namely how team members deal with each other. Below I will first detail the components of social reflexivity and in the next part I will review task reflexivity and its components regarding reflection, planning, and action.

II. Social reflexivity, how a team deals with collaboration

I-P-O model of team performance stated that there is two main parts of team functioning: task related processes and social related processes. Not only teams have to do their tasks but also

the way team members work together in team is important. The social side of team work mainly refers to the way team members collaborate with each other. The concept of reflexivity also reflects these two parts. On one hand team members have to focus on objective and review their strategies, and on the other hand teams have to manage the human side of a team. According to Carter and West (1998), social reflexivity refers to:

'How a team deals with conflicts, reviews member social support, and promotes the well-being and development of its members' (Carter & West, 1998, p. 588).

Social reflexivity deals with the social functioning part of a team. Dealing with interpersonal relations in a team can lead to better team performance in general because work within a team requires collaboration among team members. When team members reflect regularly on the way they provide support to each other, on how to constructively deal with conflicts, and on how to ensure a friendly social climate, they develop strategies to address actively potential troubles in the team's interpersonal relationships. Such a team is likely to increase team member well-being, team member satisfaction, and team viability (West, 1996) which are the social and interpersonal dimensions of team performance (Hackman, 1987).

Engaging in social reflexivity should not only promote satisfaction and team viability but should also sustain the effects of task reflexivity on team performance. By promoting good and supportive relationships, social reflexivity may also impact the willingness of team members to engage in reflection on task related aspects and by the way promoting task reflexivity and thus increase team performance. When social reflexivity is high, team members feel safe engaging in open discussion, and bringing divergent ideas forward which may increase the effects of task reflexivity on team performance (Edmondson, 1999). Even if a team reviews its strategies and thus performs well, if the team members receive no social support and interpersonal conflicts are present, individual satisfaction may be reduced and team members may fail to stay together for a long time.

Social reflexivity also sustains the effects of task reflexivity by encouraging teams to deal with team conflict. Optimal collaboration of team members depends on their ability to integrate divergent views and interests (Arrow et al., 2000; Gladstein, 1984). Task reflexivity may increase the level of conflict. Indeed, during the task reflexivity process, team members may have diverse opinions about strategies which may cause conflicts. In that case, social reflexivity sustains the

task reflexivity process because teams are aware of potential disagreements and deal with conflicts instead of letting conflicts escalate.

Dealing with conflict, providing social support, and promoting a good social climate are the main purposes of social reflexivity. In the next section, I will do an overview of research on these domains in order to understand more deeply the impact of social reflexivity on team performance.

A. Conflict

One reason why social reflexivity can improve team performance is that teams high in social reflexivity reflect on conflicts and have strategies to handle them effectively. More generally, conflict can be functional or detrimental to team performance. Research has highlighted that the positive or negative effects of conflict depend on the type of conflict: task or interpersonal conflicts (De Dreu & Weingart, 2003; Jehn, 1994, 1997).

Although researchers agree on the fact that interpersonal conflicts are detrimental to the team in part because they interfere with team information processes; some research indicates that task conflict (discussion about divergent view points about the task) can be functional to team performance. Jehn (1994, 1997) found that interpersonal conflicts hindered team satisfaction and performance but that task conflicts benefited team performance. She added conditions to the positive effects of task conflict, such that the level of task conflict should not be too high, the task should be non routine, and there should be interdependence between members (Jehn, 1995). So interpersonal conflict is damaging whatever the level but a reasonable level of task conflict seems desirable.

However, in a recent meta-analysis, De Dreu and Weingart (2003) demonstrated that this positive effect of task conflict on team performance is in fact marginal. They established strong correlations between conflicts (task and interpersonal) and the reduction of team performance as well as the reduction of team members' satisfaction. Those results reinforce the importance of appropriate conflict management which is proposed in team performance models.

The mixed results of task conflict may be due to the absence of reflection and good strategies to manage conflicts. Indeed, research has shown that under certain circumstances, that enable teams to integrate divergent points of view, disagreement over ideas can be beneficial to

team decision quality and innovation (See Levine, Resnick, & Higgins, 1993). Moreover, diversity in the sense of divergent opinion has been related to better quality of team decision (Jackson, 1996) and higher innovation (Williams & O'Reilly III, 1998) despite their potential of creating task conflict.

Tjosvold shows that under some circumstances teams deal better with conflicts. Tjosvold speaks about constructive controversy, an open expression of divergent opinions leading to questioning, integration, and implementation of task related issues (Tjosvold, 1985, 1998). Constructive controversy is more likely to happen under cooperative goals than competitive goals because in teams with cooperative goals, members are more willing to integrate the opinions of others in order to achieve a common goal, as they perceive that they need others to get the job done. This is contrary to teams with competitive goals, where team members tend to impose their own views on the team rather than discussing alternatives. For instance, Tjosvold, Law and Sun (2006) in a study of 186 teams in China found that when teams dealt with conflict cooperatively; their level of team performance was higher than the performance of teams which relied on a competitive approach to conflict management. Relational conflict was more negatively related to team performance than task conflict. However, task conflict led to mixed results, sometimes increasing team performance and sometimes decreasing it. These results demonstrate that a cooperative approach helps to reduce the level of conflict compared to a competitive approach. Thus, the way that teams manage conflicts is more critical to team performance than the type of conflict that occurs. In a similar vein, Carnevale and Probst (1998) found that the participants who expected to take part in a tense session, showed a higher level of cognitive flexibility and creativity. But, this positive effect disappears when people anticipate a hostile and competitive conflict.

Research on minority dissent also suggests that the expression of disagreement about beliefs, attitudes, ideas, procedures, or policies can be beneficial and is necessary for teams to adapt to changes in the environment and to innovate. De Dreu and West (2001) found that a high level of minority dissent increased innovation but only when team members perceived that they had influence on decisions. In another study, De Dreu (2002) found that when a minority of team members voiced their different points of view it increased team innovation and performance but divergent thinking had to be managed through a reflexivity process. To be innovative, it seems

that teams need minority dissent to increase their creativity but teams also need to reflect on new ideas and implement them.

Overall, task related conflict needs to be managed to reach a higher level of team performance. It is under a cooperative and participative reflexive environment that team members will discuss and consider alternative strategies that are needed to profit from task conflict. The social reflexivity idea is in line with this and suggests that having good habits in dealing with conflicts are important.

B. Social support and team climate

Another aspect of social reflexivity concerns the social support potentially provided by the members of the team, in particular in stressful situations. Social support is one strategy team members may use to reduce stress and improve team member well-being, satisfaction, and team viability. Social support can be manifested by listening to other team members' problems, teaching each other new skills, or helping each other to perform their tasks. Social support has been recognized for a long time as having a positive influence on well-being and serving as a barrier against the negative effects of stress (Beehr, 1995). At work, the superior as well as the colleagues (thus the members of our team) are important sources of social support (Elfering, Semmer, Schade, Grund, & Boos, 2002).

In teams high in social reflexivity, there is a good quality of relationships and team members display friendly attitudes because they reflect and deal effectively with collaboration problems. This good climate may come from the fact that social reflexivity promotes a safe climate with no fear of voicing opinions. Indeed, psychological safety appears to be an important prerequisite for dealing with problems in teams (Edmonson, 1996, 2004). Moreover, Jehn (1995) found a positive effect of conflict on team performance for teams which discuss conflicts overtly. Thus, social reflexivity with open discussion and shared experiences of errors in a safe climate with no fear of voicing opinions (Edmondson, 1999) is a way of enhancing team learning and subsequently team performance. In a study of drug administration errors in hospitals, Edmondson (2004) showed that errors lead to learning only when team members overtly report the error, moreover learning from others team members' mistakes can lead team members to correct their own wrong behaviors, thus fostering team performance.

There are few empirical studies which test the effects of social reflexivity apart from task reflexivity. Carter and West (1998) in their first study on team reflexivity, asked questions about social reflexivity. They found that a high level of social reflexivity correlated with team performance (as rated by the clients but not as rated by team managers') and team member well-being.

To be fully effective, teams should be high on task reflexivity and social reflexivity, nevertheless more research has been done on task reflexivity than social reflexivity. This may be due to the fact that the effects of team climate, conflict and social support are well established. In the next section, I will review the concept of task reflexivity.

III. Why task reflexivity is helpful? Reflection, planning, and action components

Based on West's conceptualization (1996, 2000, 2003), task reflexivity refers to the extent to which teams self-regulate their activities towards their goals. More precisely, task reflexivity refers to team reviewing goals, processes, strategies, and previous performance. Task reflexivity in teams involves activities like discussing results of actions compared to goals, analyzing the problems that teams encounter, reflecting on the way information is communicated, and discussing and generating alternatives strategies. According to West, task reflexivity enables teams to be more adaptive in the execution of their tasks, and therefore they will be more effective and more innovative.

More broadly, task reflexivity refers to the extent to which teams self-regulate their activities towards their goals. In other words, task reflexivity is an important part of action regulation since it helps teams monitor and evaluate performance progress (Frese & Zapf, 1994; Tschan & von Cranach, 1996). As proposed by Tschan (1995, 2002) regulating actions in a team toward goals involves four steps. First, teams need to orientate and plan (preparation phase). During this step, teams discuss objectives and what has to be done. Then, teams engage in planning, they discuss and formulate strategies on who should do what, when to do it, and how to do it. The preparation phase is an important step in the development of appropriate strategies since teams have the tendency to rush into action without discussing strategies (Hackman, Brousseau, & Weiss, 1976; Weingart, 1992). This first phase also serves as a standard for

subsequent evaluations. When teams know what to do and how, they put into action their planned strategies (execution phase). Third, the progress teams make in achieving objectives is monitored (monitoring phase). Teams review their activities and compare them to the planned actions. This monitoring enables teams to detect mistakes or performance gaps. This awareness leads teams to make adjustments if necessary (evaluation phase) to efficiently progress toward completing task. If corrective actions are needed, teams perform adaptations and start revising strategies.

In similar vein, West suggests that task reflexivity exerts impact on team performance as a three-stage process including (1) to reflect, (2) to plan, and (3) to act (West, 1996, 2000, 2003). *Reflection* refers to a team discussion of goals, strategies, and processes and a review of the previous performance of the team. Reflection corresponds to an orientation phase when it is done before engaging in task execution and corresponds to monitoring phase when it is done while performing and corresponds to evaluation phase when it is done after task completion. This analysis needs to result in a *plan* on how the team wants to proceed in the future which finally should lead the team to *act* accordingly. As in action theory framework, planning or strategies development are separate from the action phase. Teams may come up with good strategies but failed to implement them because implementation takes time and resources which may not be available to the team. Action phase is thus an important step to benefit from reflection and planning.

Evidence to support why the task reflexivity process exerts influence on team outcomes can be drawn from previous research on detecting and solving problems, information sharing, speaking up behavior in teams, and planning and strategy development, as well as studies on overcoming inertia and routine. I will discuss part of this literature below.

A. Reflection

Reflection is the starting point of the task reflexivity process.

Reflection can occur at different depths (Swift & West, 1998). Imagine a team meeting where team members review their performance. First, the team states what the objectives were and if these objectives were fulfilled. Then the team reviews progress towards goals and the strategies used to do it. Teams often only give quick and superficial attention to exchanging information, analyzing strategies, and monitoring performance. This level of depth has been

labeled as shallow reflexivity and is similar to single-loop learning (Argyris & Schön, 2002). If there is a gap between the desired objectives and actual performance then team members go through a deeper reflection process. Team members start to determine what needs to be done or changed in order to achieve goals and propose alternative ways of achieving these goals. This is a more critical appraisal of team tasks, processes, strategies, and performance which refers to a moderate level of reflection and is similar to double loop learning (Argyris & Schön, 2002). Deep level of reflection refers to an explicit discussion of assumptions about norms and values of the team or their organization (rarely found according to West, 1996) this corresponds to a triple loop learning (Nielsen, 1993).

It is likely that task reflexivity influences team performance because it ensures overt discussion among team members during the reflection stage. This is an important aspect, because people often fail to speak up in teams. For example, Milliken, Morrison, and Hewlin (2003) found that most people in organizations felt unable to voice their suggestions for improvements. They chose not to speak up because they fear potential negative outcomes like being labelled negatively, damaging important relationships, retaliation, and negative impact on others. If team members choose not to voice their opinions, this can hurt team performance, particularly for complex or new tasks. Indeed, Edmondson (2003) has found positive effects of speaking up in surgical teams that implemented a new procedure.

West (1996, 2000, 2003) suggested that task reflexivity is particularly helpful when a team encounters failure, errors, or interruptions, and thus has to adjust or change its strategies. The reflection phase enables teams to detect and correct failure or errors, by reflecting on the reason behind the problem. Open discussion in teams has several advantages: The importance of overtly discussing what went wrong or right and to become aware of how the team solves its problems may contribute to better problem identification (Moreland & Levine, 1992). A correct examination of problems and a critical evaluation of alternative solutions have been found to be an important step in achieving better decisions (Orlitzky & Hirokawa, 2001). Moreover, overt discussion may help teams overcome potential problems related to (the lack of) information sharing (Stasser & Titus, 1985, 1987). Because it encourages open discussion, reflexivity may help teams to not only share critical unshared information but also to evaluate the way in which they share information.

As proposed by De Dreu, Nijstad, and van Knippenberg (2008), teams are an information-processing system prone to biases and errors. In their model of motivated information processing, teams are driven by two motivation sources when processing information: social and epistemic. A social motivation concerns outcome distribution and comparisons between individual outcomes and group outcomes and epistemic motivation concerns the willingness to search and deeply process new information. Both a high level of epistemic motivation and a high level of pro-social motivation are desirable. A high level of epistemic motivation is needed to counteract the negative effects of information biases; team members become aware of potential biases of social motivation in information processing such as social loafing and groupthink. Applying to task reflexivity, the reflection phase may be viewed as an epistemic motivation which may reduce biases because teams conscientiously think about how information is processed and teams adopt a less automatized thinking process while promoting the team goal.

Furthermore, team performance can be impaired due to the fact that teams have a tendency to stick to habitual routines (Gersick & Hackman, 1990). Routine is *"when a group repeatedly exhibits a functionally similar pattern of behavior in a given stimulus situation, without explicitly selecting it over alternative ways of behaving"* (Gersick & Hackman, 1990, p. 69). Although the development of habitual routines in teams is functional because they save time and energy, routines may at the same time be a source of inertia (Feldman & Pentland, 2003; Hodgkinson, 1997; Hodgkinson & Wright, 2002; Zellmer-Bruhn, 2003). Teams must be able to recognize when requirements change and when old routines may no longer be appropriate. Task reflexivity can prompt the team to regularly review its routines. Indeed, Tjosvold, Yu, and Hui (2004) reported that a problem solving orientation in teams was helpful to overcome the negative effects of routines on team performance in a changing environment.

The question now is how this reflection exerts impact on team performance? The answer is likely found in the planning phase which is described below.

B. Planning

During the reflection phase team had identified the problem and the cause of the problem which is an important step for good decision making but the concept of task reflexivity goes further because planning and action are also considered as an important step in the resolution of

problem. Reflection, as the discussion of objectives, strategies, and processes is a necessary, but not sufficient condition to change team behavior. After the reflection phase, teams need to plan or to develop strategies. Teams engage in planning to discuss and formulate strategies about who should do what, when to do it, and how to do it, this allows team members to coordinate their actions effectively. Note that planning activities not only include task related strategies but also include how to combine individual efforts and knowledge.

At the individual level, Tripoli (1998) found that planning activities like prioritizing tasks and determining alternative ways of completing tasks was related to employees' performances.

The planning phase is an important step since teams tend to avoid it (Hackman et al., 1976; Weingart, 1992). Many team performance models suggest that task adaptive strategies are an important factor for team performance (Hackman, 2002; Gladstein, 1984; Salas, Sims, & Burke, 2005; Tschan et al., 2000). Indeed, Stout, Cannon-Bowers, Salas, and Milanovich (1999) in an experimental study found that teams which engaged in high quality planning performed better during periods of high-workload. Planning increased the degree to which team members shared an understanding of each other's needs and information requirements which in turn improved communication and coordination. Moreover, Fussell et al. (1998), in a business simulation, Orasanu (1994) in a study of cockpit crews, as well as Edmondson, Bohmer, and Pisano (2001) using hospitals teams, confirmed the importance of strategy discussion and development for team performance.

The temporal aspect of planning also seems to be important. According to Weingart (2002), planning can take place before teams engaged in task execution but more often take place during task execution. Planning contributes to team performance especially during the execution phase and can thus be seen as the necessary link between reflection and action.

Activities during planning also include setting goals and selecting appropriate strategies to actually accomplish those goals. Setting specific and clear goals is related to individual as well as team performance (Locke & Latham, 1990; O'Leary-Kelly et al., 1994) mainly because it helps team members to focus on what needs to be done to perform effectively, clarifies expectations, increases the motivation to exert effort to be effective, and fosters the commitment to goals. ProMES (Productivity Measurement and Enhancement System) is a system designed to manage individual performance (but can be applied to team performance as well) and is based in part on

these assumptions (Pritchard, Holling, Lammers, & Clark, 2002). Not only do people identify indicators of good team performance (setting goals) but they also select the amount of time and effort needed for each indicator to reach effectiveness (develop strategies) and receive feedback on their performance. Thus, it is important for teams not only to reflect but also to engage in planning new goals and develop strategies to facilitate the implementation of the reflection phase and this planning and strategizing should lead to the next phase: action.

C. Action, implementation

Once team members agree on how to get the job done during the reflection and planning phase, they enter into an action phase by implementing strategies. West defined action as *'goal-directed behaviors relevant to achieving the desired changes in team objectives, strategies, processes, organizations, or environments, identified by the team during the stage of reflection'* (West, 2000, p. 6). Action is critical because as West argues *'Ideas are ten a penny: It's team implementation not idea generation that counts'* (West, 2002a, p.1). It is also important to implement the results of reflection. However, planning or strategy development does not always lead to better team performance. Enhancement of performance is also affected by factors such as task complexity (Weingart, 1992), the quality of planning (Stout et al., 1999), whether contingency plans were made (Weldon, Jehn, & Pradhan, 1991), and implementation of separate planning sessions (Shure, Rogers, Larsen, & Tassonte, 1962).

As suggested by West (1996), the reflexivity process is complete when reflection and planning actually lead to action by implementing the new strategies that were discussed. Reflexivity is therefore a regulatory process that is used to achieve goals and foster team performance. In support of this argument, Tschan (2002) demonstrated that team performance was enhanced when teams engaged in a complete regulatory process such as planning, execution, and monitoring. Gurtner, Tschan, Semmer, and Nägele (2007) found that teams performed better when they actually implemented the results of their reflexivity session.

The action phase also serves an evaluative function of the reflexivity process. It is a test phase where strategies are submitted to the experience of the team. Implementation of new strategies will lead to new information which should lead to further reflection, planning, and adaptation. Reflexivity is a continuous cycle which parallels the cycle of team performance. The

result of one reflexivity cycle serves as feedback for the next action until the team reaches satisfying goals.

To sum up, team reflexivity qualifies the extent to which teams self-regulate their social functioning as well as their activities related to task accomplishment. Task reflexivity exerts the positive effect on team performance because teams reflect on past performance, identify potential problems, plan new goals, adapt strategies, and implement those strategies. At the same time, social reflexivity guarantees a good social climate and a smooth task reflexivity process.

IV. Other concepts related to task reflexivity

As shown before, West (1996, 2000, 2003) has defined team reflexivity as actively reviewing and adjusting the team's task-related and social processes. There are a number of related concepts in organizational and team research which I will discuss below. I will first examine team learning (Edmondson, 1999) and team self-correction (Blickensderfer, Cannon-Bowers, & Salas, 1997) concepts then I will expose after-event review concept (Baird, Holland, & Deacon, 1999). These concepts are based primarily on structured team discussion guided by formal rules to benefit from team reflection, whereas the concept of team reflexivity refers to the 'spontaneous' habits of teams to reflect, plan and act and can be done before, during or after task completion. Nevertheless, the related concepts can help understanding how the (externally forced or internally developed) reflexivity process influences team processes and performance.

A. Team learning

The construct of reflexivity used in this dissertation parallels in part the team learning process. Both conceptions emphasize the importance of a team to have a certain level of reflection on their experiences so that learning from experience occurs and serves as a guide for future performance.

Learning in teams is *"an ongoing process of reflection and action, characterized by asking questions, seeking feedback behavior, experimenting, reflecting on results, and discussing errors or unexpected outcomes of actions"* (Edmondson, 1999, p. 353). In a study among surgical teams, Edmondson et al. (2001) identified four steps in a successful learning process: enrolment, preparation, trials, and reflection. During the reflection phase, teams collectively discussed the

results of their trials and plan changes for subsequent trials. In their study, teams benefited from an iterative process between action and reflection for the implementation of new practice. Similarly, Gibson and Vermulen (2003) conceptualized team learning as *"a cycle of experimentation, reflective communication, and knowledge codification"* (p.202). They proposed that teams generate ideas through experimentation; this experimentation needs to be processed in order to develop a common understanding by reflective communication and then knowledge needs to be translated into concrete actions.

Team learning has been investigated mainly in field studies with the aim of exploring factors that affect team learning and subsequently team performance. For instance, Edmondson (1999) in 51 teams, found that psychological safety (shared perception that the team is safe for interpersonal risk-taking) contributed to team learning behaviors (manifestation of a team learning process) such as seeking feedback, discussing errors, and seeking information from others. These behaviors then lead to an improvement of team performance. Psychological safety also mediated the effects of leadership and a supportive team design on team learning behaviors.

The role of the team leader in promoting team learning was further investigated by Edmondson (2003). Effective leaders were able to create psychological safety within teams and to promote speaking up behaviors by motivating the need for learning and deemphasizing status differences. This open discussion was then related to successful implementation of new practices in operation rooms. The relationship between team learning and psychological safety also points to a possible relationship between social reflexivity and task reflexivity.

Team learning also includes the notion that teams are able to self-correct and learn from errors. Edmondson (1996) explored how speaking up about errors (a specific learning behavior) in administering drugs to hospitalized patients affected detection and correction of these errors. Surprisingly, she found that teams with good leaders, when teams perceived better performance and quality of interpersonal relationships, was associated with a higher rate of error detection. She proposed and confirmed with qualitative analyses that better teams were more willing to report and openly discuss mistakes thanks to behaviors of the leader who promoted a climate of openness.

Cannon and Edmondson (2001) also supported that a shared perception among team members on how to respond to mistakes influenced engagement in learning behaviors. They

found that when team members shared the idea that reporting errors is a way to prevent mistakes and learn, then team performance was better. Team leaders also played a critical role in displaying effective coaching and providing clear direction which seem to be important antecedents of team learning from failures. Interestingly, West (1996) suggested that errors can initiate task reflexivity on what did not work. In fact, learning from mistakes means that team members have to be aware that there is a gap between their objectives and obtained results; team members have to discuss this fact and find new ways of doing things in order to not make the same mistakes later (Tjosvold, Yu et al., 2004).

However, team learning might be a time consuming activity and might hinder performance under specific conditions. The context in which the team evolves including task characteristics and organizational constraints may determine the level of learning needed. Much of the research on team learning also points to the importance of team task characteristics and organizational characteristics (Edmondson, 1999; Wong, 2004; Zellmer-Bruhn & Gibson, 2006). For instances, Zellmer-Bruhn and Gibson (2006), in a study among multinational teams found that team learning (creating new practices and processes) was more likely to occur when the team was embedded in an organization which emphasized local responsiveness (less centralized) because teams were independent and had greater autonomy. Contrary to teams within an organization with more global strategies, where teams conform to these strategies and are less free to engage in learning to adapt to the local environment. These results suggest the necessity of taking into account the context when studying the effects of learning or task reflexivity on team performance. Finally, team learning is a basis for team adaptation and is especially critical to adapt to changes, reflecting the dynamic view of team performance (Ilgen, Hollenbeck, Johnson, & Jundt, 2005).

B. Team self-correction

Team self-correction like team learning and task reflexivity, relies primarily on team members to review past events, diagnose problems, develop effective strategies, and plan for the future execution. However, team self-correction is only employed at a specific point in time; this is after task completion and may also include an external intervention to guide the process.

Team self-correction is a process that helps teams correct their team attitudes, behaviors, and cognitions (Blickensderfer et al., 1997). The effects of self-correction on team performance are mediated by the development of a shared mental model. Sessions of team self-correction are a way of developing shared expectations and explanations about the tasks and about the roles of each team member. Improvement of shared mental models helps team members to adjust to each other effectively and to coordinate their activities. This mutual understanding will increase cohesiveness and a collective orientation.

Self-correction can be guided within a training intervention. Smith-Jentsch, Zeisig, Acton, and McPherson (1998) developed the Team Dimensional Training (TDT) that focuses on developing the natural tendency to self-correct. The training process in TDT provides four steps in the team work cycle. First, prebrief where the instructor introduces the four critical teamwork dimensions (information exchange, communication, supporting behavior, and team initiative/leadership), clarifies goals, emphasizes a learning objective rather than a performance objective, and establishes psychological safety. Then teams perform exercises and instructors observe and collect data about displayed behaviors. After exercises, teams enter the diagnosing performance phase where instructors identify the best examples, strengths and weakness, and set up goals for improvement. Finally, during a debriefing phase, instructors summarize key exercise events and ask team members to critically discuss their performance according to the four critical teamwork dimensions. This final debriefing stage uses guided self-correction to enhance team mental models and performance. A recent meta-analysis on team training strategies demonstrated the effectiveness of guided team self-correction training on team performance (Salas, Nichols, & Driskell, 2007).

C. After event review, post-action review

Despite the process involve in after event review and post-action review is similar to the task reflexivity process, it explicitly relies on the leader to manage the task reflexivity process and like self-correction takes place at a certain point in time, namely after action. Tannenbaum, Smith-Jentsch, and Behson (1998) proposed the concept of post-action review to improve the process of deliberate reflection on past performance; post-action review helps team to learn from past performances and enhance subsequent performances. The authors acknowledge the difficulties teams have in learning while they are performing their task. Learning requires

cognitive resources which are not available while teams are performing their tasks; teams need a time out in action to process the results of that action.

Post-action review is embedded in a broader learning cycle: Prebriefing (team meeting were team members confirm strategies, roles and goals), action and post-action review. Post-action review phase provides teams with the feedback that is needed to learn and guide subsequent actions. Tannenbaum et al. (1998) emphasized the role of team leader in conducting an effective reflection. In an experimental study with fourteen five-persons teams with naval officers, the role of team leaders in conducting an effective pre-briefing and post-action review for team performance was examined. In the experimental group, each team leader received a 2 hours training session on effective pre-briefing and debriefing skills. Results indicated that trained team leaders showed more of the effective briefing behaviors especially during post-action review. For instance, trained leaders asked team members to engage in critique themselves. During the post-action review, team members with trained leaders were more engaged in discussions about teamwork behaviors and more likely to critique themselves and offer suggestions to others. This study suggests that reflection does not occur naturally and that team leaders trained in the use of post-action review could help teams to engage in reflection and raise the level of subsequent performance.

In a similar vein, Baird et al. (1999) proposed a guided reflection technique, after action review (AAR) which was primarily used in US army. After action review is a technique *"for a team to reflect on and learn while it is performing*" (Baird et al., 1999, p.22) that occurs just after actions. To be fully effective teams also need to focus on a few critical issues: that all team members participate, that reflection leads to action quickly, and that team members follow the six proposed steps. The steps are as follows: 1. what was the intent? 2. what happened? 3. what have we learned? 4. what do we do? 5. take action 6. tell someone else.

The effect of after action review on team performance has been empirically demonstrated but depends on the result of previous performances. That is, teams performed better when they reflected on both success and failure (Ellis & Davidi, 2005) and this effect is stronger when teams were previously successful. However, successful teams profited less from reviewing only success maybe because success confirms appropriateness of previous strategies and strengthen routines (Ellis, Mendel, & Nir, 2006). One possible explanation is that high performing teams have

already developed good team processes and do not profit from such meetings revising strategies seems then to be counterproductive. Thus, like task reflexivity, after action review is more critical when team experience failures.

In this section I reviewed concepts related to task reflexivity such as team learning, team self-correction, after-event review, and post-action review. Those concepts share similarities as well as differences which offer potential explanations for the effect of task reflexivity on team performance. Team learning, team self-correction, and after-action review include a cognitive component because their effects on team performance are mediated by the enhancement of a shared mental model. More broadly, team reflexivity conceptually goes well with these conceptions because reflexivity also aims at creating a shared understanding among team members of team problems and the way to solve them. Moreover, each concept relies on the same psychological mechanism, they emphasize the critical role of reflection about past performance, and actively correction of errors to develop and implement new strategies. However, team reflexivity is a broader concept than the others because team reflexivity can be applied not only to task related issues but also to the social functioning of the team; reflection does not necessarily include the intervention of a facilitator and can be done before, during, or after task execution.

V.When task reflexivity is needed? An Empirical model of task reflexivity: sometimes good and sometimes not

In the following section, I will present empirical studies done with the task reflexivity concept as suggested by West (1996, 2000, 2003). But I will only focus on task reflexivity because most of the empirical studies have investigated the role of task reflexivity in team performance rather than the role of social reflexivity. First, I will present studies that showed that task reflexivity had many positive effects on team performance, and then I will focus on boundary conditions previously found for these effects.

Although task reflexivity is promising and studies demonstrate the positive effects of task reflexivity on team performance and especially on innovation, many studies also showed no effect of task reflexivity on team performance, a negative correlation, or a conditional effect.

In this study, perceived team performance is considered to be the immediate final outcome of the team's work and represents the achievement of team's objectives and expected requirements. On the other hand, team innovation is viewed as the result of strategic adaptation. Since one part of task reflexivity is a reflection on teams' strategies, the immediate result will be an improvement in the way of doing things; this is a higher level of team innovation. This strategic adaptation may have stronger effects on future team performance than on the current team performance. Thus, I propose that task reflexivity will be more closely related to team innovation and to a lesser extent to immediate team performance.

A. Task reflexivity and innovation: the good

Innovation in teams has been identified as an important aspect of team performance (Scott & Bruce, 1994; West, 2003; West & Anderson, 1996). In the present study, team innovation is considered as a possible output of task reflexivity. West (2002b) in a model of team innovation proposed that task reflexivity is an important process to benefit from diversity and team autonomy and increased the level of innovation.

Innovation refers to, *"The intentional introduction and application within a job, work team or organization of ideas, processes, products or procedures which are new to that job, work team or organization and which are designed to benefit the job, work team or the organization"* (West & Farr, 1990, p.9). Innovation entails a creativity part where idea are generated and an implementation part where creative ideas are actually implemented.

Team innovation requires teams to leave old routines behind and to implement a new way of doing things for future actions. Task reflexivity seems then particularly helpful to reach this since it includes adaptation of strategies. Indeed, overt reflection may reduce the reliance on inappropriate routines and favor the discovery of new ways of doing things. Moreover task reflexivity can facilitate the integration of divergent opinions. Indeed, task related diversity will benefit innovation when team process reduces the potential process losses cause by diversity such as conflicts, and misinterpretation. Task reflexivity by encouraging an overt discussion of divergent opinions may suppress process loses associated with diversity and render diversity as a positive element to foster team innovation.

Another important factor of innovation is the climate in which innovation occurs. Teams with a shared vision and a high level of participation in a safe climate with a great concern for quality of team performance and support for the expression of creative ideas and their implementation displayed a higher level of team innovation (Burningham & West, 1995; West & Andersson, 1996). As overarching factor task reflexivity can impact virtually all aspects of task related processes, thus task reflexivity also impacts other team processes such as climate for innovation. Indeed, Carter and West (1998) in their first study of reflexivity with television production teams found that the four dimensions of climate for innovation correlated strongly with task reflexivity. One aspect of team climate for innovation is to develop a constructive controversy (an open expression of divergent opinions leading to questioning, integration, and implementation of task related issues; Tjosvold, 1985, 1998), which is similar to the task reflexivity process. Task reflexivity seems then to be a critical factor for team innovation.

Empirical studies confirmed this argument. Task reflexivity has been proven to foster the level of team innovation (Carter & West, 1998; Tjosvold, Tang et al., 2004; Somech, 2006). This effect is relatively stable, despite one study which found no direct effect on team innovation but showed that only teams with a high level of minority dissent profited from task reflexivity for team innovation (De Dreu, 2002). Indeed, a recent study demonstrated that task reflexivity is positively related to team innovation even after controlling for possible other causes of innovation (Somech, 2006). Furthermore, a large-scale longitudinal study found that high levels of task reflexivity were significantly related to various aspects of innovation one year later (Patterson et al., 2005).

B. Task reflexivity and team performance: the good

According to West (1996, 2000, 2003), the extent to which team members overtly reflect on team objectives, strategies, and processes; and plan and implement changes enhances team performance. Support for this proposition comes first by a study from Carter and West (1998).

In their first study on the reflexivity concept, Carter and West (1998) empirically tested the effects of reflexivity on subsequent team performance for BBC-TV project teams. Reflexivity should be particularly useful for these kinds of complex decision-making teams evolving in a changing environment. Reflexivity (task and social reflexivity) was self-evaluated by team

members with the questionnaire developed by Swift and West (1998). For a detailed description of the reflexivity scale, see chapter 4. Teams evaluated their levels of reflexivity and the climate of innovation at the midpoint of the TV production project. Team effectiveness was rated by managers and evaluated by an index of audience appreciation both gathered at the end of the project and during or after transmission of the program, 6 months afterwards team members evaluated reflexivity and climate. The results of the nineteen teams surveyed, showed that that television production teams with higher levels of reflexivity (social and task reflexivity) produced more successful TV shows (as rated by managers and by the audience) after controlling for the effect of team size and team climate. But together, size, climate, and reflexivity were only significant for managers' evaluations not for the audience index. Unfortunately, they did not test models in which the effects of task reflexivity were separate from those of social reflexivity. However, the correlation pattern indicated that task reflexivity did not correlate with team performance (as rated by both managers and the audience) but that social reflexivity correlated with audience appreciation and not with managers' ratings.

Another study performed in China (Tjosvold et al., 2003) confirmed the role of task reflexivity to foster team performance. 100 teams evaluated their level of task reflexivity (with West's scale) and how they dealt with conflict; managers evaluated team performance. As they expected, they found that when team members dealt cooperatively with conflicts, they were able to reflect on their objectives, strategies, and processes which led to increases in team performance. This study also points to the potential relationship between social reflexivity, in which teams manage interpersonal relationships and task reflexivity.

Schippers, Den Hartog, Koopman, and Wienk (2003) in a field study among 54 teams from various organizations tested a full model of task reflexivity. Teams performed a wide variety of tasks. Task reflexivity is here a central process for managing diversity and to foster the positive effects of diversity on team performance. They proposed diversity as an antecedent of task reflexivity and also proposed outcome interdependence and group longevity as moderators of both the link between diversity and task reflexivity and between task reflexivity and teams' outcomes. They found a link between task reflexivity and the self-reports of the team members' performance, satisfaction, and team commitment, even having controlled for the effects of team diversity, task interdependence, as well as for the longevity of the team. Thus diverse teams

benefited from task reflexivity especially when team members depended on each others to get the job done (outcome interdependence) or when it was a 'young' team (low in group longevity).

In similar vein, Somech (2006) studied the effects of functionally heterogeneous teams (diversity in task-related attributes) and leadership styles (participative vs. directive leadership) on task reflexivity and subsequent team performance. This research was conducted with 136 health care teams. Team members evaluated their level of task reflexivity (with six items based on the West's scale of reflexivity) and the leadership style; and team managers evaluated team performance. She proposed a model in which functional teams had the potential to be more reflexive when the team leader displayed a participative leadership style or a directive style. Because teams are diverse and the leader displayed appropriate behaviors, teams will be more reflexive and thus more effective. The results showed that task reflexivity was positively correlated with team performance. However, when testing the full model, task reflexivity did not mediate the relationship between the interactive effects of functional heterogeneity and participative leadership.

Finally, the positive effects of task reflexivity were also found in quasi-experimental study. Gevers, van Eerde, and Rutte (2001) studied the effect of task reflexivity on the progress of 22 student teams. They proposed that task reflexivity would help team to complete their task in time, because of the monitoring and evaluation activities that reflexive teams display. Reflexivity was indeed related to the progress of the project during the execution phase.

Based on the above considerations and previous findings, I expect a positive, direct relationship between higher levels of task reflexivity, team performance, and team innovation.

C. Task reflexivity and team performance: not so good

Although the research reviewed in the previous sections found direct and positive relationships between task reflexivity, team performance, and team innovation, some studies could not establish this link.

Indirect effect of task reflexivity on team performance: mediating variables. In an experimental study, McMinn and Moreland (2006) asked half participants to engage in a reflexivity session in the middle of a business simulation. Participants were asked to discuss "what went right and what went wrong". Despite this reflexivity intervention, they found no

improvement of team performance compared to a control group who did not reflect. They suggested that team reflection was not well done in those groups, and that team members tended to discuss mostly irrelevant aspects of the task, as was found in another experimental study (Gurtner et al., 2007).

Gurtner et al. (2007) also reported mixed effects of task reflexivity. 49 teams performed a simulated team-based military air-surveillance task. At the mid point of the experimental group's life, groups stopped to reflect in group or individually. They proposed that groups which reflect in a group would perform better because each member can give new insights, agree on new strategies, and start planning. However, group reflection did not outperform individual reflection. Moreover, they proposed that the impact of reflexivity on team performance is due to the implementation of the strategies and the more similar mental models among team members. Indeed, thanks to reflexivity session, teams were able to increase the number of strategies suggested by their superior as well as the implementation of the strategies by the subordinates. Moreover, reflexivity sessions in teams led to increased similarity of the team members' mental models and to the adoption of better task adaptive strategies in the team which in turn were related to better team performance (Gurtner et al., 2007). Thus, task reflexivity only improves team performance under specific conditions.

To sum up, these experimental studies provided explanations on why reflexivity fosters or does not foster team performance. Guided reflexivity induced more communication of the strategies, more implementation of the strategies, and more shared mental models, which in turn increase team performance. This indicates that the effects of reflexivity on performance are more pronounced in the later phase of execution of the task than in the earlier orientation phase, as found by Gevers et al. (2001). It may be that reflexivity is needed when teams are in a certain stage of the project life (Gersick, 1988). Monitoring and evaluation involved in reflexivity is obviously more helpful when teams have already been working together. Adapting strategies and plans seems to be more necessary after a while, as a training intervention (Gurtner et al., 2007; Hackman, 2002, Hackman & Wageman 2005; McMinn & Moreland, 2006). Wolley (1998) showed that teams profit more from an intervention on strategies during the transition phase, in the middle of the task, than in the beginning of the team project.

In line with this, several field studies found mediation variables between task reflexivity and team performance. Task reflexivity fosters information sharing and team learning (De Dreu, 2007) which then lead to an increase in team performance.

Interactive effect of task reflexivity on team performance: moderating variables. Some field studies have failed to establish significant correlations between task reflexivity and team performance. A 1-year longitudinal study on Fifty R&D teams, found no significant correlations between task reflexivity (as rated by team members and team leaders) and team performance and quality (as rated by clients) but they did not discuss these interesting results (Hirst, Mann, Bain, Pirola-Merlo, & Richver, 2004). Furthermore, two studies (De Dreu, 2002, 2007) even found negative direct effects between task reflexivity and team performance or team innovation.

These negative results suggest that task reflexivity in itself may not impact team performance and may combine with other variables to influence team performance. Several studies included moderating variables to establish conditions under which reflexivity is most useful for performance.

De Dreu (2002) found that task reflexivity and minority dissent interacted to explain team performance. This study was done with 32 teams performing complex tasks. Team members evaluated their level of task reflexivity (with West's scale) and the level of minority dissent in their teams; teams' supervisors evaluated team performance. He suggested that task reflexivity enables team members to voice and discuss their dissenting views so that teams are more likely to induce creativity in the majority opinions. Task reflexivity was negatively related to team performance but the effect of task reflexivity were positive only for teams high in minority dissent.

Recently, the same author showed that the effect of task reflexivity depends on a high level of outcome interdependence. He studied 46 cross-functional teams performing a complex task. Task reflexivity and outcome interdependence were self-evaluated and team supervisors provided evaluations of team performance. He suggested that under cooperative outcome interdependence, team members were more willing to engage in deep reflection and thus promote team performance. He found that only teams with a high level of outcome interdependence profited from high level of task reflexivity; those teams with high interdependence who reflected had higher performance levels. He suggested that a positive effect of task reflexivity can only be

expected in circumstances where there is a need to engage in deep information processing and furthermore that reflexivity "…may help when the tasks are moderately complex but hurts when the tasks are simple and straightforward…" (De Dreu, 2007, p. 636). This is in line with the initial conceptualization of West (1996) who suggested that task reflexivity may be most useful for complex decision making teams.

Finally, Somech (2006) also explained her findings (task reflexivity did not mediate between inputs and team performance) with the type of task and stated that "team reflection may be important for more complex tasks, such as innovative acts, but redundant for routine tasks" (Somech, 2006, p. 151).

Taken together, the findings about the effects of task reflexivity on team performance suggest that there are conditions under which task reflexivity is likely to have more positive effects on team performance. Most of the examples cited point to the fact that task reflexivity is most useful when there is a higher need to reflect and integrate knowledge of members; for example, if complex decisions have to be made, or if the team members are not familiar with each other. However, besides outcome interdependence, other task related aspects have not yet been systematically studied with regard to the potentially moderating role between task reflexivity and team performance. In the next chapter, I will argue that the positive effects of task reflexivity on team performance may depend on one hand on the task characteristics as suggested in previous studies and on the other hand task reflexivity may interact with other implicit team process such as transactive memory systems.

Chapter 3

Proposing additional boundary conditions of the task reflexivity effect: task variety, autonomy, and transactive memory system

In the previous chapter, I presented a literature review of the boundary conditions of the effects of task reflexivity on team performance. One of the reasons invoked to explain why task reflexivity is sometimes not helpful has to do with the fact that task reflexivity seems to be more useful when there is a higher need to reflect, to integrate knowledge of members, or to process complex information. This need may come from two sources. On one hand, the need to deeply reflect on past performance is related to the task that teams are performing. If the task is simple and the way of proceeding appears to be evident for the team, team members do not need to discuss strategies, but rather teams rely on strategies already known and shared by the members of the team; they rely on routines. Most of the studies on reflexivity assume that reflexivity is more important in complex decision-making teams however, aspects such as task characteristics have not yet been systematically studied despite some authors' acknowledgments of the need to take into account task type when studying the effects of reflexivity on team performance (De Dreu, 2002, 2007; Schippers, Den Hartog, Koopman, & Wienk, 2003; Somech, 2006; West 1996). To address this gap, I propose to study the moderation effect of two task characteristics: task variety and autonomy (Figure 2). Argument for the proposed moderation will be developed in the next section and tested in chapter 5.

Moreover, previous research does not address specifically how task reflexivity combines with implicit team coordination mechanism which also deals with the knowledge of team members. It may be that the effect of task reflexivity on team performance and innovation may

depend on the level of implicit coordination mechanism. As some recent research emphasizes the role of team cognition as a critical team coordination process to foster team performance (Cannon-Bowers, Salas, & Converse, 1993; Moreland, 1999; Kozlowski & Ilgen, 2006; Klimoski & Mohammed, 1994; Salas, Sims, & Burke, 2005), I chose to focus on one such process, namely, team transactive memory systems (Moreland, 1999). Figure 3 displays the proposed model.

The concept and research done on transactive memory systems will be presented in section III and arguments for the interaction effect between task reflexivity and transactive memory systems will be developed in section III and tested empirically in chapter 6.

Figure 2. Effects of task reflexivity, task variety, and task autonomy on team's outcomes (team performance and innovation).

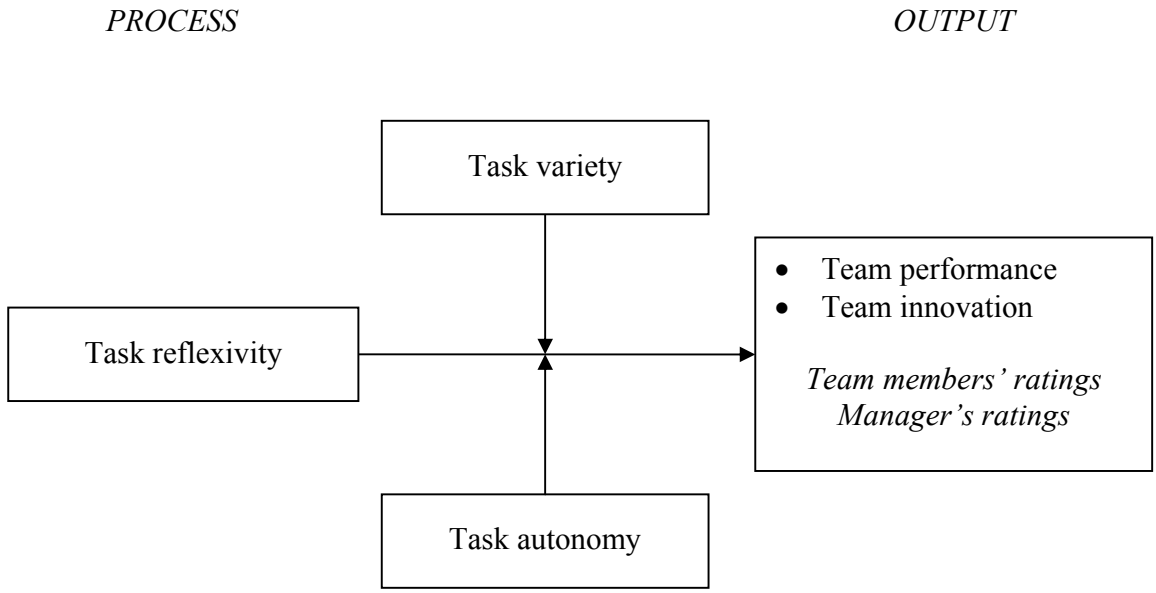
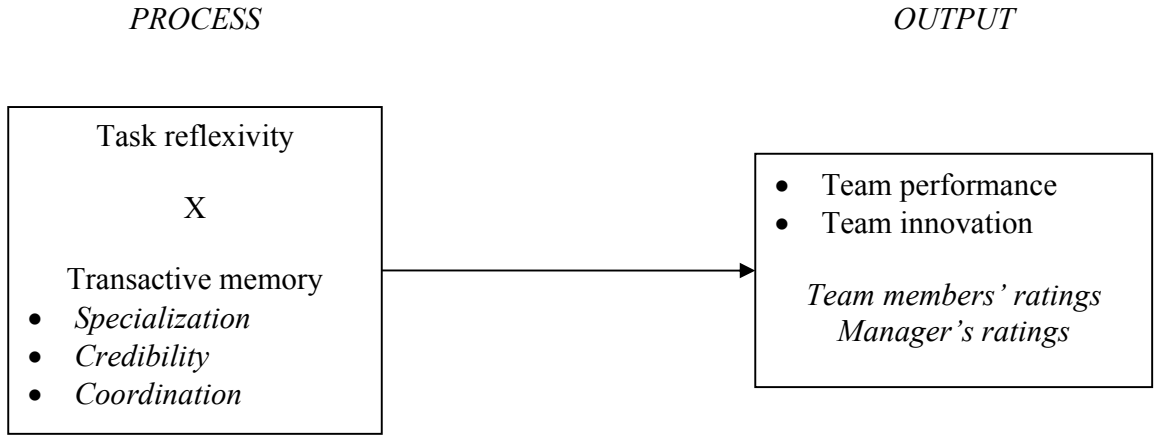


Figure 3. Effects of task reflexivity and transactive memory on team's outcomes (team performance and innovation).



I. Task characteristics

Many theoretical frameworks have been developed to categorize tasks. For instance, social psychologist's Steiner (1972) proposed a typology of team tasks according to team process interaction and interdependence. He distinguished between additive task (team members' resources are summed for productivity), conjunctive task (all team members need to perform well for productivity), disjunctive task (only one member must perform well for the success of the team) and discretionary task (team members' resources are combined in any way). Similarly, McGrath (1984) proposed dimensions for classifying task characteristics regarding the cognitive (creativity tasks, intellectual tasks, decision-making tasks, cognitive conflict tasks) versus behavioral components (planning tasks, performance tasks, contests tasks, mixed motive tasks) and regarding the degree of interdependence (task is cooperative or conflictual). However, teams in field settings, contrary to experimental settings, perform a lot of tasks. So it appears that classical task typology (Steiner, 1972; McGrath, 1984; Shaw, 1964) used in experimental setting is not appropriate because it does not capture the fact that teams carry out several type of tasks among the typology. In organizational psychology, some research also emphasizes the fact that teams' processes need to be aligned with the characteristics of the task. Conditions which magnify the importance of using teams for a specific task are not always fulfilled and are receiving more attention (Hackman, 2002; Hackman & Wageman, 2005).

Within the Input-Process-Outcome model, task characteristics are seen as inputs which influence the processes, and then have an impact on team outputs. I suggest that the impact of task reflexivity on team performance may vary according to task variety and autonomy. Earlier studies focused on goal and outcome interdependence as moderators of the effects of task reflexivity (De Dreu, 2007; Schippers et al., 2003; Tjosvold, Tang, & West, 2004). Whereas task interdependence has a strong social aspect because of the focus on collaboration, on how team members have to exchange information or expertise and on how team goals are communicated to team members (Wageman & Baker, 1997); task variety and task autonomy relate more to the type of work that a team is assigned.

So far, the influence of other task-related aspects on the link between task reflexivity and outcomes has not been studied. I expect that teams with high task variety will profit more from task reflexivity; they will display higher team performance as a result of their reflection. I expect

this effect because the discussion of task-related strategies is most useful for coordination when task is varied and less routine. I furthermore expect that more autonomous teams will show higher innovation levels as a result of task reflexivity, because only teams with high autonomy may be able to actually implement their innovative ideas, which makes reflexivity more worthwhile for them.

Below, I will present the concepts of task variety and autonomy and argue for a moderation effect of task variety between task reflexivity and team performance and autonomy between task reflexivity and team innovation.

A. Task variety

Task variety refers to the extent to which a job requires a high variety of methods as opposed to a low variety and repetitiveness of methods and processes from day to day (Hall, 1972, as cited in Van de Ven, Delbecq, & Koenig, 1976). Task variety thus is an index of the non-routineness of the task. Non-routine task have a high level of task variety with a high degree of uncertainty and unexpected events. Higher task variety also implies a certain degree of uncertainty and unexpected events or changing environments that may require adaptation of task related strategies. Task variety can further mean that team members perform a number of different activities; this higher variety would require higher coordination to achieve the team's objectives.

Reflexivity may be more useful for teams with non-routine tasks and may be less important during routine tasks because these often do not require any strategy changes nor do they have a high degree of coordination requirements. Previous empirical evidence supports these arguments. First, Daft and Macintosh (1981) showed that when perceived task variety is high, information processing is also high. In order to deal with uncertainty raised by task variety, more information needs to be gathered and processed. Task variety has also been directly linked to perceived team performance as rated by team members and managers (Cohen, Ledford, & Spreitzer, 1996). In support of this argument, Jehn, Northcraft, and Neale (1999) found that differences in knowledge and perspectives among team members was related to team performance only under high task variety, but not for routinized tasks. They argued that strategy discussion may even be disruptive and counterproductive for routine tasks, whereas under high

task variety conditions, discussing strategies increased accuracy in problem solving. Task variety may also indicate that team members need more coordination. Indeed task variety requires team members to perform a number of different activities at work and is likely to demand team members to explicitly discuss their activities in order to deal with this variety and still achieve team objectives.

B. Autonomy

Task autonomy is defined as the possibility to make one's own decision about the work schedule, decision making, and working methods (Hackman & Oldham, 1980). Autonomy can also be viewed as decision latitude which has been primarily studied in stress research and at the individual level (Karasek, 1979; Spector, 1986). This task characteristic is an important element of job design (Hackman & Oldman, 1980; Langfred & Moye, 2004; Wageman, Hackman, & Lehman, 2005) and has been found to have consistent positive effects on a variety of variables across studies. A recent meta-analysis (Stewart, 2006) found that a higher level of autonomy in teams was related to a higher level of team performance (rated by supervisor and objective indicators) and another study also reported a positive link with innovation (Cohen et al., 1996). Agrell and Gustafson (1996) in a theoretical paper on innovation and creativity suggested autonomy, among other variables, to be an important condition for idea exploration and creativity. Amabile, Conti, Coon, Lazenbi, and Herron (1996) in a validation of an instrument to measure climate of creativity in organizations, found that autonomy or freedom of choice is an important antecedent to creativity and innovation at work. As said above, I suggest that task reflexivity is most useful for innovation, because the team develops new strategies during the reflection process. However, if a team has low autonomy, if the team cannot itself make the decision to implement the strategies developed; task reflexivity may not be able to fully unfold its potential for innovation. Thus, the extent to which team members have autonomy in their job may be a moderator between task reflexivity and subsequent innovation.

II. Transactive memory systems: approved to enhanced team performance

In this section I will present the concept of transactive memory on team and its effect on team performance. I will also develop hypothesis on the combining effect of task reflexivity and transactive memory to lead to higher team performance and innovation. I chose to focus on transactive memory because how teams deal with information and expertise differences amongst team members is receiving more attention (Brauner & School, 2000; De Dreu, Nijstad, & van Knippenberg, 2008; Moreland, 1999) and could give insight on why task reflexivity is not always needed to perform better.

A. Transactive memory systems in team and team performance

Recent research emphasizes that when members of a team share a cognitive structure of how each member's knowledge fits together, team performance is enhanced (Cannon-Bowers et al., 1993; Hollingshead & Brandon, 2003; Klimoski & Mohammed, 1994; Kozlowski & Ilgen, 2006; Moreland, 1999; Salas et al., 2005). Transactive memory system (TMS) is one such cognitive structure. TMS is often described as team members knowing who knows what. TMS is comprised of two components, the knowledge possessed by members of the team and an awareness of the locations of knowledge within the team. As such, TMS enables teams to effectively process and use knowledge of team members. More formally, transactive memory is defined as a shared cognitive system for encoding, storing, and retrieving team members' knowledge (Moreland, Argote, & Krishnan, 1996; Wegner, 1987). When TMS is present in a team, the cognitive load of remembering all the information needed to accomplish their team task is shared, the team has access to a greater amount of knowledge, locates easily the source of knowledge, reduces overlap of knowledge among team members, and each team members can strengthen his or her specific knowledge (Hollingshead & Brandon, 2003; Moreland, 1999; Wegner, 1987).

TMS is qualified as an implicit mechanism for coordination (Moreland, 1999; Kozlowski & Ilgen, 2006; Rico, Sanchez-Manzanares, Gil, & Gibson, 2008) because when TMS is well developed it reduces the need to explicitly communicate while maintaining coordination among

team members' activities. Indeed, Lewis et al. (2007) reported that teams rarely discussed explicitly who knows what and thus implicitly understood how each other's knowledge is related and rely on those implicit assumptions without communicating.

Research on TMS in team has addressed two main questions: How TMS impacts team performance and how to foster the development of TMS. Experimental, field studies, and case studies examined the relationship between TMS and team performance and offer insight on the manifestations of TMS and how to measure them (Austin, 2003; Ellis, 2006; Espinosa et al., 2007; Faraj & Sproull, 2000; Jackson & Klobas, 2008; Lewis, 2003, 2004; Lewis et al., 2007; Lewis et al., 2005; Liang et al., 1995; Michinov, 2007; Michinov & Michinov, 2007; Michinov et al., 2008; Michinov & Michinov, in press, 2008; Moreland, 1999; Moreland & Myaskovsky, 2000; Pearsall & Ellis, 2006; Peltokorpi & Manka, 2008; Rau, 2005, 2006; Ren et al., 2006; Zhang et al., 2007). Second, most of studies examined the role of training (Lewis, 2003; Liang et al., 1995; Moreland, 1999, Moreland & Myaskovsky, 2000; Pritchard & Ashleigh, 2007) and face to face communication in developing and maintaining a TMS (Hollingshead, 1998; Lewis, 2004; Michinov, 2007; Moreland & Myaskovsky, 2000; Peltokorpi & Manka, 2008).

Beside training and communication, Wegner (1987) proposed a variety of ways TMS can be formed. TMS starts when someone learns something about another team member, based on a stereotype, based on someone's reputation (known as expertise), based on assigned role, or because someone is exposed to that specific knowledge. However, in the following section, I focus on research that uses training and face to face communication to foster the development and maintaining of TMS and subsequent team performance. Then I will present how TMS manifested.

Training in TMS. In a series of experiments Moreland and Colleagues (Liang et al., 1995; Moreland, 1999; Moreland & Myaskovsky, 2000) investigated the role of different variation of training (individual vs. group) in developing a TMS in a group and the subsequent effects on group performance. In all of their experiments, three group members have to assemble an AM transistor radio after having practiced in a group or individually. Results were consistent across the experiments. Group whose members were trained together (and remained together), recalled more information about the task and made less mistakes (the measure of group performance) than groups whose members were trained individually. Other experiments demonstrated the

superiority of performance for groups whose members were trained together above (1) groups whose members were also trained together but were reassigned to a new group when performing; and above (2) groups whose members received individual training and a team building exercise. And finally, their last experiment demonstrated that groups whose members were trained apart but received information about each others skills, performed as well as groups whose members were trained together (Moreland & Myaskovsky, 2000). This is not to say that communication does not play a role at all in TMS development but that written feedback was as effective as face to face communication. In all the experiments, TMS manifestations (specialization, coordination, and credibility) during task production and TMS direct measures (complexity of knowledge, accuracy on members beliefs, and agreement on this beliefs) were greater in groups whose members were trained together than other possible group types (individual plus team building exercise or group reassignment) and predicted team performance. Similar results were reported in other experiments with student teams in which TMS was developed base on team training (Lewis, 2003; Lewis et al., 2005).

Recently, Prichard and Ashleigh (2007) demonstrated that not only training a team together to complete a task increased TMS and subsequent team performance but also adding a specific training session on team skills led to a higher level of TMS and team performance. Their experiment was also based on a three team members building an AM radio. The experiment began by team members attending a team skills training (only for those in the experimental condition). Then, as groups in Moreland's experiment, they received a demonstration on how to build the radio and then practiced in teams. The following week teams were invited to return to build the radio. Their team skills training encompassed a range of generic skills such as developing skills to solve problems, interpersonal relationships, goal setting, and role allocation, time management, and equality of participation. During the skill training session, teams were asked to plan and build a tent blindfolded. What is particularly interesting in this training is that team members identified the team's goal, gathered the information needed to achieve their goal, and planned strategies. While doing this, team members were encouraged to monitor and review their team process. This type of training is advocated to facilitate a review of team activities by a collective reflection on what happened during the task, and thus facilitate learning for future team tasks. These activities are similar to those involved in the reflexivity process (West, 1996, 2000, 2003). Teams engage on a reflection of team functioning, develop alternative strategies, and

implement the results of discussion in subsequent tasks, which lead to higher team functioning and team performance. Results indicated that TMS as evidenced by higher coordination, memory differentiation, and task credibility, was more developed in teams which received team-skills training and task training than those that only received task training (as in Moreland and colleagues experiments). Moreover, the problem solving aspect of the team-skills training was particularly related to TMS. Better planning, monitoring activities, and task role allocation enabled teams to have a more accurate and shared understanding of knowledge specialization, and enabled them to use that knowledge during task performance.

To sum up, previous research demonstrated that task training and team skills-training (similar to a reflexivity process) fostered the development of an accurate and shared TMS among team members. As a result of developing TMS, by training team members together, teams were able to better coordinate members' activities, to better manage information by remembering different aspects of the task, and trusted more in one another's knowledge. This implies that reflexive activities in team may be particularly useful when teams do not have formed a TMS.

Communication and TMS. Consistent with the first conceptualization of Wegner (1987), even if TMS is an implicit coordination mechanism, this does not mean that communication does not play a role at all in TMS. Because knowledge has to be distributed (otherwise there is no TMS), communication can be used by team members to learn and update who knows what. For instance, in a new team, by introducing themselves, team members can explicitly declare their specialized knowledge and others learn who knows what. Explicit communication is especially useful to share new information, update each other's knowledge, revise the TMS structure of who is good at what, and maintain an efficient TMS (Hollingshead & Brandon, 2003; Lewis et al., 2007). To be fully effective the knowledge possessed by each member need to be shared and known by others thus communication, especially face to face communication, may help teams in this respect. Communication is important because each member has their own TMS and those perceptions may vary among team members, thus interactions help to align perceptions and foster the sharedness. Note that TMS could also be built by observing other team members' activities, for instance during a training session (Moreland, 1999), but that explicit communication may have the advantage of being a faster way to develop a good TMS.

Face to face communication is perceived to be the better way to learn or readjust each team member's expertise (Wegner, 1987; Jackson & Klobas, 2007). In support of this argument several studies demonstrate that face to face communication is somewhat beneficial in achieving a better TMS. Lewis (2004), in a longitudinal study, found that frequent face to face meetings fostered the development of TMS. Hollingshead (1998) showed that not only nonverbal cues were used among couples but also that face to face contact was sometimes required to better retrieve knowledge. Moreover, she demonstrated that couples of strangers were able to recall more information when they were allowed to communicate. Communication helped them to learn about each other's knowledge and to divide responsibility to specific knowledge about the task they were doing.

The importance of face to face contact for coordination was particularly evidenced with teams those members collaborating from several geographic locations. Indeed, results of interviews conducted among team members of geographically distributed software teams (Espinosa et al., 2007) and project teams composed of distributed members (Jackson & Klobas, 2007), revealed that knowing team members expertise was especially important for collocated teams to achieve better coordination (Espinosa et al., 2007). However, because they were geographically distributed, there was no opportunity to meet each other face to face and few opportunities for interaction. Physical distance impeded the development of effective TMS because there were fewer opportunities to update and share information and information was difficult to retrieve consequently they did report more coordination problems. Several times, team members expressed the need for a face to face meeting to share information (Jackson & Klobas, 2007). Brandon and Hollingshead (2004) also suggest that co-presence and frequent interaction increase the sharedness and accuracy of TMS. Face to face communication provides opportunity to adjust TMS.

Peltokorpi and Manka (2008) demonstrated that frequent and open face to face interaction among team members of daycare teams was related to a better functioning TMS which was then positively related to team performance. The levels of familiarity and interdependence among team members were controlled in this study, thus allowing for more confidence in the effect of face to face interaction on TMS. The teams in this study had a lot of opportunities to formally interact thanks to daily, weekly, and monthly meetings, providing many chances to share

information, communicate their expertise, coordinate activities, and build trust in each other expertise.

In the development of a TMS scale, Lewis (2003) found that TMS was positively related to functional communication. The same results were found for the French validation of the TMS scale (Michinov, 2007). TMS was related to how easily team members were able to communicate with each other and to exchanges ideas.

To sum up, training team members together on the task (to develop team-skills through training) and enabling face to face communication have been both identified as methods of developing TMS. This implies that explicit communication may not only be useful to develop a well functioning TMS but moreover to maintain it. Task reflexivity, as an explicit mechanism to coordinate, may thus be especially useful when TMS is not well developed. Before explaining when task reflexivity may be especially helpful depending on the level of TMS, it is important to understand how TMS actually manifests in team.

The manifestations of TMS. Research has relied on two different but related ways of evidencing TMS. Direct measures of TMS manifestations consist in complexity, accuracy, and agreement and provide direct evidences of what team members know about the knowledge of one another. TMS may also be evidenced by indirect manifestations such as specialization, credibility, and coordination which represent behaviors enacted by a team using a TMS.

When researchers measured direct manifestations of TMS, they try to capture the awareness of who knows what. Through their experiments, Moreland and colleagues identified three dimensions of the awareness: complexity, accuracy, and agreement (Liang et al., 1995; Moreland, 1999; Moreland & Myaskovsky, 2000). Complexity refers to the specialization of expertise among team members and the level of detail used to describe the expertise of others. Accuracy represents the recognition of other's expertise. Agreement refers to agreement within team members about who has what expertise. Other researchers also measured agreement and expertise specialization, for instance in a field study of top management teams (Rau, 2005, 2006), and a computational model measured complexity and accuracy (Ren et al., 2006). Brandon and Hollingshead (2004) also suggested direct manifestations to evidence TMS. They proposed accuracy, sharedness, validation (acceptation by team members for responsibilities of specific

expertise), and convergence (shared representation of who knows what which accurately reflects the knowledge possessed by team members and is validated by members) as dimensions of TMS.

Based on Moreland's dimensions, Austin (2003) assessed TMS on four dimensions: knowledge stock (knowledge available in the team), consensus about knowledge sources (agreement of who knows what), specialization of expertise, and accuracy of knowledge identification. He found that the dimensions of TMS were not highly correlated. Consensus was positively correlated with specialization and accuracy; and knowledge stock was related to accuracy. Other relationships among the TMS dimensions were non-significant. He proposed that each of those dimensions had a unique contribution to team performance. He separately ran analyses for each of the dimensions of transactive memory and found that accuracy was the most significant predictor of team performance and that other dimensions were differently related to team performance depending on who evaluated team performance (team members, managers or an external rater).

Moreland and colleagues also evidenced more indirect manifestations of TMS during task completion. Videos of team performing the task showed that TMS was manifested by greater knowledge specialization, by greater trust in each other's expertise, and by effective coordination among team members' activities. Pritchard and Ashleigh (2007) also coded video of team performing their task for those manifestations. They found that specialization had the greater effect size when comparing the effect of two trainings on TMS. Based on Moreland's works, Lewis (2003) developed a scale for measuring TMS in the field. Lewis (2003) conceives transactive memory as an abstract conception (latent construct) which can be assessed by manifestations (observable variables). Based on Moreland and colleagues work, Lewis (2003) proposed to measure three manifestations of a TMS, namely, specialization (specialized knowledge of team members), credibility (belief about the reliability of other's knowledge and comfort in accepting suggestions or feedback from other team members), and coordination (coordination of member actions and few misunderstandings on how to proceed). Thus, a transactive memory system is present in a team when the team members hold a differentiated knowledge, can rely on and trust each other's knowledge, and coordinate their actions by referring to information about who knows what and how they are connected. Her findings support the idea that transactive memory is better captured by three dimensions than one. In the first two

studies (Lewis, 2003), all the three dimensions were positively intercorrelated, however, in her third experiment, there was no significant correlation between coordination and specialization.

Others field studies used Lewis' scale to measure TMS (Michinov, 2007; Michinov et al., 2008; Michinov & Michinov, in press; Peltokorpi & Manka, 2008; Zhang et al., 2007). Some analyzed the three dimensions separately and some aggregated the three dimensions into a total score of TMS. Results of different studies generally showed that specialization was not related to coordination nor credibility and that specialization and coordination had the weakest relationship among the dimensions (Michinov, 2007; Michinov et al., 2008; Michinov & Michinov, in press). Factorial analysis of the three dimensions revealed that credibility and coordination formed one factor and specialization another one (Peltokorpi & Manka, 2008).

Results from research measuring direct and indirect manifestations of TMS suggested that specialization, credibility, and coordination are somewhat related but that specialization is relatively different from the two others. Contrary to shared mental models, transactive memory systems stress the importance of distributed knowledge rather than similarity to one another (Kozlowski & Ilgen, 2006). Theoretically, specialization lies at the heart of TMS, because TMS starts when team members specialized in expertise and develops when team members have a shared mental representation of each other's expertise. When team knowledge is effectively distributed and team members are aware of this role distribution, they are able to encode, store, and retrieve information effectively, anticipate the actions of others and thus increase coordination of individual activities.

Specialization should be identified first in team. Then, as team members are working together, they evaluate the specialization and start to trust in each other's expertise. Finally, because team members are specialized and trust in each other expertise, they are able to coordinate effectively. Thus when teams develop a TMS, specialization should precede credibility and consequently should lead to coordination. Reagans, Argote, & Brooks (2005) distinguish the distribution of the knowledge about the task from the knowledge about '*how to govern relationship'* among members (Reagans et al., 2005, p. 872). They suggest that both specialization of team members' knowledge and trust among members explain team coordination and allows for better team performance. This implies that specialization represents the part of TMS related to the task, and trust refers more to the team part of the TMS. The distribution of

knowledge among team members allows for task division and responsibility inside the team, thus enabling coordination of task activities. Trust will determine how well team members will rely on other's knowledge and how well specialized team members could combine their knowledge, thus enabling coordination of the team members' activities.

This review of the manifestations of TMS implies two important points for this study. One is that, TMS will be better evidenced by indirect manifestations (specialization, credibility and coordination) when studying standing teams. The second point is that the three manifestations address three specific aspects of TMS (all needed to capture TMS) but still may differently combined with task reflexivity to maintain team performance.

Even if both direct and indirect manifestations of TMS reflect the presence of TMS and are related to each other (Moreland, 1999; Lewis, 2003), indirect manifestations seem to be easier to collect in field studies to capture evidence of transactive memory behaviors, namely, specialization knowledge, credibility perception, and coordination processes. Moreover, I also wanted to capture TMS independently of the tasks that teams performed, because standing teams perform a lot of different tasks compared to the teams in experimental studies which only deal with one specific task. Therefore, I need to have a general evaluation of transactive memory systems, so I will use the scale proposed by Lewis (2003) which is designed to assess transactive memory manifestations in the field and is task-independent.

In the following part, I will propose how implicit coordination (TMS) could combine with one specific explicit mechanism that teams also use to coordinate, to foster team performance and innovation.

B. Task reflexivity and transactive memory systems

In this study, I examine the joint influence of task reflexivity and transactive memory system, thus responding to the call for studies that integrate both implicit and explicit coordination mechanisms to explain team performance (Rico et al., 2008; Wittenbaum, Vaughan, & Stasser, 1998). Indeed, teams, and especially teams in organizations, have multiple coordination mechanisms which may interact with one another. Previous research has revealed that both TMS and task reflexivity is related to team performance, but no studies have examined yet how those two team processes combine and lead to team performance.

Research suggests that shared experience of working together and face to face communication is important for the emergence of a TMS in team. Yet TMS can be weakening as time passes. Previous research showed that TMS may be less developed when team members lack experience of working together; team members exhibited less specialization, less credibility and less coordination (Lewis, 2003, Lewis et al., 2005; Liang et al., 1995; Moreland et al., 1999; Moreland & Myaskovski, 2000, Pritchard & Ashleigh, 2007). Moreover, a well established TMS may be damage in team. For instance when a team member leaves the team, the team may be lacking the knowledge of that person which may implies a reallocation of expertise and may reduce temporarily team performance until TMS was readjusted. Indeed, Moreland (1999) found that TMS was disrupted when there was reassignment of team members which hindered team performance. Wegner, Erber, and Raymond (1991) in a study of TMS in close relationships showed that intimate couple performed worse than stranger couples when experimentors impose responsibility for knowledge in specific areas onto specific individuals. In those researches, TMS was disrupted; team members were not more able to rely on previous knowledge division. According to Hollingshead, McGrath, and O'Connor (1993), changes may disrupt task performance pattern by disrupting the transactive memory system which may lead to lower performance, especially for effective teams.

Several researchers have also suggested that face to face communication is needed to achieve better TMS (Espinosa et al., 2007; Hollingshead, 1998; Jackson & Klobas, 2008; Lewis, 2004). TMS may be reduced when team members do not have opportunities to meet face to face to learn or update the knowledge of each others and to share their knowledge. Then, team members may rely on an inaccurate distribution of knowledge.

I suggest that when TMS is lacking or failing, task reflexivity could be especially useful. Indeed, explicit coordination mechanism may supplant the implicit coordination mechanism. During reflexive activities, teams explicitly review their functioning, and thus reflexive teams may engage in a deep reflection on how knowledge and expertise are used and adjust for potential troubles. In particular, task reflexivity helps to identify problems, shares information, revises and plans strategies, and encourages team members to voice their opinions. Task reflexivity helps teams to scan for errors in members' shared beliefs. When teams engage in reflexive activities team members is more likely to share and effectively use team members' knowledge, to foster trust in each others expertise, and to develop strategies to better coordinate.

When TMS is not well functioning, It may be that the perception of each others' expertise is inaccurate, that team coordination is not well established, or that team members do not trust each others' expertise. Explicit communication of those aspects may foster team performance.

When there is a low level of recognized specialization in a team, this may indicate that others are not aware of each other's domain of expertise, or that responsibility for task parts is not clear and thus reduces team performance, or that team members do not share an accurate distribution of knowledge. Researchers have found evidence that team have trouble sharing critical unshared information (Stasser & Titus, 1985, 1987) consequently team members may not be aware of each other's expertise and may have trouble specializing in a specific task area. Stasser, Stewart, and Wittenbaum (1995) found that open discussion of who knows what increased the mentioning of unshared information during team discussion. Thus, when team members are reflexive unshared information is more likely to be mentioned during discussion because discussion and reflection foster the probability that individual team members recall information and mention it during discussion. Task reflexivity should be helpful in accessing individual knowledge possessed by each team member and increasing verbalization of implicit and perhaps important knowledge (Brauner & Becker, 2006). Task reflexivity should increase the awareness of specialization by encouraging team members to share their own knowledge and to be aware of each others' expertise and by effectively processing divergent opinion (De Dreu, 2002). Moreover, a shared awareness of who knows what makes possible the use of effective knowledge and reinforces coordination. Discussion may also help team members to reinforce or readjust their previous thoughts on specialization or strategies. Indeed, each member has their own representation of the TMS and those perceptions may vary among team members. The benefit of task reflexivity is to highlight the troubles also in implicit coordination and thus discussion may help to align perceptions and foster sharedness (Brandon & Hollingshead, 2004). A low level of specialization also indicates that team members are not clear about their respective specializations. Planning activities includes in task reflexivity may help to clarify one's role and thus team members will collect, store, and retrieve information related to their role.

Credibility is another component of TMS. Credibility is important because team members must rely on each other to access specific knowledge, they do not have to claim their expertise and are willing to accept suggestion, otherwise no TMS is possible (Moreland, 1999; Wegner, 1987). But to actually use information coming from others, team members must trust in the

credibility of this expertise. Credibility is higher when team members have a shared experience of working together and is higher when team members have opportunities to interact face to face. Indeed, results of interviews conducted with project teams composed of distributed members, revealed that team members perceived computer based information (the information that is stored on a computer instead of in team members' heads) less credible and less informative than face to face interactions (Jackson & Klobas, 2007). Task reflexivity by increasing open discussion and planning activities can help members in increasing accuracy in knowing who knows what, helping to align the right person with the right knowledge to the right task (Brandon & Hollingshead, 2004), thus increasing the credibility of team members' expertise.

Finally coordination is another important aspect of TMS. When members know who knows what and how team members' knowledge fits together, coordination is high and team members work well together. The coordination aspect of TMS implies that coordination is implicitly achieved because they do not necessarily have to neither communicate openly nor plan explicitly to use each other's knowledge and to ensure smooth coordination. Team members do not need to backtrack and there is no confusion about the strategies used to accomplish the task. Reflexivity is advocated to be particularly useful when a team encounters internal functioning problem, such as coordination loss. Thus, when TMS is failing, explicit communication and reflection on who do what may clarify responsibility and help to plan better strategies.

I expect that when TMS is lacking or failing task reflexivity may substitute for the implicit coordination mechanism and contribute to higher performance.

Nevertheless, team innovation is another important outcome of teams. Team innovation is viewed as the result of strategic adaptation which leads to improvements in the way of doing things. Innovation requires teams to rethink their whole functioning and develop new strategies. That is why task reflexivity is particularly useful for team innovation and TMS appears to be not directly related to the level of innovation. However, when TMS is combined with task reflexivity, TMS may also impact the level of innovation in teams. The interaction effect may be slightly different from the one explaining team performance. Task reflexivity may be especially helpful when specialization, credibility and coordination are low but one can also argue that teams with high levels of specialization, credibility, and coordination may also benefit from task reflexivity. Indeed, theoretical work suggests that TMS may engage teams in finding new ways of doing

things because more knowledge is brought to the team without disturbing coordination. Team members have access to more information, they coordinate well and trust in each other expertise, thus TMS offers the team the basis to take advantages of task reflexivity. Team members do not have to focus on their primary functioning since they are specialized and they coordinate well, thus they can go to a further step, and then the effect of reflexivity on team innovation could be stronger. Indeed, it could be especially useful to explicitly reflect and discuss a new way of doing things when team members are specialized and well-coordinated. When knowledge of each member is combined, they may discover another solution that alone members would not have thought about (Wegner, 1987). Moreover, task reflexivity may reinforce the perception that different knowledge and insights can be effectively combined. Thus, when transactive memory is high and task reflexivity is high, the effects of task reflexivity on team innovation may be stronger.

On the other hand, teams have a tendency to skip reflexive activities such as planning and strategy adaptation unless they are forced to by an external intervention or by a big failure (Gurtner et al., 2007; Hackman et al., 1976; McMinn & Moreland, 2006; Weingart, 1992). Consequently, although teams with high specialization, credibility, and coordination may benefit from task reflexivity, teams with low level of specialization, credibility and coordination will profit more from task reflexivity.

In this dissertation I propose that task reflexivity will be especially useful to improve team performance and increase innovation when the levels of specialization, credibility, and coordination are low rather than high.

III. Research questions and hypotheses

Figure 2 and 3 presents the hypotheses tested. It shows that task reflexivity is expected to explain team performance and team innovation. However, the effects of task reflexivity on team outcomes (performance and innovation) are hypothesized to be contingent on task variety and autonomy and on the transactive memory system.

To sum up, this dissertation contains three studies. Given that the data collection was done in the French part of Switzerland, I had to establish the validity and reliability of the French version of the reflexivity scale. With regard to the relationship between task reflexivity and team performance and innovation, this dissertation attempts to contribute to two main questions: *Do task variety and autonomy moderate the impact of task reflexivity on team performance and innovation? Does task reflexivity interact with transactive memory systems to explain team performance and innovation?*

Study 1: Chapter 4

- *Validation of the reflexivity scale for a French sample.*

Study 2: Chapter 5 (Figure 2)

- *Hypothesis 1(a)*: Task reflexivity is positively related to team performance.
- *Hypothesis 1(b)*: Task reflexivity is positively related to team innovation.
- *Hypothesis 2*: Task variety moderates the link between task reflexivity and team performance. Task reflexivity will benefit team performance more when there is greater task variety.
- *Hypothesis 3*: Task autonomy moderates the link between task reflexivity and team innovation. Task reflexivity will benefit team innovation more when there is greater task autonomy.

Study 3: Chapter 6 (Figure 3)

- *Hypothesis 4*: Task reflexivity and transactive memory dimensions (knowledge specialization, credibility perception, and coordination processes) will each contribute to a higher level of team performance.

- *Hypothesis 5:* Task reflexivity and transactive memory dimensions (knowledge specialization, credibility perception, and coordination processes) will each contribute to a higher level of team innovation.
- *Hypothesis 6:* Task reflexivity and transactive memory dimensions interact to explain team performance (H6) such that:
    a. Teams with a low level of knowledge specialization will perform better when there is a high level of task reflexivity than a low level of task reflexivity. (*H6a*).
    b. Teams with a low level of credibility perception will perform better when there is high level of task reflexivity than a low level of task reflexivity. *(H6b)*.
    c. Teams with a low level of coordination will perform better when there is high level of task reflexivity than a low level of task reflexivity. *(H6c)*.
- *Hypothesis 7:* Task reflexivity and transactive memory dimensions interact to explain team innovation *(H7)* such that:
    a. Teams with a low level of knowledge specialization will be more innovative when there is high level of task reflexivity than a low level of task reflexivity. *(H7a)*.
    b. Teams with a low level of knowledge credibility will be more innovative when there is high level of task reflexivity than a low level of task reflexivity. *(H7b)*.
    c. Teams with a low level of coordination will be more innovative when there is high level of task reflexivity than a low level of task reflexivity. *(H7c)*.

Figure 2. Effects of task reflexivity, task variety, and task autonomy on team's outcomes (team performance and innovation).

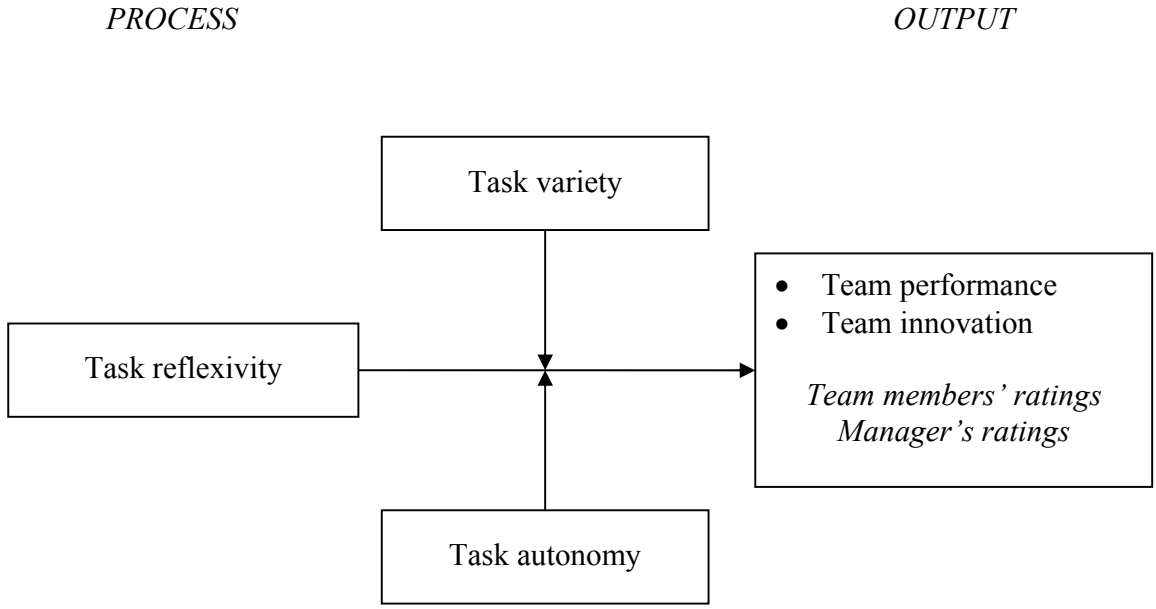
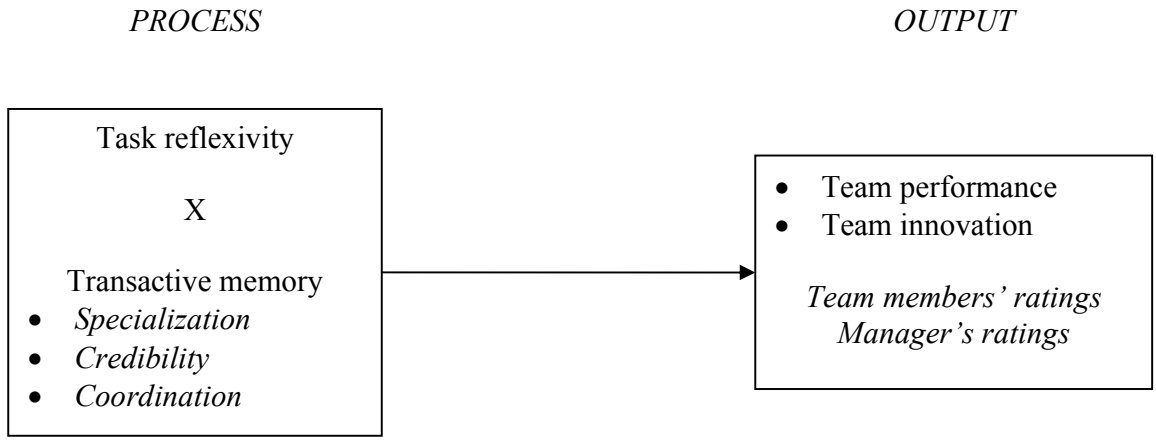


Figure 3. Effects of task reflexivity and transactive memory on team's outcomes (team performance and innovation).



Chapter 4

Validation de l'échelle de réflexivité de Carter et West (1998) en français

The first step of this dissertation was to validate the reflexivity scale (Carter & West, 1998) into French. This chapter is thus the corresponding article already published in a French journal. This article is based on the introduction part, thus there are many repetitions. Others people were involved in this project:

Facchin, S., Tschan, F., Gurtner, A., Cohen, D., & Dupuis, A. (2006). Validation de la version française de l'échelle de réflexivité en groupe de Carter et West, 1998. *Psychologie du Travail et des Organisations, 12*, 291-306.

Résumé

Plusieurs études ont montré que la réflexivité — le niveau de discussion d'un groupe sur ses objectifs, stratégies et processus et leurs adaptations aux changements — est positivement liée à la performance en groupe. Deux études, comprenant 80 groupes (320 personnes), ont été réalisées pour valider la version française de l'échelle de réflexivité. Dans l'étude 1, l'analyse factorielle exploratoire révèle trois facteurs confirmant en partie la structure à deux facteurs (réflexivité tâche et réflexivité sociale) attendue et trouvée dans l'étude originelle de Carter et West, 1998. Deux items du facteur de réflexivité tâche forment un troisième facteur nommé réflexivité stratégique. L'analyse factorielle confirmatoire dans l'étude 2 confirme cette structure. La validité concourante est établie par les corrélations entre réflexivité et performance en groupe. On constate que les réflexivités tâche, sociale et stratégique ont des impacts différents sur la

performance. La version française de l'échelle de réflexivité a une bonne consistance interne. Elle est adéquate pour évaluer le niveau de réflexivité d'un groupe.

Abstract

Several studies found reflexivity —the extent to which team discuss objectives, strategies and processes and adapt them to changes— to be related to team effectiveness. Two studies were conducted with 80 teams (320 participants) to validate French version of reflexivity scale. In study 1 exploratory factor analysis revealed 3 factors which partly confirm the 2 factor structure (task reflexivity and social reflexivity) expected from the original study (Carter and West, 1998). Two items of the original task reflexivity scale load on a third factor named strategic reflexivity. The three factor structure was replicated in study 2 with confirmatory factor analysis. Criterion validity is proved by correlations between reflexivity and team performance. Task, social and strategic reflexivity correlate with different aspects of team effectiveness. The French version of reflexivity scale is reliable and appropriate for evaluating team reflexivity.

I. Introduction

Dans de nombreuses organisations modernes, les groupes de travail constituent, de plus en plus, une base pour organiser le travail et assurer la productivité de l'organisation. Une enquête réalisée auprès de grandes entreprises (Waterson et al., 1999) a confirmé que la réorganisation du travail en groupe est une des mesures de restructuration parmi les plus populaires et jugée comme prometteuse. Selon cette même étude, les entreprises fonctionnant en groupe de travail sont assez satisfaites des résultats obtenus suite à une telle réorganisation.

Cependant, le travail en groupe n'est pas automatiquement couronné de succès. Lors d'une enquête menée chez Microsoft (Raikes, 2005) les difficultés de collaboration en groupe ont été mentionnées par la majorité des participants. Ces difficultés représentent un obstacle important à une bonne performance. La recherche concernant le travail en groupe confirme les difficultés de beaucoup de groupes à assurer un bon fonctionnement et une bonne performance (Hackman, 2002; Steiner, 1972).

Dans un premier temps, cet article présente l'importance des processus de groupe en tant que facteur de performance et plus précisément le processus de réflexivité en groupe (West, 1996, 2000). Puis, en nous basant sur deux études empiriques, nous présentons la validation de l'échelle de réflexivité de Carter et West (1998) dans sa version française.

Dans cet article, le terme groupe désigne un ensemble de personnes qui travaillent de manière interdépendante à la réalisation d'un but commun. Le terme groupe est préféré à celui d'équipe pour éviter l'amalgame avec un autre usage du terme équipe désignant un type d'horaire de travail (3X8 heures).

A. Modèles de performance en groupe

Les modèles de performance en groupe relèvent l'importance d'un processus de groupe bien géré pour une performance optimale (Gladstein, 1984; Hackman, 1987, 2002; McGrath, 1991; McGrath & Argote, 2001; Salas, Sims, & Burke, 2005). Ils mettent en outre l'accent sur l'adaptation aux changements et le développement de stratégies liées aux tâches. D'un autre côté, ils soulignent l'importance d'une bonne gestion de la coopération entre les membres et d'une

gestion des conflits maîtrisée. Le succès d'un groupe dépend donc en grande partie de la capacité du groupe à réagir rapidement aux changements, de façon réfléchie et sans créer de conflits.

En s'inspirant des modèles psychologiques individuels, plusieurs chercheurs ont suggéré qu'une adaptation rapide des groupes aux changements et que le développement de stratégies optimales dépendent de la capacité du groupe à avoir un certain niveau de réflexion (Carter & West, 1998; Salas et al., 2005; West, 1996, 2000). La supposition qu'une réflexion critique concernant sa propre façon de fonctionner et ses propres stratégies, a déjà été discutée et confirmée d'une part dans la psychologie individuelle et d'autre part dans des recherches concernant l'apprentissage organisationnel. Au niveau individuel, les recherches sur le développement d'expertise ont trouvé que la répétition délibérée est un facteur clé de succès. L'expérience en tant que telle ne suffit pas à développer l'expertise, elle doit être accompagnée d'une répétition réfléchie et consciente (Ericsson & Lehmann, 1996). Similairement, Schön (1987) a souligné l'importance d'une prise de recul et d'une réflexion consciente des acteurs individuels pour une bonne performance. Un processus similaire a été suggéré par Argyris et Schön (2002) au niveau organisationnel avec le concept d'apprentissage en double boucle qui consiste en un processus de réflexion sur les suppositions qui gouvernent nos actions pour arriver à de meilleures stratégies. Si l'on applique ces concepts au fonctionnement du groupe, on peut supposer que le succès d'un groupe dépend en partie de sa capacité à consciemment remettre en question ses stratégies et son fonctionnement, à réfléchir et à développer des stratégies adaptées à la tâche (Tschan, Semmer, Nägele, & Gurtner, 2000).

B. Le concept de réflexivité de West

Le concept de réflexivité proposé par West (1996, 2000) applique, à un niveau groupal, la notion d'une délibération consciente par rapport à ses propres stratégies et à son propre fonctionnement. Swift et West (1998) ont défini la réflexivité comme « le niveau de réflexion collectif des membres d'un groupe sur ses objectifs, stratégies, processus et sur son environnement et leurs adaptations en conséquence » (Swift & West, 1998, p. 4).

La réflexion, première phase du processus de réflexivité, peut être conçue comme un mécanisme de régulation de soi, mais à un niveau groupal avec un niveau de régulation élevé de l'action (Tschan & von Cranach, 1996), nécessitant la verbalisation des actions. Selon West, le

niveau de réflexion peut être faible, si peu d'attention est donnée à la réflexion sur les tâches, les objectifs et les stratégies; il est modéré, si le groupe mène une discussion plus critique sur ses processus et si le groupe produit des stratégies alternatives à celles déjà implantées. Le niveau de réflexion profond (rarement trouvé, selon West, 1996) se caractérise par un apprentissage à un méta-niveau: le groupe prend conscience de la manière dont il apprend en réaction aux changements. La réflexion délibérée et consciente sur le fonctionnement du groupe ne représente que la première étape du processus de réflexivité. L'étape suivante est la planification des changements proposés dans la réflexion et la dernière étape consiste en la mise en œuvre de ces changements.

West (1996, 2000) distingue deux aspects de la réflexivité: la réflexivité sociale et la réflexivité tâche qui sont décrites ci-dessous.

Réflexivité sociale. La coordination optimale des membres du groupe dépend de sa capacité à intégrer les différents avis et intérêts (Arrow, McGrath, & Berdahl, 2000; Gladstein, 1984). Une bonne gestion des processus sociaux est un facteur indispensable pour une bonne performance de groupe. Carter et West (1998) soulignent qu'une gestion rapide et constructive des conflits est un facteur social important. Egalement, une méta-analyse récente (De Dreu & Weingart, 2003) a établi des corrélations fortes entre les conflits et la diminution de la performance du groupe ainsi que le manque de satisfaction des membres. Cependant, des recherches antérieures ont suggéré que les conflits peuvent avoir des effets bénéfiques sur la prise de décision et sur le niveau d'innovation dans un groupe, grâce à la possibilité d'intégrer différents points de vue (Levine, Resnick, & Higgins, 1993). Par exemple, Carnevale et Probst (1998) ont trouvé que les participants qui s'attendaient à prendre part à une séance tendue, montraient un niveau plus élevé de flexibilité cognitive et de créativité. Or, cet effet positif disparaît dès lors que les gens anticipent un conflit hostile et compétitif. Un autre aspect de la réflexivité sociale concerne le soutien social potentiellement apporté par les membres du groupe, en particulier en situation de stress. Le soutien social est depuis longtemps reconnu comme ayant une influence positive sur le bien-être et servant de tampon contre les effets négatifs du stress (Beehr, 1995). Au travail, le supérieur ainsi que les collègues (donc les membres de son groupe de travail) sont des sources importantes de soutien social (Elfering, Semmer, Schade, Grund, & Boos, 2002).

Réflexivité tâche. La réflexivité sur la tâche se caractérise par la prise de conscience, la discussion, la planification et la mise en action des aspects liés à la tâche du groupe. Le groupe revoit ses objectifs et les modifie en fonction des changements de circonstances, discute ses stratégies et revoit la manière d'effectuer son travail. Cela lui permet de développer et d'implémenter des stratégies adaptées aux objectifs. La réflexivité tâche est importante, car souvent les groupes ne s'engagent pas spontanément dans la discussion de leurs stratégies et la planification (Hackman, Brousseau, & Weiss, 1976). De plus, parmi les groupes de l'étude de Hackman et al. (1976), seuls ceux ayant une tâche complexe ont pu tirer profit d'une phase de planification. Fussell et al. (1998), dans une étude de simulation d'entreprise et Orasanu (1994) dans une étude sur les équipages d'avion ont confirmé l'importance de la discussion des stratégies pour une bonne performance. Une autre étude a montré que dans le milieu hospitalier, l'implémentation d'une nouvelle procédure a été facilitée pour les groupes qui ont discuté de leurs stratégies (Edmondson, Bohmer, & Pisano, 2001). D'autres composantes de la réflexivité tâche peuvent être liées à d'importants processus de gestion d'un groupe : la discussion et la modification d'objectifs sont des facteurs essentiels pour augmenter l'efficacité des groupes (Locke & Lathman, 2002; Weingart, 1992). Comme ceux-ci ont souvent des difficultés à partager les informations (Stasser & Titus, 1987), évaluer la manière dont l'information est communiquée peut être un aspect notable de la réflexivité tâche.

En somme, on peut supposer que les groupes qui s'engagent plus fréquemment dans un processus de réflexivité sont plus performants. Dans la prochaine partie, nous présentons le soutien empirique qui confirme le lien entre la réflexivité et la performance en groupe.

C. Soutien empirique des effets de la réflexivité sur la performance en groupe

West (1996, 2000; Carter & West, 1998; Swift & West, 1998) suggère que la réflexivité a des effets positifs sur la performance de groupe. Cette amélioration de la performance est médiatisée par une optimalisation des processus de groupe, en particulier par l'adaptation des stratégies du groupe en fonction des circonstances et par une meilleure coordination des membres du groupe. Plusieurs recherches soutiennent ces hypothèses. Dans une première étude sur la réflexivité, Carter et West (1998) ont montré que des groupes de production d'émissions de la

télévision BBC, ayant un niveau de réflexivité plus élevée, ont été évaluées par leurs supérieurs comme étant plus performants et plus innovateurs. Récemment, Tjosvold, Tang, et West (2004) dans une étude réalisée avec des groupes en Chine, ont pu répliquer le lien entre le niveau de réflexivité tâche et l'innovation. Schippers, DenHartog, Koopman, et Wienk (2003) ont trouvé un lien entre la réflexivité et l'auto-évaluation de la performance des membres du groupe, même après avoir contrôlé pour les effets de la diversité au sein du groupe, de l'interdépendance des tâches, ainsi que de la longévité du groupe. Une autre étude réalisée en Chine (Tjosvold, Hui, & Yu, 2003) a trouvé, d'une part, un lien entre le niveau de réflexivité tâche et la performance et d'autre part, une augmentation des comportements de citoyenneté organisationnelle (Organ, 1997). Gurtner, Tschan, Semmer, et Nägele (à paraître, 2007) ont montré dans une étude expérimentale que la réflexivité, dans des groupes hiérarchiques, augmente le nombre de stratégies suggérées par le supérieur ainsi que l'implémentation des stratégies par les subordonnées. Ils ont pu établir que ces processus médiatisent le lien entre réflexivité et performance.

Pourtant, le lien entre réflexivité et performance n'est pas assuré pour tous les types de groupes dans toutes les circonstances. De Dreu (2002) a montré que seuls les groupes ayant un niveau de réflexivité tâche élevé ont pu tirer profit d'une minorité divergente pour augmenter leur innovation et leur efficacité. Gevers, van Eerde, et Rutte (2001) ont montré, dans une étude quasi-expérimentale, que la réflexivité influence la performance plutôt dans la phase d'exécution de la tâche que dans la phase d'orientation.

En somme, les études empiriques concernant la réflexivité suggèrent que les groupes plus réflexifs développent des stratégies plus adaptées et une performance supérieure par rapport aux groupes ayant un faible niveau de réflexivité.

D. Mesurer la réflexivité : l'échelle de Carter et West (1998)

Pour mesurer le niveau de réflexivité des groupes, Carter et West (1998) ont développé un questionnaire, comprenant deux échelles de huit items chacune. Les 16 items comprenant l'échelle de réflexivité se trouvent dans le Tableau 1. Carter et West (1998) dans une première étude ont trouvé une structure à deux facteurs correspondant aux items concernant la réflexivité sociale et la réflexivité tâche. Les auteurs reportent la consistance interne de ces échelles avec des

alphas de Cronbach entre .78 et .94, sans indiquer de détails. Pour l'échelle de réflexivité tâche, Tjosvold et al. (2004) indiquent un alpha de Cronbach de .88 ; Gevers et al. (2001) un alpha de .82 et .78, De Dreu (2002) un alpha de .75. La validation de l'échelle de réflexivité en français a plusieurs objectifs :

● Le premier objectif est de voir si la structure factorielle de l'étude originale peut être répliquée dans la version française. Une structure à deux facteurs est attendue: réflexivité tâche et réflexivité sociale. Pour atteindre cet objectif, plusieurs structures factorielles ont été comparées en utilisant plusieurs modèles d'équation structurés.

● Le lien entre réflexivité et performance a été confirmé dans plusieurs études. Pour tester la validité concourante, nous avons inclus des mesures d'autoévaluation de la performance du groupe et de la performance individuelle. Nous attendons un lien positif entre le niveau de réflexivité et la performance du groupe (Carter & West, 1998; De Dreu, 2002; Gevers et al., 2001; Schippers et al., 2003; Tjosvold et al., 2004). La performance individuelle pouvant également corréler avec la performance du groupe, un lien entre réflexivité et performance individuelle peut aussi être attendu. Toutefois, ce lien devrait être moins fort que le lien entre performance de groupe et réflexivité.

II. Méthode

A. Participants et procédure

Étude 1. La première étude est constituée de 139 personnes (41 groupes) de différentes entreprises de Suisse romande issues du secteur tertiaire. Chaque responsable de groupe a été contacté par téléphone pour s'assurer de son accord. Suite à cet accord, les questionnaires ont été distribués par les chercheurs à chaque membre du groupe. Lors de la distribution, les buts de l'étude ont été exposés et l'anonymat a été garanti. Les participants ont glissé les questionnaires remplis dans une enveloppe neutre qui a été récoltée sur place. Il s'agit d'un échantillon de commodité avec un taux de retour de 100 %. Tous les groupes recrutés sont composés d'au moins trois membres.

L'accord intragroupe a été calculé pour chaque groupe pour l'échelle de réflexivité sociale et tâche avec le $r_{WG(J)}$ selon la procédure suggérée par James, Demaree, et Wolf (1984). Pour tous

les groupes, le $r_{WG(J)}$ dépasse le point recommandé de .7 démontrant une vision commune des membres sur la réflexivité du groupe. La taille des groupes varie de trois à sept membres avec une moyenne de 3,63 membres par groupe (*SD* = 1,15). 52,5 % des participants sont des femmes. La moyenne d'âge est de 37,68 ans (*SD* = 12,96).

Étude 2. La seconde étude est constituée de 205 personnes (46 groupes) issues d'une entreprise du secteur secondaire de Suisse romande. Les buts de l'étude ont été présentés à chaque responsable de groupe qui a ensuite distribué les questionnaires aux membres des groupes. Les buts de l'étude, la nature volontaire de la participation ainsi que l'anonymat des réponses ont été rappelés dans une note écrite distribuée à l'ensemble des participants. Les participants ont déposé leurs questionnaires remplis dans une urne fermée. L'urne a été relevée par nos soins. Le taux de réponse pour l'enquête au niveau individuel est de 90,7 %. Nous avons inclus dans les analyses suivantes les réponses des groupes de trois membres au minimum, et seulement, si 50 % au moins des membres d'un groupe ont répondu à l'enquête. Dans cinq groupes, seul un membre avait répondu et dans un autre groupe les membres ont répondu de manière identique à tous les items. Les questionnaires de ces six groupes ont été écartés des analyses.

L'accord intragroupe pour les échelles de réflexivité sociale et tâche a été calculé pour chaque groupe avec le $r_{WG(J)}$ (James et al., 1984). Suite à ces analyses, un seul autre groupe a été écarté en raison d'un $r_{WG(J)}$ trop faible (.42 pour l'échelle de réflexivité sociale). Pour tous les groupes restant, le $r_{WG(J)}$ dépasse le point recommandé de .7. Les participants restants (181 personnes) proviennent de 39 groupes dont la taille varie de trois à dix membres avec une moyenne de 5,17 membres par groupe (*SD* = 1,72). 31,5 % des participants sont des femmes et 43,1 % des hommes, les autres 25,4 % n'ont pas mentionné leur sexe. La moyenne d'âge est de 42,89 ans (*SD* = 9,05).

B. Mesures

Réflexivité. Les items du questionnaire de réflexivité conçus par Carter et West (1998) ont été traduits en français à partir de la version originale anglaise. La version française ainsi obtenue a été retraduite en version anglaise. La procédure a été répétée jusqu'à l'obtention d'un accord sur une bonne traduction française de la version anglaise.

Le questionnaire original se compose de deux échelles: réflexivité tâche et réflexivité sociale. L'échelle de réponse est en sept points allant de complètement faux (codé 1) à complètement juste (codé 7). Les items en anglais et en français sont présentés dans le Tableau 1.

L'échelle de réflexivité tâche est constituée de huit items. Elle permet de voir si le groupe revoit ses objectifs, discute ses méthodes de travail, change de stratégies en fonction des circonstances. Cette échelle cherche à évaluer la capacité du groupe à adapter son fonctionnement selon les changements qui apparaissent. Les items RT5R « Les stratégies de notre groupe sont rarement changées » et RT8R « Nous changeons rarement les procédures de prise de décision dans notre groupe » sont des items renversés. L'échelle de réflexivité sociale est constituée de huit items. Elle concerne le fonctionnement social du groupe. Elle mesure comment le groupe se préoccupe des conflits, apporte du soutien social aux membres et développe le bien-être des membres. Les items RS2R « Quand le travail est stressant, notre groupe n'apporte pas beaucoup de soutien », RS3R « Les conflits ont tendance à traîner en longueur dans notre groupe », RS7R « Les membres de notre groupe sont souvent désagréables », RS8R « Les membres de notre groupe sont lents à résoudre les conflits » sont des items renversés. La consistance interne de l'échelle de réflexivité avec l'alpha de Cronbach est présentée dans la partie résultats.

Autoévaluation de la performance individuelle. Dans les deux études, l'autoévaluation de la performance individuelle a été mesurée par six items développés par les chercheurs. Deux exemples d'items : « Pensez-vous bien maîtriser votre travail ? », « Au travail, est-ce que vous vous considérez comme une personne très productive ? » (1 = *pas du tout*, 5 = *totalement d'accord*). L'alpha de Cronbach pour l'étude 1 est de .88 et de .73 pour l'étude 2.

Autoévaluation de la performance de groupe. Dans la première étude, nous avons mesuré l'autoévaluation de la performance du groupe en utilisant quatre items tirés de l'échelle de Roe, Dienes, TenHorn, et Zinovieva (1995). Les items ont été reformulés à un niveau groupal pour correspondre au contexte groupal de cette étude. Un exemple d'items : « Notre groupe mérite une évaluation positive », « Notre performance de groupe dépasse celle des autres groupes » (1 = *totalement pas d'accord*, 5 = *totalement d'accord*). L'alpha de Cronbach est de .66, indiquant une fidélité juste satisfaisante. Dans la seconde étude, l'autoévaluation de la performance de groupe a été évaluée avec un seul item tiré du « Team Performance Questionnaire » (West & Markiewicz, 2004) : « Il est régulièrement dit au groupe qu'il est productif » (1 = *complètement faux*, 7 =

complètement juste). Toutes les mesures ont été récoltées en même temps, ces deux recherches sont donc de nature transversale.

Tableau 1
Items en Français et en Anglais de l'Echelle de Réflexivité

Réflexivité tâche (RT)		
RT1	Notre groupe revoit souvent ses objectifs	*The team often reviews its objectives*
RT2	Notre groupe discute souvent ses méthodes de travail	*The methods used by the team to get the job done are often discussed*
RT3	Nous discutons régulièrement de l'efficacité du travail de notre groupe	*We regularly discuss whether the team is working effectively together*
RT4	Dans notre groupe, nous modifions nos objectifs en fonction des changements de circonstances	*In this team, we modify our objectives in the light of changing circumstances*
RT5R (RTS)	Les stratégies de notre groupe sont rarement changées (R)	*Team strategies are rarely changed*
RT6	Nous évaluons souvent la manière dont l'information est communiquée	*How well we communicate information is often discussed*
RT7	Notre groupe revoit souvent sa manière d'effectuer le travail	*This team often reviews its approach to getting the job done*
RT8R (RTS)	Nous changeons rarement les procédures de prise de décisions dans notre groupe (R)	*The way decisions are made in this team is rarely altered*
Réflexivité sociale (RS)		
RS1	Les membres de notre groupe se soutiennent dans les moments difficiles	*Team members provide each other with support when times are difficult*
RS2R	Quand le travail est stressant, notre groupe n'apporte pas beaucoup de soutien (R)	*When things at work are stressful, the team is not very supportive*
RS3R	Les conflits ont tendance à traîner en longueur dans notre groupe (R)	*Conflict tends to linger in this team*
RS4	Les membres de notre groupe apprennent souvent de nouvelles capacités aux autres membres	*People in this team often teach each other new skills*
RS5	Les conflits sont traités de manière constructive dans notre groupe	*Conflicts are constructively dealt with in this team*
RS6	Quand le travail est stressant, notre groupe reste soudé	*When things at work are stressful, we pull together as a team*
RS7R	Les membres de notre groupe sont souvent désagréables (R)	*Team members are often unfriendly*
RS8R	Les membres de notre groupe sont lents à résoudre les conflits (R)	*People in this team are slow to resolve arguments*

Note:(R) items renversés; (RTS) items réflexivité stratégique.

III. Résultats

A. Analyse de la structure factorielle de l'échelle de réflexivité

La structure de l'échelle de réflexivité a été examinée par une analyse factorielle exploratoire (uniquement pour l'étude 1) puis une analyse factorielle confirmatoire pour les deux études. Pour l'analyse factorielle confirmatoire, plusieurs modèles d'équation structurés (modèle à un, deux et trois facteurs) ont été estimés et comparés avec le logiciel Amos 5. Comme dans l'étude de Carter et West (1998), les analyses factorielles sont effectuées sur un niveau individuel. L'analyse factorielle confirmatoire de l'échelle de réflexivité avec le modèle d'équation structuré nécessite des données complètes (Byrne, 2001). Ainsi, pour l'échelle de réflexivité, les composantes non valides ont été exclues. Après suppression, les analyses ont été réalisées sur 139 personnes pour l'étude 1 et sur 134 personnes pour l'étude 2.

Analyses factorielles étude 1. Une analyse factorielle exploratoire avec rotation Oblimin a été réalisée avec SPSS. Selon les critères de Kaiser (1974), la solution initiale a dégagé quatre facteurs dont les valeurs propres initiales sont supérieures à 1. Ces facteurs expliquent respectivement 32,73; 17,24; 9,66 et 6,52 % de la variance totale. L'inspection du graphique des valeurs propres initiales (5,24; 2,76; 1,54; 1,04) montre une cassure au niveau du quatrième facteur. Le quatrième facteur est uniquement composé d'un item de la réflexivité sociale. En suivant les critères de Catell (1966), une solution à trois facteurs a donc été retenue. Les items du premier facteur correspondent à la réflexivité sociale de Carter et West (1998), les items du deuxième facteur, à la réflexivité tâche. Deux items de l'échelle initiale de réflexivité tâche forment néanmoins un troisième facteur : RT8R « Nous changeons rarement les procédures de prise de décisions dans notre groupe » et RT5R « Les stratégies de notre groupe sont rarement changées ». Comme ces items se réfèrent à des aspects globaux et généraux de la prise de décision et du développement des stratégies, ce troisième facteur peut être nommé: réflexivité stratégique. Il est à noter que ces deux items sont renversés ce qui peut contribuer à les faire apparaître comme un facteur à part. Cependant, ce phénomène n'apparaît pas dans l'échelle de réflexivité sociale malgré la présence de quatre items renversés. Cela renforce le fait que les deux items RT5R et RT8R de l'échelle de réflexivité tâche constituent un facteur à part. L'analyse factorielle exploratoire ne révèle pas clairement les deux facteurs attendus (réflexivité tâche et

réflexivité sociale). Ainsi, une structure à trois facteurs semble être plus adaptée qu'une structure à deux facteurs comme attendue. Il s'agit maintenant de tester cette hypothèse par une analyse factorielle confirmatoire.

Dans un second temps, une analyse factorielle confirmatoire a été réalisée avec plusieurs modèles d'équation structurés à un facteur (réflexivité générale), à deux facteurs (réflexivité tâche et sociale comme trouvé dans Carter et West, 1998) et à trois facteurs (réflexivité tâche, sociale et stratégique comme postulé). Chaque modèle a été évalué avec plusieurs indices d'ajustement aux données, « adjusted goodness-of-fit » (*AGFI*), « root mean square error of approximation » (*RMSEA*) et χ^2. Les modèles ont été comparés pour déterminer si le modèle à trois facteurs (réflexivité tâche, sociale et stratégique), trouvé dans l'analyse factorielle exploratoire, est le plus adapté aux données en comparaison avec un modèle à un facteur unique (réflexivité générale) ou le modèle attendu à deux facteurs (réflexivité tâche versus réflexivité sociale) d'après l'étude originale. Les modèles sont nichés, ainsi l'ajustement peut être comparé entre les modèles en utilisant un test de différence de χ^2.

L'analyse factorielle confirmatoire du modèle à un facteur (réflexivité générale) donne χ^2 (104, n = 139) = 563,37 ($p < .01$), *AGFI* = .48, *RMSEA* = .18. Pour le modèle attendu à deux facteurs (réflexivité tâche et réflexivité sociale) on obtient χ^2 (103, n = 139) = 307,36 ($p < .01$), *AGFI* = .72, *RMSEA* = .12. Pour le modèle supposé à trois facteurs (réflexivité tâche, réflexivité sociale et réflexivité stratégique), on obtient χ^2 (102, n = 139) = 281,77 ($p < .01$), *AGFI* = .74, *RMSEA* = .11. L'augmentation de l'ajustement du modèle supposé à trois facteurs (réflexivité tâche, sociale et stratégique) sur les modèles à un (réflexivité générale) et le modèle attendu à deux facteurs (réflexivité tâche et sociale) est significative ($\chi^2\Delta$ = 281,6, *ddl* = 2, $p < .01$; $\chi^2\Delta$ = 25,59, *ddl* = 1, $p < .01$). Les tests de différence de χ^2 montrent que le modèle supposé à trois facteurs (réflexivité tâche, sociale et stratégique) est significativement meilleur que le modèle à un facteur (réflexivité générale) et que le modèle attendu à deux facteurs (réflexivité tâche et sociale).

L'alpha de Cronbach est de .84 pour l'échelle de réflexivité générale (avec 16 items de l'échelle originale de Carter et West, 1998). L'échelle de réflexivité tâche réduite (comprenant six items de l'échelle originale) obtient un alpha de Cronbach de .83, l'échelle de réflexivité sociale (huit items de l'échelle originale) de .87. La corrélation entre les deux items de réflexivité

stratégique est positive et significative (r = 0,43, n = 139, p < .01). Ces résultats indiquent une bonne consistance interne pour les trois facteurs de réflexivité.

Analyse factorielle étude 2. L'objectif de cette analyse est de répliquer la structure factorielle à trois facteurs trouvée dans la première étude (réflexivité tâche, réflexivité sociale et réflexivité stratégique). Une analyse factorielle confirmatoire avec Amos 5 a été réalisée pour évaluer le modèle supposé à trois facteurs (réflexivité tâche, sociale et stratégique) et le comparer aux modèles à un (réflexivité générale) et à deux facteurs (réflexivité tâche et réflexivité sociale comme trouvé par Carter et West, 1998). Les modèles sont nichés, la procédure pour comparer les modèles est identique à celle de la première étude.

L'analyse factorielle confirmatoire du modèle à un facteur (réflexivité générale) donne χ^2 (104, n = 134) = 506,77 (p < 0,01), *AGFI* = .48, *RMSEA* = .17. Pour le modèle original à deux facteurs (réflexivité tâche et sociale) on obtient χ^2 (103, n = 134) = 292,04 (p < .01), *AGFI* = .70, *RMSEA* = .12. Pour le modèle supposé à trois facteurs (réflexivité tâche, réflexivité sociale et réflexivité stratégique) on obtient χ^2 (102, n = 134) = 249,94 (p < .01), *AGFI* = .74, *RMSEA* = .10. On trouve une augmentation significative de l'ajustement du modèle supposé à trois facteurs sur les modèles à un et à deux facteurs ($\chi^2\Delta$ = 256,83, *ddl* = 2, p < .01; $\chi^2\Delta$ = 42,1, *ddl* = 1, p < .01). Comme dans la première étude, les tests de différence de χ^2 montrent que le modèle supposé à trois facteurs (réflexivité tâche, sociale et stratégique) est significativement meilleur que le modèle à un (réflexivité générale) et que le modèle original à deux facteurs (réflexivité tâche et sociale).

La Figure 4 montre les résultats pour le modèle supposé à trois facteurs (réflexivité tâche, réflexivité sociale, réflexivité stratégique) pour l'étude 2. Les poids des items sont tous significatifs, supérieurs à .4 et rattachés à leur facteur respectif. L'alpha de Cronbach est de .83 pour l'échelle entière (réflexivité générale) avec les 16 items, de .87 pour la réflexivité tâche réduite (comprenant six items de l'échelle originale de Carter & West, 1998), de .85 pour la réflexivité sociale (huit items). La corrélation entre les deux items du troisième facteur de réflexivité stratégique est positive et significative (r = .53, n = 134, p < .01). Ces résultats indiquent une bonne consistance interne pour les trois facteurs de réflexivité.

Les analyses factorielles exploratoires et confirmatoires suggèrent qu'une solution à trois facteurs (réflexivité tâche, sociale et stratégique) est optimale dans les deux études et non une

structure à deux facteurs (réflexivité tâche et réflexivité sociale) comme attendue. Néanmoins, la combinaison des items dans une échelle générale de réflexivité, ainsi qu'une répartition dans les deux facteurs originaux (réflexivité tâche et réflexivité sociale) donnent une bonne consistance interne. Pour la suite des analyses, l'échelle originale de réflexivité tâche et de réflexivité sociale ainsi que l'échelle réduite de réflexivité tâche et l'échelle de réflexivité stratégique sont utilisées et comparées.

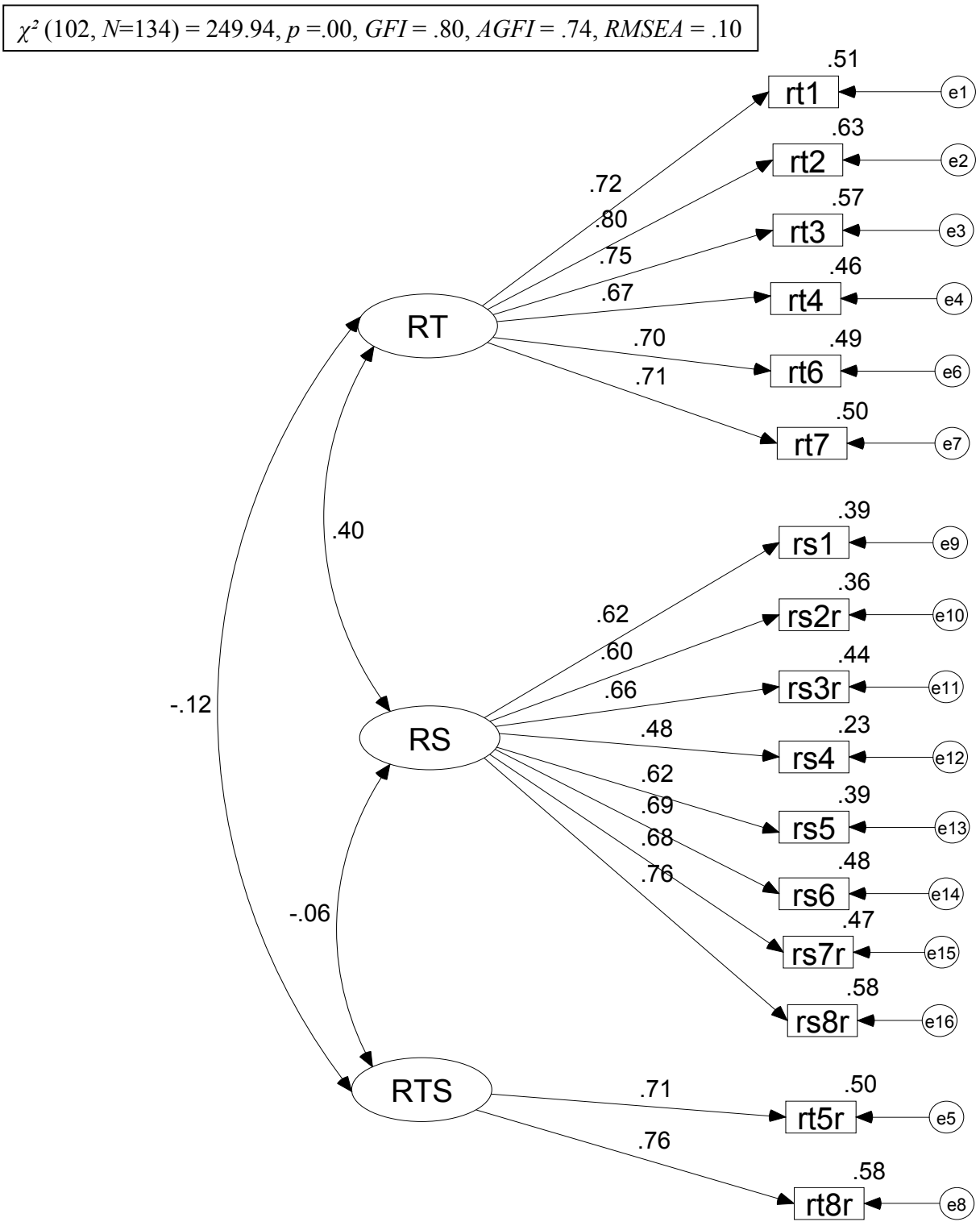


Figure 4. Résultats standardisés de l'analyse factorielle confirmatoire de l'échelle de réflexivité pour l'étude 2.

B. Validation concourante : corrélations entre les échelles de réflexivité et de performance

Plusieurs recherches ont montré un lien entre la réflexivité et la performance en groupe (Carter & West, 1998; De Dreu, 2002; Gevers et al., 2001; Schippers et al., 2003; Tjosvold et al., 2004). Nous attendons donc un lien positif entre la réflexivité et la performance. De plus, le lien entre réflexivité et performance de groupe devrait être plus fort que le lien entre réflexivité et performance individuelle.

Le Tableau 2 présente les corrélations (au niveau groupal et individuel) pour l'étude 1 entre la réflexivité (tâche originale, sociale, stratégique et tâche réduite) et l'autoévaluation de la performance de groupe et individuelle. La réflexivité tâche originale avec les huit items de Carter et West (1998) et la réflexivité tâche réduite c'est-à-dire sans les items du facteur de réflexivité stratégique (six items), sont corrélées positivement et significativement avec la performance de groupe, mais seules les corrélations au niveau individuel sont significatives. Cela peut s'expliquer par le nombre restreint de groupes dans cette étude.

Le Tableau 3 présente les mêmes analyses pour l'étude 2. Le lien entre les deux échelles de réflexivité tâche et la performance de groupe est aussi positif et de taille similaire tant au niveau individuel que groupal mais pas avec la performance individuelle. En revanche, la corrélation entre la réflexivité stratégique et la performance de groupe ainsi que la performance individuelle n'est pas significative. La réflexivité stratégique ne montre aucun lien significatif avec la performance de groupe ou la performance individuelle. Les relations entre performance et réflexivité sont très similaires tant pour les analyses au niveau individuel qu'au niveau groupal.

Également, la réflexivité sociale est liée à la performance dans les deux études. Dans l'étude 1, le lien entre réflexivité sociale et performance est élevé sur le niveau groupe et sur le niveau individuel. On retrouve les mêmes résultats dans l'étude 2 mais à un niveau moins élevé.

Comme supposé, les liens entre les différents aspects de la réflexivité et la performance individuelle sont plus faibles. Pour l'étude 1, un lien positif et significatif a été trouvé entre la réflexivité sociale et la performance individuelle, ainsi qu'un lien significatif négatif entre la réflexivité stratégique et la performance individuelle. Dans l'étude 2, ces corrélations ne sont pas significatives.

Les liens trouvés dans ces deux études entre la réflexivité et la performance en groupe répliquent ceux de précédentes recherches (Carter & West, 1998; De Dreu, 2002; Gevers et al., 2001; Schippers et al., 2003; Tjosvold et al., 2004) fournissant une indication de validité concourante pour l'échelle de réflexivité.

Tableau 2

Etude 1: Statistiques Descriptives, Fiabilité et Inter-corrélations.

Groupes								
Variables	*M*	*SD*	1	2	3	4	5	
1. Réflexivité tâche (8 items)	4.25	.69						
2. Réflexivité sociale	5.13	.77	.33*					
3. Réflexivité stratégique	4.07	.88	.56**	0				
4. Réflexivité tâche réduite (6 items)	4.31	.79	.95**	.38*	.28†			
5. Performance de groupe	3.72	.37	.23	.59**	-.05	.28†		
6. Performance individuelle	4.03	.43	.06	.35*	-.35*	.20	.19	
Individus								
Variables	*M*	*SD*	1	2	3	4	5	
1. Réflexivité tâche (8 items)	4.21	.91	.76					
2. Réflexivité sociale	5.09	.99	.34**	.87				
3. Réflexivité stratégique	4.03	1.35	.50**	.11	.43**			
4. Réflexivité tâche réduite (6 items)	4.28	1.07	.93**	.34**	.15†	.83		
5. Performance de groupe	3.7	.55	.19*	.51**	-.05	.24**	.66	
6. Performance individuelle	4.04	.64	.04	.30**	-.21*	.13	.26**	.88

Note : $N = 41$ groupes, $n = 139$ personnes; alpha de Cronbach et la corrélation pour la réflexivité stratégique sont en diagonales pour les individus. Two tailed tests. * $p < .05$. ** $p < .01$. † $p < .10$

Tableau 3

Etude 2: Statistiques Descriptives, Fiabilité et Inter-corrélations.

Groupes								
Variables	*M*	*SD*	1	2	3	4	5	
1. Réflexivité tâche (8 items)	4.13	0.49						
2. Réflexivité sociale	4.77	0.68	.29†					
3. Réflexivité stratégique	3.62	0.74	.20	-.03				
4. Réflexivité tâche réduite (6 items)	4.29	0.63	.93**	.29†	-.16			
5. Performance de groupe	3.98	1.11	.49**	.31†	-.05	.50**		
6. Performance individuelle	4.32	0.29	.18	-.04	-.18	.25	.21	
Individus								
Variables	*M*	*SD*	1	2	3	4	5	
1. Réflexivité tâche (8 items)	4.15	0.85	.74					
2. Réflexivité sociale	4.85	1.05	.30**	.85				
3. Réflexivité stratégique	3.57	1.25	.26**	-.05	.53**			
4. Réflexivité tâche réduite (6 items)	4.34	1.09	.93**	.33**	-.11	.87		
5. Performance de groupe	4.04	1.7	.46**	.25**	.14	.42**	NA	
6. Performance individuelle	4.3	0.46	.03	.16	-.07	.06	.07	.73

Note : N = 39 groupes, n = 181 personnes; alpha de Cronbach et la corrélation pour la réflexivité stratégique sont en diagonales pour les individus; NA non applicable. Two tailed tests. * $p < .05$. ** $p < .01$. † $p < .10$

IV. Discussion

Les deux études avaient pour objectif la traduction et la validation de l'échelle de réflexivité (Carter & West, 1998) dans une version française. Les résultats montrent que la version française de l'échelle de réflexivité a une bonne consistance interne avec une indication de validité concourante.

A. Réflexivité sociale, réflexivité tâche et réflexivité stratégique

Les résultats des analyses factorielles indiquent une structure factorielle un peu différente de celle attendue, c'est-à-dire une structure à deux facteurs comme proposée dans l'étude originale de Carter et West (1998). Dans la première étude, la structure factorielle suggérée est composée de trois facteurs: réflexivité tâche, réflexivité sociale et un troisième facteur, nommé réflexivité stratégique. L'analyse factorielle confirmatoire dans la deuxième étude confirme que cette structure factorielle à trois facteurs (réflexivité tâche, réflexivité sociale et réflexivité stratégique) est la plus adaptée. Cependant, c'est le niveau stratégique de la réflexivité qui apparaît comme un facteur à part, le reste de la structure factorielle de l'échelle de réflexivité reste similaire à l'étude originale. Ce troisième facteur trouvé peut être interprété comme une réflexivité qui représente une remise en question du groupe plus profonde avec un changement et une adaptation des stratégies à un niveau supérieur. Également, le fait que ces deux items soient renversés a pu contribuer à les faire apparaître comme un facteur à part entière. Cependant, l'échelle de réflexivité sociale contient aussi des items renversés qui n'apparaissent pas comme un facteur à part. Ainsi, l'hypothèse d'une mauvaise compréhension des items renversés est moins probable.

B. Consistance interne des échelles

La consistance interne des différentes échelles de réflexivité a été testée en utilisant l'alpha de Cronbach. Comme dans d'autres études (Carter & West, 1998; De Dreu, 2002; Gevers et al., 2001; Tjosvold et al., 2004), la consistance interne des échelles ainsi que la corrélation des deux items du facteur de réflexivité stratégique, dans leur version française sont aussi bonnes à très bonnes. Cela indique qu'il est possible d'utiliser l'échelle entière, ou, alternativement, de

mesurer uniquement la réflexivité tâche (comme le fait, par exemple De Dreu, 2002 ou Tjosvold et al., 2004), ou uniquement la réflexivité stratégique ou la réflexivité sociale, ou alors une combinaison des trois.

C. Validité concourante : Lien entre réflexivité et performance de groupe et performance individuelle

Les recherches antérieures concernant le concept de réflexivité ont montré en majorité un lien entre le niveau de réflexivité et la performance en groupe (Carter & West, 1998; De Dreu, 2002; Gevers et al., 2001; Schippers et al., 2003; Tjosvold et al., 2004). Dans nos études, les corrélations entre réflexivité tâche, réflexivité sociale et performance au niveau groupal indiquent une validité concourante très satisfaisante. Comme attendu, le lien entre réflexivité et performance individuelle n'est pas significatif (étude 2) ou nettement plus faible (étude 1). Ces résultats soulignent l'importance de la réflexivité comme moyen d'autorégulation sur le niveau du groupe en entier (Gevers et al., 2001), plutôt que son influence au niveau individuel.

Cependant, deux différences peuvent être constatées entre les études, en effet, les corrélations entre les différents facteurs de la réflexivité et la performance individuelle ou groupale (Tableaux 2 et 3) ne sont pas totalement identiques dans les deux études, suggérant des liens différents entre les facteurs de réflexivité et certains aspects de la performance. En premier, les résultats de l'étude 1 montrent un lien entre réflexivité sociale et performance individuelle. Cela peut être interprété comme une influence du niveau de conflits ou de tensions non résolus, non seulement sur la performance du groupe, mais aussi sur la performance individuelle. Cela concorde avec des études antérieures qui montrent un lien entre certains stresseurs sociaux, la performance et le bien-être (De Dreu & Van Vianen, 2001; De Dreu & Weingart, 2003), et souligne l'importance d'une bonne gestion des aspects relationnels dans les groupes, non seulement pour la performance du groupe en entier, mais aussi pour la performance individuelle.

La deuxième différence concerne le lien entre le facteur de réflexivité stratégique et la performance individuelle dans la première étude. Si aucune corrélation entre la réflexivité stratégique et la performance du groupe n'a été trouvée, en revanche, le lien entre la réflexivité stratégique et la performance individuelle est significatif et négatif. Ce résultat est fort intéressant. Une interprétation possible est que des changements stratégiques importants au

niveau du groupe nécessitent une adaptation aussi au niveau du travail individuel. Cela peut impliquer l'attribution de nouvelles tâches, des changements dans la collaboration, etc. Les changements cassent les routines et une adaptation à des changements de circonstances peut donc mener à une diminution temporelle de la performance (Gersick & Hackman, 1990).

Pour les objectifs d'une future étude, il serait certainement intéressant de distinguer ou de combiner les différentes dimensions de la réflexivité. Également, les résultats différents entre les deux études au niveau des corrélations pourraient être expliqués par la divergence du secteur de provenance des groupes et requièrent des études supplémentaires pour approfondir le lien entre réflexivité et performance en tenant compte des échantillons.

D. Limitations

Les deux études ont des limitations. Tout d'abord, il s'agit d'études transversales qui ne permettent pas d'établir de relations causales unidirectionnelles. Il n'est donc pas possible d'établir la validité prédictive de la réflexivité par nos études. Des études longitudinales, prédisant la performance par rapport à un niveau de réflexivité antérieur seraient donc souhaitables.

Une autre limitation de notre étude est que la performance du groupe et la performance individuelle sont évaluées par les membres du groupe. Dans l'étude originale de Carter et West (1998), la performance a été évaluée par les supérieurs du groupe, dans l'étude de Gurtner et al. (à paraître, 2007), la performance a été évaluée par une mesure objective. De manière générale, l'autoévaluation de la performance de groupe est parfois problématique (Tschan & Semmer, 1999).

Néanmoins, le but principal de cette étude est atteint : la version française de l'échelle de réflexivité est une mesure courte et simple, mais valide et fidèle pour évaluer le niveau de réflexivité d'un groupe par rapport à ses tâches, à ses aspects sociaux, ainsi qu'à ses aspects stratégiques.

Chapter 5

Do task variety and autonomy moderate the effects of reflexivity on team performance and innovation?

This chapter is devoted to test the first boundary condition of task reflexivity on team performance and innovation. Task variety and autonomy is proposed to moderate the positive impact of task reflexivity. This manuscript is based on the introduction part, thus many repetitions can be found. This manuscript is under review in Organization Science. It was submitted with Franziska Tschan and Annick Darioly from the University of Neuchâtel, Switzerland.

Abstract

Research has shown that task reflexivity (collectively reflecting on the team's objectives, strategies, and processes, and adapting them accordingly) can enhance team performance and innovation. This effect, however, may have boundary conditions. We tested whether task reflexivity influences team performance and innovation more when teams need coordination, because of task variety, and when teams can implement the results of their reflection, thanks to autonomy. These hypotheses were tested in a field study of 84 heterogeneous teams (334 participants) that performed a wide variety of tasks. The results indicated that highly reflexive teams performed better when their task was varied, and were more innovative when they had greater autonomy. Task requirements and enabling factors thus seem to be important moderators of the effects of task reflexivity on team performance and innovation.

I. Introduction

Many organizations rely on teamwork to get the job done (Devine, Clayton, Philips, Dunford, & Melner, 1999). Such organizations are better able to meet the requirements of a dynamic environment because teams are flexible and thus adaptive. Research on how to improve team performance often arises from theories built on Input Process Output (I-P-O) frameworks. I-P-O theories describe how inputs affect team performance through their effects on team processes, emphasizing the key role of certain processes for team performance (Hackman, 1990; Hackman & Morris, 1975) and adaptation (Hackman, 2002; McGrath & Argote, 2001; Salas, Sims, & Burke, 2005). Task reflexivity has been suggested as one such process (West, 1996, 2000, 2003).

Task reflexivity can enable teams to detect deviations from expected results, discuss and develop optimal performance strategies, and alter their functioning to meet changing demands. Several studies have indeed shown that task reflexivity influences team performance, and especially team innovation, positively (Carter & West, 1998; Schippers, Den Hartog, Koopman, & Wienk, 2003; Somech, 2006; Tjosvold, Hui, & Yu, 2003; Tjosvold, Tang, & West, 2004). However, these influences are seldom straightforward, they can depend on such variables as whether the reflexivity was done individually or as a group (Gurtner, Tschan, Semmer, & Nägele, 2007), the timing of the reflexivity (Gevers, van Eerde, & Rutte, 2001), minority dissent (De Dreu, 2002), and cooperative outcome interdependence (De Dreu, 2007). It seems likely that other variables can also moderate the effects of task reflexivity on team outcomes. We are especially interested in task variety and autonomy in that regard. We believe that task reflexivity has more positive effects on team performance when there is more task variety, and more positive effects on team innovation when team members have more autonomy.

A. Reflexivity in team

According to West (1996, 2000, 2003), task reflexivity is the extent to which teams self-regulate their activities towards their goals. Task reflexivity enables teams to be more adaptive, so that they can be more effective and innovative. West suggests that task reflexivity involves a three-stage process including (1) reflecting, (2) planning, and (3) acting (West, 1996, 2000, 2003). *Reflection* refers to a team discussion and review of its previous performance. This results

in a *plan* for how to proceed in the future, a plan that should lead the team to *act* accordingly. Evidence relevant to task reflexivity and its effects on team outcomes can thus be found in research on detecting and solving problems, information sharing, planning and strategy development, and even inertia and routines. We will discuss some of this literature below.

Reflection, overt discussion and error detection. Task reflexivity might influence team performance by ensuring overt discussion of task performance among team members. This is an important aspect of task reflexivity, because people often fail to speak up in teams. For example, Milliken, Morrison, and Hewlin (2003) found that many people in organizations feel unable to voice their suggestions for improvement. Why? Because they fear such negative outcomes as being labelled negatively, damaging important relationships, and possible retaliation. If team members choose not to voice their opinions, then that can hurt team performance, particularly when tasks are new or complex. Indeed, Edmondson (2003) found significant benefits of speaking up in surgical teams that were implementing a new procedure. Open discussion has several advantages for team. Discussing what went wrong or right may contribute to better problem identification, for example (Moreland & Levine, 1992). Discussion can also help teams to overcome potential problems related to (the lack of) information sharing (Stasser & Titus, 1987).

West (1996, 2000, 2003) suggested that task reflexivity is particularly helpful when teams experience failure or interruptions, and thus have to adjust their strategies. In these situations, team performance can be impaired because teams have a tendency to stick to habitual routines (Gersick & Hackman, 1990), which can be a source of inertia (Feldman & Pentland, 2003; Hodgkinson & Wright, 2002; Zellmer-Bruhn, 2003). Teams must be able to recognize when old routines are no longer be appropriate. Reflexivity can prompt a team to reassess its routines. Indeed, Tjosvold, Yu, and Hui (2004) found that a problem-solving orientation helped teams to overcome the negative effects of inappropriate routines in a changing environment.

Planning and action. Reflection can be viewed as necessary, but not sufficient, to change team behavior. After reviewing their past behaviors, teams may also need to plan new strategies. This is an important step, because teams have a tendency to rush into action without appropriate planning (Hackman, Brousseau, & Weiss, 1976; Weingart, 1992). Many theories of team performance suggest that effective strategies are an important factor in team performance

(Gladstein, 1984; Hackman, 2002; Salas et al., 2005; Tschan, Semmer, Nägele, & Gurtner, 2000). Indeed, research by Fussell et al. (1998), Orasanu (1994) and Edmondson, Bohmer, and Pisano (2001), on different kinds of teams in a variety of settings, confirmed the importance of strategy discussion and development for good team performance. Once team members agree about how to get the job done, they must try to implement their strategies. Gurtner et al. (2007) found that team performed better when they actually implemented the result of their reflexivity session.

B. Reflexivity, Team Performance, and Team Innovation

In their first study of reflexivity, Carter and West (1998) showed that television production teams with higher levels of task reflexivity produced more successful shows. Later studies corroborated these results. For example, Tjosvold et al. (2003) found a link between task reflexivity and team performance. Similar results have been reported for primary health care teams (Somech, 2006), and a variety of work teams (Schippers et al., 2003). A quasi-experimental (Gevers et al., 2001) has also shown the benefits of task reflexivity for team performance.

Innovation is another possible benefit of task reflexivity (West, 2003; West & Anderson, 1996). Task reflexivity probably influences innovation because it helps teams to find new ways of doing things. Several studies have indeed found greater innovation among teams that reflect (Carter & West, 1998; Tjosvold, Tang et al., 2004; Somech, 2006). Indeed, a recent study demonstrated that task reflexivity benefits team innovation even after controlling for other possible causes of such innovation (Somech, 2006). A large-scale, longitudinal study even found that task reflexivity was related to various aspects of innovation a year after the reflection occurred (Patterson et al., 2005).

Based on this brief review of the literature, we expected to find direct, positive effects of task reflexivity on team performance and innovation.

Hypothesis 1(a): Task reflexivity is positively related to team performance.

Hypothesis 1(b): Task reflexivity is positively related to team innovation.

C. Boundary Conditions for the Effects of Task Reflexivity on Team Performance

Although several studies have shown that task reflexivity has direct, positive effects on team performance and innovation, some studies have found no such effects. In an experiment on reflexivity, for example, McMinn and Moreland (2006) asked teams to reflect at the midpoint of a business simulation. Teams were asked to discuss, during this reflection, "what went right and what went wrong". McMinn and Moreland found no improvement in performance among these teams, compared to teams in a control condition that did not reflect. The researchers attributed this, in part, to the fact that reflecting teams spent considerable time discussing irrelevant matters, something that Gurtner and her colleagues (Gurtner et al., 2007) also found in another experiment where reflexivity failed to improve team performance. Some field studies have also failed to find any relationship between task reflexivity (rated by team members and leaders) and team performance and quality (rated by clients) (Hirst, Mann, Bain, Pirola-Merlo, & Richver, 2004). Two studies (De Dreu, 2002, 2007) have even found negative relationships between task reflexivity and team performance or innovation.

Several studies have investigated the conditions under which task reflexivity is most useful for team performance. De Dreu (2002), for example, found that only teams with early minority dissent profited from task reflexivity, and De Dreu (2007) recently showed that teams with greater outcome interdependence profited more from task reflexivity. He suggested that positive effects of task reflexivity can only be expected when there is a need to engage in deep information processing (see also Somech, 2006). This is in line with West's view (1996) that task reflexivity is most useful for complex decision-making teams.

These and other findings suggest that there are conditions under which task reflexivity is especially likely to improve team performance. Yet only a few moderating variables have been studied, more research on such variables needs to be done.

D. Task Characteristics as Moderators

We suggest that the impact of task reflexivity on team performance and innovation can vary according to task variety and autonomy.

Task variety. Task variety is to the extent to which a task requires several different procedures, rather than a single procedure that must be repeated many times (Hall, 1972, as cited in Van De Ven, Delbecq, & Koenig, 1976). Task variety thus reflects the "non-routineness" of the task. Task variety also implies a certain degree of uncertainty, which may involve unexpected events that require the adaptation of task strategies. Task reflexivity is probably more useful for teams with non-routine tasks, and less useful for teams with routine tasks. In support of this argument, Jehn, Northcraft, and Neale (1999) found that differences in knowledge and perspective among team members were related to team performance only when task variety was high. They argued that strategy discussion may even be disruptive or otherwise counterproductive for routine tasks. When task variety is high, however, discussing strategies can be helpful. We therefore expect that teams with higher task variety will profit more from task reflexivity:

Hypothesis 2: Task variety moderates the link between task reflexivity and team task performance. Task reflexivity will benefit team performance more when there is greater task variety.

Task autonomy. Task autonomy is the ability to make one's own decisions about work schedules, work procedures, and so on (Hackman & Oldham, 1980). This task characteristic is an important element of job (re)design. A recent meta-analysis (Stewart, 2006) found that greater autonomy in teams was related to better team performance (either rated by supervisors or using objectives indicators). Another study also reported a positive link between task autonomy and innovation (Cohen, Ledford, & Spreitzer, 1996). If a team has low autonomy, this is, if the team cannot itself make the decision to implement the strategies its develops, then task reflexivity may not fully affect innovation. We therefore expected that:

Hypothesis 3: Task autonomy moderates the link between task reflexivity and team innovation. Task reflexivity will benefit team innovation more when there is greater task autonomy.

II. Method

A. Sample

Based on theoretical consideration (Kozlowski & Bell, 2003), we recruited teams that met the following criteria: there should be interdependence between team members, all team members should be able to interact with one another, and team members should see themselves and be seen by others as a team. Teams from various organizations in the service and industrial sectors were sampled. These teams performed a wide variety of tasks, including administrative work, production or service work, and decision making. We excluded a few individuals (eight) who did not respond to at least 80% of the questions on our measures, and one team, because only a few members (our inclusion criteria was at least three team members or more than half the team) returned the questionnaire. The final sample consisted of 334 members from 84 teams. Team size ranged from 3 to 12 members, with an average of 5.11 (*SD* = 2.26). On the average, 90.86% (*SD* = 12.36) of a team's members returned the questionnaire. Fifty-seven percent of the respondents were male, and the average age of the respondents was 36.4 years (*SD* = 11.47). The average tenure of team members was 3.88 years (*SD* = 48.73 months).

B. Measures

All variables were measured using a self-report questionnaire. Because participants in this study spoke French, all items were translated from the original English into French and then back-translated for control.

Innovation data were collected on 43 teams (195 members), representing 51.19% of the total sample. To obtain an 'outside' perspective on team performance, we collected data from another source, but only for some teams. For 34 teams (40.48%), managers evaluated team performance and team innovation.

Task reflexivity. Task reflexivity was measured using six items from a scale developed by Carter and West (1998). These items were chosen based on a previous psychometric analysis of the scale using a French speaking sample (Facchin, Tschan, Gurtner, Cohen, & Dupuis, 2006). The items included "We regularly discuss whether the team is working effectively together" and "The methods used by the team to get the job done are often discussed". Team members

indicated on a seven-point scales the extent to which they agreed with the proposition (1 = *disagree completely*, 7 = *completely agree*). Higher scores represented more task reflexivity. Cronbach's alpha for the scale was .84.

Task characteristics. Task characteristics were measured using items from validated scales. Task variety was measured using three items from a broader task characteristics scale (ISTA; Semmer, Zapf, & Dunckel, 1995). Respondents were asked to indicate on a five-point scales their agreement with statements about their work tasks (1 = *very little*, 5 = *very much*). Examples of such statements are "To what extent is there routine in your job?" (reverse coded) and "To what extent are your tasks repetitive?" (reverse coded). Higher scores represented more task variety. Cronbach's alpha for the scale was .81. Task autonomy was measured using other six items from the Semmer et al. (1995) scale. These items included "Can you decide on your own in which way you carry out your work tasks?" and "All together, how much possibility for own decisions does your job contain?". Team members again indicated on a five-point scales the extent to which they agreed with each item (1 = *very little*, 5 = *very much*). Higher scores represented more task autonomy. Cronbach's alpha for the scale was .also 81.

Team performance. To measure team performance as perceived by team members, we used four items adapted from a scale developed by Roe, Dienes, Ten Horn, and Zinovieva (1995). Their scale has been validated in several countries and has good reliability (Roe, Zinovieva, Dienes, & Ten Horn, 2000). The items, reframed to explicitly measure team-level performance, included "Our team deserves a positive evaluation"; "Compared to the standards, our team usually get good results from our work". Ratings were made on a five-point scales (1 = *strongly disagree*, 5= *strongly agree*). Higher scores represented better team performance. Cronbach's alpha for the scale was .66. Dropping items from the scale did not improve its internal consistency.

Managers' ratings of team performance. Managers were asked to assess the performance of some teams using the same items that team members completed. Items were reformulated to reflect a manager's perspective (e.g., "Your team deserves a positive evaluation"; "Compared to the standards your team usually get good results from their work"; 1 = *strongly disagree*, 5 = *strongly agree*). We also added one new item about the general performance of teams: "How do you estimate the performance of your team generally?" (1 = *very low*, 7 = *very high*). We

computed an index of team performance by combining the z-scores of all six items. Cronbach's alpha for the scale was .72. There was a strong positive correlation between manager's ratings and team members' ratings of team performance, $r = .67$, $n = 23$, $p < .01$.

Team innovation. Innovation was measured (but only for some teams) using five items from a scale developed by Burningham and West (1995). In previous studies, this scale has proven to have good reliabilities (West & Anderson, 1996; West et al., 2003). The items were reformulated to reflect innovation in teams rather than individuals (e. g., "We try to introduce improved methods of doing things at work" and "We contribute to changes in the way we work"). All ratings were made on five-point scales (1 = *strongly disagree*, 5 = *strongly agree*). Higher scores represented more innovation. Cronbach's alpha for the scale was .86.

Managers' ratings of team innovation. We also gathered data on team innovation from some managers. We again used the same items that team members completed, but reformulated them to reflect manager's perspective (e.g., "Team members try to introduce improved methods of doing things at work" and "Team members contribute to changes in the way they work"; 1 = *strongly disagree*, 5 = *strongly agree*). Cronbach's alpha for the scale was .88. There was a strong positive correlation between manager's ratings and team members' ratings of team innovation, $r = .60$, $n = 23$, $p < .01$.

Control variables. Team size and team tenure were used as control variables, based on previous research showing that they can influence both team processes and team performance (De Dreu, 2002, 2007; Carter & West, 1998; for a review see Moreland, Levine, & Wingert, 1996; Schippers et al., 2003). Team size was measured by asking team members "How many members does your team have?". Team members agreed on the number of team members within their team. Team tenure was measured by asking team members how long they had belonged to their team. Individual scores were then aggregated by mean to create team scores for both team size and team tenure.

C. Procedure

Research assistants approached team managers and asked about participation in the study, after ensuring that the team met our criteria. Managers provided a name for their team, which was written on the title page of the questionnaire given to each member. The questionnaire included a

cover letter explaining that the aim of the study was to gather information about the functioning of teams. People were told that their individual responses would be aggregated together, so that no one could be identified, and they were reassured that no responses would be made available to the organization. Each team member returned his or her questionnaire in a sealed, prestamped envelope sent directly to the university. No incentives were given for study participation. However, each team received a feedback report summarizing and commenting on its scale scores.

D. Analyses

All analyses were done at the team level, using the mean of the team members' responses as the team score. Before aggregating individual responses, we computed for each scale and team the level of within-group agreement ($r_{WG(J)}$) (James, Demaree, & Wolf, 1984). The results showed that 22 teams had a ($r_{WG(J)}$) value below the recommended criterion of .70 on at least one scale. Because these values indicated that team members did not share a common perception of their team, we eliminated them from subsequent analyses (although these teams did not differ significantly from the other teams on any measures). The final results of the study were thus based on 62 teams. Analyses involving team members' ratings of team innovation were based on 28 teams, and analyses involving managers' ratings of team performance were based on 23 teams.

III. Results

In the study, team performance and innovation were rated both by team members and by managers. The results section is thus organized to reflect those two sources of data. To reduce confusion, we present first the results involving team members' ratings followed by the results involving managers' ratings. Table 4 presents means, standard deviations, intercorrelations, and reliability coefficients (if applicable) for all the variables in the study. An examination of the correlations revealed that task reflexivity was positively correlated with team members' ratings of both team performance and innovation. When team performance and innovation were rated by managers, task reflexivity was unrelated to team task performance, but showed a positive and significant correlation with innovation. Task autonomy was positively correlated with team members' ratings of innovation, but task variety was not. Only task variety was positively

correlated with managers' ratings of team performance. There were strong positive correlations between team members' and managers' ratings of both team performance and team innovation. Finally, none of the control variables (team size, team tenure) was significantly correlated with the other variables, except for a positive correlation between team tenure and team managers' ratings of team performance. This is consistent with other research, showing that teams perform better when their members stay together longer (See Moreland, 1999).

Table 4

Descriptive Statistics, Correlation Coefficients, and Coefficients Alpha

Variables	*Mean* (*SD*)	1	2	3	4	5	6	7	8	9
1. Team size	4.55 (2.03)	NA								
2. Team tenure (month)	42.45 (29.26)	.23†	NA							
3. Task reflexivity	4.41 (.71)	−.20	−.21	(.84)						
4. Task variety	3.37 (.70)	−.03	.05	.38**	(.81)					
5. Autonomy	3.58 (.60)	−.05	.21	.24†	.33**	(.81)				
6. Team performance	3.68 (.42)	−.19	.04	.34**	.13	.22	(.66)			
Team members' ratings										
7. Team innovation[a]	3.65 (.43)	−.28	.12	.62**	.23	.39*	.49**	(.86)		
Team members' ratings										
8. Team performance[bc]	-.02 (.68)	.16	.41*	.11	.51*	.19	.67**	.22	(.72)	
Managers' ratings										
9. Team innovation[b]	3.30 (.74)	−.16	.21	.48*	.09	.17	.21	.60**	.35	(.88)
Managers' ratings										

Note. $N = 62$ teams. Cronbach's alpha are on diagonal. All tests are two-tailed. * $p < .05$. ** $p < .01$. † $p < .10$. NA non applicable.

[a] $n = 28$ teams,[b] $n = 23$ teams. [c] z-*score*

A. Reflexivity, Performance and Innovation

To test our hypotheses, we conducted a series of hierarchical regressions with team performance (team members' ratings and managers' ratings were analyzed separately) or team innovation (team members' ratings and managers' ratings were again analyzed separately) as dependent variables. As Table 4 shows, team tenure was the only control variable related to managers' ratings of team performance. Team tenure was thus included as a control variable in the regression analysis involving those ratings.

In all of the regression analyses, we checked for multicollinearity problems. The highest variance inflation factor was 1.49. Because 10 is the accepted criterion (Cohen, Cohen, West, & Aiken, 2003), multicollinearity did not seem to be a problem. As suggested by Aiken and West (1991), we centred the independent variables around their means in order to facilitate the interpretation of the results. Task reflexivity, task variety and task autonomy were entered as a block to predict the dependent variable in Step 1 of each analysis. In Step 2, we entered variables representing the interactions between task reflexivity and task variety, and between task reflexivity and task autonomy.

Team performance. The results for team performance, as rated by either team members or by team managers, are presented in Table 5. In all analyses, we controlled for a possible influence of autonomy. Team tenure was also added as a control variable, but only for regressions involving managers' ratings. Together, task reflexivity, task variety, and task autonomy accounted for 9% ($F[3, 58] = 3.05$, $p < .05$) of the variance of team performance as rated by team members, and for 29% ($F[4, 18] = 3.22$, $p < .05$) of the variance of team performance as rated by managers. As expected (Hypothesis 1a), there was a significant main effect of task reflexivity on team performance (as rated by team members), in the predicted positive direction. The results from the analysis of manager's rating indicated that there were significant main effects only for team size and task variety, and there were no interaction effects. These results did not support Hypothesis 1a or Hypothesis 2, at least for the managers' ratings of team performance. However, as expected (Hypothesis 2) the interaction between task reflexivity and task variety explained a significant amount of variance in team performance as rated by team members. In order to interpret the significant interaction between task reflexivity and task variety (in team members'

ratings of task performance), we plotted the results according to the recommendations of Aiken and West (1991). Figure 5 shows that task reflexivity improved team performance more when there was greater task variety. Simple slopes analyses showed that when task variety was high, team performance became significantly better as task reflexivity increased, $B = .35$, $t(58) = 3.08$, $p < .01$, whereas team performance was unrelated to task reflexivity when task variety was low (the slope for low task variety did not significantly differ from zero, $B = .09$, $t[58] = 1.05$, ns). These results support Hypothesis 2, at least for team members' ratings.

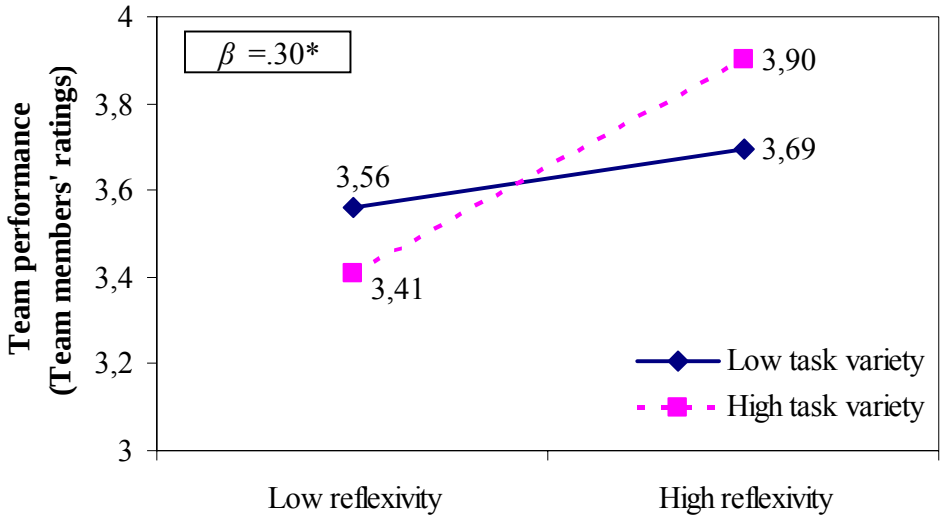
Table 5

Hierarchical Regression Analyses of Team Performance

Team performance (Members' ratings)						
	B	*SEB*	*β*	R^2	R_{adj}^2	ΔR^2
Step 1				.14*	09*	.14*
Task reflexivity (R)	.19	.08	.32*			
Task variety (VA)	−.02	.08	−.04			
Autonomy (A)	.11	.09	.15			
Step 2				.24**	.18**	.11*
R X VA	.18	.09	.30*			
R X A	.10	.16	.09			
Team performance (Managers' ratings)						
	B	*SEB*	*β*	R^2	R_{adj}^2	ΔR^2
Step 1 Team tenure	.01	.01	.41*	.17*	.13*	.17*
Step 2				.42*	.29*	.25†
Task reflexivity (R)	.01	.20	.01			
Task variety (VA)	.50	.20	.51*			
Autonomy (A)	−.07	.23	−.06			
Step 3				.49	.30	.07
R X VA	.12	.22	.12			
R X A	.42	.41	.22			

Note. * $p < .05$. ** $p < .01$. † $p < .10$.

Figure 5. Moderating effect of task variety on the relationship between task reflexivity and team performance (as rated by team members).



Team innovation. Results of the hierarchical regression testing Hypothesis 1b and Hypothesis 3, both of which involved team innovation (as rated by their team members or by managers) are presented in Table 6. In all analyses, we controlled for the possible influence of task variety. The results indicated that task reflexivity, task variety, and autonomy together explained 39% (F[3, 24] = 6.78, $p < .01$) of the variance in team members' ratings of innovation, but only 13% (F[3, 19] = 2.12, ns) of the variance in manager's ratings of innovation. Task reflexivity had a significant main effect on team innovation, whether innovation was rated by team members or by managers (supporting H1b). As predicted (H3), task reflexivity and autonomy interacted to explain team innovation, as rated by either team members or by managers. The plots for these significant interactions are presented in Figure 6 (team members' ratings) and in Figure 7 (managers' ratings). Both Figures show that teams with more task autonomy benefited more from task reflexivity than did teams with less task autonomy. These results support Hypothesis 3. Simple slopes analyses of team members' innovation ratings showed that when task autonomy was high, task reflexivity significantly improved team innovation, $B = .70$, $t(24) = 6.79$, $p < .01$. But this effect disappeared when task autonomy was low, $B = -.17$, $t(24) = -1.21$, ns. Simple slopes analyses of managers' innovation ratings showed that when task autonomy was high, task reflexivity significantly improved team innovation, $B = 1.22$, $t(19) = 6.17$, $p < .01$, but when task autonomy was low, task reflexivity decreased innovation, $B = -.74$, $t(19) = -2.82$, $p < .01$.

We also found an unexpected result: Task reflexivity and task variety interacted to explain team innovation, as rated by managers. Figure 8 reveals that task reflexivity was only helpful when task variety was low, rather than high. Simple slopes analyses of managers' innovation ratings showed that when task variety was low, task reflexivity significantly improved team innovation, $B = .72$, $t(19) = 4.68$, $p < .01$. But this effect disappeared when task variety was high, $B = -.23$, $t(19) = -1.08$, ns.

Table 6

Hierarchical Regression Analyses of Team Innovation

Team innovation (Members' ratings)						
	B	*SEB*	*β*	R^2	R_{adj}^2	ΔR^2
Step 1				.46**	.39**	.46**
Task reflexivity (R)	.36	.10	.59**			
Task variety (VA)	−.05	.10	−.09			
Autonomy (A)	.20	.12	.28†			
Step 2				.72**	.66**	26**
R X VA	−.16	.09	−.25†			
R X A	.73	.16	.60**			
Team innovation (Managers' ratings)						
	B	*SEB*	*β*	R^2	R_{adj}^2	ΔR^2
Step 1				.25	.13	.25
Task reflexivity (R)	.53	.22	.51*			
Task variety (VA)	−.14	.24	−.13			
Autonomy (A)	.12	.26	.09			
Step 2				.75**	.67**	.50**
R X VA	-.68	.16	-.62**			
R X A	1.63	.30	.79**			

Note. * $p < .05$. ** $p < .01$. † $p < .10$.

Figure 6. Moderating effect of task autonomy on the relationship between task reflexivity and team innovation (as rated by team members).

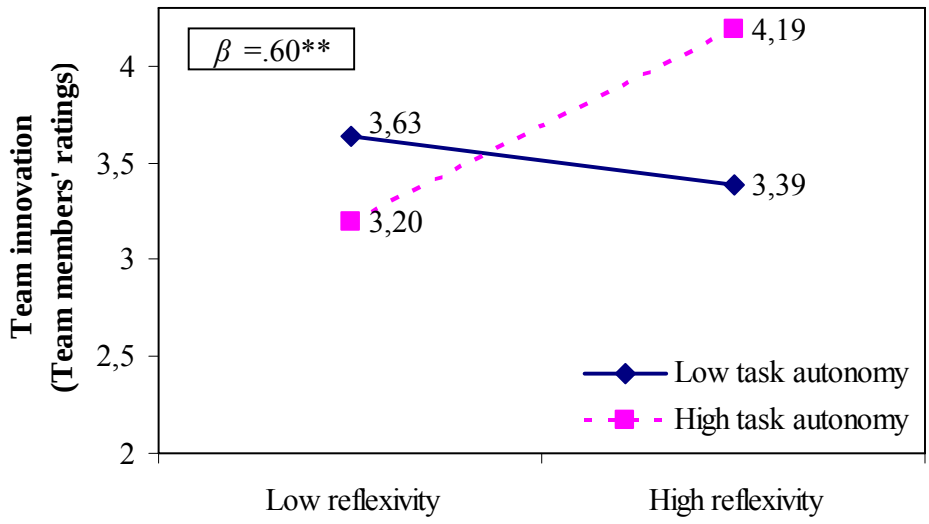


Figure 7. Moderating effect of task autonomy on the relationship between task reflexivity and team innovation (as rated by team managers).

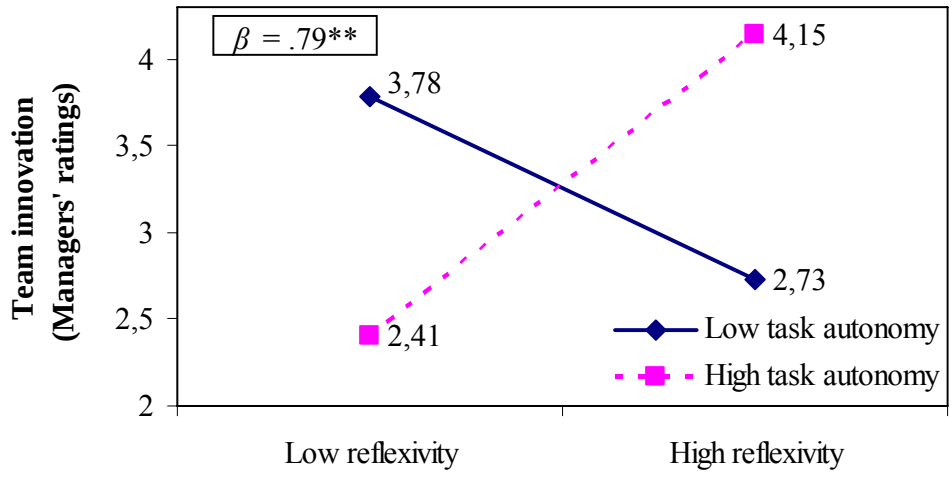
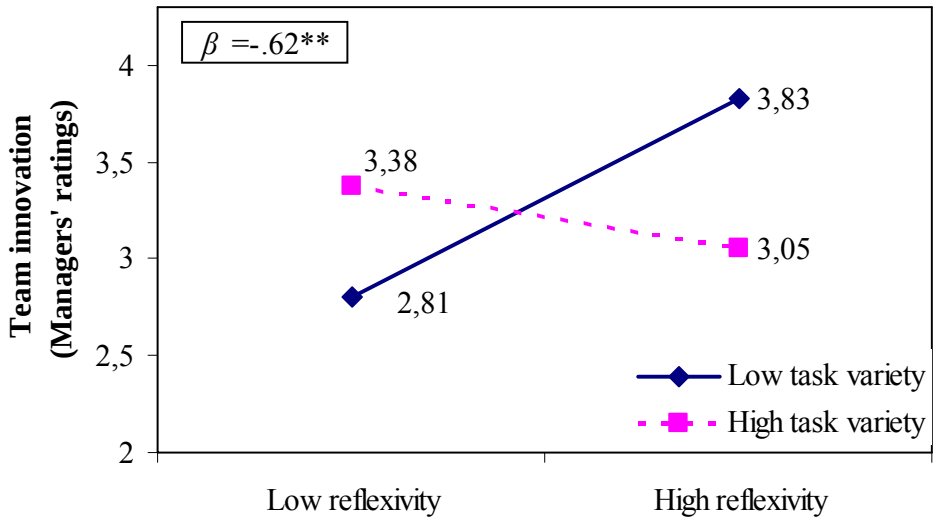


Figure 8. Moderating effect of task variety on the relationship between task reflexivity and team innovation (as rated by team managers).



IV. Discussion

We investigated whether the effects of task reflexivity on team performance and innovation depend on levels of task variety and autonomy. We found that more reflective teams are indeed more successful (but only as rated by team members), and more innovative (as rated by either team members or team managers) and that these effects are indeed moderated by task variety and autonomy, but in somewhat complex ways. Task variety was a significant moderator of the relationship between task reflexivity and team performance (but only for team members), and task autonomy was a significant moderator of the relationship between task reflexivity and team innovation (for both team members and team managers). The first result supports our argument that task reflexivity is most helpful when the team performs non-routine tasks that may require more integration and coordination. The second result supports our argument that task reflexivity benefits teams only when they are autonomous, and thus able to implement the results of their reflection.

A. The Effects of Reflexivity Depend on Task Characteristics

Our results partially corroborate earlier studies (Carter & West, 1998; Schippers et al., 2003; Somech, 2006; Tjosvold et al., 2003; Tjosvold, Tang et al., 2004) showing that task reflexivity leads to better performance and more innovation. Thus, task reflexivity improves not only a team's everyday performance, but also its adaptation potential.

Our study also contributes to the growing body of research on contextual factors that may influence the link between task reflexivity and team performance (De Dreu, 2002, 2007; Gevers et al., 2001; Gurtner et al., 2007; Hirst et al., 2004; McMinn & Moreland, 2006; Schippers et al., 2003; Somech, 2006; Tjosvold, Tang et al., 2004). We found, as have others, that task reflexivity may not be useful for all groups in all circumstances. Task characteristics seem to play an important role. We found that task reflexivity is less helpful for teams with lower levels of task variety or task autonomy. This is consistent with West's (1996) claim that task reflexivity is especially useful for complex decision-making teams. However, we also found that different task characteristics were important for different outcomes, which might reflect the short- or long-term effects of task reflexivity. When a task is non-routine and thus poses greater strategic and

integration requirements for the team, reflection on objectives and strategies could enhance performance. In contrast, if a team relies on well established routines to get the job done, then further reflection is not useful. However, when it comes to future performance (innovation), teams with greater autonomy profit more from task reflexivity. First, autonomy may enable such teams to implement the results of their reflection. Second, autonomy is associated with greater motivation (See Hackman & Oldham, 1980), and so autonomy might make a team more willing to reflect. To sum up, variables that represent task requirements (variability), and enabling factors (autonomy) are appropriate for evaluating the usefulness of task reflexivity, confirming the importance of task design for team performance (Hackman, 1987; Gladstein, 1984).

B. Do Team Members and Managers View the Effects of Reflexivity in Similar Ways?

In our study, team performance and innovation were evaluated by both team members and by team managers. Although evaluations from these two sources were positively correlated, our results regarding the effects of task reflexivity differed somewhat depending on who evaluated team performance. When team members evaluated team performance, we found a direct effect of task reflexivity, as well as an interaction between task variety and task reflexivity. When team managers evaluated team performance, however, only task variety was important. As for team innovation, the results for evaluations by team members and managers converged when it came to task autonomy (task reflexivity helped autonomous teams), but diverged when it came to task variety. We found that task reflexivity helped innovation only when task variety was low rather than high.

These findings raise several issues. First, there is an ongoing debate about whether self-ratings or managerial ratings of team performance should be used in this type of research. Many researchers believe that manager's ratings are more "objective" than self-ratings and thus preferable. Nevertheless, there are some advantages to including both team members' and managers' ratings. First, two kinds of ratings can help to reduce common method variance bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Second, differences between these ratings may reflect genuinely different perspectives on team performance, and thus provide a more complete picture of that performance. Both team members and managers may have biases when it comes to

evaluation. When team members rate their performance, they may rely on an implicit theory of what a "good team" does and thus rate their performance higher when they think it displays those characteristics (Ehrlinger & Dunning, 2003; Gladstein, 1984; Martell & Guzzo, 1991). Managers may also rely on their own implicit theories. Indeed, a meta-analysis showed that both supervisor evaluations and self-evaluations of performance suffered from bias. Supervisor tended to make negative evaluations, whereas workers' self-evaluations tended to be more positive (Georgesen & Harris, 1998). This lack of agreement between self and supervisor evaluation may result from an egocentric bias (over estimate self performance to improve and secure our own job) from an attribution bias (I attribute success to myself but others attribute it to circumstances) from different perspective on what is important and from a lack of opportunity for the supervisor to observe performance of subordinates (Harris & Schaubroeck, 1988). It is this difference in perspectives that may explain why team members and managers diverged in our study when it came to the importance of task variety and task reflexivity for actual team performance. Managers may have a more external perspective when evaluating team performance and may compare different teams, and thus rate teams that are given more complex tasks as more efficient, compared to teams with simpler and more routine tasks.

Interestingly, the relationships among task reflexivity, autonomy and team innovation were viewed similarly by team members and managers. Innovation differs from performance (in fact, the correlations between performance and innovation were quite high for team members [r = .49, n = 28, p < .01], but not very high for managers [r = .35, n = 23, ns]), and could be related more to future performance. Thus, the beliefs of managers and team members may be more similar when it comes to innovation rather than (current) performance. Church (1997), for example, suggested that when people are more aware of their performance, they can assess it more accurately, which would produce greater agreement between self and other evaluations of performance.

C. Limitations and Strengths of the Study Implication

In this study we used a cross-sectional design, which makes it difficult to reach firm conclusions about the causal relations among task reflexivity, team performance, and team innovation. Although experimental research (Gurtner et al., 2007; McMinn & Moreland, 2006) showed few benefits of a reflexivity intervention, we would like to supplement such research

with a longitudinal field study research. Another limitation of our study is that we relied on questionnaire data; more behavioral data on task reflexivity could be useful to explore its effects in more detail. For instance, one might videotape team interactions and evaluate task reflexivity using a coding system proposed by Swift and West (1998). Similarly, performance measures beyond ratings by team members and managers would be interesting to collect. A further shortcoming of the study was its relatively small sample size, especially when it came to data on innovation and manager's ratings.

However, our study also has its merits. First, it adds to the growing body of research that specifies when task reflexivity will have more beneficial effects, and points to task requirements as well as autonomy as important factors. This may help to explain why some studies have failed to establish a relationship between task reflexivity and team performance. It may also improve experimental research involving reflexivity interventions – if a task is too simple and does not need reflection, or if a setting does not make it possible or worthwhile for people to implement the results of their reflection, then team members may not engage in the difficult process of analyzing their task strategies.

Our study also has some practical implications. It shows that task design remains a crucial factor for team performance, and that using task reflexivity to improve team performance may not work unless appropriate conditions exist regarding task design and autonomy. Finally, reflexivity is often done in meetings. Studies of meetings show that they are viewed as something disruptive by many people, and that most people do not like to participate in them (Luong & Rogelberg, 2005), unless the meetings seem necessary for achieving a task (Rogelberg, Leach, Warr, & Burnfield, 2006). If a task does not require strategy changes, or a team has a too little autonomy, then reflection may seen frustrating and useless to team members.

Chapter 6

The contribution of task reflexivity and transactive memory to team performance and innovation

This chapter is devoted to test the second boundary condition of task reflexivity proposed in this thesis. In this paper we will argue and demonstrate that task reflexivity is especially useful when a team does not have a well develop transactive memory system. This chapter is a working paper, thus the number of pages is not limited, contrary to the first two papers (chapter 4, 5) and this chapter repeats parts of the chapter 2 and 3.

Abstract

Managing information and ensuring smooth coordination among team members are particularly critical to team performance. Task reflexivity and transactive memory systems are two team processes which teams use to manage information and to coordinate their activities explicitly (in the case of task reflexivity) and implicitly (in the case of transactive memory). Thus, the aim of this study is to investigate the impact of task reflexivity combined with the effects of transactive memory on team performance and innovation for standing teams. 101 teams (420 team members) and 50 team managers provided self-report data on the study's variables. Results show that task reflexivity and some transactive memory dimensions foster not only team performance but also team innovation. As expected, task reflexivity and some transactive memory dimensions did interact. Task reflexivity was particularly useful for team with a less well developed transactive memory system (as evidenced by low level of specialization) in increasing their team

performance. Concerning innovation, high task reflexivity increased team innovation especially when the transactive memory was less well developed (as evidenced by low specialization and low coordination) but also had an impact on innovation when teams had a good transactive memory system. This study highlights the importance of studying the relationship among implicit and explicit coordination system for team performance and innovation.

I. Introduction

Many articles and books have been written on team performance and contain specific variables to which the authors advocate one should pay attention. Input Process Output (referred as I-P-O) model of team performance appeared to be a good way to sum up all these variables that impact team performance. I-P-O theories describe how inputs affect team performance through their effects on team processes, placing team processes as an essential issue for team performance (Gladstein, 1984; Hackman, 1987; McGrath & Argote, 2001; Salas, Sims, & Burke, 2005; Sundstrom, De Meuse, & Futrell, 1990; Tannenbaum & Salas, 1996). Recently researchers acknowledge the particular importance of team coordination processes such as reflexivity and transactive memory systems for effective teams (Klimoski & Ilgen, 2006; Moreland, 1999; West, 1996, 2000, 2003). Both refer to how teams process and use information and knowledge to achieve greater team performance.

Team reflexivity refers to a collective reflection of team members on the way they work (including discussions of the team's objectives, strategies, processes, and previous performances) and adapt these aspects accordingly (West, 1996, 2000, 2003). Reflexive teams engage in constructive discussions on team functioning which aim to develop shared and appropriate goals, and task adaptive strategies. This discussion result in a plan on how the team wants to proceed in the future which finally lead the team to act accordingly. Because reflexive teams process information they receive on their functioning in a thoughtful, open way, and because team members discuss verbally, and openly plan to change strategies and functioning, reflexivity can be viewed as an explicit way team use to coordinate. Although some studies showed that reflexivity is related to increases in team performance and innovation (Carter & West, 1998; Patterson et al., 2005; Schippers, Den Hartog, Koopman, & Wienk, 2003; Somech, 2006; Tjosvold, Hui, & Yu, 2003; Tjosvold, Tang, & West, 2004), some found moderators between reflexivity and team performance (De Dreu, 2002, 2007; Somech, 2006).

Transactive memory system (as referred as TMS) in teams describes how team members combine the distributed knowledge each team member holds. TMS is often described as 'who knows what'. This implies that team member's knowledge is specialized and that team members are aware of the location of knowledge within their teams. TMS reflects the implicit coordination

in teams because team members share a cognitive structure (knowing who knows what, who does what, and how member's knowledge combines with other members' knowledge). Laboratories as well as field studies found a positive effect of TMS on team performance (Austin, 2003; Ellis, 2006; Espinosa, Slaughter, Kraut, & Herbsleb, 2007; Faraj & Sproull, 2000; Jackson & Klobas, 2008; Lewis, 2003, 2004; Lewis, Belliveau, Herndon, & Keller, 2007; Lewis, Lange, & Gillis, 2005; Liang, Moreland, & Argote, 1995; Michinov, 2007; Michinov & Michinov, 2007; Michinov, Olivier-Chiron, Rusch & Chiron, 2008; Michinov & Michinov, in press, 2008; Moreland, 1999; Moreland & Myaskovsky, 2000; Pearsall & Ellis, 2006; Peltokorpi & Manka, 2008; Rau, 2005, 2006; Ren, Carley, & Argote, 2006; Zhang, Hempel, Han, & Tjosvold, 2007).

Both concepts, reflexivity and TMS are concerned with the relationship between how the team organizes and coordinates its behavior and performance. Reflexivity refers to explicit communication about these aspects, TMS to knowledge that allows implicit coordination. To the best of my knowledge, reflexivity as explicit coordination and TMS as implicit coordination have not yet been studied together. Only a few studies address the question of how implicit and explicit coordination combines in team.

Whereas reflexivity process in teams has been found to be related to team performance, but even more so to team innovation, TMS studies have focused mainly on team performance. It is, however, conceivable that a better TMS may also have an impact on team innovation, another important aspect of long term team performance.

In the following, we will develop the hypothesis that reflexivity is particularly helpful for teams with a less well developed TMS. The purpose of the field study reported in this article is to examine the relative contribution of reflexivity (explicit coordination) and TMS (implicit coordination) for team performance and innovation.

A. Task reflexivity, team performance and innovation

West (1996, 2000, 2003) identified reflexivity as an important factor of team performance, particularly for outcomes measuring team innovation. He defined reflexivity as "collective reflection of team members upon their objectives, strategies, processes and wider environments; plan to adapt these aspects of their task functional worlds and make changes accordingly" (West, 2000, p.151). Reflexivity is a process combining three critical aspects: an

exchange and reflection on information (including discussion on goals, strategies, processes, and past performance), an adaptation aspect (revising goals and processes, and changing strategies), and an implementation aspect.

During reflection stage, reflexive teams engage in a constructive discussion and overtly review their functioning and their performance. This is an important aspect of reflexivity, because people are often reluctant to voice their point of view about task and interpersonal problems in their teams (Milliken, Morrison, & Hewlin, 2003). If team members choose not to voice their opinions, this can hurt team performance, particularly for complex or new tasks. Indeed, Edmondson (2003) has found positive effects of speaking up in surgical teams that implemented a new procedure.

Open discussion in teams has several advantages. The importance of overtly discussing what went wrong or right and to become aware of how the team solves its problems may contribute to better problem identification (Moreland & Levine, 1992). A correct examination of problems and a critical evaluation of alternative solutions have been found to be an important step in achieving better decisions (Orlitzky & Hirokawa, 2001). Moreover, overt discussion may help teams overcome potential problems related to (the lack of) information sharing (Stasser & Titus, 1985, 1987). Because it encourages open discussion, reflexivity may help teams to not only share critical unshared information but also to evaluate the way in which they share information.

Teams are not always perfect. Indeed, team is an information-processing system prone to biases and errors (De Dreu, Nijstad, & van Knippenberg, 2008). Furthermore teams have a tendency to stick to habitual routines, even if a strategic adaptation would be beneficial (Gersick & Hackman, 1990). Reflexivity may be particularly useful to recounteract those imperfections. First, the reflection phase may be viewed as an epistemic motivation (the willingness to search and deeply process new information) which may reduce biases when processing information. Biases may be reduced because teams conscientiously think about how information is processed and teams adopt a less automatic way of thinking while promoting team goals (De Dreu et al., 2008). Second, although the development of habitual routines in teams is functional because they save time and energy, routines may at the same time be a source of inertia (Feldman & Pentland, 2003; Hodgkinson, 1997; Hodgkinson & Wright, 2002; Zellmer-Bruhn, 2003). Teams must be able to recognize when requirements change and when old routines may no longer be appropriate.

Task reflexivity can prompt the team to regularly review its routines. Indeed, Tjosvold, Yu, and Hui (2004) reported that a problem solving orientation in teams was helpful to overcome the negative effects of routines on team performance in a changing environment.

Reflexive teams also engage in planning activities such as discussing and formulating strategies about who should do what, when to do it, and how to do it, this allows team members to coordinate their actions effectively. Note that planning activities not only include task related strategies but also include how to combine individual efforts and knowledge. Planning is an important step in the development of appropriate strategies and team functioning since teams have the tendency to rush into action without discussing strategies (Hackman, Brousseau, & Weiss, 1976; Weingart, 1992). Moreover, planning increased the degree to which team members shared an understanding of each other's needs and information requirements which in turn improved communication and coordination.

The main effect of reflexivity lies in improving team performance and team innovation. Team performance has been widely proposed for measuring team's outputs within an input-process-output model. Also, team innovation has been identifying as a critical effectiveness variable for research involving field studies (Scott & Bruce, 1994; West, 2003; West & Anderson, 1996) particularly for teams evolving in rapidly changing environment. Therefore several researchers have demonstrated the positive effect of task reflexivity on team performance (Carter & West, 1998; Schippers et al., 2003; Somech, 2006; Tjosvold et al., 2003) and team innovation (Carter & West, 1998; Patterson et al., 2003; Somech, 2006; Tjosvold, Tang, et al., 2004). Those studies focused on a particular aspect of reflexivity namely task reflexivity where the reflection focuses on task-related aspects as opposed to social reflexivity where the team reflects on its social functioning. For a discussion of these aspects see West (1996). In their first study of task reflexivity, Carter and West (1998) showed that television production teams with higher levels of task reflexivity produced more successful shows. Another study from China (Tjosvold et al., 2003) also found a positive link between task reflexivity and team performance. Similar results have been reported for primary health care teams (Somech, 2006) and a variety of work teams (Schippers et al., 2003). A quasi experiment (Gevers, van Eerde, & Rutte, 2001) has also shown the benefits of task reflexivity on team performance. But not only team performance improved, the level of innovation also increased. A recent study demonstrated that task reflexivity benefits team innovation even after controlling for other possible causes of such

innovation (Somech, 2006). A large-scale, longitudinal study even found that task reflexivity was related to various aspects of innovation a year after the reflection occurred (Patterson et al., 2005).

Others studies beside those cited previously showed that even if teams had a natural tendency to reflect or were told to reflect, a high level of task reflexivity was not a guarantee of high team performance unless reflexivity occurred under specific conditions (De Dreu, 2002, 2007; Gurtner, Tschan, Semmer & Nägele, 2007; McMinn & Moreland, 2006; Somech, 2006). De Dreu (2002) found that task reflexivity and minority dissent interacted to explain team performance improvements. He suggested that task reflexivity enables team members to voice and discuss their dissenting views so that teams are more likely to induce creativity in the majority opinions. Thus, he found that task reflexivity was negatively related to team performance but this effect disappeared when minority dissent was high. Recently, De Dreu (2007) investigated how the perception of cooperative outcome interdependence impacted team performance more when teams systematically processed information due to high levels of task reflexivity. Despite the negative correlation between task reflexivity and team performance (suggesting that it is not always good for a team to reflect deeply and change routines), task reflexivity especially profited teams with a high level of outcome interdependence. When team members perceived that they needed each other to achieve goals (cooperative outcome interdependence) they engaged in more information sharing and learning, and were more effective, but only when task reflexivity was high. Task reflexivity was also directly related to information sharing and learning. Thus, teams did not only share information they also deeply processed it and learned from it, which then fostered the team's performance.

Experimental research from Ellis, Mendel, and Nir (2006) showed that an after-event review (a procedures to guide team reflection) on failure was effective in improving team performance because team members were motivated to question errors. But successful teams profited less from reviewing success possibly because success confirmed the appropriateness of previous strategies and strengthened routines. This suggests that high performing teams have already developed good team processes and do not need to be reflexive. Recently, Gurtner et al. (2007) used a guided reflexivity session with hierarchical teams in team-based military air-surveillance tasks (TAST) (Choi & Levine, 2004). At the midpoint of the experimental groups' life, groups stopped to reflect. Reflexivity sessions in teams led to more similarity of the team

members' mental models (a shared understanding of how the team works) and to the adoption of better task adaptive strategies in the team which in turn were related to team performance. Thanks to a reflexivity session, teams were able to question their shared mental model, adapt their strategies according to circumstances, and better coordinate.

Those experimental studies showed that the effectiveness of a reflexivity intervention was mainly due to an increase in the team members' shared mental model and because they were experiencing failure. Combined with the results from field studies, this suggests that there are conditions under which task reflexivity is likely to provide greater benefit to team performance. Most of the examples cited point to the fact that task reflexivity is most useful when there is a higher need to reflect and integrate knowledge of members; for example, if complex decisions have to be made, or if the team members are not familiar with each other. However, the impact of task reflexivity on the use of distributed knowledge and subsequent team performance has not been yet systematically studied. Indeed, task reflexivity (as an explicit coordination mechanism) may interact with another mechanism which teams use to implicitly coordinate, namely the transactive memory system.

B. Transactive memory systems in team and team performance

Recent research emphasizes that when members of a team share a cognitive structure of how each member's knowledge fits together, team performance is enhanced (Cannon-Bowers, Salas, & Converse, 1993; Hollingshead & Brandon, 2003; Klimoski & Mohammed, 1994; Kozlowski & Ilgen, 2006; Moreland, 1999; Salas et al., 2005). Transactive memory system (TMS) is one such cognitive structure. TMS is often described as team members knowing who knows what. TMS is comprised of two components, the knowledge possessed by members of the team and an awareness of the locations of knowledge within the team. As such, TMS enables teams to effectively process and use knowledge of team members. More formally, transactive memory is defined as a shared cognitive system for encoding, storing, and retrieving team members' knowledge (Moreland, Argote, & Krishnan, 1996; Wegner, 1987). When TMS is present in a team, the cognitive load of remembering all the information needed to accomplish their team task is shared, the team has access to a greater amount of knowledge, locates easily the source of knowledge, reduces overlap of knowledge among team members, and each team

members can strengthen his or her specific knowledge (Hollingshead & Brandon, 2003; Moreland, 1999; Wegner, 1987).

TMS is qualified as an implicit mechanism for coordination (Moreland, 1999; Kozlowski & Ilgen, 2006; Rico, Sanchez-Manzanares, Gil, & Gibson, 2008) because when TMS is well developed it reduces the need to explicitly communicate while maintaining coordination among team members' activities. Indeed, Lewis et al. (2007) reported that teams rarely discussed explicitly who knows what and thus implicitly understood how each other's knowledge is related and rely on those implicit assumptions without communicating.

Research on TMS in team has addressed two main questions: How TMS impacts team performance and how to foster the development of TMS. Experimental, field studies, and case studies examined the relationship between TMS and team performance and offer insight on the manifestations of TMS and how to measure them (Austin, 2003; Ellis, 2006; Espinosa et al., 2007; Faraj & Sproull, 2000; Jackson & Klobas, 2008; Lewis, 2003, 2004; Lewis et al., 2007; Lewis et al., 2005; Liang et al., 1995; Michinov, 2007; Michinov & Michinov, 2007; Michinov et al., 2008; Michinov & Michinov, in press, 2008; Moreland, 1999; Moreland & Myaskovsky, 2000; Pearsall & Ellis, 2006; Peltokorpi & Manka, 2008; Rau, 2005, 2006; Ren et al., 2006; Zhang et al., 2007). Second, most of studies examined the role of training (Lewis, 2003; Liang et al., 1995; Moreland, 1999, Moreland & Myaskovsky, 2000; Pritchard & Ashleigh, 2007) and face to face communication in developing and maintaining a TMS (Hollingshead, 1998; Lewis, 2004; Michinov, 2007; Moreland & Myaskovsky, 2000; Peltokorpi & Manka, 2008).

Beside training and communication, Wegner (1987) proposed a variety of ways TMS can be formed. TMS starts when someone learns something about another team member, based on a stereotype, based on someone's reputation (known as expertise), based on assigned role, or because someone is exposed to that specific knowledge. However, in the following section, we focus on research that uses training and face to face communication to foster the development and maintaining of TMS and subsequent team performance. Then we will present how TMS manifested.

Training in TMS. In a series of experiments Moreland and Colleagues (Liang et al., 1995; Moreland, 1999; Moreland & Myaskovsky, 2000) investigated the role of different variation of training (individual vs. group) in developing a TMS in a group and the subsequent effects on

group performance. In all of their experiments, three group members have to assemble an AM transistor radio after having practiced in a group or individually. Results were consistent across the experiments. Group whose members were trained together (and remained together), recalled more information about the task and made less mistakes (the measure of group performance) than groups whose members were trained individually. Other experiments demonstrated the superiority of performance for groups whose members were trained together above (1) groups whose members were also trained together but were reassigned to a new group when performing; and above (2) groups whose members received individual training and a team building exercise. And finally, their last experiment demonstrated that groups whose members were trained apart but received information about each others skills, performed as well as groups whose members were trained together (Moreland & Myaskovsky, 2000). This is not to say that communication does not play a role at all in TMS development but that written feedback was as effective as face to face communication. In all the experiments, TMS manifestations (specialization, coordination, and credibility) during task production and TMS direct measures (complexity of knowledge, accuracy on members beliefs, and agreement on this beliefs) were greater in groups whose members were trained together than other possible group types (individual plus team building exercise or group reassignment) and predicted team performance. Similar results were reported in other experiments with student teams in which TMS was developed base on team training (Lewis, 2003; Lewis et al., 2005).

Recently, Prichard and Ashleigh (2007) demonstrated that not only training a team together to complete a task increased TMS and subsequent team performance but also adding a specific training session on team skills led to a higher level of TMS and team performance. Their experiment was also based on a three team members building an AM radio. The experiment began by team members attending a team skills training (only for those in the experimental condition). Then, as groups in Moreland's experiment, they received a demonstration on how to build the radio and then practiced in teams. The following week teams were invited to return to build the radio. Their team skills training encompassed a range of generic skills such as developing skills to solve problems, interpersonal relationships, goal setting, and role allocation, time management, and equality of participation. During the skill training session, teams were asked to plan and build a tent blindfolded. What is particularly interesting in this training is that team members identified the team's goal, gathered the information needed to achieve their goal,

and planned strategies. While doing this, team members were encouraged to monitor and review their team process. This type of training is advocated to facilitate a review of team activities by a collective reflection on what happened during the task, and thus facilitate learning for future team tasks. These activities are similar to those involved in the reflexivity process (West, 1996, 2000, 2003). Teams engage on a reflection of team functioning, develop alternative strategies, and implement the results of discussion in subsequent tasks, which lead to higher team functioning and team performance. Results indicated that TMS as evidenced by higher coordination, memory differentiation, and task credibility, was more developed in teams which received team-skills training and task training than those that only received task training (as in Moreland and colleagues experiments). Moreover, the problem solving aspect of the team-skills training was particularly related to TMS. Better planning, monitoring activities, and task role allocation enabled teams to have a more accurate and shared understanding of knowledge specialization, and enabled them to use that knowledge during task performance.

To sum up, previous research demonstrated that task training and team skills-training (similar to a reflexivity process) fostered the development of an accurate and shared TMS among team members. As a result of developing TMS, by training team members together, teams were able to better coordinate members' activities, to better manage information by remembering different aspects of the task, and trusted more in one another's knowledge. This implies that reflexive activities in team may be particularly useful when teams do not have formed a TMS.

Communication and TMS. Consistent with the first conceptualization of Wegner (1987), even if TMS is an implicit coordination mechanism, this does not mean that communication does not play a role at all in TMS. Because knowledge has to be distributed (otherwise there is no TMS), communication can be used by team members to learn and update who knows what. For instance, in a new team, by introducing themselves, team members can explicitly declare their specialized knowledge and others learn who knows what. Explicit communication is especially useful to share new information, update each other's knowledge, revise the TMS structure of who is good at what, and maintain an efficient TMS (Hollingshead & Brandon, 2003; Lewis et al., 2007). To be fully effective the knowledge possessed by each member need to be shared and known by others thus communication, especially face to face communication, may help teams in this respect. Communication is important because each member has their own TMS and those perceptions may vary among team members, thus interactions help to align perceptions and foster

the sharedness. Note that TMS could also be built by observing other team members' activities, for instance during a training session (Moreland, 1999), but that explicit communication may have the advantage of being a faster way to develop a good TMS.

Face to face communication is perceived to be the better way to learn or readjust each team member's expertise (Wegner, 1987; Jackson & Klobas, 2007). In support of this argument several studies demonstrate that face to face communication is somewhat beneficial in achieving a better TMS. Lewis (2004), in a longitudinal study, found that frequent face to face meetings fostered the development of TMS. Hollingshead (1998) showed that not only nonverbal cues were used among couples but also that face to face contact was sometimes required to better retrieve knowledge. Moreover, she demonstrated that couples of strangers were able to recall more information when they were allowed to communicate. Communication helped them to learn about each other's knowledge and to divide responsibility to specific knowledge about the task they were doing.

The importance of face to face contact for coordination was particularly evidenced with teams those members collaborating from several geographic locations. Indeed, results of interviews conducted among team members of geographically distributed software teams (Espinosa et al., 2007) and project teams composed of distributed members (Jackson & Klobas, 2007), revealed that knowing team members expertise was especially important for collocated teams to achieve better coordination (Espinosa et al., 2007). However, because they were geographically distributed, there was no opportunity to meet each other face to face and few opportunities for interaction. Physical distance impeded the development of effective TMS because there were fewer opportunities to update and share information and information was difficult to retrieve consequently they did report more coordination problems. Several times, team members expressed the need for a face to face meeting to share information (Jackson & Klobas, 2007). Brandon and Hollingshead (2004) also suggest that co-presence and frequent interaction increase the sharedness and accuracy of TMS. Face to face communication provides opportunity to adjust TMS.

Peltokorpi and Manka (2008) demonstrated that frequent and open face to face interaction among team members of daycare teams was related to a better functioning TMS which was then positively related to team performance. The levels of familiarity and interdependence among

team members were controlled in this study, thus allowing for more confidence in the effect of face to face interaction on TMS. The teams in this study had a lot of opportunities to formally interact thanks to daily, weekly, and monthly meetings, providing many chances to share information, communicate their expertise, coordinate activities, and build trust in each other expertise.

In the development of a TMS scale, Lewis (2003) found that TMS was positively related to functional communication. The same results were found for the French validation of the TMS scale (Michinov, 2007). TMS was related to how easily team members were able to communicate with each other and to exchanges ideas.

To sum up, training team members together on the task (to develop team-skills through training) and enabling face to face communication have been both identified as methods of developing TMS. This implies that explicit communication may not only be useful to develop a well functioning TMS but moreover to maintain it. Task reflexivity, as an explicit mechanism to coordinate, may thus be especially useful when TMS is not well developed. Before explaining when task reflexivity may be especially helpful depending on the level of TMS, it is important to understand how TMS actually manifests in team.

The manifestations of TMS. Research has relied on two different but related ways of evidencing TMS. Direct measures of TMS manifestations consist in complexity, accuracy, and agreement and provide direct evidences of what team members know about the knowledge of one another. TMS may also be evidenced by indirect manifestations such as specialization, credibility, and coordination which represent behaviors enacted by a team using a TMS.

When researchers measured direct manifestations of TMS, they try to capture the awareness of who knows what. Through their experiments, Moreland and colleagues identified three dimensions of the awareness: complexity, accuracy, and agreement (Liang et al., 1995; Moreland, 1999; Moreland & Myaskovsky, 2000). Complexity refers to the specialization of expertise among team members and the level of detail used to describe the expertise of others. Accuracy represents the recognition of other's expertise. Agreement refers to agreement within team members about who has what expertise. Other researchers also measured agreement and expertise specialization, for instance in a field study of top management teams (Rau, 2005, 2006), and a computational model measured complexity and accuracy (Ren et al., 2006). Brandon and

Hollingshead (2004) also suggested direct manifestations to evidence TMS. They proposed accuracy, sharedness, validation (acceptation by team members for responsibilities of specific expertise), and convergence (shared representation of who knows what which accurately reflects the knowledge possessed by team members and is validated by members) as dimensions of TMS.

Based on Moreland's dimensions, Austin (2003) assessed TMS on four dimensions: knowledge stock (knowledge available in the team), consensus about knowledge sources (agreement of who knows what), specialization of expertise, and accuracy of knowledge identification. He found that the dimensions of TMS were not highly correlated. Consensus was positively correlated with specialization and accuracy; and knowledge stock was related to accuracy. Other relationships among the TMS dimensions were non-significant. He proposed that each of those dimensions had a unique contribution to team performance. He separately ran analyses for each of the dimensions of transactive memory and found that accuracy was the most significant predictor of team performance and that other dimensions were differently related to team performance depending on who evaluated team performance (team members, managers or an external rater).

Moreland and colleagues also evidenced more indirect manifestations of TMS during task completion. Videos of team performing the task showed that TMS was manifested by greater knowledge specialization, by greater trust in each other's expertise, and by effective coordination among team members' activities. Pritchard and Ashleigh (2007) also coded video of team performing their task for those manifestations. They found that specialization had the greater effect size when comparing the effect of two trainings on TMS. Based on Moreland's works, Lewis (2003) developed a scale for measuring TMS in the field. Lewis (2003) conceives transactive memory as an abstract conception (latent construct) which can be assessed by manifestations (observable variables). Based on Moreland and colleagues work, Lewis (2003) proposed to measure three manifestations of a TMS, namely, specialization (specialized knowledge of team members), credibility (belief about the reliability of other's knowledge and comfort in accepting suggestions or feedback from other team members), and coordination (coordination of member actions and few misunderstandings on how to proceed). Thus, a transactive memory system is present in a team when the team members hold a differentiated knowledge, can rely on and trust each other's knowledge, and coordinate their actions by referring to information about who knows what and how they are connected. Her findings support

the idea that transactive memory is better captured by three dimensions than one. In the first two studies (Lewis, 2003), all the three dimensions were positively intercorrelated, however, in her third experiment, there was no significant correlation between coordination and specialization.

Others field studies used Lewis' scale to measure TMS (Michinov, 2007; Michinov et al., 2008; Michinov & Michinov, in press; Peltokorpi & Manka, 2008; Zhang et al., 2007). Some analyzed the three dimensions separately and some aggregated the three dimensions into a total score of TMS. Results of different studies generally showed that specialization was not related to coordination nor credibility and that specialization and coordination had the weakest relationship among the dimensions (Michinov, 2007; Michinov et al., 2008; Michinov & Michinov, in press). Factorial analysis of the three dimensions revealed that credibility and coordination formed one factor and specialization another one (Peltokorpi & Manka, 2008).

Results from research measuring direct and indirect manifestations of TMS suggested that specialization, credibility, and coordination are somewhat related but that specialization is relatively different from the two others. Contrary to shared mental models, transactive memory systems stress the importance of distributed knowledge rather than similarity to one another (Kozlowski & Ilgen, 2006). Theoretically, specialization lies at the heart of TMS, because TMS starts when team members specialized in expertise and develops when team members have a shared mental representation of each other's expertise. When team knowledge is effectively distributed and team members are aware of this role distribution, they are able to encode, store, and retrieve information effectively, anticipate the actions of others and thus increase coordination of individual activities.

Specialization should be identified first in team. Then, as team members are working together, they evaluate the specialization and start to trust in each other's expertise. Finally, because team members are specialized and trust in each other expertise, they are able to coordinate effectively. Thus when teams develop a TMS, specialization should precede credibility and consequently should lead to coordination. Reagans, Argote, & Brooks (2005) distinguish the distribution of the knowledge about the task from the knowledge about '*how to govern relationship'* among members (Reagans et al., 2005, p. 872). They suggest that both specialization of team members' knowledge and trust among members explain team coordination and allows for better team performance. This implies that specialization represents the part of

TMS related to the task, and trust refers more to the team part of the TMS. The distribution of knowledge among team members allows for task division and responsibility inside the team, thus enabling coordination of task activities. Trust will determine how well team members will rely on other's knowledge and how well specialized team members could combine their knowledge, thus enabling coordination of the team members' activities.

This review of the manifestations of TMS, implies two important points for this study. One is that, TMS will be better evidenced by indirect manifestations (specialization, credibility and coordination) when studying standing teams. The second point is that the three manifestations address three specific aspects of TMS (all needed to capture TMS) but still may differently combined with task reflexivity to maintain team performance.

Even if both direct and indirect manifestations of TMS reflect the presence of TMS and are related to each other (Moreland, 1999; Lewis, 2003), indirect manifestations seem to be easier to collect in field studies to capture evidence of transactive memory behaviors, namely, specialization knowledge, credibility perception, and coordination processes. Moreover, we also wanted to capture TMS independently of the tasks that teams performed, because standing teams perform a lot of different tasks compared to the teams in experimental studies which only deal with one specific task. Therefore, we need to have a general evaluation of transactive memory systems, so we will use the scale proposed by Lewis (2003) which is designed to assess transactive memory manifestations in the field and is task-independent.

In the following part, we will propose how implicit coordination (TMS) could combine with one specific explicit mechanism that teams also use to coordinate, to foster team performance and innovation.

C. Task reflexivity and transactive memory systems

In this study, we examine the joint influence of task reflexivity and transactive memory system, thus responding to the call for studies that integrate both implicit and explicit coordination mechanisms to explain team performance (Rico et al., 2008; Wittenbaum, Vaughan, & Stasser, 1998). Indeed, teams, and especially teams in organizations, have multiple coordination mechanisms which may interact with one another. Previous research has revealed

that both TMS and task reflexivity is related to team performance, but no studies have examined yet how those two team processes combine and lead to team performance.

Research suggests that shared experience of working together and face to face communication is important for the emergence of a TMS in team. Yet TMS can be weakening as time passes. Previous research showed that TMS may be less developed when team members lack experience of working together; team members exhibited less specialization, less credibility and less coordination (Lewis, 2003, Lewis et al., 2005; Liang et al., 1995; Moreland et al., 1999; Moreland & Myaskovski, 2000, Pritchard & Ashleigh, 2007). Moreover, a well established TMS may be damage in team. For instance when a team member leaves the team, the team may be lacking the knowledge of that person which may implies a reallocation of expertise and may reduce temporarily team performance until TMS was readjusted. Indeed, Moreland (1999) found that TMS was disrupted when there was reassignment of team members which hindered team performance. Wegner, Erber, and Raymond (1991) in a study of TMS in close relationships showed that intimate couple performed worse than stranger couples when experimentors impose responsibility for knowledge in specific areas onto specific individuals. In those researches, TMS was disrupted; team members were not more able to rely on previous knowledge division. According to Hollingshead, McGrath, and O'Connor (1993), changes may disrupt task performance pattern by disrupting the transactive memory system which may lead to lower performance, especially for effective teams.

Several researchers have also suggested that face to face communication is needed to achieve better TMS (Espinosa et al., 2007; Hollingshead, 1998; Jackson & Klobas, 2008; Lewis, 2004). TMS may be reduced when team members do not have opportunities to meet face to face to learn or update the knowledge of each others and to share their knowledge. Then, team members may rely on an inaccurate distribution of knowledge.

We suggest that when TMS is lacking or failing, task reflexivity could be especially useful. Indeed, explicit coordination mechanism may supplant the implicit coordination mechanism. During reflexive activities, teams explicitly review their functioning, and thus reflexive teams may engage in a deep reflection on how knowledge and expertise are used and adjust for potential troubles. In particular, task reflexivity helps to identify problems, shares information, revises and plans strategies, and encourages team members to voice their opinions.

Task reflexivity helps teams to scan for errors in members' shared beliefs. When teams engage in reflexive activities team members is more likely to share and effectively use team members' knowledge, to foster trust in each others expertise, and to develop strategies to better coordinate. When TMS is not well functioning, It may be that the perception of each others' expertise is inaccurate, that team coordination is not well established, or that team members do not trust each others' expertise. Explicit communication of those aspects may foster team performance.

When there is a low level of recognized specialization in a team, this may indicate that others are not aware of each other's domain of expertise, or that responsibility for task parts is not clear and thus reduces team performance, or that team members do not share an accurate distribution of knowledge. Researchers have found evidence that team have trouble sharing critical unshared information (Stasser & Titus, 1985, 1987) consequently team members may not be aware of each other's expertise and may have trouble specializing in a specific task area. Stasser, Stewart, and Wittenbaum (1995) found that open discussion of who knows what increased the mentioning of unshared information during team discussion. Thus, when team members are reflexive unshared information is more likely to be mentioned during discussion because discussion and reflection foster the probability that individual team members recall information and mention it during discussion. Task reflexivity should be helpful in accessing individual knowledge possessed by each team member and increasing verbalization of implicit and perhaps important knowledge (Brauner & Becker, 2006). Task reflexivity should increase the awareness of specialization by encouraging team members to share their own knowledge and to be aware of each others' expertise and by effectively processing divergent opinion (De Dreu, 2002). Moreover, a shared awareness of who knows what makes possible the use of effective knowledge and reinforces coordination. Discussion may also help team members to reinforce or readjust their previous thoughts on specialization or strategies. Indeed, each member has their own representation of the TMS and those perceptions may vary among team members. The benefit of task reflexivity is to highlight the troubles also in implicit coordination and thus discussion may help to align perceptions and foster sharedness (Brandon & Hollingshead, 2004). A low level of specialization also indicates that team members are not clear about their respective specializations. Planning activities includes in task reflexivity may help to clarify one's role and thus team members will collect, store, and retrieve information related to their role.

Credibility is another component of TMS. Credibility is important because team members must rely on each other to access specific knowledge, they do not have to claim their expertise and are willing to accept suggestion, otherwise no TMS is possible (Moreland, 1999; Wegner, 1987). But to actually use information coming from others, team members must trust in the credibility of this expertise. Credibility is higher when team members have a shared experience of working together and is higher when team members have opportunities to interact face to face. Indeed, results of interviews conducted with project teams composed of distributed members, revealed that team members perceived computer based information (the information that is stored on a computer instead of in team members' heads) less credible and less informative than face to face interactions (Jackson & Klobas, 2007). Task reflexivity by increasing open discussion and planning activities can help members in increasing accuracy in knowing who knows what, helping to align the right person with the right knowledge to the right task (Brandon & Hollingshead, 2004), thus increasing the credibility of team members' expertise.

Finally coordination is another important aspect of TMS. When members know who knows what and how team members' knowledge fits together, coordination is high and team members work well together. The coordination aspect of TMS implies that coordination is implicitly achieved because they do not necessarily have to neither communicate openly nor plan explicitly to use each other's knowledge and to ensure smooth coordination. Team members do not need to backtrack and there is no confusion about the strategies used to accomplish the task. Reflexivity is advocated to be particularly useful when a team encounters internal functioning problem, such as coordination loss. Thus, when TMS is failing, explicit communication and reflection on who do what may clarify responsibility and help to plan better strategies.

We expect that when TMS is lacking or failing task reflexivity may substitute for the implicit coordination mechanism and contribute to higher performance.

Nevertheless, team innovation is another important outcome of teams. Team innovation is viewed as the result of strategic adaptation which leads to improvements in the way of doing things. Innovation requires teams to rethink their whole functioning and develop new strategies. That is why task reflexivity is particularly useful for team innovation and TMS appears to be not directly related to the level of innovation. However, when TMS is combined with task reflexivity, TMS may also impact the level of innovation in teams. The interaction effect may be slightly

different from the one explaining team performance. Task reflexivity may be especially helpful when specialization, credibility and coordination are low but one can also argue that teams with high levels of specialization, credibility, and coordination may also benefit from task reflexivity. Indeed, theoretical work suggests that TMS may engage teams in finding new ways of doing things because more knowledge is brought to the team without disturbing coordination. Team members have access to more information, they coordinate well and trust in each other expertise, thus TMS offers the team the basis to take advantages of task reflexivity. Team members do not have to focus on their primary functioning since they are specialized and they coordinate well, thus they can go to a further step, and then the effect of reflexivity on team innovation could be stronger. Indeed, it could be especially useful to explicitly reflect and discuss a new way of doing things when team members are specialized and well-coordinated. When knowledge of each member is combined, they may discover another solution that alone members would not have thought about (Wegner, 1987). Moreover, task reflexivity may reinforce the perception that different knowledge and insights can be effectively combined. Thus, when transactive memory is high and task reflexivity is high, the effects of task reflexivity on team innovation may be stronger.

On the other hand, teams have a tendency to skip reflexive activities such as planning and strategy adaptation unless they are forced to by an external intervention or by a big failure (Gurtner et al., 2007; Hackman et al., 1976; McMinn & Moreland, 2006; Weingart, 1992). Consequently, although teams with high specialization, credibility, and coordination may benefit from task reflexivity, teams with low level of specialization, credibility and coordination will profit more from task reflexivity.

To sum up, we propose that task reflexivity will be especially useful to improve team performance and increase innovation when the levels of specialization, credibility, and coordination are low rather than high.

Based on the review of research on task reflexivity and transactive memory, we propose the following hypotheses:

- *Hypothesis 4*: Task reflexivity and transactive memory dimensions (knowledge specialization, credibility perception, and coordination processes) will each contribute to a higher level of team performance.

- *Hypothesis 5:* Task reflexivity and transactive memory dimensions (knowledge specialization, credibility perception, and coordination processes) will each contribute to a higher level of team innovation.
- *Hypothesis 6:* Task reflexivity and transactive memory dimensions interact to explain team performance (H6) such that:
    d. Teams with a low level of knowledge specialization will perform better when there is a high level of task reflexivity than a low level of task reflexivity. (*H6a*).
    e. Teams with a low level of credibility perception will perform better when there is high level of task reflexivity than a low level of task reflexivity. *(H6b)*.
    f. Teams with a low level of coordination will perform better when there is high level of task reflexivity than a low level of task reflexivity. *(H6c)*.
- *Hypothesis 7:* Task reflexivity and transactive memory dimensions interact to explain team innovation *(H7)* such that:
    d. Teams with a low level of knowledge specialization will be more innovative when there is high level of task reflexivity than a low level of task reflexivity. *(H7a)*.
    e. Teams with a low level of knowledge credibility will be more innovative when there is high level of task reflexivity than a low level of task reflexivity. *(H7b)*.
    f. Teams with a low level of coordination will be more innovative when there is high level of task reflexivity than a low level of task reflexivity. *(H7c)*.

II. Method

A. Sample

Based on theoretical consideration (Kozlowski & Bell, 2003), we recruited teams that met the following criteria: There should be interdependence among team members, all team members should be able to interact with one another, and team members should see themselves and be seen by others as a team. The sample consisted of 464 members of 112 teams from various organizations in the service sector. We surveyed standing teams in organizations and excluded student teams (Arrow, McGrath, & Berdahl, 2000). We excluded individuals who did not respond to at least 80% of the questions on our measures, and excluded teams if less than three

respondents and if less than 50% of team members returned the questionnaire. The final sample consisted of 420 members from 101 teams. Team size ranged from 3 to 30 members, with an average of 7.27 team members (*SD* = 5.27). The within-team response rate was 87.76% (*SD* = 15.20)[1]. 54.2% of the respondents were female and three participants did not provide their genders. The average age was 36.23 years (*SD* = 12.50).

B. Measures

All variables were measured using a self-report questionnaire. Because participants in this study spoke French, all items were translated from the original English into French and then back-translated for control.

Innovation data were collected on 60 teams (259 members), representing 59.41% of the final sample. To obtain an 'outside' perspective on team performance, we collected data from another source, but only for some teams. For 62 teams, managers were asked to evaluate the team performance and team innovation of their respective teams. 50 team managers returned the questionnaire (49.50% of the final sample).

Task reflexivity. Task reflexivity was measured with six items from the scale developed by Carter and West (1998). These items were chosen based on a previous psychometric analysis of the scale using a French speaking sample (Facchin, Tschan, Gurtner, Cohen, & Dupuis, 2006; see chapter 4). The items included "We regularly discuss whether the team is working effectively together" and "The methods used by the team to get the job done are often discussed". Team members indicated on a seven-point scale the extent to which they agreed with the proposition (1 = *disagree completely*, 7 = *completely agree*). Higher scores represented more task reflexivity. The Cronbach's alpha for the scale was .82.

Transactive memory. To assess transactive memory, we used the scale developed by Lewis (2003). This fifteen item scale has been shown to be a reliable and valid self-report measure of the transactive memory system in field settings. Lewis' (2003) measure consists of three subscales, measuring specialization of knowledge, credibility perception, and coordination. Examples of the items for the specialization scale are "Different team members are responsible for expertise in different areas", "I know which team members have expertise in specific areas"; for the credibility scale "I was confident relying on the information that other team members

brought to the discussion", "I was comfortable accepting procedural suggestions from other team members", and for the coordination scale are "Our team worked together in a well-coordinated fashion", "Our team had very few misunderstandings about what to do". Respondents indicated the extent to which they agreed about each affirmation on five-point scales (1 = *strongly disagree*, 5 = *strongly agree*). Higher scores represented more transactive memory.

The Cronbach's alpha was .79 for the overall scale, .72 for specialization, .76 for credibility, and .84 for coordination. Confirmatory factor analysis with varimax rotation was carried out on the transactive memory items (at the individual level) to assess whether the three expected dimensions of transactive memory system (coordination, credibility, and specialization) can be found in the study. Results revealed that items nicely loaded onto their respective factors, reproducing the three factors structure found by Lewis (2003).

Team performance. To measure team performance as perceived by team members, we used four items adapted from a scale developed by Roe, Dienes, Ten Horn, and Zinovieva (1995). Their scale has been validated in several countries and has good reliability (Roe, Zinovieva, Dienes, & Ten Horn, 2000). The items, reframed to explicitly measure team-level performance, included, "Our team deserves a positive evaluation", "Compared to the standards, our team usually gets good results from our work". Ratings were made on five-point scales (1 = *strongly disagree*, 5 = *strongly agree*). Higher scores represented better team performance. The Cronbach's alpha for the scale was .56. The value of correlation of each item with the total score was higher than .29. Dropping items from the scale did not improve its internal consistency to reach the .70 cut-off.

[1] Team members were asked to indicate how many members their teams had. The score given by team members were in some cases not equal to the number of respondents. Team members provided a team size slightly higher than the number of people that responded. This implies that team members did not agree on the team size which we specified in the questionnaire. It seems that team members did not know who was and who was not part of the team indicating unclear team boundaries which may hinder team performance (Hackman, 2002; Hackman & Wageman, 2005). For those teams, we set the percentage of respondents per team to 100%.

Manager's ratings of team performance. Managers of 50 teams assessed the task performance of their respective team using the same items that team members completed. Items were reformulated to reflect the manager's perspective (e.g., "Your team deserves a positive evaluation"; "Compared to the standards your team usually get good results from their work"; 1 = *strongly disagree*, 5= *strongly agree*). The Cronbach's alpha for the scale was .73. There was no significant correlation between manager's ratings and team members' ratings of team performance.

Team innovation. Innovation was measured (but only for 60 teams) using five items from a scale developed by Burningham and West (1995). In previous studies, this scale has proven to have good reliability (West & Anderson, 1996; West et al., 2003). The items were reformulated to reflect innovation in teams rather than individuals (e.g., "We try to introduce improved methods of doing things at work" and "We contribute to changes in the way we work"). All ratings were made on a five-point scales (1 = *strongly disagree*, 5 = *strongly agree*). High scores represented more innovation. The Cronbach's alpha for the scale was .89.

Manager's ratings of team innovation. We also gathered data on team innovation from 50 managers. We again used the same items that team members completed, but reformulated them to reflect manager's perspective (e.g., "Team members try to introduce improved methods of doing things at work" and "Team members contribute to changes in the way they work"; 1 = *strongly disagree*, 5 = *strongly agree*). The Cronbach's alpha for the scale was .85. There was a significant correlation between manager's ratings and team members' ratings of innovation ($r = .31$, $n = 50$, $p < .05$.

Control variables. Based on previous research which shows that team size can impact both transactive memory and task reflexivity (Austin, 2003; Carter & West, 1998; De Dreu, 2002, 2007; Michinov et al., 2008; Ren et al., 2006; Schippers et al., 2003) we included it as a control. Team size was measured by asking team members "How many members does your team have?" Individual scores were then aggregated by mean to create team size scores.

C. Procedure

Research assistants approached team managers and asked for their participation in the study, after ensuring that the team met our criteria. Managers provided a name for their team,

which was written on the title page of the questionnaire given to each member. The questionnaire included a cover letter explaining that the aim of the study was to gather information about the functioning of teams. People were told that their individual responses would be aggregated together, so that no one could be identified, and they were reassured that no responses would be made available to the organization. Each team member returned his or her questionnaire in a sealed, prestamped envelope directly to the university. No incentives were given for study participation. However, each team received a feedback report summarizing and commenting on its scores. Some teams were also invited to fill out the questionnaire online, thus data were retrieved from the website.

D. Analyses

All analyses were done at the team level, using the mean of the team members' responses as the team score. Before aggregating individual responses, we computed for each scale and team the level of within-group agreement ($r_{WG(J)}$) (James, Demaree, & Wolf, 1984). The mean value of all scales was above the recommended criterion of .70. The mean $r_{WG(J)}$ of the task reflexivity scale was .87 (92.1% of the values above .70), of the team performance scale was .83 (85% of the values above .70), of the team innovation scale was .85 (88.3% of the values above .70). The transactive memory scale is composed of three dimensions we therefore calculated $r_{WG(J)}$ for the subscales. The mean $r_{WG(J)}$ of the specialization, credibility, and coordination subscales was .81, .92, .89, respectively (84.2%, 96%, 95% of the values above .70 respectively). Because these values indicated that team members did share a common perception of their team, aggregation at the team level was justified.

III. Results

In the study, team performance and innovation were rated both by team members and by managers. The results section is thus organized to reflect those two sources of data. To reduce confusion, I present first the results involving team members' ratings followed by the results involving managers' ratings.

Table 7 presents means, standard deviations, intercorrelations, and reliability coefficients (if applicable) for all the variables in the study. An examination of the correlations between

independent variables revealed significant positive correlations between task reflexivity, knowledge specialization, and credibility perception and a marginal correlation with coordination. Among the three transactive memory dimensions, credibility was correlated positively with specialization and coordination, whereas no significant correlation was found between specialization and coordination, suggesting that each dimension captured a different part of the transactive memory not necessarily related to other dimensions. Moreover, specialization, credibility and coordination were differently related to team performance and innovation. Specialization and credibility were positively correlated with team members' ratings of innovation. On the other hand, coordination was positively correlated with team members' ratings of performance; and specialization was marginally correlated to managers' ratings of team performance and innovation. Task reflexivity was positively correlated with team members' ratings of team performance and innovation. When team performance and innovation were rated by managers, task reflexivity was unrelated to them. It should be noted that team members' ratings of team innovation were positively correlated with the managers' ratings of innovation but there was no significant correlation between team members' ratings of team performance and managers' ratings of team performance suggesting partial agreement on evaluation of the team outcome. Finally, team size showed a significant negative correlation with coordination and team members' ratings of team performance. This is consistent with other research, suggesting that larger teams tended to have more coordination problems which impaired team performance (Karau & Williams, 1993; Steiner, 1972).

Table 7

Descriptive Statistics, Correlation Coefficients, and Coefficients Alpha for Study Variables

Variables	*Mean* (*SD*)	1	2	3	4	5	6	7	8	9
1. Team size	6.32 (4.60)	___								
2. Task reflexivity	4.35 (.69)	−.13	(.82)							
3. Specialization	3.49 (.55)	.09	.37**	(.72)						
4. Credibility	3.93 (.32)	.00	.34**	.32**	(.76)					
5. Coordination	3.68 (.45)	−.23*	.18†	−.01	.21**	(.84)				
6. Team performance	3.59 (.37)	−.23*	.28**	.16	−.03	.32**	(.56)			
7. Team innovation [a]	3.23 (57)	−.05	.72**	.46**	.33*	.11	.33**	(.85)		
8. Team performance[b] Managers' ratings	3.70 (.72)	.04	.10	.27†	.15	−.01	.14	−.05	(.73)	
9. Team innovation[b] Managers' ratings	3.48 (.77)	−.01	.21	.24†	−.05	.01	−.26†	.31*	.10	(.85)

Note. *N*=101 teams. Cronbach's alphas are on diagonal when available. Two tailed tests. * $p < .05$. ** $p < .01$. † $p < .10$.

[a] $n = 60$ teams, [b] Manages' ratings $n = 50$ teams.

A. Test of Hypotheses

We expected task reflexivity, knowledge specialization, credibility perception, and coordination to positively explain a part of team performance variance (rated by team members and by team managers) (H4) and a part of team innovation variance (H5). Hypothesis 6 and 7 concern the expected interaction effects between task reflexivity and the three transactive memory dimensions to explain team performance (H6) and innovation (H7). Teams with low level of specialization (H6a), credibility (H6b), or coordination (H6c) will perform better and will be more innovative (H7a, H7b, H7c) when there is a high level of task reflexivity than a low level of task reflexivity. Moreover, those hypotheses suggest that teams with a high level of specialization, credibility, or coordination also profit from a high level of task reflexivity but to a lesser extent than teams with low levels of specialization, credibility, and coordination.

Main effects proposed in Hypothesis 4 and 5 were tested separately from the interaction effects proposed in Hypothesis 6 and 7. To test the main effect of task reflexivity on team performance and innovation (both as rated by team members and managers) we relied on results provided by correlation analysis (Table 7). Then regression analysis were conducted to test the main effects of specialization, credibility and coordination as a block on team performance and innovation (both for team members' and managers' ratings).

To test the hypotheses, we conducted a series of hierarchical regressions with team performance (team members' ratings and managers' ratings separately) or team innovation (team members' ratings and managers' ratings separately) as dependent variables. In all regression analyses, we checked for multicollinearity problems. The highest variance inflation factors was 1.49. Because 10 is the accepted criterion (Cohen, Cohen, West, & Aiken, 2003), multicollinearity did not seem to be a problem.

Interaction effects between task reflexivity and the three TMS dimensions on team performance and innovation (both as rated by team members and managers; H6 and H7) were tested in others set of regressions. As suggested by Aiken and West (1991), we centered the independent variables around their means in order to facilitate the interpretation of the results. We controlled for main effects of task reflexivity, specialization, credibility, and coordination. Thus they were first entered as a block to predict the dependent variables. Then, we entered

variables representing the interactions between task reflexivity and the three transactive memory dimensions. We also controlled for team size in the regression involving team members' ratings of team performance; and because results were similar to those without controlling, we presented results of analysis without controlling for team size.

B. Team performance

Results concerning main effects are presented first, followed by results concerning interaction effects.

When team members evaluated team performance, task reflexivity had a positive relationship with team performance (r=.28, n=101, p<.01). But when team managers rated team performance, no significant relationship with task reflexivity were found (r=.10, n=50, ns). Task reflexivity was only related to an increase in team members' evaluations of team performance, which only confirmed H4 for team members' ratings.

Regressions analyses were run to test the contribution of specialization, credibility and coordination to team performance (both as rated by team members and by managers). Results are presented in Table 8. The three measures of TMS accounted for 16% of the variance of team performance as rated by team members (F[3, 97] = 6.06, p < .01) but not as rated by team managers (F[3, 46] = 1.27, ns). As expected, specialization and coordination had a positive relationship with team performance (as rated by team members). But a trend negative relationship was found for credibility with team performance (as rated by team members) (see discussion on that point). Similar analyses with the managers' ratings of team performance revealed no significant main effects of specialization, credibility and coordination.

Results concerning interaction effects between task reflexivity and the three TMS dimensions on team performance (both as rated by team members and managers) are presented in Table 9. As expected (H6a), the results show that the interaction term between task reflexivity and specialization explained a significant part of the variance in team performance for both team member's ratings (B = −.34, t = −3.16, p < .01) and managers' ratings (B = −.44, t = −2.61, p < .05). However, neither credibility nor coordination did significantly interact with task reflexivity to explain team performance as both rated by managers and team members (H6b and H6c disconfirmed).

In order to interpret the significant interaction between task reflexivity and specialization (as rated by team members and team managers), we plotted the results according to the recommendations of Aiken and West (1991). Figures 9 and 10 show that, as predicted (H6a) teams with low level of specialization performed better when there was a higher level of task reflexivity than a low level of task reflexivity. Simples slope analysis for team members' ratings showed that when specialization was low, team performance was significantly higher with higher levels of task reflexivity than with lower levels of task reflexivity, $B = .29$, $t(97) = 4.01$, $p < .01$. Concerning managers' ratings of team performance the simple slope analysis showed that when specialization was low, team performance showed no difference under high or low levels of task reflexivity, $B = -.37$, $t(97) = 1.71$, $p < .10$. Figure 9 (related to team members' ratings of team performance) also suggests that teams with high levels of specialization were not influenced by the level of reflexivity (team members' ratings) as supported by simple slope analyses ($B = -.01$, $t[97] = -.18$, ns). Figure 10 (related to managers' ratings of team performance) showed that team performance of highly specialized teams slightly decreased when task reflexivity was high. However, simple slope analysis revealed no difference under high or low levels of task reflexivity when specialization was high ($B = -.39$, $[t97] = -1.75$, $p < .10$). It should be noted that Figures 9 and 10 suggest that teams with low levels of specialization which were highly reflexive were still performing better than highly specialized teams with high reflexivity.

Compared to the analysis done to test the hypothesized unique contribution of task reflexivity and the three TMS manifestations on team performance, results presented in Table 9 offer insight on the contribution of those variables controlled for each others. When task reflexivity, specialization, credibility and coordination were entered together in the first step, together, they accounted for 17% of the variance of team performance as rated by team members ($F[4, 96] = 6.22$, $p < .01$) but not as rated by team managers ($F[4, 45] = .93$, ns). Similar to the test of hypothesis reported earlier, task reflexivity and coordination had a positive relationship with team performance (as rated by team members only). However, there are two differences. First, the negative (but non significant) main effect of credibility found previously is now significant (see discussion on that point). Second, no effect on team performance was found for specialization contrary to the results found in previous analysis.

To sum up, H4 is partly confirmed. As expected higher task reflexivity and greater specialization and coordination were related to increases in team performance (as rated by team

members only) but credibility was not related to team performance (both as rated by team members and team managers). Concerning H6, only specialization interacted with task reflexivity to explain both team members' ratings and managers' ratings of team performance (H6a confirmed but H6b and H6c disconfirmed).

Table 8

Hierarchical Regression Analyses of Main Effects of Specialization, Credibility and Coordination on Team Performance and Innovation

	B	*SEB*	*B*	R^2	R_{adj}^2
DV : team performance as rated by team members					
				.16**	.13**
Specialization (S)	.15	.07	.22**		
Credibility (C)	−.21	.11	−.18†		
Coordination (CO)	.30	.08	.36**		
DV : team performance as rated by managers					
				.08	.02
Specialization (S)	.32	.19	.24		
Credibility (C)	.16	.34	.07		
Coordination (CO)	−.03	.23	−.02		
DV : team innovation as rated by team members					
				.25**	.21**
Specialization (S)	.42	.13	.40**		
Credibility (C)	.32	.22	.18		
Coordination (CO)	.10	.15	.08		
DV : team innovation as rated by managers					
				.08	.02
Specialization (S)	.41	.21	.29		
Credibility (C)	−.35	.35	−.15†		
Coordination (CO)	.07	.23	.04		

Note. * $p < .05$. ** $p < .01$. † $p < .10$.

Table 9

Hierarchical Regression Analyses of Interaction Effects on Team Performance

Team performance (Members' ratings)						
	B	*SEB*	*β*	R^2	R_{adj}^2	ΔR^2
Step 1 (main effects)				.21**	.17**	.21**
Task reflexivity (TR)	.13	.05	.25*			
Specialization (S)	.10	.07	.15			
Credibility (C)	−.26	.11	−.23*			
Coordination (CO)	.27	.08	.32**			
Step 3 (interactions)				.29**	.23**	.08*
TR X S	−.28	.09	−.34**			
TR X C	.28	.15	.18†			
TR X CO	−.03	.09	−.04			
Team performance (Managers' ratings)						
	B	*SEB*	*B*	R^2	R_{adj}^2	ΔR^2
Step 1 (main effects)				.08	−.01	.08
Task reflexivity (TR)	−.02	.17	−.01			
Specialization (S)	.32	.21	.25			
Credibility (C)	.17	.35	.08			
Coordination (CO)	−.03	.24	−.02			
Step 2 (interactions)				.21	.08	.14†
TR X S	−.69	.27	−.44*			
TR X C	.26	.47	.09			
TR X CO	−.29	.28	−.17			

Note. * $p < .05$. ** $p < .01$. † $p < .10$.

Figure 9. Interaction effect between task reflexivity and specialization on team performance as rated by team members.

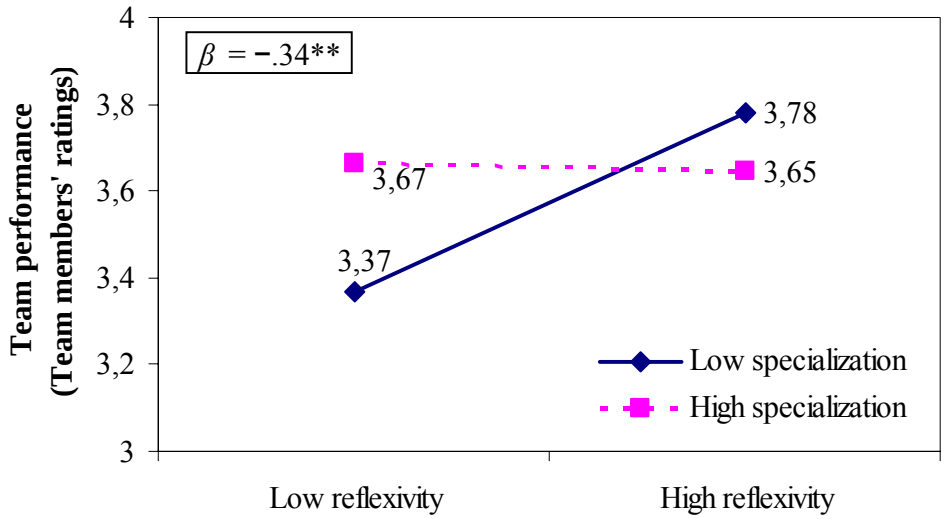
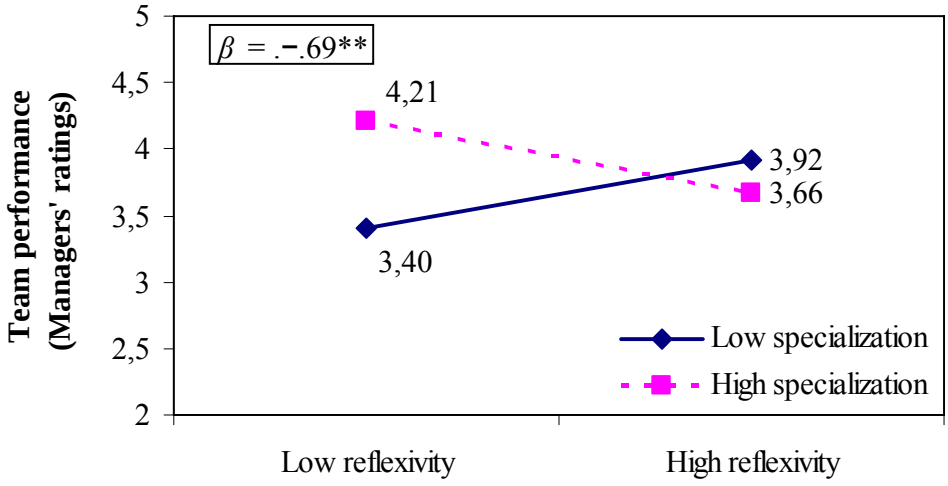


Figure 10. Interaction effect between task reflexivity and specialization on team performance as rated by team managers.



C. Team innovation

Similar analysis were done to test the expected positive relationship between task reflexivity, knowledge specialization, credibility perception, coordination, and team innovation (both as rated by team members and managers) (H5) and the expected interaction effects between task reflexivity and each of the transactive memory dimensions on team innovation (both as rated by team members and managers) (H7).

Results concerning main effect of task reflexivity on team innovation (both as rated by team members and managers) are presented in Table 7. When team members evaluated team innovation, task reflexivity was positively related to team innovation (r=.72, n=60, p<.01); but when managers evaluated team innovation, no significant relationship was found (r=.21, n=50, ns). Similar results were found for team performance. Task reflexivity was only related to an increase in team members' evaluations of team innovation, which confirmed H5 only for team members' ratings.

Results concerning main effects of specialization, credibility and coordination on team innovation (both as rated by team members and managers) are presented in Table 8. The three dimensions of TMS accounted for 25% of the variance of team innovation as rated by team members (F[3, 56] = 6.35, p < .01, but not as rated by managers (F[3, 46] = 1.30, ns). Among the three TMS dimensions, only specialization had a significant relationship with team innovation (as rated by team members) and in the predicted positive direction. Similar analysis with managers' ratings of team innovation revealed a trend negative relationship between credibility and team innovation.

Results concerning interaction effects between task reflexivity and the three TMS dimensions on team innovation (both as rated by team members and managers) are presented in Table 10. As expected (H7a), task reflexivity and specialization interacted to explain team members' ratings of team innovation, B = −.29, t = −3.03, p < .01, (H7a was supported only for team members' ratings). As expected (H7c), an interaction effect between task reflexivity and coordination was also found when team innovation was rated by team members, B = −.33, t = −3.51, p < .01 (H7c was supported only for team members' ratings). However, when managers evaluated team innovation, none of the three TMS dimensions interacted significantly with task reflexivity.

The pattern of the significant interactions is depicted in Figure 11 (interaction effect between task reflexivity and specialization) and Figure 12 (interaction effect between task reflexivity and coordination). As predicted (H7a), Figure 11 shows that teams with low level of specialization were more innovative when there was a higher level of task reflexivity than a lower level of task reflexivity. Simple slopes analyses showed that when specialization was low, innovation was higher under high level of task reflexivity than low task reflexivity, $B = .34$, $t(97) = 3.40$, $p < .01$. Figure 11 indicates that team innovation of highly specialized teams also increased when task reflexivity was high. Simple slopes analyses showed that when specialization was high, innovation was higher under higher levels of task reflexivity than lower ones, $B = .76$, $t(97) = 7.36$, $p < .01$.

As predicted (H7c), Figure 12 indicates that teams with low levels of coordination are more innovative when task reflexivity was higher. Simple slopes analyses showed that when coordination was low, innovation was higher under high levels of task reflexivity than lower levels of task reflexivity, $B = .35$, $t(97) = 3.81$, $p < .01$. The same pattern was found for teams with high level of coordination. Simple slopes analyses showed that when coordination was high, innovation was higher under higher levels of task reflexivity than lower levels of task reflexivity, $B = .76$, $t(97) = 7.50$, $p < .01$.

Figures 11 and 12 also suggest that teams with lower levels of specialization or coordination profit more from higher task reflexivity than teams with higher levels of specialization or coordination. It should also be noted that a marginal positive but not significant interaction was found between task reflexivity and credibility when team innovation was rated by team managers.

Similar to the analysis done to explain team performance, we also reported here the results of the regression analysis which showed the contribution of task reflexivity and the three TMS dimensions controlled for each other. The results are presented in Table 10 and indicated that task reflexivity, specialization, credibility, and coordination together explained 57%, ($F[4, 55] = 18.18$, $p < .01$) of the variance of team members' ratings of innovation. However, those variables did not significantly explain managers' ratings of innovation ($F[4, 45] = 1.32$, ns). Similar to analysis reported to test main effect (H5), task reflexivity and specialization had a

positive significant main effect on team innovation as rated by team members, but no significant main effects were found when team manager's rated team innovation.

To sum up, H5 is partly confirmed. As expected higher task reflexivity and greater specialization were related to higher team innovation (as rated by team members only) but neither credibility nor coordination were related to team innovation (both as rated by team members and managers). Concerning H7, specialization (H7a) and coordination (H7c) did interact with task reflexivity to explain team members' ratings of team innovation.

Table 10

Hierarchical Regression Analyses of Interaction Effects on Team Innovation

Team innovation (Members' ratings)						
	B	*SEB*	*β*	R^2	R_{adj}^2	ΔR^2
Step 1 (main effects)				.57**	.54**	.57**
Task reflexivity (TR)	.52	.08	.63**			
Specialization (S)	.22	.10	.21*			
Credibility (C)	.09	.17	.05			
Coordination (CO)	−.02	.12	−.01			
Step 2 (interactions)				.68**	.64**	.11**
TR X S	−.37	.12	−.29**			
TR X C	.20	.21	.08			
TR X CO	−.45	.13	−.33**			
Team innovation (Managers' ratings)						
	B	*SEB*	*B*	R^2	R_{adj}^2	ΔR^2
Step 1 (main effects)				.10	.03	.10
Task reflexivity (TR)	.21	.18	.18			
Specialization (S)	.33	.22	.23			
Credibility (C)	−.45	.37	−.19			
Coordination (CO)	.02	.25	.01			
Step 2 (interactions)				.26	.14	.16*
TR X S	.28	.28	.16			
TR X C	.94	.49	.29†			
TR X CO	−.30	.29	−.16			

Note. * $p < .05$. ** $p < .01$. † $p < .10$.

Figure 11. Interaction effect between task reflexivity and specialization on team innovation as rated by team members.

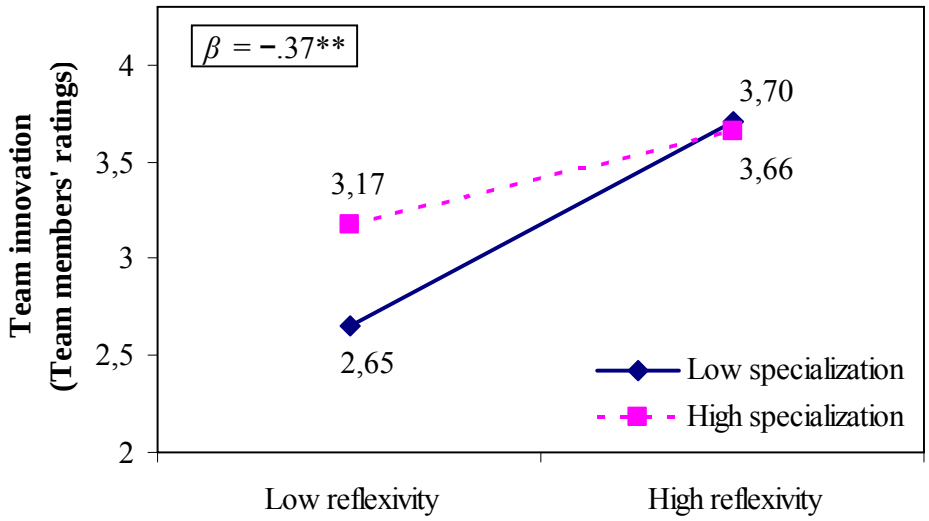
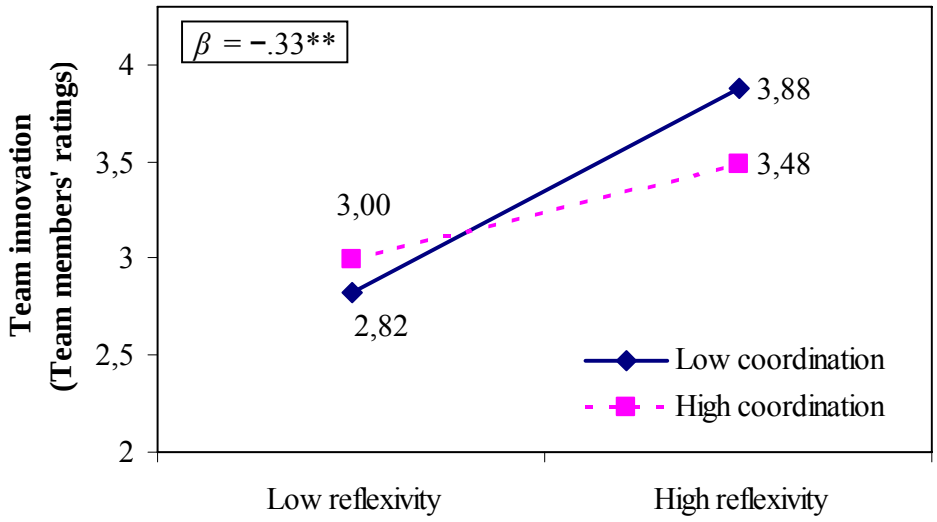


Figure 12. Interaction effect between task reflexivity and coordination on team innovation as rated by team members.



IV. Discussion

The primary goal of this study was to test the contributions of task reflexivity and the three dimensions of transactive memory (specialization, coordination, credibility) to explain the team performance and the team innovation of standing teams. This study responds to the need to study the joint impact of explicit and implicit coordination mechanisms on a team's outcome. As expected task reflexivity fostered team performance and innovation (but only for team members' ratings). Some of the transactive memory dimensions were positively related to team performance and innovation depending on which dimension and who evaluated the teams' outcome. This study adds to the knowledge about the relationship between explicit and implicit coordination in teams by demonstrating that as expected, task reflexivity and some of the transactive memory dimensions did interact to explain team performance and innovation. Task reflexivity was particularly useful for team with a less well developed TMS (as evidenced by low level of specialization) in increasing their team performance, suggesting that when TMS is lacking or failing task reflexivity may substitute for the implicit coordination mechanism and contribute to higher performance. Concerning innovation, we found the same effect. High task reflexivity increased team innovation especially when the TMS was less well developed (as evidenced by low specialization and low coordination). But interestingly, higher task reflexivity also had a good impact on innovation when teams had a good TMS. Together results of the study suggest that task reflexivity may substitute as well as combine with implicit coordination mechanism to foster team performance and innovation.

A. The main contribution of task reflexivity and transactive memory to team performance and innovation

Results indicated that teams with a higher level of task reflexivity performed better and were more innovative (but only as rated by team members). Thus, a high level of constructive discussion about team objectives, functioning, and strategies and an effective adaptation of those aspects were positively related to team performance and to team innovation. These results confirmed those of previous researchers indicating that task reflexivity is an effective method that teams use to process information and that reflexivity has the potential to foster team performance and innovation (Carter & West, 1998; Patterson et al., 2003; Schippers et al., 2003; Somech,

2006; Tjosvold et al., 2003; Tjosvold, Tang et al., 2004). This study demonstrated the need for explicit coordination mechanisms to achieve good team outcomes.

Consistent with previous research, results indicated that higher levels of TMS contributed to higher level of team performance (Austin, 2003; Ellis, 2006; Espinosa et al., 2007; Faraj & Sproull, 2000; Jackson & Klobas, 2008; Lewis, 2003, 2004; Lewis et al., 2007; Lewis et al., 2005; Liang et al., 1995; Michinov, 2007; Michinov & Michinov, 2007; Michinov et al., 2008; Michinov & Michinov, in press, 2008; Moreland, 1999; Moreland & Myaskovsky, 2000; Pearsall & Ellis, 2006; Peltokorpi & Manka, 2008; Rau, 2005, 2006; Ren et al., 2006; Zhang et al., 2007). The results revealed that this positive effect was essentially due to coordination and specialization dimensions (only for team members' ratings).

Moreover, we argued that TMS may also impact team innovation. The positive relation between specialization and team innovation (as rated by team members) that was found support this proposition. It means that when team members possess diverse but complementary knowledge and are aware of this distribution, their level of innovation increased. Team innovation may profit from distributed expertise because more knowledge is brought to the team which may enable team members to find new way of doing things (Wegner, 1987). This is an interesting result because this study demonstrated that a team which relies on an implicit system for distributing knowledge was still able to innovate. This study suggest that implicit coordination mechanism impact not only team performance but also innovation.

Interestingly (but as found by others), the dimensions of TMS were differently related to each other (Lewis, 2003; Michinov, 2007; Michinov et al., 2008; Michinov & Michinov, in press; Peltokorpi & Manka, 2008). The pattern of correlation between TMS dimensions indicated that credibility was both related to coordination and specialization but that specialization and coordination was not related. Lewis (2003), Michinov, et al. (2008), Michinov and Michinov (in press) also found no correlation between specialization and coordination. The results of this study indicated that TMS may be better captured with multiple dimensions (as proposed by Lewis, 2003), indeed, results of factorial analysis showed the appropriateness of a three factor solution for our sample.

Finally, we would like to address an important issue concerning Hypothesis 4, main effect of TMS dimensions on team performance. Correlation patterns revealed that credibility was not

correlated to team performance, as rated by team members (r= −.03, n= 101, ns) but this relation became negative when the other variables (task reflexivity, specialization and coordination) were added to the regression (Table 8 and 9). Thus, this changes in the direction of the relation between credibility and team performance (as rated by team members) after others variables were introduced, is called 'suppression effect' (Tu, Grunnell, & Gilthorpe, 2008). Because credibility is related to coordination and to task reflexivity which are then related to team performance (as rated by team members); credibility (when controlled for the other variables) suppressed the part of coordination and task reflexivity that are uncorrelated with team performance. Thus increasing or maintaining the high relationship between coordination or task reflexivity and team performance while also affecting the relationship between credibility and team performance so that it became negative and significant.

This means that some aspect of credibility is negatively related to team performance (as rated by team members). It is surprising but we suggest that it is not because team members trust in each other's expertise that this expertise is really credible and needed to achieve better team performance. As Austin (2003) results suggested, accuracy is an important element of TMS. Team members may believe that one member is an expert on a specific domain, but this perception may be derived on stereotype and might not be accurate. Then team members trust in each other expertise but this might lead to negative performance because their perception of knowledge distribution were inaccurate.

B. The combination of task reflexivity and transactive memory

As expected, task reflexivity and some of the transactive memory dimensions did interact to explain team performance and innovation. Task reflexivity was particularly useful for teams with a low level of specialization in increasing their team performance (as both rated by team members and managers). These results support the argument that explicit coordination mechanism may supplant implicit coordination mechanism when this one is lacking or failing.

Regarding the interaction effect of TMS and task reflexivity on team innovation, as expected teams with low levels of specialization benefited from high task reflexivity (only as rated by team members). This effect is similar to the one for team performance suggesting that reflexive activities (sharing information, reflecting on team functioning, and adjusting strategies)

in teams with low specialization can increase the level of innovation. Task reflexivity also interacted with coordination to explain team innovation (as rated by team members). Task reflexivity was especially useful for teams with a low level of coordination. Task reflexivity may encourage teams to explicitly communicate to readjust coordination. Thus when implicit coordination is low, taking a time out to discuss in team what is wrong and what is right in the team may enable teams to discover and correct for coordination problems. Task reflexivity may help teams to regain a smooth level of coordination and thus improve team innovation.

An interesting result is that teams with high levels of specialization or coordination also benefited from high level of reflexivity by increases in their team innovation. Task reflexivity fostered team innovation for both teams with low or high levels of specialization and coordination. As argued in introduction section, explicit reflection with specialized diverse team members and highly coordinated teams also increased innovation. Thus task reflexivity fostered team innovation and especially when the team was well-functioning thanks to a high level of specialization and coordination. However, simple slope analyses did not support this combining effect for team performance. When team members were high in specialization there were no differences in team performance under a high or low level of task reflexivity. These results can be explained by the fact that teams do not engage in reflexive activities unless they are forced to (Gurtner et al., 2007; Hackman et al., 1976). Thus team members might think that a time out to deeply reflect on their functioning is counterproductive because the team is well functioning and rely on effective implicit patterns of coordination. This goes well with task reflexivity research which demonstrates that a high level of task reflexivity may not always be desirable (De Dreu, 2002, 2002, Facchin, Tschan, & Darioly, chapter 5; Somech, 2006). As we noted in the results section, Figure 9 and 10 suggest that low specialized highly reflexive teams were still better performing than highly specialized and highly reflexive teams. In sum, teams with a low level of specialization not only benefited more from task reflexivity but also increased their level of performance to a higher degree than highly specialized and highly reflexive teams.

Finally, the results of hierarchical regression indicated no significant interaction between task reflexivity and credibility to explain neither team performance nor innovation.

To sum up, these results support the argument that task reflexivity is most helpful when the team has a poor TMS that requires a reflection on and an adaptation of who knows what and

of strategies. The results also support the argument that task reflexivity benefits team innovation when a team is highly specialized and coordinates well. The results are also consistent with previous studies that demonstrate that the impact of transactive memory on team performance may be different according to which dimension is studied. Finally, the results suggest that specialization is the critical part of TMS because it can be influenced by other explicit coordination mechanisms, such as task reflexivity.

C. Limitations, strengths and future research

Limitations. This study has several limitations. First, the cross-sectional design does not allow for drawing conclusions about the direction of the results. A reverse causality (team performance or innovation increasing transactive memory and task reflexivity) cannot be ruled out. According to West (1996), this reverse causality is possible because of the task reflexivity construct; past performance may lead to task reflexivity, especially when teams encounter bad performances. TMS is also strengthened as team members experience working together. Previous performance may serve as a basis for learning who knows what (Brandon & Hollingshead, 2004; Lewis, 2004).

Secondly, we tried to reduce common method and common sources of variance by asking some team managers to evaluate team performance and team innovation. However, we were not able to collect this data for all teams reducing the sample size of data coming from team managers. Only evaluations of team innovation by team members and managers correlated. These differences reflect different perspectives on team innovation, but are still valuable in providing a more complete picture. Future research should use multiple methods to measure team outcomes but also independent variables (reflexivity and transactive memory) to overcome this problem. For instance, TMS has also been measured by observation of teams during team work, (Ellis, 2006; Lewis, 2003; Liang et al., 1995; Moreland, 1999; Pritchard & Ashleigh, 2007) as has team reflexivity (Gurtner et al., 2007; McMinn & Moreland, 2006); by comparing self and other reports of expertise (Austin, 2003; Lewis et al., 2007; Rau, 2006); or by interview (Espinosa et al., 2007; Jackson & Klobas, 2008).

Strengths. However this study also has its merits. First, the use of a cross-sectional design was appropriate to examine how implicit and explicit coordination mechanism combined.

Second, similar results were found when team members and team managers rated team performance (specialization interacted with task reflexivity) increasing the reliance of these results. Third, results of this study extended previous findings by showing that task reflexivity is more helpful for team performance and innovation when teams have a less well developed TMS (as evidenced by low specialization and low coordination). And this study also extended previous research on task reflexivity by showing that the effects of task reflexivity on team performance can be influenced by other moderating variables such as implicit team processes. All in all, the results of this study allow a better understanding of which aspects of team performance are affected by which team process and how implicit and explicit coordination mechanism combines or supplants with each other.

Future research. Future research should continue to look at each dimension of transactive memory rather than aggregating the dimensions. Future research should also address when task reflexivity is really needed and how to foster the development of a good transactive memory system by taking into account the time frame and task of the team. It may be important to be reflexive early in the life of a team in order to develop a routine of reflection during activities and to foster the development of TMS. As proposed by Rico et al. (2008), the more team members were together the more the structure of knowledge was accurate and shared by team members. This implies that newly formed teams do not have a well developed TMS, and thus reflexivity may be more helpful when the team is at its beginning stages rather than its later ones.

Some studies highlight the possible role of task and team characteristics on the usefulness of task reflexivity and transactive memory (Brandon & Hollingshead, 2004; De Dreu, 2007; Facchin et al., chap. 5; Peltokorpi & Manka, 2008; Somech, 2006; Zhang et al., 2007), especially the role of interdependence. Recently task and team characteristics were given emphasis in studies of transactive memory. More interdependence should lead team to more development of the TMS since team members need each other (Brandon & Hollingshead, 2004; Moreland, 1999; Wegner, 1987). When team members perceived that they depend on the expertise of each other to get the job done (Michinov, 2007; Peltokorpi & Manka, 2008), or that their goals are related and they depend on each other for informational or material support (Zhang et al., 2007) transactive memory is also high and in turn had a positive impact on team performance. De Dreu (2007) demonstrated that when team members perceived that the outcome of their team depends on their joint effort, they benefited from a high level of task reflexivity. Both lines of research suggest

that teams are more likely to develop TMS and deeply process information when the task is complex rather than simple. Although this study suggested some answers, much work remain to be done on what sustain TMS in work teams and when reflexivity is more useful.

Chapter 7

General discussion and conclusion

In this dissertation, I tried to answer the question proposed as the title: *Is it necessary to think to be a successful team?* Indeed, many organizations rely on teams to perform and teams are expected to be flexible and adaptive in order to face changes. Thus to function effectively, teams should display reflexive behaviors. But increasing activities such as explicit reflection may appear to be counterproductive for some teams because the team's tasks do not require engagement in deep reflection or because teams lack the autonomy to implement the results of reflection or because team members rely on a good implicit coordination process. I argued that the positive main effect of reflexivity is likely to happen but depends on boundary conditions. Thus the main question driving this dissertation was *under what circumstances should teams use reflexivity to improve team performance?* Although previous studies demonstrated that many variables moderate the relationship between task reflexivity and team outcomes, so far other important aspects such as task variety, and autonomy and how reflexivity combines with implicit coordination processes, such as transactive memory have been neglected.

The purpose in this dissertation was twofold: A first aim of this dissertation was to take a detailed look at the concept of reflexivity and how it is measured. I did a review of the literature not only on team reflexivity and related constructs but also more broadly on team performance. Then I validated the reflexivity questionnaire developed by Carter and West (1998) for a sample of French speaking employees. This first step was particularly important because the reflexivity scale demonstrated particular properties for the French speaking sample. The second main objective was to study the link between task reflexivity and team performance and innovation, taking into account possible moderator variables: two task characteristics (task variety and autonomy) and one particular implicit coordination process, namely transactive memory. I therefore proposed a model of the relationships between task variety, autonomy, and transactive

memory with task reflexivity and team performance and innovation. I tested this proposed model with two field studies with teams from various organizations performing a variety of tasks from the French speaking part of Switzerland. In this dissertation, I did not focus on a specific kind of team rather I surveyed teams in the field performing a wide variety of tasks. This choice may prevent this study's results from having effects only applicable to a specific task or to a specific kind of team.

I. Theoretical discussion

In chapter 1, I reviewed some of the major team performance models. I put more emphasis on the description of Input Process Output models, because they offer a framework for studying the relationship between team reflexivity and team performance. As outlined in chapter 1, the traditional I-P-O models fail to capture the dynamics of team performance. Recently some authors (Ilgen, Hollenbeck, Johnson, & Jundt, 2005; Marks, Mathieu, & Zaccaro, 2001; McGrath & Tschan, 2004) have provided a very interesting view of team performance by adding a stage where the output become the input for the next performance. Unfortunately, the finishing stage proposed by Ilgen et al. (2005) did not really address how an output becomes an input. I would argue that it is also critical to look at how teams deal with their outputs, what is the next step? At this point it seems particularly important that a team explicitly discusses, reviews, and learns from past experience, plans new strategies, and implements adaptation into their processes. This is precisely what reflexivity adds to those previous models. When I embedded team reflexivity in this I-P-O framework, I considered reflexivity as a team process and in that sense reflexivity represents the team activities of reflecting, planning, and adapting past performance to increase future performance. Moreover, in line with West (1996, 2000, 2003), reflexivity is also considered here as an overarching team process which can impact others team processes, particularly those process related to coordination. Taking an action regulation theory perspective, reflexivity could be defined as an important mechanism in the regulation of work team functioning (Frese & Zapf, 1994; Tschan & von Cranach, 1996).

Then in chapter 2, I reviewed the concept of reflexivity and its related concepts. Team reflexivity shares some similarities with concepts like team learning, team self-correction, after-event review, and post-action review. Research on these topics recognizes the importance of

reviewing performance and learning from previous experiences. But there are also differences between these concepts and that of reflexivity. Whereas reflexivity is a general activity that should occur naturally (most of the time, a team will naturally stop and think about objectives, strategies, and processes) before, during, or after task execution, the others concepts are based on structured team discussion guided by formal rules or by a person (mainly the leader) which mainly take place after task execution. They can be considered as a tool to guide discussion. This is not to say that team reflexivity can not be used as an intervention before or in the middle of the task; as McMinn & Moreland (2006) and Gurtner, Tschan, Semmer, & Nägele (2007) did; but most of the empirical studies done with reflexivity measured the natural occurrence of reflexivity rather than using it as an intervention.

This chapter was also an occasion to address further the main critical question driving this dissertation: when is reflexivity actually needed (in the sense of the conditions to use or not to use reflexivity to perform better)? Indeed based on the results of previous research, I concluded that reflexivity can be good or bad for team performance and innovation. On one hand, from some research it can be concluded that increasing the level of team reflexivity leads to higher performance and innovation. As proposed in this dissertation, this positive effect can be explained by the reflexivity process itself. When a team is reflexive, they can identify problems correctly, detect errors accurately, have clear and shared goals, reduce processes loss, and plan adequate strategies for future performances. On the other hand, some studies reported no effect or negative effects of reflexivity. Indeed, it is appealing that too much reflexivity can be counterproductive and lead to inaction. I am sure that everyone has already experienced endless discussion during meeting where people think too much about reasons for choices without reaching any decisions. The core project of this dissertation was therefore to test two possible explanations for these differing effects of reflexivity. In the first case, teams may not need to deeply reflect because the task itself does not require it and team may not be able to actually implement the results of their reflection into action because they lack autonomy. Reflexivity may be more useful when teams possess a less well established implicit coordination system. The results are discussed in the next section.

II. Main findings

A. Validation of the reflexivity questionnaire

The first step in this dissertation was to validate the reflexivity questionnaire into French. Items were translated from the original questionnaire developed by Carter and West (1998). The reflexivity questionnaire was designed to measure task and social reflexivity and to distinguish between teams with low and high reflexivity. One main advantage of this questionnaire is that it is not task specific so I could apply it to the different kinds of teams I surveyed. The results presented in chapter 4 indicate that the French version of the reflexivity scale was reliable and appropriate for evaluating team reflexivity for different kind of teams.

Two studies were conducted, and the factor structure was assessed in several steps, as well as the reliability and validity of the reflexivity scale for those samples. In study 1, exploratory factor analysis revealed 3 factors which partly confirm the 2 factors structure expected from the original study (Carter & West, 1998). Two items of the original task reflexivity scale loaded on a third factor named 'strategic reflexivity'. The three factor structure was replicated in study 2 with confirmatory factor analysis. Strategic reflexivity represents a deeper questioning with changes of strategies at a higher level. Criterion validity was confirmed by correlations between reflexivity and team performance.

Although task, social and strategic reflexivity correlate with each other, they were differentially related to team performance. First, results of study 1 showed a link between social reflexivity and individual performance. This could mean that the level of unresolved conflict influences not only team performance but also individual performance. This is in line with previous research which shows a relationship between some social stressors, performance, and well-being (De Dreu & Van Vianen, 2001; De Dreu & Weingart, 2003). All in all, the results highlight the importance of dealing effectively with relational aspects in teams, not only for team performance but also for individual performance.

The second difference concerns the link between strategic reflexivity and individual performance in study 1. Although no correlation was found between strategic reflexivity and team performance, the link between strategic reflexivity and individual performance was significant and negative. This result is interesting. It may be that strategic changes at the team

level also need an adaptation at the individual level. Changes may involve the allocation of new tasks, changes in collaboration, and so on. Changes break routines and adaptation to changes can temporally lead to decrease individual performance (Gersick & Hackman, 1990).

The contribution of this study is to demonstrate a slightly different structure than the original study. The third factor, strategic reflexivity reflects another aspect of reflexivity which might not be present in every team since it includes decisions at a strategic level. Future research should be aware of this third factor and its possible influence on the remaining items and on team performance. That is why, for the subsequent study, I choose not to include the strategic reflexivity items.

B. Task characteristics as boundary conditions of the positive effect of task reflexivity

In chapter 3, I proposed that task variety and autonomy will moderate the link between task reflexivity and team performance and innovation. Below, the main findings are summarized and discussed.

First, I tested whether task reflexivity influences team performance more when teams need coordination, because of task variety. Results presented in chapter 5 indicated that task reflexivity improved team performance more when there was greater task variety. Second, I investigated whether the effects of task reflexivity on team innovation depend on the level of autonomy. Again, results in chapter 5 showed that teams with greater autonomy benefited more from task reflexivity than teams with less autonomy. The extent to which team members have autonomy in their job seems important to task reflexivity and subsequent innovation. The effect of autonomy is similar to the effect of participation. Both displayed the same pattern, teams experiencing autonomy should be more willing to participate and to engage in a reflexivity process (Spector, 1986). Because of the motivational aspect of autonomy (Hackman & Oldham, 1980) teams with higher levels of autonomy should participate more in decisions and should display more reflexivity. But not only motivation plays a role, Frese and Zapf (1994) explain the positive effect of autonomy on team performance by the fact that *'people who have control can do better because they can choose adequate strategies to deal with the situation. For example, they can plan ahead better and are more flexible in the event that something goes wrong'* (Frese

& Zapf, 1994, p. 319). In that case, task reflexivity may foster the effect of autonomy because task reflexivity helps team to decide on strategies and autonomy is needed to implement the results of this discussion.

The results support my argument that task reflexivity benefits teams when teams perform non-routine tasks that may require more integration and coordination; and is most helpful when they are autonomous, and thus able to implement the results of their reflection. Another possible explanation for these results is that when tasks are routine or when teams have a low level of autonomy, it could be that it is the leader who has control over the work. Decisions about strategies may not be made by team members; they just execute what has been decided at a higher level. Indeed, the results of the validation study support this and show that strategic reflexivity is different from the rest of the task and social reflexivity. Teams with low autonomy may not need to reflect because it is the leader's job to do that. The leader processes information and gives the results of his/her reflection to the team. In that case, the leader is responsible for regulating action of the team. The leader's goal is to plan, monitor, and evaluate; team members are only involved in the execution phase. This possible explanation also goes well with other research on team self-correction and after-event review (Baird, Holland, & Deacon, 1999; Blickensderfer, Cannon-Bowers, & Salas, 1997). In this research, the reflexivity process is structured and most of the time, the leader is in charge of leading the process. Moreover, West (1996) stated that reflexivity is most useful for complex decision-making teams, I partially addressed this suggestion in this dissertation by studying task variety, but the role of task complexity was never fully tested. Future research could aim at examining the interaction between the role of the leader in the reflexivity process and task complexity in an experimental study. For example, what is the effect of a reflexivity intervention guided by a leader under two conditions when task is simple versus a complex task?

C. When explicit coordination helps implicit coordination

The primary contribution of this dissertation was to provide explanation for understanding the mixed results of task reflexivity on team performance. As indicated in chapter 5, task characteristics can play a role on the effects of task reflexivity on team performance and innovation. When I presented a model of reflexivity in chapter 3, I also suggested that task reflexivity and the three dimensions of transactive memory system (coordination, credibility, and

specialization) will interact to explain team performance and innovation. In this dissertation task reflexivity represented an explicit method of coordination since team members reflected overtly and verbally on team functioning and formally decided on goals and strategies. In contrast, transactive memory system (TMS) can be considered as an implicit mode of coordination because team members share a cognitive structure of who knows what and rely on that to coordinate their behaviors.

Results presented in chapter 6 showed that task reflexivity and TMS indeed interacted. Task reflexivity only enhanced team performance in teams with a less well developed TMS (as evidenced by low specialization). Concerning innovation, similar results were found, task reflexivity was more helpful for teams with a less well developed TMS (as evidenced by specialization and coordination). Results also indicated that high task reflexivity profited teams with a good TMS (as evidenced by high specialization and coordination). More precisely, both a high level of task reflexivity and specialization or coordination was needed to achieve higher innovation. Credibility did not interact with task reflexivity to explain team performance or innovation.

All in all these results support the argument that task reflexivity is most helpful when the TMS is failing or lacking. Teams with a low level of specialization may profit from reflexivity due to an increase of sharing critical unshared knowledge possessed by team members, increased accuracy in the TMS structure, and clarification of the roles of team members. The results also support the argument that task reflexivity benefits team innovation when a team is highly specialized and thus explicit reflection with specialized, diverse team members, increased innovation. However, this combining effect (high task reflexivity and high transactive memory) was not found for team performance. When specialization was high team performance was not higher with higher level of task reflexivity. Team members may be reluctant to engage in deep reflexivity because team are well performing thanks to a well developed TMS. In that case, task reflexivity is not necessary to increase team performance. This suggests that reflexivity would be more useful when the task is new or when the team is newly formed, because an explicit discussion may help the development of an accurate and shared TMS as well as routines. Future research could test whether reflexivity is better to do at the start, before the development of routine and transactive memory or at the midpoint of the task because teams are more open to changes and willing to revise their routines (Gersick, 1988; Gersick & Hackman, 1990).

III. Implications and Limitations

A. Implications for practice

Studies done in this dissertation not only provide clarity to the concept of reflexivity but also have practical implication. Namely regarding when reflexivity should be used to maximize team performance? An understanding of the boundary conditions can help practitioners to tailor the use of reflexivity and develop appropriate interventions.

To fully benefit from reflexivity organizations should pay attention to the conditions that foster or hinder reflexivity. Results in this dissertation would suggest that task characteristics, more generally task design, remains a crucial factor for team performance and that using reflexivity to improve team performance may not work unless appropriate conditions exist regarding task design and autonomy. Task variety and autonomy determine the extent to which reflexive behavior displayed by team members influences team performance and innovation. As suggested by West (1996, 2000, 2003) reflexivity is best suited for teams with complex tasks because it requires more coordination. Reflection is needed when tasks are variable but autonomy is then needed. Indeed, teams may be unable to implement into practice their innovation ideas because they do not have the authority to do so.

Hackman (2002) in his recent book dedicated an entire chapter to enabling conditions for team success. Creating a real team with a compelling direction and an enabling structure is the basis for effective team work. The first step of the team life seems to be important. Moreover, team functioning is set up early in the team's life (Gersick & Hackman, 1990). Reflexivity is often done in meetings and could be particularly useful at the first meeting of a team as the team can develop a routine of being reflexive, a reflexivity culture. As Gersick (1988) suggested and Gurtner et al. (2007), McMinn & Moreland (2006) tested, reflexivity can also be used as an intervention at the mid point of the task to prompt a revision of routines or when teams encounter trouble. In chapter 6, it was found that reflexivity profits team performance when team members do not share who knows what. When it comes to future performance (innovation), similar effects were found but both a high level of specialization or coordination plus a high level of reflexivity also benefited team innovation. Greater specialization means that team members possess diverse knowledge. Managing diversity is thus important to have the positive effects of diversity (for a

review see Moreland, Levine, & Wingert, 1996; Milliken & Martins, 1996; West, 2002b). Diversity can be beneficial because team members may have a different perspective of problem and find alternatives strategies but this diversity needs to be managed through group processes like reflexivity for groups to benefit from diversity. Thus managers could use reflexivity as an intervention to foster the readjustment of a TMS and increase subsequent team performance and innovation. Setting a reflexivity meeting regularly or when changes occur may help team to update who knows what and may prevent from relying on an inaccurate TMS.

Finally, the reflexivity scale is now available in French. French speaking practitioners now have a good tool to evaluate team reflexivity.

B. Limitations and strengths

Limitations. In these studies I used a cross-sectional design, which makes it difficult to reach firm conclusions about the causal relations among reflexivity, TMS, team performance, and team innovation. A reverse causality (team performance or innovation increasing transactive memory and reflexivity) cannot be ruled out. Past performance may lead to reflexivity, especially when a team encounters bad performances, team performance serves as an input to the reflexivity process. Past performance may also increase the adjustment of the TMS. Although experimental research (Gurtner et al., 2007) has shown that a reflexivity intervention can improve team performance, I would like to supplement such research with a longitudinal field study research.

Another limitation of these studies is that I relied on questionnaire data. More behavioral data on reflexivity could be useful to explore its effects in more detail. For instance, one might videotape team interactions and evaluate reflexivity using the coding system proposed by Swift and West (1998). And other dimensions of the TMS, namely accuracy and agreement should provide more information on the TMS processes.

I tried to reduce common method and common sources of variance by asking some team managers to evaluate team performance and team innovation (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). However, I was not able to collect this data for all teams considerably reducing my sample size for data coming from team managers and many relationships were not significant. Evaluations of team performance and innovation from team members and managers did correlate in the study presented in chapter 5 but only evaluation on innovation converged in the study

presented in chapter 6. I also found different results depending on who evaluated team performance and innovation. These differences reflect different perspectives on team performance and innovation, but are still valuable to provide a more complete picture of reflexivity. Indeed, I think that team members' evaluations are also appropriate because they know what is going on in their teams contrary to managers who may have limited opportunities to observe team performance. Moreover, self-report questionnaires may not be as bad as we think (Spector, 1994, 2006). This study should be replicated with more teams. Future research should use multiple methods to measure team outcome but also independent variables to overcome the problems associated with cross-sectional self report studies.

Strengths. However, studies presented in this dissertation also have their merits. First, they add to the growing body of research that specifies when task reflexivity will have more beneficial effects, and point to task requirements as well as autonomy as important factors. This may help to explain why some studies have failed to establish a relationship between task reflexivity and team performance. It may also improve experimental research involving reflexivity interventions – if a task is too simple and does not need reflection, or if a setting does not make it possible or worthwhile for people to implement the results of their reflection then team members may not engage in the difficult process of analyzing their task strategies.

Second, the results extend previous findings by showing that task reflexivity is helpful for team performance when teams have a less well developed TMS (as evidenced by low specialization and coordination). Thus explicit coordination mechanism can supplant the failing or lacking implicit coordination mechanism.

Future research should continue to address when task reflexivity is really needed. It may be important to be reflexive early in the team's life to develop a routine of reflecting during activities. Finally, this study extends previous research on reflexivity by showing that the positive effects of task reflexivity are still not strongly established. Other moderator variables and their interaction with task reflexivity may be of interest in future research. Also much work remains to be done on what stimulates task reflexivity in teams. Intervention from team leader (Tannenbaum, Smith-Jentsch, & Behson, 1998) or an external intervention (Okhuysen & Eisenhardt, 2002) both seem to be promising variables. Finally, it seems that the content of task reflexivity (what is discussed) and the depth of the discussion of strategies (Swift & West, 1998)

are crucial to have positive effects on team performance. Therefore, future research should look more closely at the team reflexivity process. Is it the level of discussion which makes a difference?

IV. Conclusion

In this dissertation I was able to demonstrate that task reflexivity is useful under specific conditions such as a varying tasks, a degree of autonomy, and supplant implicit coordination. The researches and studies presented in this dissertation suggest that being reflexive may be a key factor in improving team performance. The use of explicit coordination techniques, such as reflexivity, should be used under specific conditions. In other words, it is not always necessary to reflect to perform greatly.

The positive effects of task reflexivity are likely to depend on several factors that others have already identified, here I add three more important aspects. First, task reflexivity enhanced team performance when the tasks were varied by managing coordination needs. Second, task reflexivity enhanced team innovation when teams had a high level of autonomy to implement the results of the reflexivity. Third, a high level of task reflexivity was needed to achieve higher performance and innovation when teams lacked of a shared cognitive structure of who knows what; but also increased team innovation when team members were specialized and coordinated well.

In this dissertation I tried to answer to the title question, *Is it necessary to think to be a successful team?* Well the answer is *sometimes*. I hope that the studies reported in this dissertation will stimulate future research on reflexivity and its boundary conditions.

References

Agrell, A., & Gustafson, R. (1996). Innovation and creativity in work groups. In M. A. West (Ed.), *Handbook of work group psychology* (pp. 317-343). Chichester, UK: John Wiley & Sons Ltd.

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. London: Sage publications.

Allen, N. J., & Hecht, T. D. (2004). The 'romance of teams': Toward an understanding of its psychological underpinnings and implication. *Journal of Occupational and Organizational Psychology, 77*, 439-461.

Amabile, T. M., Conti, R., Coon, H., Lanzeby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of Management Journal, 39*, 1154-1184.

Ancona, D. G., & Caldwell, D. F. (1992). Bridging the boundary: External activity and performance in organizational teams. *Administrative Science Quarterly, 37*, 634-665.

Argyris, C., & Schön, D. A. (2002). *Apprentissage organisationnel: Théorie, méthode, pratique.* Traduction de la 1ère édition américaine par M. Aussanaire et P. Garcia-Melgares. Paris: De Boeck Université.

Arrow, H., McGrath, J. E., & Berdahl, J. L. (2000). *Small groups as complex systems. Formation, coordination, development, and adaptation*. Thousand Oaks: Sage Publications.

Austin, J. R. (2003). Transactive memory in organizational groups: The effect of content, consensus, specialization, and accuracy on group performance. *Journal of Applied Psychology, 88*, 866-878.

Baird, L., Holland, P., & Deacon, S. (1999). Learning from action: Imbedding more learning into the performance fast enough to make a difference. *Organizational Dynamics, 27*, 19-32.

Beehr, T. A. (1995). Social support as a form of treatment. In T. A. Beehr (Ed.), *Psychological stress in the workplace* (pp. 182-210). New York: Routledge.

Blickensderfer, E., Cannon-Bowers, J. A., & Salas, E. (1997). Theoretical bases for team self-correction: Fostering shared mental models. *Advances in Interdisciplinary Studies of Work Teams, 4*, 249-279.

Brandon, D. P., & Hollingshead, A. B. (2004). Transactive memory systems in organizations: Matching tasks, expertise, and people. *Organization Science, 15*, 633-644.

Brauner, E., & Becker, A. (2006). Beyond knowledge sharing: The management of transactive knowledge systems. *Knowledge and Process Management, 13*, 62-71.

Brauner, E., & Scholl, W. (2000). Editorial: Information processing approach as a perspective for groups research. *Group Processes and Intergroup Relations, 3*, 115-122.

Burningham, C., & West, M. A. (1995). Individual, climate, and group interaction processes as predictors of work team innovation. *Small Group Research, 26*, 106-117.

Byrne, B. M. (2001). *Structural equation modeling with amos. Basic concepts, applications, and programming*. London: Lawrence Erlbaum Associates Publishers.

Cannon, M. D., & Edmondson, A. C. (2001). Confronting failure: Antecedents and consequences of shared beliefs about failure in organizational work groups. *Journal of Organizational Behavior, 22*, 161-177.

Cannon-Bowers, J. A., Salas, E., & Converse, S. (1993). Shared mental models in expert team decision making. In J. N. Castellan Jr (Ed.), *Individual and group decision making* (pp. 221-246). Hillsdale, NJ: Lawrence Erlbaum.

Carnevale, P. J., & Probst, T. M. (1998). Social values and social conflict in creative problem solving and categorization. *Journal of Personality and Social Psychology, 74*, 1300-1309.

Carter, S. M., & West, M. A. (1998). Reflexivity, effectiveness, and mental health in BBC-TV productions teams. *Small Group Research, 29*, 583-601.

Catell, R. B. (1966). The scree test for number of factors. *Multivariate Behavioral Research, 1*, 245-276.

Choi, H.-S., & Levine, J. M. (2004). Minority influence in work teams: The impact of newcomers. *Journal of Experimental Social Psychology, 40*, 273-280.

Church, A. H. (1997). Managerial self-awareness in high-performing individuals in organizations. *Journal of Applied Psychology, 82*, 281-292.

Clegg, C. W., Wall, T. D., Pepper, K., Stride, C., Woods, D., Morrison, D., et al. (2002). An international survey of the use and effectiveness of modern manufacturing practices. *Human Factors and Ergonomics in Manufacturing, 12*, 171-191.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences*. Mahwah, NJ: Lawrence Erlbaum Associates.

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*, 239-290.

Cohen, S. G., Ledford, G. E., & Spreitzer, G. M. (1996). A predictive model of self-managing work team effectiveness. *Human Relations, 79*, 643-676.

Daft, R. L., & Macintosh, N. B. (1981). A tentative exploration into the amount and equivocality of information processing in organizational work units. *Administrative Science Quarterly, 26*, 207-224.

De Dreu, C. K. W. (2002). Team innovation and team effectiveness: The importance of minority dissent and reflexivity. *European Journal of Work and Organizational Psychology, 11*, 285-298.

De Dreu, C. K. W. (2007). Cooperative outcome interdependence, task reflexivity, and team effectiveness: A motivated information processing perspective. *Journal of Applied Psychology, 92*, 628-638.

De Dreu, C. K. W., Nijstad, B. A., & van Knippenberg, D. (2008). Motivated information processing in group judgment and decision making. *Personality and Social Psychology Review, 12*, 22-49.

De Dreu, C. K. W., & Van Vianen, A. E. M. (2001). Managing relationship conflict and the effectiveness of organizational teams. *Journal of Organizational Behavior, 22*, 309-328.

De Dreu, C. K. W., & Weingart, L. R. (2003). Task versus relationship conflict, team performance, and team member satisfaction: A meta-analysis. *Journal of Applied Psychology, 88*, 741-749.

De Dreu, C. K. W., & West, M. A. (2001). Minority dissent and team innovation: The importance of participation in decision making. *Journal of Applied Psychology, 86*, 1191-1201.

Devine, D. J., Clayton, L. D., Philips, J. L., Dunford, B. B., & Melner, S. B. (1999). Teams in organizations. Prevalence, characteristics, and effectiveness. *Small Group Research, 30*, 678-711.

Edmondson, A. C. (1996). Learning from mistakes is easier said than done: Group and organizational influences on the detection and correction of human error. *Journal of Applied Behavioral Science, 32*, 5-28.

Edmonson, A. C. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly, 44*, 350-383.

Edmondson, A. C. (2003). Speaking up in the operating room: How team leaders promote learning in interdisciplinary action teams. *Journal of Management Studies, 40*, 1419-1452.

Edmondson, A. C. (2004). Learning from mistakes is easier said than done. Group and organizational influences on the detection and correction of human error. *The Journal of Applied Behavioral Science, 40*, 66-90.

Edmondson, A. C., Bohmer, R. M., & Pisano, G. P. (2001). Disrupted routines: Team learning and new technology implementation in hospitals. *Administrative Science Quarterly, 46*, 685-715.

Ehrlinger, J., & Dunning, D. (2003). How chronic self-views influence (and potentially mislead) estimates of performance. *Journal of Personality and Social Psychology, 84*, 5-17.

Elfering, A., Semmer, N. K., Schade, V., Grund, S., & Boos, N. (2002). Supportive colleague, unsupportive supervisor: The role of provider-specific constellations of social support at work in the development of low back pain. *Journal of Occupational Health Psychology, 7*, 130-140.

Ellis, A. P. J. (2006). System breakdown: The role of mental models and transactive memory in the relationship between acute stress and team performance. *Academy of Management Journal, 49*, 576-589.

Ellis, S., & Davidi, I. (2005). After-event reviews: Drawing lessons from successful and failed experience. *Journal of Applied Psychology, 90*, 857-871.

Ellis, S., Mendel, R., & Nir, M. (2006). Learning from successful and failed experience: The moderating role of kind of after-event review. *Journal of Applied Psychology, 91*, 669-680.

Ericsson, K. A., & Lehmann, A. C. (1996). Expert and exceptional performance: Evidence of maximal adaptation to task constraints. *Annual Review of Psychology, 47*, 273-305.

Espinosa, J. A., Slaughter, S. A., Kraut, R. E., & Herbsleb, J. D. (2007). Team knowledge and coordination in geographically distributed software development. *Journal of Management Information Systems, 24*, 135-169.

Facchin, S., Tschan, F., & Darioly, A. (Under review). Do task variety and autonomy moderate the effects of task reflexivity on team performance and innovation? *Organization Science*.

Facchin, S., Tschan, F., Gurtner, A., Cohen, D., & Dupuis, A. (2006). Validation de la version française de l'échelle de réflexivité de groupe de Carter et West, 1998. *Psychologie du Travail et des Organisations, 12*, 291-306.

Faraj, S., & Sproull, L. (2000). Coordinating expertise in software development teams. *Management Science, 46*, 1554-1568.

Feldman, M. S., & Pentland, B. T. (2003). Reconceptualizing organizational routines as a source of flexibility and change. *Administrative Science Quarterly, 48*, 94-118.

Frese, M., & Zapf, D. (1994). Action as the core of work psychology: A German approach. In H. Triandis, M. D. Dunnette & L. M. Hough (Eds.), *Handbook of industrial and organizational psychology* (2 ed., Vol. 4, pp. 271-340). Palo Alto, CA: Consulting Psychologists Press.

Fussell, S. R., Kraut, R. E., Lerch, F. J., Scherlis, W. L., McNally, M. M., & Cadiz, J. J. (1998). *Coordination, overload and team performance: Effects of team communication strategies.* Paper presented at the Conference on Computer Supported Cooperative Work, New York.

Georgesen, J. C., & Harris, M. J. (1998). Why's my boss always holding me down? A meta-analysis of power effects on performance evaluations. *Personality and Social Psychology Review, 2*, 184-195.

Gersick, C. J. G. (1988). Time and transition in work teams: Toward a new model of group development. *Academy of Management Journal, 31*, 9-41.

Gersick, C. J. G., & Hackman, J. R. (1990). Habitual routines in task-performing groups. *Organizational Behavior and Human Decision Processes, 47*, 65-97.

Gevers, J. M. P., van Eerde, W., & Rutte, C. G. (2001). Time pressure, potency, and progress in project groups. *European Journal of Work and Organizational Psychology, 10*, 205-221.

Gibson, C., & Vermulen, F. (2003). A healthy divide subgroups as a stimulus for team learning behavior. *Administrative Science Quarterly, 48*, 202-239.

Gist, M. E., Locke, E. A., & Taylor, M. S. (1987). Organizational behavior: Group structure, process, and effectiveness. *Journal of Management, 13*, 237-257.

Gladstein, D. L. (1984). Groups in context: A model of task group effectiveness. *Administrative Science Quarterly, 29*, 499-517.

Gurtner, A., Tschan, F., Semmer, N. K., & Nägele, C. (2007). Getting groups to develop good strategies: Effects of reflexivity interventions on team process, team performance, and

shared mental models. *Organizational Behavior and Human Decision Processes, 102*, 127-142.

Guzzo, R. A., & Dickson, M. (1996). Teams in organizations: Recent research on performance and effectiveness. *Annual Review of Psychology, 47*, 307-338.

Guzzo, R. A., & Shea, G. P. (1992). Group performance and intergroup relations in organizations. In M. D. Dunnett & L. M. Hough (Eds.), *Handbook of industrial and organizational psychology* (2nd ed., Vol. 3, pp. 269-313). Palo Alto, CA: Consulting Psychologist Press.

Hackman, J. R. (1987). The design of work teams. In W. Losch (Ed.), *Handbook of organizational behavior* (pp. 315-342). Englewood Cliffs, NJ: Prentice-Hall.

Hackman, J. R. (1990). *Groups that work (and those that don't): Creating conditions for effective team work*. San Francisco: Jossey-Bass.

Hackman, J. R. (1998). Why teams don't work. In R. S. Tindale, L. Heath, J. Edwards, E. J. Posavac, F. B. Bryant, Y. Suarez-Balcazar, E. Henderson-King & J. Myers (Eds.), *Theory and research on small groups* (pp. 245-268). New York: Plenum Press.

Hackman, J. R. (2002). *Leading teams. Setting the stage for great performances*. Boston: Harvard Business School Press.

Hackman, J. R., Brousseau, K. R., & Weiss, J. A. (1976). The interaction of task design and group performance strategies in determining group effectiveness. *Organizational Behavior and Human Performance, 16*, 350-365.

Hackman, J. R., & Morris, C. G. (1975). Group tasks, group interaction process, and group performance effectiveness: A review and proposed integration. In R. Berkovitz (Ed.), *Advances in experimental social psychology* (Vol. 8, pp. 47-96). New York: Academic Press.

Hackman, J. R., & Oldham, G. R. (1980). *Work redesign*. Reading, MA: Addison-Wesley.

Hackman, J. R., & Wageman, R. (2005). A theory of team coaching. *Academy of Management Journal, 30*, 269-287.

Harris, M. M., & Schaubroeck, J. (1988). A meta-analysis of self-supervisor, self-peer, and peer-supervisor ratings. *Personnel Psychology, 41*, 43-62.

Hirst, G., Mann, L., Bain, P., Pirola-Merlo, A., & Richver, A. (2004). Learning to lead: The development and testing of a model of leadership learning. *The Leadership Quarterly, 15*, 311-327.

Hodgkinson, G. P. (1997). Cognitive inertia in a turbulent market: The case of UK residential estate agents. *Journal of Management Studies, 34*, 921-945.

Hodgkinson, G. P., & Wright, G. (2002). Confronting strategic inertia in a top management team: Learning from failure. *Organization Studies, 23*, 949-977.

Hollingshead, A. B. (1998). Communication, learning, and retrieval in transactive memory systems. *Journal of Experimental Social Psychology, 34*, 423-442.

Hollingshead, A. B., & Brandon, D. P. (2003). Potential benefits of communication in transactive memory systems. *Human Communication Research, 29*, 607-615.

Hollingshead, A. B., McGrath, J. E., & O'Connor, K. M. (1993). Group task performance and communication technology: A longitudinal study of computer-mediated versus face-to-face work groups. *Small Group Research, 24*, 307-333.

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.

Jackson, P., & Klobas, J. (2008). Transactive memory systems in organizations: Implications for knowledge directories. *Decision Support Systems, 44*, 409-424.

Jackson, S. E. (1996). The consequences of diversity in multidisciplinary work teams. In M. A. West (Ed.), *Handbook of work group psychology* (pp. 53-75). Chichester, UK: John Wiley & Sons Ltd.

James, L. R., Demaree, R. G., & Wolf, G. (1984). Estimating within-group interrater reliability with and without response bias. *Journal of Applied Psychology, 69*, 85-98.

Janis, I. L. (1982). *Groupthink* (2nd Ed.). Boston: Houghton Millflin.

Jehn, K. A. (1994). Enhancing effectiveness: An investigation of advantages and disadvantages of value-based intragroup conflict. *The International Journal of Conflict Management, 5*, 223-238.

Jehn, K. A. (1995). A multimethod examination of the benefits and detriments of intragroup conflict. *Administrative Science Quarterly, 40*, 256-282.

Jehn, K. A. (1997). A qualitative analysis of conflict types and dimensions in organizational groups. *Administrative Science Quarterly, 42*, 530-557.

Jehn, K. A., Northcraft, G. B., & Neale, M. A. (1999). Why differences make a difference: A field study of diversity, conflict, and performance in workgroups. *Administrative Science Quarterly, 44*, 741-763.

Kaiser, H. (1974). An index of factorial simplicity. *Psychometrika, 39*, 31-36.

Karasek, R. A. (1979). Job demands, job decision latitude, and mental strain: Implications for job redesign. *Administrative Science Quarterly, 24*, 285-307.

Karau, S. J., & Williams, K. D. (1993). Social loafing: A meta-analytic review and theoretical integration. *Journal of Personality and Social Psychology, 65*, 681-706.

Klimoski, R., & Mohammed, S. (1994). Team mental model: Construct or metaphor? *Journal of Management, 20*, 403-437.

Kozlowski, S. W. J., & Bell, B. S. (2003). Work groups and teams in organizations. In W. C. Borman, D. R. Ilgen & R. J. Klimoski (Eds.), *Handbook of psychology: Industrial and organizational psychology* (pp. 333-375). New York: John Wiley & Sons.

Kozlowski, S. W. J., & Ilgen, D. R. (2006). Enhancing the effectiveness of work groups and teams. *Psychological Science in the Public Interest, 7*, 77-124.

Langfred, C. W., & Moye, N. A. (2004). Effects of task autonomy on performance: An extended model considering motivational, informational, and structural mechanisms. *Journal of Applied Psychology, 89*, 934-945.

Levine, J. M., Resnick, L. B., & Higgins, E. T. (1993). Social foundations of cognition. *Annual Review of Psychology, 44*, 585-612.

Lewis, K. (2003). Measuring transactive memory systems in the field: Scale development and validation. *Journal of Applied Psychology, 88*, 587-604.

Lewis, K. (2004). Knowledge and performance in knowledge-worker teams: A longitudinal study of transactive memory systems. *Management Science, 50*, 1519-1533.

Lewis, K., Belliveau, M., Herndon, B., & Keller, J. (2007). Group cognition, membership change, and performance: Investigating the benefits and detriments of collective knowledge. *Organizational Behavior and Human Decision Processes, 103*, 159-178.

Lewis, K., Lange, D., & Gillis, L. (2005). Transactive memorys sytems, learning, and learning transfer. *Organization Science, 16*, 581-598.

Liang, D. W., Moreland, R., & Argote, L. (1995). Group versus individual training and group performance: The mediating role of transactive memory. *Personality and Social Psychology Bulletin, 21*, 384-393.

Locke, E. A., & Lathman, G. P. (1990). *A theory of goal setting and task motivation*. Englewood Cliffs, NJ: Prentice-Hall.

Luong, A., & Rogelberg, S. G. (2005). Meetings and more meetings: The relationship between meeting load and the daily well-being of employees. *Group Dynamics: Theory, Research, and Practice, 9*, 58-67.

Marks, M. A., Mathieu, J. E., & Zaccaro, S. J. (2001). A temporally based framework and taxonomy of team processes. *Academy of Management Review, 26*, 356-376.

Martell, R. F., & Guzzo, R. A. (1991). The dynamics of implicit theories of group performance: When and how do they operate? *Organizational Behavior and Human Decision Processes, 50,* 51-74.

McGrath, J. E. (1964). *Social psychology: A brief introduction*. New-York: Holt.

McGrath, J. E. (1984). *Groups: Interaction and performance*. Englewood Cliffs, NJ: Prentice-Hall.

McGrath, J. E. (1991). Time, interaction, and performance (tip): A theory of groups. *Small Group Research, 22*, 147-174.

McGrath, J. E., & Argote, L. (2001). Group processes in organizational contexts. In M. A. Hogg & R. S. Tindale (Eds.), *Blackwell handbook of social psychology: Group processes* (pp. 603-627). Oxford: Blackwell Publishers.

McGrath, J. E., Arrow, H., & Berdahl, J. L. (2000). The study of groups: Past, present, and future. *Personality and Social Psychology Review, 4*, 95-105.

McGrath, J. E., & Tschan, F. (2004). Dynamics in groups and teams: Groups as complex action systems. In M. S. Poole & A. H. Van de Ven (Eds.), *Handbook of organizational change and development* (pp. 50-73): Oxford, UK: Oxford University Press.

McMinn, J. G., & Moreland, R. L. (2006). *Reflection and performance in small groups.* Paper presented at the First INGRoup conference, Pittsburgh.

Michinov, E. (2007). Validation de l'échelle de mémoire transactive en langue française et adaptation au contexte académique. *Revue Européenne de Psychologie Appliquée, 57*, 59-68.

Michinov, E., & Michinov, N. (2007). Identifying a transition period at the midpoint of an online collaborative activity: A study among adult learners. *Computers in Human Behavior, 23*, 1355-1371.

Michinov, E., Olivier-Chiron, E., Rusch, E., & Chiron, B. (2008). Influence of transactive memory on perceived performance, job satisfaction and identification in anaesthesia teams. *British Journal of Anaesthesia, 100*, 327-332.

Michinov, N., & Michinov, E. (In press). Investigating the relationship between transactive memory and performance in collaborative learning. *Learning and Instruction*.

Milliken, F. J., & Martin, L. L. (1996). Searching for common threads: Understanding the multiple effects of diversity in organizational groups. *Academy of Management Review, 21*, 402-433.

Milliken, F. J., Morrison, E. W., & Hewlin, P. F. (2003). An exploratory study of employee silence: Issues that employees don't communicate upward and why. *Journal of Management Studies, 40*, 1453-1476.

Moreland, R. L. (1999). Transactive memory: Learning who knows what in work groups and organizations. In L. L. Thompson, J. M. Levine & D. M. Messik (Eds.), *Shared cognition in organizations* (pp. 3-31). Mahwah, NJ: Lawrence Erlbaum.

Moreland, R. L., Argote, L., & Krishnan, R. (1996). Socially shared cognition at work. Transactive memory and group performance. In J. L. Nye & A. M. Brower (Eds.), *What's social about social cognition?* (pp. 57-84). Thousand Oaks: Sage.

Moreland, R. L., & Myaskovsky, L. (2000). Exploring the performance benefits of group training: Transactive memory or improved communication? *Organizational Behavior and Human Decision Processes, 82*, 117-133.

Moreland, R. L., & Levine, J. M. (1992). Problem identification by groups. In S. Worchel, W. Wood & J. A. Simpson (Eds.), *Group processes and productivity* (pp. 17-47). Newbury Park, CA: Sage.

Moreland, R. L., Levine, J. M., & Wingert, M. (1996). Creating the ideal group: Composition effects at work. In E. H. Witte & J. H. Davis (Eds.), *Understanding group behavior: Small group processes and interpersonal relations* (pp. 11-35). Mahwah, NJ: Erlbaum.

Nielsen, R. P. (1993). Wollman's "I am we" triple-loop action-learning: Origin and application in organization ethics. *The Journal of Applied Behavioral Science, 29*, 117-138.

Okhuysen, G. A. (2001). Structuring change: Familiarity and formal interventions in problem-solving groups. *Academy of Management Journal, 44*, 794-808.

Okhuysen, G. A., & Eisenhardt, K. (2002). Integrating knowledge in groups: How formal interventions enable flexibility. *Organization Science, 13*, 370-386.

O'Leary-Kelly, A. M., Martocchio, J. J., & Frink, D. D. (1994). A review of the influence of group goals on group performance. *Academy of Management Journal, 37*, 1285-1301.

Orasanu, J. M. (1994). Shared problem models and flight crew performance. In N. Johnston, N. McDonald & R. Fuller (Eds.), *Aviation psychology in practice* (pp. 255-285). Hants: Avebury Technical.

Organ, D. W. (1997). Organizational citizenship behavior: It's construct clean-up time. *Human Performance, 10*, 85-97.

Orlitzky, M., & Hirokawa, R. Y. (2001). To err is human, to correct for it divine: A meta-analysis of research testing the functional theory of group decision-making effectiveness. *Small Group Research, 23*, 313-341.

Patterson, M. G., West, M. A., Shackleton, V. J., Dawson, J. F., Lawthom, R., Maitlis, S., et al. (2005). Validating the organizational climate measure: Links to managerial practices, productivity and innovation. *Journal of Organizational Behavior, 26*, 379-408.

Pearsall, M. J., & Ellis, A. P. J. (2006). The effects of critical team member assertiveness on team performance and satisfaction. *Journal of Management, 32*, 575-594.

Peltokorpi, V., & Manka, M.-L. (2008). Antecedents and the performance outcome of transactive memory in daycare work groups. *European Psychologist, 13*, 103-113.

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*, 879-903.

Pritchard, J. S., & Ashleigh, M. J. (2007). The effects of team-skills training on transactive memory and performance. *Small Group Research, 38*, 696-726.

Pritchard, R. D., Holling, H., Lammers, F., & Clark, B. D. (Eds.). (2002). *Improving organizational performance with the productivity measurement and enhancement system: An international collaboration*. Humington, New York: Nova Science.

Raikes, J. (2005). The increasing need for real-time collaboration. Retrieved 27th December, 2005, from http://office.microsoft.com/en-us/assistance/HA011927661033.aspx

Rau, D. (2005). The influence of relationship conflict and trust on the transactive memory. *Small Group Research, 36*, 746-771.

Rau, D. (2006). Top management team transactive memory, information gathering, and perceptual accuracy. *Journal of Business Research, 59*, 416-424.

Reagans, R., Argote, L., & Brooks, D. (2005). Individual experience and experience working together: Predicting learning rates from knowing who knows what and knowing how to work together. *Management Science, 51*, 869-881.

Ren, Y., Carley, K. M., & Argote, L. (2006). The contingent effects of transactive memory: When is it more beneficial to know what others know? *Management Science, 52*, 671-682.

Rico, R., Sanchez-Manzanares, M., Gil, F., & Gibson, C. (2008). Team implicit coordination processes: A team knowledge-based approach. *Academy of Management Review, 33*, 163-184.

Roe, R. A., Dienes, E., Ten Horn, L. A., & Zinovieva, I. L. (1995). *Expanded delft measurement kit: English version.* Tillburg: WORC.

Roe, R. A., Zinovieva, I. L., Dienes, E., & Ten Horn, L. A. (2000). A comparison of work motivation in Bulgaria, Hungary, and the Netherlands: Test of a model. *Applied Psychology: An International Review, 49*, 658-687.

Rogelberg, S. G., Leach, D. J., Warr, P. B., & Burnfield, J. L. (2006). "Not another meeting!" Are meeting time demands related to employee well-being? *Journal of Applied Psychology, 91*, 86-96.

Salas, E., Nichols, D. R., & Driskell, J. E. (2007). Testing three team training strategies in intact teams. *Small Group Research, 38*, 471-488.

Salas, E., Sims, D. E., & Burke, C. S. (2005). Is there a “big five” in teamwork? *Small Group Research, 36*, 555-599.

Schippers, M. C., Den Hartog, D. N., Koopman, P. L., & Wienk, J. A. (2003). Diversity and team outcomes: The moderating effects of outcome interdependence and group longevity and the mediating effect of reflexivity. *Journal of Organizational Behavior, 24*, 779-802.

Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. New York: Basic books.

Schön, D. A. (1987). *Educating the reflective practitioner: Toward a new design for teaching and learning in the professions*. San Francisco: Jossey-Bass.

Scott, S. G., & Bruce, R. A. (1994). Determinants of innovative behavior: A path model of individual innovation in the workplace. *The Academy of Management Journal, 37*, 580-607.

Semmer, N., Zapf, D., & Dunckel, H. (1995). Assessing stress at work: A framework and an instrument. In O. Svane & C. Johansen (Eds.), *Work and health – Scientific basis of progress in the working environment.* (pp. 105-113). Luxembourg: European Commission.

Shaw, M. E. (1964). Communication networks. *Advances in Experimental Social Psychology, 1*, 111-147.

Shure, G. H., Rogers, M. S., Larsen, I. M., & Tassone, J. (1962). Group planning and task effectiveness. *Sociometry, 25*, 263-282.

Smith-Jentsch, K. A., Zeisig, R. L., Acton, B., & McPherson, J. (1998). Team dimensional training: A strategy for guided team self-correction. In J. A. Cannon-Bowers & E. Salas (Eds.), *Decision making under stress: Implication for individual and team training* (pp. 271-297). Washington, DC: American Psychological Association.

Somech, A. (2006). The effects of leadership style and team process on performance and innovation in functionally heterogeneous teams. *Journal of Management, 32*, 132-157.

Spector, P. E. (1986). Perceived control by employees: A meta-analysis of studies concerning autonomy and participation at work. *Human Relations, 39*, 1005-1016.

Spector, P. E. (1994). Using self-report in ob research: A comment on the use of a controversial method. *Journal of Organizational Behavior, 15*, 385-392.

Spector, P. E. (2006). Method variance in organizational research. Truth or urban legend? *Organizational Research Methods, 9*, 221-232.

Stasser, G., Stewart, D. D., & Wittenbaum, G. M. (1995). Expert roles and information exchange during discussion: The importance of knowing who knows what. *Journal of Experimental Social Psychology, 31*, 244-265.

Stasser, G., & Titus, W. (1985). Pooling of unshared information in group decision making: Biased information sampling during discussion. *Journal of Personality and Social Psychology, 48*, 1476-1478.

Stasser, G., & Titus, W. (1987). Effects of information load and percentage of shared information in the dissemination on unshared information during discussion. *Journal of Personality and Social Psychology, 53*, 81-93.

Steiner, I. D. (1972). *Group process and productivity*. New York: Academic Press.

Stewart, G. L. (2006). A meta-analytic review of relationships between team design features and team performance. *Journal of Management, 32*, 29-54.

Stout, R., Cannon-Bowers, J. A., Salas, E., & Milanovich, D. M. (1999). Planning, shared mental models, and coordinated performance: An empirical link is established. *Human Factors, 41*, 61-71.

Sundstrom, E., De Meuse, K. P., & Futrell, D. (1990). Work teams. Applications and effectiveness. *American Psychologist, 45*, 120-133.

Sundstrom, E., McIntyre, M., Halfhill, T., & Richards, H. (2000). Work groups: From the hawthorn studies to work teams of the 1990s and beyond. *Group Dynamics: Theory, Research, and Practice, 4*, 44-67.

Swift, T. A., & West, M. A. (1998). *Reflexivity and group processes: Research and practice*. Sheffield: University of Sheffield.

Tannenbaum, S. I., & Salas, E. (1996). Promoting team effectiveness. In M. A. West (Ed.), *Handbook of work group psychology* (pp. 503-529): Chichester, UK: John Wiley & Sons Ltd.

Tannenbaum, S. I., Smith-Jentsch, K. A., & Behson, S. J. (1998). Training team leaders to facilitate team learning and performance. In J. A. Cannon-Bowers & E. Salas (Eds.), *Decision making under stress: Implications for individual and team training* (pp. 247-270). Washington, DC: American Psychological Association.

Tjosvold, D. (1985). Implications of controversy research for management. *Journal of Management, 11*, 21-37.

Tjosvold, D. (1998). Cooperative and competitive goal approach to conflict: Accomplishments and challenges. *Applied psychology: An international review, 47*, 285-342.

Tjosvold, D., Hui, C., & Yu, Z. (2003). Conflict management and task reflexivity for team in-role and extra-role performance in China. *The International Journal of Conflict Management, 14*, 141-163.

Tjosvold, D., Law, K. S., & Sun, H. (2006). Effectiveness of Chinese teams: The role of conflict types and conflict management approaches. *Management and Organization Review, 2*, 231-252.

Tjosvold, D., Tang, M. M. L., & West, M. A. (2004). Reflexivity for team innovation in China. *Group and Organization Management, 29*, 540-559.

Tjosvold, D., Yu, Z.-Y., & Hui, C. (2004). Team learning from mistakes: The contribution of cooperative goals and problem-solving. *Journal of Management Studies, 41*, 1223-1245.

Tripoli, A. M. (1998). Planning and allocating: Strategies for managing priorities in complex job. *European Journal of Work and Organizational Psychology, 7*, 455-476.

Tschan, F. (1995). Communication enhances small group performance if it conforms to task requirements: The concept of ideal communication cycles. *Basic and Applied Social Psychology, 17*, 371-393.

Tschan, F. (2002). Ideal cycles of communication (or cognitions) in triads, dyads, and individuals. *Small Group Research, 33*, 615-643.

Tschan, F., & Semmer, N. K. (1999). Savoir plus que ce que l'on puisse enseigner: Limites d'accès par la réflexion à des processus de groupe, et les conséquences pour l'enseignement des groupes. In A. Savoie (Ed.), *Leadership et pouvoir; équipes et groupes* (pp. 159-172). Cap-Rouge (CA): Presses Inter-Universitaires.

Tschan, F., Semmer, N. K., Nägele, C., & Gurtner, A. (2000). Task adaptive behavior and performance in groups. *Group Processes and Intergroup Relations, 3*, 367-386.

Tschan, F., & von Cranach, M. (1996). Group task structure, processes and outcome. In M. A. West (Ed.), *Handbook of work group psychology* (pp. 95-121). Chichester, UK: John Wiley & sons Ltd.

Tu, Y.-K., Gunnell, D., & Gilthorpe, M. S. (2008). Simpson's paradox, lord's paradox, and suppression effects are the same phenomenon-the reversal paradox. *Emerging Themes in Epidemiology, 5*, 1-9.

Van de Ven, A. H., Delbecq, A. L., & Koenig, R. (1976). Determinants of coordination modes within organizations. *American Sociological Review, 41*, 322-338.

Wageman, R., & Baker, G. (1997). Incentives and cooperation: The joint effects of task and reward interdependence on group performance. *Journal of Organizational Behavior, 18*, 139-158.

Wageman, R., Hackman, J. R., & Lehman, E. (2005). Team diagnostic survey: Development of an instrument. *The Journal of Applied Behavioral Science, 41*, 373-398.

Waterson, P. E., Clegg, C. W., Bolden, R., Pepper, K., Warr, P. B., & Wall, T. D. (1999). The use and effectiveness of modern manufacturing practices: A survey of UK industry. *International Journal of Production Research, 37*, 2271-2292.

Wegner, D. M. (1987). Transactive memory: A contemporary analysis of the group mind. In B. Mullen & G. R. Goethals (Eds.), *Theories of group behavior* (pp. 185-208). New York: Springer-Verlag.

Wegner, D. M., Erber, R., & Raymond, P. (1991). Transactive memory in close relationships. *Journal of Personality and Social Psychology, 61*, 923-929.

Weingart, L. R. (1992). Impact of group goals, task component complexity, effort, and planning on group performance. *Journal of Applied Psychology, 77*, 682-693.

Weldon, E., Jehn, K. A., & Pradhan, P. (1991). Processes that mediate the relationship between a group goal and improved group performance. *Journal of Personality and Social Psychology, 61*, 555-569.

Weldon, E., & Weingart, L. R. (1993). Group goals and group performance. *British Journal of Social Psychology, 32*, 307-334.

West, M. A. (1996). Reflexivity and work group effectiveness: A conceptual integration. In M. A. West (Ed.), *Handbook of work group psychology* (pp. 555-579). Chichester, UK: John Wiley & Sons Ltd.

West, M. A. (2000). Reflexivity, revolution, and innovation in work teams. In M. M. Beyerlein, D. A. Johnson, & S. T. Beyerlein (Eds.), *Advances in interdisciplinary studies of work teams: Product development teams* (Vol. 5, pp. 1-29). Stamford, CT: JAI Press.

West, M. A. (2002a). Ideas are ten a penny: It's team implementation not idea generation that counts. *Applied psychology: An International Review, 51*, 411-424.

West, M. A. (2002b). Sparkling fountains or stagnant ponds: An integrative model of creativity and innovation implementation in work group. *Applied Psychology: An International Review, 51*, 355-424.

West, M. A. (2003). Innovation implementation in work teams. In P. B. Paulus & B. A. Nijstad (Eds.), *Group creativity. Innovation through collaboration* (pp. 245-276). New York: Oxford University Press.

West, M. A., & Anderson, N. R. (1996). Innovation in top management teams. *Journal of Applied Psychology, 81*, 680-693.

West, M. A., Borrill, C. S., Dawson, J. F., Brodbeck, F., Shapiro, D. A., & Haward, B. (2003). Leadership clarity and team innovation in health care. *The Leadership Quarterly, 14*, 393-410.

West, M. A., Brodbeck, F. C., & Richter, A. W. (2004). Does the 'romance of teams' exist? The effectiveness of teams in experimental and field settings. *Journal of Occupational and Organizational Psychology, 77*, 467–473.

West, M. A., & Farr, J. L. (1990). The social psychology of innovation in groups. In M. A. West & J. L. Farr (Eds.), *Innovation and creativity at work* (pp. 309-333). Chichester: John Wiley & Sons.

West, M. A., Hirst, G., Richter, A., & Shipton, H. (2004). Twelve steps to heaven: Successfully managing change through developing innovative teams. *European Journal of Work and Organizational Psychology, 13*, 269-299.

West, M. A., & Markiewicz, L. (2004). *Building team-based working. A practical guide to organizational transformation*. British Psychological Society and Blackwell Publishing Ltd.

Williams, K. Y., & O'Reilly III, C. A. (1998). Demography and diversity in organizations: A review of 40 years of research. In B. M. Staw & L. L. Cummings (Eds.), *Research in organizational behavior* (Vol. 20, pp. 77-140).

Wittenbaum, G. M., Vaughan, S. I., & Stasser, G. (1998). Coordination in task-performing groups. In R. S. T. a. Associates (Ed.), *Theory and research in small group* (pp. 177-204). New York: Plenum.

Woolley, A. W. (1998). Effects of intervention content and timing on group task performance. *Journal of Applied Behavioral Science, 34*, 30-46.

Wong, S.-S. (2004). Distal and local group learning: Performance trade-offs and tensions. *Organization Science, 15*, 645-656.

Zellmer-Bruhn, M. E. (2003). Interruptive events and team knowledge acquisition. *Management Science, 49*, 514-528.

Zellmer-Bruhn, M., & Gibson, C. (2006). Multinational organization context: Implications for team learning and performance. *Academy of Management Journal, 49*, 501-518.

Zhang, Z.-X., Hempel, P. S., Han, Y.-L., & Tjosvold, D. (2007). Transactive memory system links work team characteristics and performance. *Journal of Applied Psychology, 92*, 1722-1730.