Master thesis

'Less is more?': A video-based field study about patterned behavioral interaction and team effectiveness

Matthijs Brunink

a.m.brunink@student.utwente.nl

Master of Science Business Administration

University of Twente

Faculty of Behavioral, Management and Social Sciences

Department Change Management and Organizational Behavior

Supervisors

Prof. Dr. Celeste Wilderom

Drs. Marcella Hoogeboom

28 June 2016

Abstract

This present study investigates the effect of behavioral interaction patterns of team leaders and followers on team effectiveness. At first, the focus is on the number of interaction patterns and its complexity. Secondly, the focus is on the specific behaviors displayed within the detected interaction patterns. This cross-sectional field study includes three methods: 1) inter-reliable coding of leader and follower behaviors during staff meetings; 2) surveys of 111 these same leaders and 1445 followers; 3) expert scores of each team's level of effectiveness.

Multiple hierarchical regression analyses showed that effective teams exhibit fewer and more simple interaction patterns. The predicted moderation effect of the degree of knowledge-intensive work was found in part. Focus on the specific nineteen behaviors within the detected interaction patterns led to the finding that transformational and transactional behavior were not significantly related with team effectiveness. However, counter-effective behavior of the leader was found significantly negative. It is concluded that the role of the follower in team performances must not be underestimated because its occurrence within interaction patterns is associated with team effectiveness. The findings of this study indicate that within patterned interaction, less is more. Practical implications, and strengths and limitations of this current study are discussed. Moreover, future research directions are proposed.

Key words: team effectiveness, social interaction, video-based field study, patterned interaction.

Table of content

Introduction

Nowadays effective performances of teams within day-to-day work can be described as pivotal to organizational performances (Zaccaro & Bader, 2003). A work team is a group of members with mutually shared responsibilities and interdependent interaction for achieving certain organizational outcomes (Cohen & Bailey, 1997). The use of work teams within organizations has increased for multiple reasons (Mohrman, Cohen, & Mohrman, 1995; Wageman, 1995; Zaccaro & Bader, 2003).

Based on previous research, social interaction and team dynamics must be considered as key in effective team functioning (DeRue & Ashford, 2010; Kozlowski & Ilgen, 2006; Stachowski, Kaplan, & Waller, 2009). Social interaction is also considered to be crucial in the leadership process (DeRue & Ashford, 2010). In addition, Fairhurst and Uhl-Bien (2012) defined leadership as "*a relational process co-created by leaders and followers in context*" (p. 1044). Besides the formal and hierarchical power of the leader, followers also have power in social interaction (DeRue & Ashford, 2010). Adopting the definition of Fairhurst and Uhl-Bien (2012), the traditional leadership approach, which is characterized by the focus on the persona of the leader and ignores the belief that followers could contribute in an active way, is rejected (Fairhurst & Uhl-Bien, 2012; Oc & Bashshur, 2013). Because of the informal power of team interaction, individual leader and follower behaviors are pivotal for effective team performances (Oc & Bashshur, 2013). An important aim of future research should be to get insights in these team-based behavioral dynamics.

Because it has widely been accepted that human interaction is more patterned than can be detected with the naked eye, Magnusson (1996) developed an algorithm that detects patterns of behaviors. These algorithms are called T-patterns and can be detected using special software called Theme. T-patterns analysis is a multivariate approach for the detection of the informal structure of behavior (Casarrubea et al., 2015) and results in the detection of

patterns (in this study called interaction patterns), defined as a repeating sequence of events sharing statistically significant inter-relationships within a certain critical interval (Magnusson, 1996). Research using Magnusson's Theme-software has successfully been applied in the study of various settings. In particular animal and sport behaviors were topic of such previous research (Casarrubea et al., 2014; Jonsson et al., 2006). Starting in the late ninety's, Theme was also introduced in business research.

In previous business studies using Theme, the focus was on swift-starting teams in the airline industry (Zijlstra, Waller, & Phillips, 2012), or tasks that can be observed as non-routinely (e.g., crises, Stachowski et al., 2009). This research will perform a T-pattern analysis within a routine setting in the field of management but without any simulated events. It aims to provide new practical and theoretical insights on interaction patterns within team meetings. This study will answer the question '*what makes teams effective in their interaction patterns during their regular staff meetings?*'

Examining team dynamics is not possible with traditional survey methods, hence a video-based analysis was employed. The team meetings analyzed for this research are video-taped during their regular meetings. Obtrusiveness was minimized by, for instance, scheduling the meetings at the normal location and by using only small cameras during the team meetings. The video-taped team meetings were coded by using the behavioral software program called 'The Observer XT 12' ((Noldus, Trienes, Hendriksen, Jansen, & Jansen, 2000), hereafter The Observer). During the extensive coding process, nineteen mutually exclusive behaviors were coded by two independent trained coders.

In total ten hypotheses were developed to answer the research question. Within Theme a distinction can be made between quantitative and qualitative aspects of an interaction pattern. The quantitative aspects focus on the number of interaction patterns and the complexity of interaction patterns while the qualitative aspects do focus on the content of an

interaction patterns. Five hypotheses (H1-H5) will be focused on the quantitative variables. Four hypotheses (H6-H9) will be focused on the content of the interaction patterns. Finally, a moderation effect will be tested (H10).

This study aims to make both practical and academic contributions. At first, this study offers a view on the complete team interaction instead of only a fraction of the team interaction (e.g., Zijlstra et al., 2012). By analyzing a complete and regular team meeting, a reliable and complete impression of its content and the day-to-day work activities will be presented (Allen & Rogelberg, 2013; Vine, Holmes, Marra, Pfeifer, & Jackson, 2008). Because meetings offer insights in the processes observable during team interaction (Fairhurst, 2007; Svennevig, 2008), meetings perfectly fit the purpose of this study.

In the second place, an analysis based on the content of interactions with Theme will offer new insights. It links pattern occurrences to the actual behavior that the team members display, a combination that was hardly not studied before. A third contribution is the new insights in to the question: 'to what extent quantitative aspects of interaction patterns influence team effectiveness in a day-to-day work setting?' Also the question, 'to what extent the developed habitual rituals and routines for dealing with frequently encountered stimuli are effective?' (Gersick & Hackman, 1990), will be answered. The fourth and last contribution is the effective structuring of meetings. Previous research found that meetings have become more and more an integral part of contemporary working life (Rogelberg, Leach, Warr, & Burnfield, 2006; Rogelberg, Shanock, & Scott, 2011). Given that much time and money is spent on them (Leach, Rogelberg, Warr, & Burnfield, 2009; Rogelberg, Scott, & Kello, 2007) and that meetings are crucial in employee socialization, inter-relationship building and shaping team's culture and effectiveness (Rogelberg et al., 2006; Romano & Nunamaker, 2001). With the underpinned importance and increased number of team meetings, structuring them effective is quite important. This video-based field study thus offers better

understanding of team dynamics and social interaction in relation with team effectiveness within a meeting type of work setting.

The structure for this paper is as follows: after this introduction, the theoretical foundation of this research will be presented. This will consist of a theoretical review of representative literature on both leadership as social construction and team effectiveness. Also the hypotheses will be presented in this section. Thirdly, the methodology which describes the method and further explains the software program called Theme will be presented. Fourthly, the results will be discussed. Lastly, a discussion and a conclusion will be presented.

Theoretical foundation

The theoretical foundation of this research consists of three sections. Firstly, the literature on social interaction and social influence theories will be reviewed. Secondly, team effectiveness, in light of social interaction and team dynamics, will be explained. Finally, the hypotheses will be presented in a conceptual model.

From social interaction to patterned interaction

In the previous century, the most common way of studying leadership was the leader-centric approach (Fairhurst, 2007). Within this approach, the focus is on the persona of the leader. An underlying assumption was that their interaction with co-workers (i.e., followers) was mainly top down (Kelley, 1988). Recent leader-follower interaction research focuses more on equal interactions (Meindl, 1995; Pentland, 2012). Based on the idea that followers can also contribute to organizational success and team's leadership, the importance of the social interaction within teams stands clear. In addition, Zaccaro, Rittman, and Marks (2001) stated that leadership and team processes reciprocally influence each other. Thirdly, Rogelberg et al. (2006) stated the importance of relationship building, especially in combination with meeting science. Kozlowski and Ilgen (2006) found that team processes are dynamic but that repeated interactions among individuals tend to regularize, such that shared (interaction) structures and emergent states crystallize and, finally, can be used to guide subsequent interactions and relationships.

Meindl (1995) used the metaphor 'romance of leadership' to describe leadership as social construction. It serves as a complement to the leader-centric approach. The 'romance of leadership' focuses on the linkage between leaders and followers as constructed in the minds of followers (Meindl, 1995). Meindl (1995) suggested that the relationship between leaders and followers is primarily a constructed relation influenced by inter-follower relationships. An example of inter-follower relationship pertains to the task interdependence of the

followers. Task interdependence refers to the degree to which team members depend on one another for their efforts, information, and resources (Van de Ven, Delbecq, & Koenig, 1976). Another example is provided by Meindl (1990), where follower processes are reviewed as social information, social construction and social contagion processes.

The intra-team relations and the collectivity, led by the leader, are subject to change over time. For example in response to the leader's actions and behaviors but also in response to external factors or inter-follower relationships (Kozlowski, Grand, Baard, & Pearce, 2015; Kozlowski & Ilgen, 2006). Following Marks, Mathieu, and Zaccaro (2001), team processes are represented by collective constructs that raise from motivation, affect, individual cognition and behavior. Having collective constructs, therefore, is important for the development of social relations between the leader and followers. Meindl (1995) tried to examine social relationships as a function of a network in which, besides leaders, also followers are embedded. Following Meindl, Ehrlich, and Dukerich (1985), the social construction of leadership has developed to a 'lofty' status. As a consequence, the social construction was used often in previous literature, as a starting point for further development of the follower-oriented leadership approach (Carsten, Uhl-Bien, West, Patera, & McGregor, 2010; Kean, Haycock-Stuart, Baggaley, & Carson, 2011).

Previous research stressed the importance of social interaction within teams (DeRue & Ashford, 2010; Stasser & Taylor, 1991). Stasser and Taylor (1991) mentioned that complex patterns of speaker turns can arise from confluence of stable differences in speaking rates. A statement which is in contrast to Pentland (2012), who empirically showed the importance of an equal distribution of voice during staff meetings. In addition, previous research argued that, in task oriented groups, frequent speakers are seen as leaders (Mullen, Salas, & Driskell, 1989). Leadership in groups can, therefore, be observed as shared responsibility in equality (Pentland, 2012).

Building on the equal importance of leaders and followers, in the social interaction literature a two-perspective relational leadership theory was introduced (Uhl-Bien, 2006). The first perspective is an entity perspective that focuses on identifying attributes of individuals while the individual engages in interpersonal relationship. The entity perspective is a traditional orientation. The second perspective is a modernized perspective that observes leadership as a process of social construction (Uhl-Bien, 2006). Applying this perspective to leadership, the relational orientation focus is not about identifying attributes of individuals involved in leadership behavior but about social construction processes by which understandings of leadership come about. Furthermore, social constructions which were given privileged ontology are most important in this view (Meindl, 1995; Uhl-Bien, 2006). Another influential relation-based leadership theory is the leader-member exchange (LMX, Gerstner & Day, 1997). The LMX theory is the most used relationship-based approach in the academic leadership literature (Gerstner & Day, 1997; Graen & Uhl-Bien, 1995).

The focus within the relationship-based approach is on identifying characteristics of a dyadic relationship, for instance: building trust, showing respect, and mutual obligation (Gerstner & Day, 1997). The relationship-based approach does also include the evaluation of reciprocal influence between leaders and followers (Graen & Uhl-Bien, 1995; Liden, Wayne, & Stilwell, 1993). Even though this approach gained insight in the reciprocal dyadic process between leaders and followers, insights in team dynamics in combination with team effectiveness are still lacking in today's theorizing.

Team effectiveness & team interaction

Although empirical evidence is scarce, scholars have pointed to the importance of team interaction to better understand team effectiveness (e.g., Kozlowski et al., 2015). However, previous literature about team effectiveness has been dominated by the IPO heuristic as proposed by McGrath (1964) which places processes in a static box (Kozlowski &

Ilgen, 2006). IPO represents input (conditions that exist prior to a performance), processes (how team inputs are transformed into outputs and tend to bring together all of the behavioral, cognitive, and affective phenomena existing in teams), and output (results and by-products of team activity)(Ilgen, Hollenbeck, Johnson, & Jundt, 2005). In contrast, it is stated that team processes and dynamics influence leadership and vice versa (Zaccaro et al., 2001). Thus, the social interaction associated with leadership has high importance for team performance. As discussed before, the role of team processes and dynamics within team effectiveness received little attention within research. Previous literature discussed this understudied view as the bottom-up emergence (e.g., Kozlowski & Klein, 2000). Within the bottom-up emergence, the dynamic interaction processes manifest at a collective level (Kozlowski, Chao, Grand, Braun, & Kuljanin, 2013). In addition, Kozlowski and Klein (2000) argued that team processes are inherently multilevel occurrences that, shaped by team's context, emerge bottom-up from team member interactions.

Team effectiveness is broadly defined by previous scholars. Previous research used measures like performance, member satisfaction, and shared interaction (Gibson, Cooper, & Conger, 2009; Hackman, 1987; Marks et al., 2001; Stewart & Barrick, 2000). Team interaction received an important yet understudied role in the literature about team effectiveness. In addition, the earlier mentioned IPO model was reshaped into the IMO model where inputs (organizational context, team context and members) and outcomes (multiple criteria) are still present but mediators (processes and emergent states) were added. This is because Ilgen et al. (2005) noted that many of the mediational factors are no processes. Ilgen et al. (2005) also added a fourth dimension to the model, they discussed the IMOI model. Here the second 'I' represents the input to exhibit the developmental processes that unfold over time as a team matures and, thus, a more cyclical or episodic process (Mathieu, Maynard, Rapp, & Gilson, 2008).

In addition to the discussed literature, Lehmann-Willenbrock, Chiu, Lei, and Kauffeld (2016) stated that the extent to which a team's interaction is dynamic depends on the extent to which team members are involved and build on each other's contributions. The discussed arguments support the finding that team effectiveness is not a static property or attribute, but emerges from a series of ongoing processes and dynamics that differ and mature over time (Ilgen et al., 2005; Mathieu et al., 2008).

Marks et al. (2001) discussed a model that described the rhythmic nature of team processes in combination with team effectiveness. The rhythmic nature of team processes can be observed as a pattern over a longer period of time. Marks et al. (2001) found that teams performing different processes at different times are related to what they called performance episodes. This study also argues that between episodes, teams execute transition processes as the teams review their previous efforts and prepare for future work. As an addition, Marks et al. (2001) discussed team process as "*members' interdependent acts that convert inputs to outcomes through cognitive, verbal, and behavioral activities directed toward organizing task work to achieve collective goals*" (p. 357).

Zellmer-Bruhn, Waller, and Ancona (2004) performed research on interaction patterns in combination with temporal entrainment. They concluded that entrainment creates team rhythms that include pauses in activity that can act as a trigger to future change. These pauses alone are not enough to impel teams to change. Managers must also employ a temporal design to make use of these opportunities for change. Rhythms of temporal entrainment and the pauses that accompany them are part of a team's task environment. Based on the above presented literature review, it can be stated that research into patterned interaction has a linkage with team effectiveness but that is hardly ever studied in previous research.

Patterned interaction

Most common ways to detect patterns in interaction, are 1) lag sequential analysis and 2) Theme software (Casarrubea et al., 2015; Magnusson, 2000). The lag sequential analysis technique calculates the frequency of transition between pairs of events within a certain lag in a time series (Noldus et al., 2000). For example, Lehmann-Willenbrock, Allen, and Kauffeld (2013) performed a lag sequential analysis where the role of team interaction on meeting effectiveness was subject of research. They found that procedural meeting behaviors are sustained by supporting statements within the team interaction process and that stable interaction processes promote proactive communication and inhibit dysfunctional meeting behaviors. A second example is the study of Lehmann-Willenbrock and Allen (2014). They concluded that humor patterns triggered positive socio-emotional communication and innovativeness towards new solutions. At the team level, humor patterns are positively related to team performance. In the appendixes a table is presented with an overview of studies using lag sequential analyses or Theme. This current study used Theme to detect patterns in team interaction.

Discovering behavioral lags offer new ways of analyzing behaviors. This will offer new insights in the management or leadership literature. Most important advantage of pattern analysis (e.g., Theme or lag sequential analysis) is the detection of patterns which is not possible with the naked eye (Magnusson et al., 2004). By the introduction of multiple selection criteria, pattern detection can be as precise as desired. Pattern analysis allows quantitative analysis at a new and higher level. Point of attention is the current scarcity of using these ways of analyzing, because of its extensive data requirement. Nevertheless, Theme has shown its usefulness in previous research (e.g., Stachowski et al., 2009; Waller, 1999; Zijlstra et al., 2012).

Quantity of interaction patterns

The first dimension of the quantity of interaction patterns to be discussed is the number of discovered interaction patterns. The number of interaction patterns is used to characterize team interaction as highly or low patterned. Taking the example of a leader giving a task and a follower who reacts on the task, the predictability of the interaction (here described as the amount of behaviors that belongs to an interaction pattern (Magnusson, 1996)) has decreased when the follower reacts with more than a simple confirmatory answer. Previous research (e.g., Zijlstra et al., 2012) observed the lower predictability of interaction as an increase of uncertainty and a reduction of efficiency. However, this was not statistically supported.

The lower predictability can also be observed as an indication of unexpected and positive contributions of the follower since the goal accomplishment and the constructive conflict are considered to have an effect on team effectiveness (Gibson et al., 2009; Ilgen et al., 2005). In addition, Burke, Fiore, and Salas (2003) mentioned the importance of shared leadership present in more effective teams and absent in ineffective teams. Shared leadership is characterized by more team interaction where equality between the leader and followers is required (Pentland, 2012; Shamir, 2007; Uhl-Bien, 2006). More team interaction can, thus, be followed by more interaction patterns.

In contrast to this expectation, the increased team interaction can also be more spread over the team. Following the theory of Pentland (2012), effectiveness is considered to be a function of voice distribution within the team. When the team members have an equal input, team effectiveness is highest. Hence, equal voice distribution can lead to less detected interaction patterns because of its lower predictability. In addition, James and Wooten (2010) argued that teams with stable roles require members that are fluid and shifting, this in order to allow a higher level of adaptation. Summarized, it can be concluded that the communication

of effective teams is less patterned than less effective teams. Based on the findings discussed above, it is hypothesized that:

Hypothesis 1: *Effective teams will exhibit significantly fewer interaction patterns during their regular staff meetings, compared to less effective teams*

Teams exhibiting more interaction patterns do not directly show more unique interaction patterns. For example, a team can exhibit eight unique interaction patterns with an occurrence of one time per interaction pattern or a team can exhibit four unique interaction patterns with an occurrence of two times per interaction pattern. In other words, teams can score differently on the number of interaction patterns and the uniqueness of the interaction patterns.

The research of Waller (1999) studied teams in crises and non-routine events and found a significant difference between effective and less effective teams regarding variability in their interaction patterns. This means that effective teams exhibit fewer unique interaction patterns in comparison with the interaction patterns exhibited by less effective teams.

The study of Kanki, Folk, and Irwin (1991) also found differences between effective and less effective teams. Effective teams were characterized by less unique interaction patterns and low effective teams, in contrast, performed a higher diversity of interaction patterns (Kanki et al., 1991). However, the studies of Waller (1999) and Kanki et al. (1991) focused on airline crews. Airline crews are, in common, characterized by swift-starting teams (Ginnett, 1987) and can also be characterized by non-routine work. The research of James and Wooten (2010) argued that teams with stable role distributions can influence their team effectiveness by shaping routines and patterns in interactions. Zellmer-Bruhn et al. (2004) supported this statement with the finding that stable interaction patterns in teams may improve efficiency by reducing meeting-time or uncertainty. For this reason, it is hypothesized that:

Hypothesis 2: *Effective teams will exhibit significantly fewer unique interaction patterns during their regular staff meetings, compared to less effective teams*

Complexity of interaction patterns

The complexity of the interaction patterns can be separated in the number of switches within an interaction pattern (H3), the level of the interaction pattern (H4), and the length of an interaction pattern (H5). The level represents the number hierarchical levels showed in an interaction pattern while the number of switches represents the amount of switches between the subjects (in this study: the leader and the followers) within an interaction pattern. The length is the number of behaviors displayed in a detected interaction pattern.

The first component to be discussed is the number of switches. Salas, Cooke, and Rosen (2008) stated that team members have to coordinate their cognition, affects and behaviors. In order to coordinate the group's behavior, it can be argued that followers and the leader will interact more with each other than less effective teams (Kozlowski et al., 2015; Pentland, 2012; Salas et al., 2008). The number of switches between followers and the leader, therefore, seems to be a good predictor for the intensity of interaction showed by the team members. For teams with a low number of switches, the leader will probably behave more common with the traditional leadership approach. The traditional leadership approach, in fact, adopts the follower as docile and passive (Carsten et al., 2010). In contrast with teams showing a higher number of switches, it can be expected that the social interaction between the leader and the followers is on a more equal level. According to some scholars, having an active social interaction with your followers, can have impact on team effectiveness (Meindl, 1995; Meindl et al., 1985; Pentland, 2012). Hence, it is hypothesized that:

Hypothesis 3: *Effective teams will exhibit significantly more switches in their interaction patterns during their regular staff meetings, compared to less effective teams*

The second component of complexity within interaction patterns is the level of the interaction pattern (the number hierarchical levels showed in an interaction pattern, H4). Gersick (1989) pointed out that groups exhibiting an increased level of activity during their work, tended to achieve better overall outcomes than groups not exhibiting this behavior. Building on this assumption, Stachowski et al. (2009) analyzed teams during simulated crises and hypothesized that higher performing teams demonstrated interaction patterns characterized by a higher level of complexity. However, this research did not find a significant relation between the variables. Therefore, Stachowski et al. (2009) concluded that less standardized responses are effective and that team training should emphasized this flexibility. In line with Stachowski et al. (2009), it is stated that higher performing teams followed occurrences with the interaction concerning task prioritization and resource allocation (Waller, 1999). In addition, Waller (1999) found that effective teams did this more quickly than less effective teams. Building on the discussed findings, the interaction of effective teams is considered to be more stable (James & Wooten, 2010; Zellmer-Bruhn et al., 2004; Zijlstra et al., 2012) but less regulated (Stachowski et al., 2009). Hence, the effective teams are expected to show less complex behavioral interactions. Therefore, it can be hypothesized that:

Hypothesis 4: *Effective teams will exhibit significantly simpler (lower-leveled) interaction patterns during their regular staff meetings, compared to less effective teams*

The fifth hypothesis will cover the length of the interaction pattern. LePine (2003) observed a positive relation between role structure adaptation and team decision-making accuracy. This finding is consistent with the idea that increased flexibility is functional (Ilgen et al., 2005). Additional support was provided by the adaptation of follower-oriented leadership (e.g., rotating leadership or follower-centric leadership, e.g., Burke et al., 2006; Carsten et al., 2010) or by equal distribution of voice within a team (Pentland, 2012). In this

case, a follower receives power while the leader loses power at a certain point in time. Hence, it is suggested that effective teams perform greater flexibility by showing less and more simple interaction patterns. Based on previous literature and the same consideration as discussed above, it is hypothesized:

Hypothesis 5: *Effective teams will exhibit significantly shorter interaction patterns during their regular staff meetings, compared to less effective teams*

Qualitative analysis of interaction patterns

Qualitative analysis performed with Theme will focus on the content of the interaction patterns. Every interaction pattern is built upon multiple behaviors. By focusing not only on the quantitative aspects related to team effectiveness but also on the content of the interaction patterns, a conclusion can be drawn about the effectiveness of certain behaviors within interaction patterns. Because taking the nineteen coded behaviors separately would lead to too precise and fewer detected patterns, the behaviors were clustered in five clusters (transactional behavior, transformational behavior, initiating structure, counter-effective behavior and humor) underpinned by academic literature. Firstly, transactional behavior will be discussed.

Previous research focused on the question if performing transactional or transformational behavior is most effective (e.g., Burke et al., 2006; Wang, Oh, Courtright, & Colberg, 2011). Transactional behavior is characterized by the relationship between followers and the leader in order to meet their own self-interest (Bass, 1999; Bass & Avolio, 1995) and is based on three different dimensions namely, contingent reward, active-management-by-exception and passive management-by-exception (Bass, 1985). Contingent reward is the reward followers get after performing according their contract or the leaders' expectations (Bass, 1999). The second dimension is active-management-by-exception in which the leader observes the performance by the followers and acts when the followers fails the appointed standards. The third dimension is passive management-by-exception where the leader waits

for problems caused by the follower before taking any action (Bass, 1999). Following the items which represent these behavioral categories in the MLQ, transactional behavior is considered to consist of: task monitoring; providing negative feedback; and correcting (Bass & Avolio, 1995).

In previous empirical work, some research was performed on the linkage between transactional behavior and team performances (Burke et al., 2006; Pearce & Sims Jr., 2002). It is stated that transactional behavior influence team effectiveness through the impact on effort. Transactional leadership creates a close relation between organizational goals and (individual) rewards. According to Burke et al. (2006), transactional behavior may lead to employees which are motivated to exert an extra effort in their tasks. Thus, it can be stated that transactional behavior can encourage team effectiveness by its effect on team member's motivation. However, Jung and Avolio (2000) stated that employee's motivation can be decreased by the focus on current organizational goals instead of the focus on personal development (as observed by transformational behavior). In addition, previous research found that a potential trap can be social loafing (Erez, LePine, & Elms, 2002). The problem within social loafing is the moment when single team members put more effort in completing their own tasks than the shared team tasks (Karau & Williams, 1993). To reach a higher level of team effectiveness, less social loafing is desired. Finally, transactional behavior is expected to have a negative effect on creativity coming from team members (Bryant, 2003). According to the discussed literature, it is hypothesized:

Hypothesis 6: *Effective teams will exhibit significantly fewer interaction patterns containing transactional behavior, compared to less effective teams*

The second clustered group of behaviors is transformational behavior. Transformational behavior can be described as the leader moving the follower beyond immediate self-interest (Bass, 1985; Burns, 1978). Transformational behavior raises the

follower's level of ideals and its concerns for achievement of goals, well-being of others and the organization (Bass, 1999). Following Bass (1985), transformational behaviors could have large psychological impact on followers and also have more effect than the effect caused by quid-pro-quo transactional leadership. Transformational behavior shapes confidence, encourages team members to raise questions and coaches team members to develop their capabilities (Burns, 1978). Transformational behavior is considered to consist of the following behaviors: providing positive feedback; intellectual stimulation; and individualized consideration (Bass & Avolio, 1995).

According to Bass and Avolio (1990, 1995), leaders who are more transformational and less transactional in their behavior are more satisfying to their followers and more effective than leaders showing more transactional behavior. Previous research found that transformational behavior is more effective than transactional behavior (Bass, 1999; Bass & Avolio, 1995). Also, transformational behavior is expected to let team members intellectually stimulate each other; inspire each other; and let team members identify themselves with common goals (Bass, 1991, 1999). Hence, the next hypothesis is as follows:

Hypothesis 7: *Effective teams will exhibit significantly more interaction patterns containing transformational behavior, compared to less effective teams*

Besides showing transactional or transformational behavior, effective leadership does also require actions like influencing the transformation process; ensuring organizational adaption; and sharing visions (Fleishman et al., 1991). In the previous literature, this is called initiating structure (IS, Hoogeboom & Wilderom, 2015; Judge & Piccolo, 2004). In this research, the following three behaviors are defined as initiating structure: structuring the meeting; informing; and directing.

The fourth group is one single behavior called humor (i.e., making a jokes or another funny behavior). Avolio, Howell, and Sosik (1999) showed the impact of humor on

21

leadership, therefore this behavior was too important to disregard. According to Avolio et al. (1999), humor can create a more amiable atmosphere within transformational leadership. However, humor is not directly related to one of the previously clustered behaviors (Avolio et al., 1999).

The fifth group is counter-effective behavior. Counter-effective behavior can be observed as systematic behavior performed by a person with the goal to violate the legitimate interest of the organization by undermining the goals, tasks or effectiveness (Einarsen, Aasland, & Skogstad, 2007). The coded behaviors are: disagreeing; interrupting; and defending one's own position.

Counter effective behavior, thus, must be observed as negative energy performed by one of the team members. Einarsen et al. (2007) observed that counter-effective behavior contributes to less team effectiveness. Also Aubé and Rousseau (2014) concluded that counterproductive behaviors are negatively related to the team performances. They indicated that counterproductive behaviors within teams shape a collective phenomenon which affect not only team members, but also the functioning and effectiveness of the complete team. Because the leader's behavior is a proximal predictor of team effectiveness (DeRue, Nahrgang, Wellman, & Humphrey, 2011), interaction patterns containing leader's counter-effective behavior are key in the next hypothesis:

Hypothesis 8: *Effective teams will exhibit significantly less interaction patterns containing counter-effective behavior performed by the leader, compared to less effective teams*

Even though it has been stated that the behavior of the leader is a proximal indicator of team effectiveness, the role of the follower must not be underestimated (Howell & Shamir, 2005). As already discussed, within team interaction the role of the follower is considered as important (e.g., Uhl-Bien, 2006). Previous research already focused on the participation of the follower during team interaction. For example, Meindl (1995) suggested that the relationship

between leaders and followers is primarily a constructed relation influenced by inter-follower relationships. In addition, Pentland (2012) argued that a distribution of voice over team members has a positive on team performances. Based on the literature discussed, it may be stated that the participation of followers within team interaction is an important factor for team effectiveness.

Within this study, the participation of followers in team interaction is measured by the occurrence of a follower behavior within an interaction pattern. Table 1 presents interaction patterns that occur in at least 50 percent of the teams. In addition, a distinction was made between the fifteen most and the fifteen least effective teams and the interaction patterns detected within these teams (see Table 2). In order to examine a difference between follower participation within effective teams and less effective teams, the next hypothesis has been stated:

Hypothesis 9: *Effective teams display more follower behavior within their interaction patterns, compared to less effective teams*

The final hypothesis of this study aims to find a moderation effect for the negative hypothesized quantitative variables (H1, H2, H4 and H5). The moderating role of work type was already point of attention in previous research (e.g., LePine, Piccolo, Jackson, Mathieu, & Saul, 2008; Steward & Barrick, 2000). In general, previous scholars argued that a distinction can be made between teams that fulfill their work based on knowledge-intensive work and teams that do not (e.g., Janz, Colquitt & Noe, 1997). In addition, Cross and Cummings (2004) argued that knowledge-intensive work is associated with both networks and social ties.

In accordance to the social network theory, spanning social divides are associated with performance-related outcomes (Cross & Cummings, 2004). It can be concluded that employees working knowledge-intensive, perform, for instance, more social networks which

are associated with team performances (e.g., Cross & Cummings, 2004). Based on the social interaction theories (as discussed before), it could be argued that the negative relation between quantitative variables (H1-H5) and team effectiveness could become positive when the work of the team is knowledge-intensive.

In addition, LePine et al. (2008) argued that teamwork processes have a positive relationship with team performances. The results of their moderator analyses suggested that relationships among teamwork processes and team performance are dependent on task interdependence (LePine et al., 2008). Task interdependence is described as the degree to which team members depend on one another for their efforts, information, and resources (Van de Ven et al., 1976). De Dreu (2007) argued that a collective outcome interdependence is related to higher team effectiveness. Finally, Vandenberg, Richardson, and Eastman (1999) found that work which requires more information and knowledge, will lead to higher team performances. The expected negative relation between the quantitative variables and team effectiveness, may be positively influenced by knowledge-intensive work and, thus, task interdependence.

Within the public organization analyzed for this study, two types of work can be distinguished: procedural-oriented work and knowledge-oriented work. Based on the articles discussed, the knowledge-oriented work type is hypothesized to positively moderate the relation between team effectiveness and quantitative aspects of an interaction pattern. Hence, it is suggested that:

Hypothesis 10: The degree of knowledge intensiveness of a team positively moderates the relation between a team's effectiveness and patterned interaction

Hypothetical model

Before presenting this study's methodology, the hypotheses for this research are summarized below.
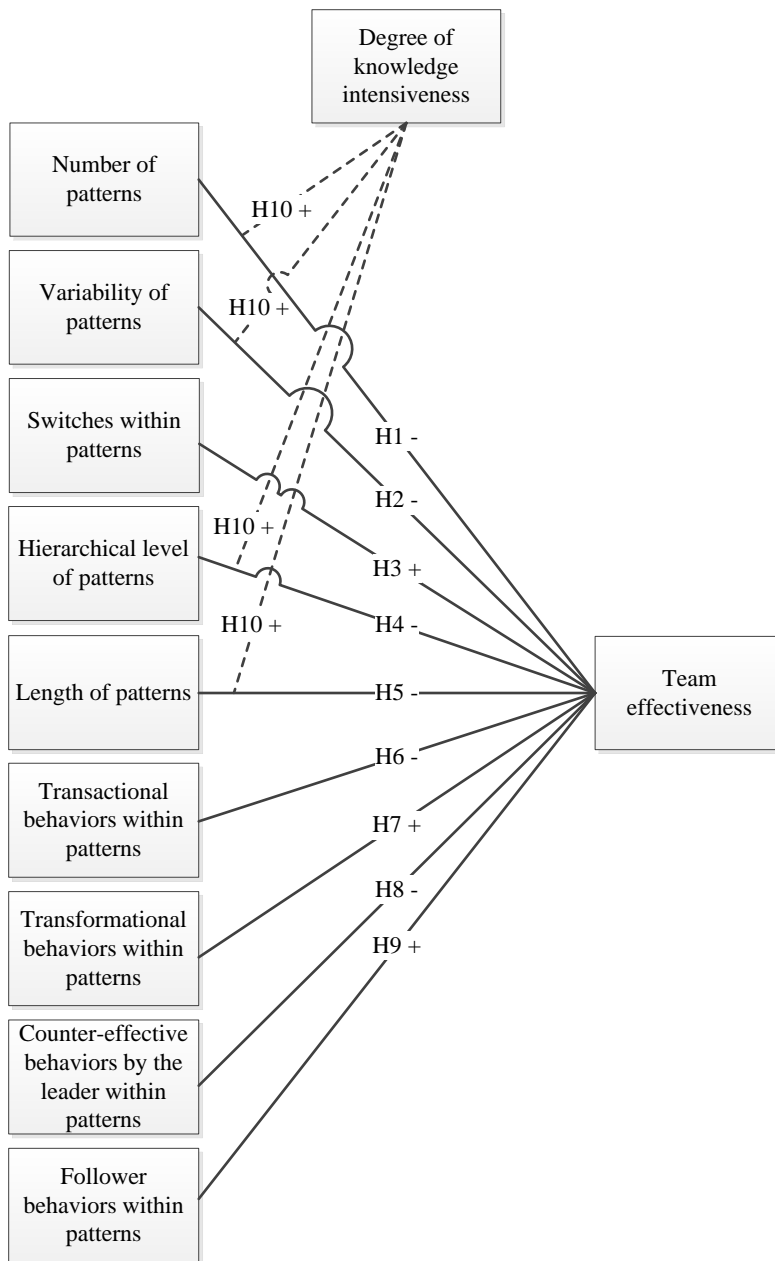
Figure 1 - The hypothetical model of this study (transactional and transformational behavior were measured by

the detection of both leader and follower behaviors)

Methodology

Research design

This study has a cross-sectional design. Such a design is suitable when the data is selected at a single point in time (Gerring, 2001). The context of this study is a large Dutch public-sector organization. It consists of three divisions. With help of a random stratified sample, a similar proportional amount of teams from every division was selected. For this reason, the results might be generalizable over the complete organization. Besides scientific purposes of the collected data, the leaders received a feedback report. This report offers the opportunity to improve one's leadership skills, based on the context-specific study. In this study three different data sources are used. Each of them will be discussed in the next section. By focusing on regular scheduled team meetings, a reliable representation of the day-to-day work behaviors and interactions including leadership behavior was assessed (Uhl-Bien, 2006; Vine et al., 2008).

Methods of data collection

We captured, with a video-recording device, follower and leader behaviors during regularly scheduled staff meetings. In total 111 teams ($N = 111$) were recorded and coded, with a total of 111 leaders, 1445 followers and 9205 minutes of recorded staff meetings. In total 51518 leader behaviors were coded with an average of 464 behaviors per meeting (S.D. = 219), followers showed in total 75990 behaviors with an average of 685 (S.D. = 426) per meeting.

The leaders' demographic details are as follows: in total 74.8% (83 leaders) were male and 25.2% (28 leaders) were female. The leaders have an average age of 51.2 (S.D. = 7.5) and an average employment of 24.3 years (S.D. = 13.5) within the organization and an employment of 2.5 years (S.D. = 3.6) within the team. The educational level of the leader is

distributed as follows: 38.7% of them has a Bachelor's degree from a university of applied sciences, 37.8% a Master degree, 1.8% have PhD level, 1.8% obtained a Bachelor degree at an university, 15.3% was lower educated and 4.5% did not complete this question.

The followers' demographics are as follows: 832 (57.6%) of them are male, 474 (32.8%) are female and 139 (9.6%) did not answer this question. The average age is 49.0 (S.D. = 10.7). The followers worked on average for 23.9 years (S.D. = 13.8) within the organization and for 3.9 (S.D. = 5.1) within their team. Finally the educational level: 43.1% was educated at a lower level, 26.5% got a Bachelor degree on an university of applied sciences, 1.5% completed a Bachelor degree at an university, 14.7% obtained a Master's degree, 1.4% has a PhD level and 12.9% did not complete this survey question.

Coding is processed by the software program called The Observer (Noldus et al., 2000). This software program was mainly developed for the recording of behavioral data in a structural way. For coding the recorded staff meetings, an extensive codebook was developed and tested (Van der Weide, 2007). In total nineteen mutually exclusive behaviors were examined, an overview of the coded behaviors can be found in one of the appendixes. Coders were all university-level students (Bachelor or Master degrees) with a background in business administration, communication science or psychology.

In order to secure the reliability of the coding work, every recorded staff meeting was coded twice. By using the same codebook and a discussion about the disagreements afterwards, a minimum reliability level of 90 percent was required (a two seconds time interval was allowed for agreement). In practice the coded videos had a Kappa of 98%.

To validate the findings of this research, a second validity check was introduced. The survey contained questions to check if the recorded meeting represents the regular staff meeting. In total three questions were posed to check the representativeness of the meeting with a mean of respectively 5.5 (S.D. = 1.4), 5.9 (S.D. = 1.1) and 5.7 (S.D. = 1.2) on a 7-scale

Likert scale (where 1 represents *strongly disagree* and 7 *strongly agree*, questions are attached in the appendixes).

The second data source is an extensive survey. Every team that was recorded, was asked to complete a survey at an individual level. In total the survey contains 149 questions. Most of the questions were related to team effectiveness, work values, team characteristics and demographic details. Survey results were progressed with help from SPSS.

The third data source are the expert scores. The hierarchical leader of the team's leader was asked to complete a survey containing four questions about the relative effectiveness of the team. This survey was completed by the hierarchical leader of the team's leader in order to rule out common-source bias. The answers were given on a scale from one (*very ineffective*) to ten (*very effective*) and were based on the study of Gibson et al. (2009). The questions are attached in the appendixes.

By using multiple data sources, the validity of this research is improved and common-source bias in this study is ruled out (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). In data collection process, the followers were all given a number. This to improve follower's perception of confidential treatment of the data and also to make sure the survey of the follower corresponds with the coded behavior of that follower in The Observer.

Data analysis

Within this research, three data sources were used. Also the analysis were performed in three steps. First of all, the behaviors of leaders and followers were coded in The Observer. The output of The Observer forms the input for the second step in analyzing by using Theme 5.0 (Magnusson, 1996, 2000; hereafter Theme).

Theme is a professional software program for detecting and analyzing hidden patterns in behaviors, an analysis which cannot be performed by the naked eye (Magnusson, 2000). Theme detects patterns by performing analyses of behavioral data. Not only the order of

events in behavior are taken into account but also the hierarchical structure of behavioral events. Magnusson (2000) presented Theme as an unique algorithm that searches for relationships between events in behavioral data; the exact method of pattern detection used by Theme can be found in Appendixes.

Theme was used here to detect behavioral interaction patterns within each team. In order to ensure that the detected interaction patterns are valuable for research, some search criteria must be set. This study used the following search criteria: the significance level is 0.005 and the minimal number of pattern occurrences is three. This is the minimum number of occurrences an interaction pattern must have within one meeting before it is part of the statistical analysis. The last search criteria is the hierarchical level. An one-level interaction pattern is represented by only two behaviors (see Figure 2). In order to overcome an enormous amount of meaningless lower-leveled interaction patterns, the minimal hierarchical level is two.
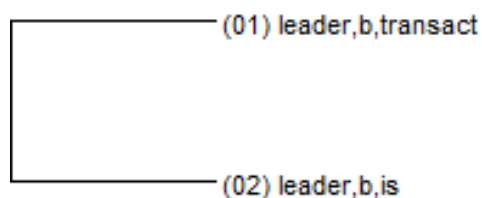
Figure 2 - An one-level interaction pattern

The nineteen coded behaviors were partly grouped into five clusters (transformational behavior; transactional behavior; initiating structure; counter-effective behavior; and humor, as already discussed). Without these clusters, Theme would discover very specific interaction patterns that occur fewer compared to the clustered interaction patterns. This will result in difficulties with performing statistical analysis. For this same reason, the followers of one team were interpreted as one subject. Thus, in total two subjects (the leader and the followers) were distinguished.
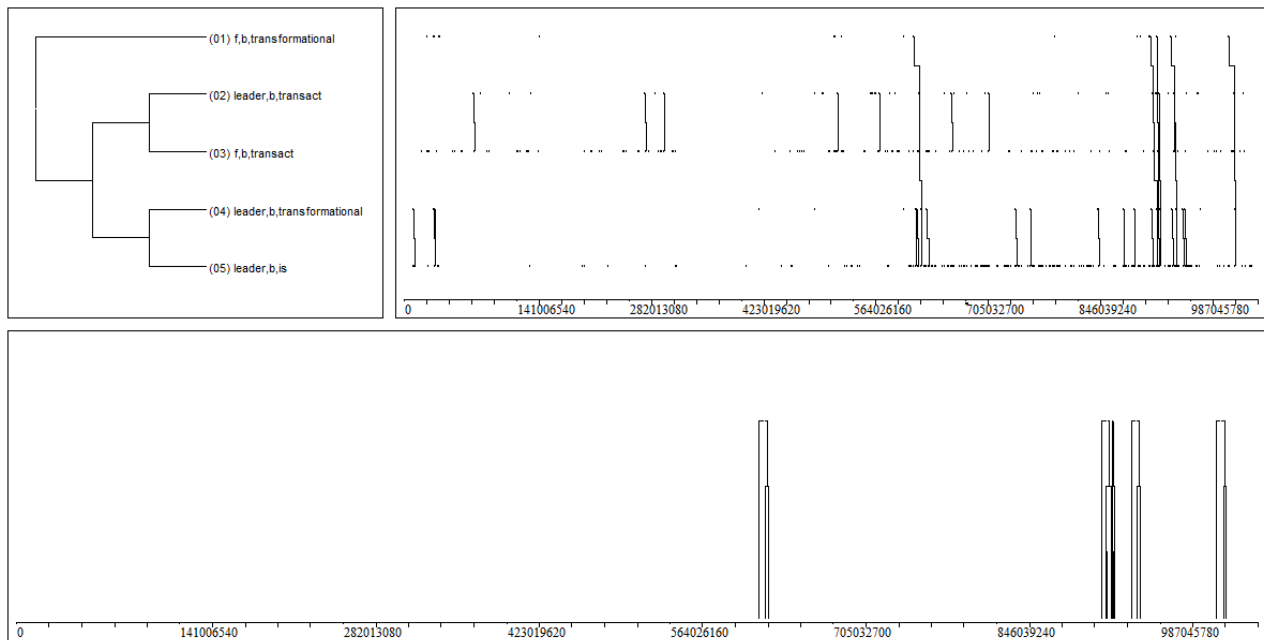
Figure 3 - Screenshot from Theme

Above a screenshot is copied from Theme (Figure 3), consisting of three parts. In the upper small left box, the detected interaction pattern is presented. In the lower box, the occurrences of one interaction pattern is presented on a time scale (in seconds). In this case the interaction pattern is most detected in the final phase of the meeting. Finally, the upper right box presents the pattern occurrences. However, when only a fraction of the interaction pattern is exhibited, this is represented by shorter lines. Thus besides the occurrence of the complete interaction pattern, also fractions of the same interaction patterns were detected.

In the next example (see Figure 4 below), an interaction pattern is displayed. The length of this interaction pattern is five (represented by the numbers between the brackets) and the level of this interaction pattern is three. Level one is presented by the connection between behavior two and three or four and five. Level two is represented by the connection between these four behaviors. The third level is the connection with first behavior (f,b,transformational).
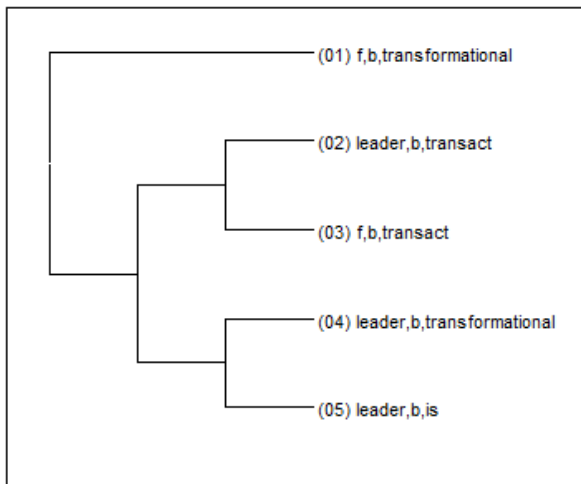
Figure 4 - An example of an interaction pattern (F represents Follower, Transformational represents Transformational behavior, Transact represent Transactional behavior, IS represents Initiating Structure and B represents the beginning of a behavior)

Due to the input restrictions of Theme, it was not possible to perform the qualitative analysis (H6-H8) with 111 teams. Therefore, the sample size for these hypotheses is 98 teams ($N = 98$). The third and final step is analyzing the survey data and the staff's behaviors. The data is analyzed by introducing a mathematical formula in order to secure a normal distribution for the data. The new value is represented by matching a percentile with the standardized outcome. The mean is considered to be zero and the standard deviation is expected to be one (Field, 2013). This formula computes the inverse of the cumulative normal distribution. For the data analysis, a multiple hierarchical regression analysis has been performed. Additional statistics can be found in the appendixes.

In addition, Theme offers a test to check the reliability of the detected interaction patterns. A mean of five randomized data distributions is compared to the actual detected data. A graphical overview of this test, can be found in the appendixes (Figure 8).

Measures

Team effectiveness

First variable to be discussed is team effectiveness. In order to ensure an accurate measure of variables used, only those questions that have previously been used in the literature and are considered as reliable were included. Team effectiveness was measured via the four-item scale developed by Gibson et al. (2009). In this research, a maximum of three hierarchical leaders of the team's leader were asked to rate the effectiveness of the team. The mean of the hierarchical leaders was taken as the indicator for team effectiveness. The reason why the expert rates were selected for measuring team effectiveness is because of ruling out the common source bias and the additional finding that data coming from multiple sources makes the findings more reliable (Podsakoff et al., 2003). The question can be found in the appendixes.

Transformational, transactional and other behavioral patterns

The qualitative pattern analysis resulted in a total of 76 unique interaction patterns. By counting the occurrence of a specific behavior within patterned interaction, an overview of frequent patterned behaviors has been showed. By selecting only the interaction patterns that occur in 50 percent of the teams, a reliable sample of patterns is selected. The number of interaction patterns containing group's transformational behavior, transactional behavior and leader's counter-effective behavior has been used for analysis in this study as well as the behavior of followers within interaction patterns.

Quantitative interaction patterns

The remaining measured variables (the number, the variability, the switches, the level and the length of patterns) are all computed by the algorithm called Theme. The variables discussed, all add a new dimension to the explanation of patterned team interaction in

organizational science. This because Theme offers a method different from, for instance, Markov chains or lag sequential analysis (Magnusson, 2000). Variables were used to get insights in the complexity, number and variability of interaction patterns (Casarrubea et al., 2015; Casarrubea et al., 2014).

Moderation effect

The moderation effect of this research is expected to be caused by the degree of knowledge intensiveness of the team's work. Within the public organization, a distinction was made between procedural- and knowledge-oriented work. The project leader was responsible for the collection of the data regarding the distinction between procedural and knowledge work of the team.

Control variables

To make sure that the proposed outcomes can be attributed to the measured variables, some control variables are included. First of all, team tenure is included as control variable. Some previous scholars argued that teams that work together for a longer time, reach a higher level of team effectiveness (Cohen & Bailey, 1997; Schippers, Den Hartog, Koopman, & Wienk, 2003) or developed more regular stimuli, behaviors, attitudes or patterns (Gersick & Hackman, 1990). Secondly, the average age of the team members was included as a control variable for their potential impact on team effectiveness. The third control variable is gender. The reason that gender and age were selected as control variable is because previous scholars argued that differences in behavior may exist between generational and gender groups (LePine, Hollenbeck, Ilgen, Colquitt, & Ellis, 2002; Van der Vegt & Janssen, 2003).

Meeting time is also considered to have a certain influence on the pattern statistics, a longer meeting can show more interaction patterns because the team members have more time for interactions. Therefore the data for this research were standardized. Standardization for the Theme variables is executed by dividing the shortest meeting time of the sample with the

actual absolute meeting time of the team meeting and multiply this factor with the variable coming from Theme. In order to be as precise as possible, the meeting time in seconds was used.

Results

Table 7, which can be found in the appendixes, presents the means, standard deviations and bivariate correlations between the most important variables of this study. In line with the regression analyses, the relation between the number of interaction patterns ($r=-.201$, p<.05), switches within interaction patterns ($r=-.294$, p<.01), the length of interaction patterns ($r=-.245$, p<.05), and team effectiveness turned out to be negatively supported. The level of interaction patterns ($r=-.232$, p<.05) turned out to be negative while the regression analysis showed a positive relation. No support was found for the variability of interaction patterns ($r=.078$, p>.05), transformational behavior and transactional behavior within interaction patterns ($r=-.068$, p>.05; $r=-.126$, p>.05, respectively). Finally, counter-effective behavior performed by the leader was found negative ($r=-.238$, p<.05) and significant.

As already discussed, within this study a multiple hierarchical regression was used to test the hypotheses (see Table 8). Three control variables (gender, age and team tenure) were added. A significant ANOVA was found ($F(104)=2.171$, p<.05) with an explained variance of .252. The first hypothesis predicted a negative relation between the number of interaction patterns and team effectiveness. As observable in Table 8, the relation between team effectiveness and number of interaction patterns is negative (ß=-.048, p>.05) and the hypothesis was not significantly supported. The second hypothesis expected a negative relation between variability of interaction patterns and team effectiveness. After analyzing, the relation was positive and not significantly supported (ß=.179, p>.05). The third hypothesis was about a positive relation between the number of switches within an interaction pattern and team effectiveness. In contrast with our expectations, this relation was observed to be significantly negative (ß=-.364, p< .05). Hence, it must be concluded that a higher score on team effectiveness is related to less switches within an interaction pattern. The fourth hypothesis discussed the hierarchical level of the interaction pattern. A negative relation

between team effectiveness and the level of an interaction pattern was hypothesized. This negative relation was not found (ß=.979, p>.05). The last hypothesis about quantitative aspects is the negatively hypothesized relation between the length of an interaction pattern and team effectiveness. This relation, indeed, seems to be negative but not significantly supported (ß=-.918, p>.05).

The final part of the first model is the moderation effect (H10, see Table 8). For the number of interaction patterns, the positive relation was found (ß=.186, p>.05, see Figure 6) but not significantly supported. The moderation effect for the variability of interaction patterns was found negative significantly supported (ß=-.272, p<.05, see Figure 7). The third moderation effect, the switches within an interaction pattern, was found positively but not supported (ß=.133, p>.05). The level of an interaction pattern was already found positively. Although the level of an interaction patterns was negatively moderated by the work type (ß =-1.224, p>.05). Finally, the moderation effect of the length of an interaction pattern was positive. However, no significant support was found (ß=1.063, p>.05).

The second model focused on the content of the interaction patterns (H6-H8). A ANOVA was found (F(97)=1.878, p>.05) with an explained variance of .110. A full overview of the regression results can be found in Table 9. The occurrence of transactional behavior within an interaction pattern was expected to be negative related to team effectiveness. This predicted relation, however, turned out to be positive but not significant (ß=.080, p>.05). In contrast, the occurrence of transformational behavior within an interaction pattern was expected to be positively related to team effectiveness. However, the results presented a negative and not significant relation (ß=-.288, p>.05). In accordance with the occurrence of transactional behavior within an interaction pattern, also this hypothesis must be rejected. The eighth hypothesis discussed the negative relation between team effectiveness and the occurrence of counter-effective behavior interaction patterns performed by the leader. In

accordance with the theoretical foundation, this relation was found negative and significantly supported (ß=-.328, p<0.05).

Hypothesis 9 was tested by performing an independent sample T-test. A significant difference was found for the occurrence of followers within interaction patterns for effective teams (Mean = 2.29, S.D. = .76) and less effective teams (Mean = 1.29, S.D. = .76), t(12)=2.48, p<.05. For analyzing this hypothesis, the focus was on the fifteen most detected interaction patterns within both the fifteen most effective and the fifteen least effective teams.

Discussion

The main objective of this study was to gain a detailed understanding of how effective teams structure their interaction in a day-to-day work setting. In general, it can be stated that 'less is more'. Based on the results presented in the previous chapter, it is advised to use less complex, more diverse and fewer interaction patterns. Also interaction patterns performed by the followers are considered to be more effective.

The method selected to carry out this study is a relatively unique one. In the first place, fine-grained analyses of video-based leader and follower behaviors captured during 111 regular scheduled staff meetings were used. Secondly, the observed behaviors were analyzed with the unique algorithm called Theme. Results from T-pattern analyses are key for this study. The first set of hypotheses focused on team effectiveness in relation with quantitative variables (e.g., the number and the level of the interaction patterns).

Firstly, our regression results showed that the number of interaction patterns and the length of interaction patterns were negatively related to team effectiveness. Unexpected was the positive relation of the variability of interaction patterns. Hence it is concluded that although a negative relation between the number of interaction patterns and team effectiveness, more unique interaction patterns contribute to team effectiveness. It may be the case that more uniqueness of the interaction patterns is caused by the routine setting of this study. Previous research focused on crises situations or simulations where fast, urgent and ad-hoc decisions in unknown situations were studied (e.g., Zijlstra et al., 2012; Waller, 1999).

Previous scholars (e.g., Janz et al., 1997) already found support for a distinction between knowledge and non-knowledge-intensive work. Also differences between routine and non-routine work has been observed in previous research (e.g., Stachowski et al., 2009). In order to test the influence of work type on patterned interaction, this study tested a moderation effect. The moderation effect of this study tested the effect of knowledge-

intensive work between team effectiveness and the quantitative aspects of patterned interaction.

The expected moderation effect had a positive effect on the number of interaction patterns, the length of interaction patterns, and the number of switches within interaction patterns. Even though this effect was not significant. However, a negative relation was found for the level of interaction patterns and the variability of interaction patterns. For this reason, it is expected that effective knowledge-intensive teams are more beneficial by less complex and more stable interaction patterns.

Another potential reason to explain the uniqueness of interaction patterns is the relation to the switches within interaction patterns (r=.328, p<.01). Based on this strong relation, it can be assumed that interaction patterns performed by the leader or the follower (i.e., an interaction pattern without switches) are more effective than an interaction pattern consisting of social interaction with team members. Interaction patterns displayed by one subject are expected to be more unique, since both variables are strongly inter-related and supported by the results of hypothesis 9. Here the occurrence of follower behavior (and thus an interaction pattern completely performed by the follower) is positively related to team effectiveness.

Subsequently, Zijlstra et al. (2012) observed that effective teams perform more simple interaction patterns, compared to less effective teams. This is in line with the finding that more simple interaction patterns can contain less switches than complex interaction patterns. The length of interaction patterns was found negatively related towards team effectiveness while the level of interaction patterns was found to be positive. This positive relation was not expected but one can argue that higher-leveled interaction is an indication of developed regularities within the team more than inter-team flexibility. Earlier research into the topic of interaction patterns found that team effectiveness is (also) characterized by stable interaction

(e.g., Zellmer-Bruhn et al., 2004). Hence, higher-leveled interaction can be observed as a habitual developed routine for effective teams.

Besides to the quantitative aspects, the focus within this study was also on the content of the interaction patterns. The hypotheses about both transformational and transactional displayed behavior were not significantly supported and offered no renewed insights in literature. Nevertheless, counter-effective behavior performed by the leader is considered to be a proximal indicator for team effectiveness.

As proposed in the theoretical foundation, the linkage between social interaction and team effectiveness was observed as positive in previous research (Pentland, 2012; Uhl-Bien, 2006). This study showed that follower contributions to team interactions are more effective than contributions of the leader. In addition, by analyzing the fifteen most detected interaction patterns (Table 2), it can be concluded that most of the interaction patterns are performed by both effective and less effective teams. Seven interaction patterns were observed to be different when taking into account the fifteen most detected patterns of both groups. Hence, it can be concluded that some patterned interaction might be needed for common purposes (i.e., starting or structuring the meeting) and do not contribute to or affect a team's effectiveness. This could be a potential question for further research.

Strengths, weaknesses and future research

Strength is the combination of both quantitative and qualitative analysis by using Theme. Also previous research focused on the early interaction (Zijlstra et al., 2012), simulated data (Waller, 1999), crises (Stachowski et al., 2009), or sports (Jonsson et al., 2006), the focus on routinely and complete team interactions remained unstudied. In addition, this study used a relatively large and reliable sample ($N = 111$).

Although the method of this study was designed with caution, some methodological weaknesses can be mentioned. An example is the weakness that teams were analyzed at one point in time. Therefore it is impossible to perform an analysis about the causal links between the different variables. For this reason, it would be valuable to perform a comparable study with measurement of multiple similar meetings over the same teams. Secondly, Theme analyses were performed with two subjects (leader and follower). As already discussed, this to overcome the detection of fewer and meaningless interaction patterns. However, this choice did not offer the possibility to perform an analysis on team member level.

Each of the 111 teams in this study is part of a large Dutch public organization. Previous scholars found differences between private- and public-sector organizational contexts. Especially the differences related to the behavior showed by the leader were examined by previous research (e.g., Andersen, 2010). Therefore, it might be questioned to what extent the findings of this study are generalizable to private organizations. A public organization, often in combination with many hierarchical levels, can offer more clear insights about effective leaders since factors like rotating leadership and equal voice distribution are less present (Collinson, 2006). Ideally, future research must sample an equal and balanced combination of private and public teams. Also, examining the behavioral regularities within a greater varieties of teams such as project teams (e.g., Cohen & Bailey, 1997) or the growing number of virtual teams (Bell & Kozlowski, 2002) may be interesting

for further research.

Based on the result that followers are considered to have a large influence on team effectiveness, a more in-depth assessment of follower behavior is important to enhance team effectiveness. Besides this, the traditional approach of leadership, once again, has been rejected.

Practical implications

The focus on team interaction in combination with team effectiveness is important because of the growing number of work teams within organizations (e.g., Zaccaro & Bader, 2003). As a consequence, also the number of organizational staff meetings has increased and meetings became an integral part of working life (e.g., Rogelberg et al., 2006). Together with the increasing number of organizational staff meetings, meeting costs are growing. Especially when meetings are not structured effectively. This study added new insights about effective patterned interaction, valuable insights that can be used for training as well as for organizational purposes (i.e., improving effective interaction and behaviors).

Effective patterned interaction, as found by this study, can be a basis for change of behavioral habits of managers. An example is the negative relation between the length of interaction patterns and team effectiveness. For instance, providing a more detailed and strict agenda offers less room for improvisation or ambiguity and, thus, potentially shorter interaction patterns.

Because the role of the follower in social interaction has been observed as important, the focus must be not primary on the leader but also on the follower. Understanding them is as important as understanding leaders (Howell & Shamir, 2005). For decades, previous literature accepted the believe that team effectiveness is especially influenced by the leader. However, the role of the follower within the social interaction is found to be important. Therefore, the key to organizational success is to focus especially on the follower and by taking into account the development of the follower besides the multiple leader development programs.

Finally, leaders should be made more aware of the influence from their behavioral patterns to team effectiveness (e.g., through leadership training or HRD). Surely, leaders should be trained to show less negatively oriented behavior. As a recommendation for team leaders, this research advised that 'less is more'. Based on the results presented in this study,

it is advised to use less complex, more diverse and fewer interaction patterns. Also providing

more space to followers within social interaction is recommended.

Conclusion

This paper offers new insights into the management literature by offering new insights in the effective structure of regular scheduled staff meetings within a large Dutch public organization. It was demonstrated that effective teams exhibit shorter and more simple interaction patterns while focusing on the content of an interaction patterns offers a new way of analyzing. Support was found for the role of counter-effective behavior in combination with team effectiveness. This is a contribution that might be important for further research. Finally, also a moderating effect caused by the team's work type was found.

The majority of the leadership literature focuses on the leader, this study found that the followers in a team play an important role in team interaction and performances. For this reason, followers cannot be longer ignored in leadership studies. Thus, the statistical evidence reported in this paper and the relatively distinctive methodology, offers multiple opportunities for further research on the dynamic interactions and behavioral patterns, and their effects of both leaders and followers. Finally, from an academic point of view, the method performed could be introduced in multiple (behavioral) disciplines and in various settings and preferably in a private organizational setting in order to test the generalizability of the results reported herein.

Acknowledgements

References

Allen, J. A., & Rogelberg, S. G. (2013). Manager-led group meetings: A context for promoting employee engagement. *Group & Organization Management, 38*(5), 543-569. doi:10.1177/1059601113503040

Andersen, J. A. (2010). Public versus private managers: How public and private managers differ in leadership behavior. *Public Administration Review, 70*(1), 131-141. doi:10.1111/j.1540-6210.2009.02117.x

Aubé, C., & Rousseau, V. (2014). Counterproductive behaviors: Group phenomena with team-level consequences. *Team Performance Management, 20*(5/6), 202-220. doi:10.1108/tpm-05-2013-0014

Avolio, B. J., Howell, J. M., & Sosik, J. J. (1999). A funny thing happened on the way to the bottem line: Humor as a moderator of leadership style effects. *Academy of Management Journal, 42*(2), 219-227. doi:10.2307/257094

Bass, B. M. (1985). *Leadership and performance beyond expectations*. New York: The Free Press.

Bass, B. M. (1991). From transactional to transformational leadership: Learning to share the vision. *Organizational Dynamics, 18*(3), 19-31. doi:10.1016/0090-2616(90)90061-s

Bass, B. M. (1999). Two decades of research and development in transformational leadership. *European Journal of Work and Organizational Psychology, 8*(1), 9-32. doi:10.1080/135943299398410

Bass, B. M., & Avolio, B. J. (1990). *Transformational leadership development: Manual for the multifactor leadership questionnaire*. Sunnyvale, CA: Consulting Psychologists Press.

Bass, B. M., & Avolio, B. J. (1995). *MLQ multifactor leadership questionnaire*. Redwood City: Mind Garden.

Bell, B. S., & Kozlowski, S. W. J. (2002). A typology of virtual teams implications for effective leadership. *Group & Organization Management, 27*(1), 14-49. doi:10.1177/1059601102027001003

Bryant, S. E. (2003). The role of transformational and transactional leadership in creating, sharing and exploiting organizational knowledge. *Journal of Leadership & Organizational Studies, 9*(4), 32-44. doi:10.1177/107179190300900403

Burke, C. S., Fiore, S. M., & Salas, E. (2003). The role of shared cognition in enabling shared leadership and adaptability. In C. L. Pearce & J. A. Conger (Eds.), *Shared leadership: Reframing the hows and whys of leadership* (pp. 103-122). Thousand Oaks, CA: Sage.

Burke, C. S., Stagl, K. C., Klein, C., Goodwin, G. F., Salas, E., & Halpin, S. M. (2006). What type of leadership behaviors are functional in teams? A meta-analysis. *The Leadership Quarterly, 17*(3), 288-307. doi:10.1016/j.leaqua.2006.02.007

Burns, J. M. (1978). *Leadership*. New York: Harper & Row.

Carsten, M. K., Uhl-Bien, M., West, B. J., Patera, J. L., & McGregor, R. (2010). Exploring social constructions of followership: A qualitative study. *The Leadership Quarterly, 21*(3), 543-562. doi:10.1016/j.leaqua.2010.03.015

Casarrubea, M., Jonsson, G. K., Faulisi, F., Sorbera, F., Di Giovanni, G., Benigno, A., . . . Magnusson, M. S. (2015). T-pattern analysis for the study of temporal structure of animal and human behavior: A comprehensive review. *Journal of Neuroscience Methods, 239*, 34-46. doi:10.1016/j.jneumeth.2014.09.024

Casarrubea, M., Magnusson, M. S., Roy, V., Arabo, A., Sorbera, F., Santangelo, A., . . . Crescimanno, G. (2014). Multivariate temporal pattern analysis applied to the study of rat behavior in the elevated plus maze: Methodological and conceptual highlights. *Journal of Neuroscience Methods, 234*, 116-126. doi:10.1016/j.jneumeth.2014.06.009

Cohen, S. G., & Bailey, D. E. (1997). What makes team work: Group effectiveness research from the shop floor to the executive suite. *Journal of Management, 23*(3), 464-476. doi:10.1177/014920639702300303

Collinson, D. (2006). Rethinking followership: A post-structuralist analysis of follower identities. *The Leadership Quarterly, 17*(2), 179-189. doi:10.1016/j.leaqua.2005.12.005

Cross, R., & Cummings, J. N. (2004). Tie and network correlates of individual performance in knowledge-intensive work. *Academy of Management Journal, 47*(6), 928-937. doi:10.2307/20159632

De Dreu, C. K. W. (2007). Cooperative outcome interdependence, task reflexivity, and team effectiveness: A motivated information processing perspective. *Journal of Applied Psychology, 92*(3), 628-638. doi:10.1037/0021-9010.92.3.628

DeRue, D. S., & Ashford, S. J. (2010). Who will lead and who will follow? A social process of leadership identity construction in organizations. *Academy of Management Review, 35*(4), 627-647. doi:10.5465/amr.2010.53503267

DeRue, D. S., Nahrgang, J. D., Wellman, N. E. D., & Humphrey, S. E. (2011). Trait and behavioral theories of leadership: An integration and meta-analytic test of their relative validity. *Personnel Psychology, 64*(1), 7-52. doi:10.1111/j.1744-6570.2010.01201.x

Einarsen, S., Aasland, M. S., & Skogstad, A. (2007). Destructive leadership behaviour: A definition and conceptual model. *The Leadership Quarterly, 18*(3), 207-216. doi:10.1016/j.leaqua.2007.03.002

Erez, A., LePine, J. A., & Elms, H. (2002). Effects of rotated leadership and peer evaluation on the functioning and effectiveness of self-managed teams: A quasi-experiment. *Personnel Psychology, 55*(4), 929-948. doi:10.1111/j.1744-6570.2002.tb00135.x

Fairhurst, G. T. (2007). *Discursive leadership: In conversation with leadership psychology*. Thousand Oaks, CA: Sage.

Fairhurst, G. T., & Uhl-Bien, M. (2012). Organizational discourse analysis (ODA): Examining leadership as a relational process. *The Leadership Quarterly, 23*(6), 1043-1062. doi:10.1016/j.leaqua.2012.10.005

Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. London: Sage publications.

Fleishman, E. A., Mumford, M. D., Zaccaro, S. J., Levin, K. Y., Korotkin, A. L., & Hein, M. B. (1991). Taxonomic efforts in the description of leader behavior: A synthesis and functional interpretation. *The Leadership Quarterly, 2*(4), 245-287. doi:10.1016/1048-9843(91)90016-u

Gerring, J. (2001). *Social science methodology: A criterial framework*. Cambridge: Cambridge University Press.

Gersick, C. J. G. (1989). Marking time: Predictable transitions in task groups. *Academy of Management Journal, 32*(2), 274-309. doi:10.2307/256363

Gersick, C. J. G., & Hackman, R. (1990). Habitual routines in task-performing groups. *Organizational Behavior and Human Decision Processes, 47*(1), 65-97. doi:10.1016/0749-5978(90)90047-d

Gerstner, C. R., & Day, D. V. (1997). Meta-analytic review of leader-member exchange theory: Correlates and construct issues. *Journal of Applied Psychology, 82*(6), 827-844. doi:10.1037/0021-9010.82.6.827

Gibson, C. B., Cooper, C. D., & Conger, J. A. (2009). Do you see what we see? The complex effects of perceptual distance between leaders and teams. *Journal of Applied Psychology, 94*(1), 62-76. doi:10.1037/a0013073

Ginnett, R. C. (1987). The formation process of airline crews. In R. S. Jensen (Ed.), *Proceedings* (pp. 399-405). Columbus, OH: Ohio State University Press.

Graen, G. B., & Uhl-Bien, M. (1995). Relationship-based approach to leadership: Development of leader-member exchange (LMX) theory of leadership over 25 Years: Applying a multi-level multi-domain perspective *The Leadership Quarterly, 6*(2), 219-247. doi:10.1016/1048-9843(95)90036-5

Hackman, J. R. (1987). The design of work teams. In J. Lorsch (Ed.), *Handbook of Organizational Behavior* (pp. 315-342). Englewood Cliffs, NJ: Prentice-Hall.

Hoogeboom, A. M. G. M., & Wilderom, C. P. M. (2015). *Integrating two leadership models: Augmentation effects with initiating structure*. Paper presented at the 75th Annual Academy of Management Conference, Vancouver, British Columbia.

Howell, J. M., & Shamir, B. (2005). The role of followers in the charistmatic leadership process: Relationships and their consequences. *Academy of Management Journal, 30*(1), 96-112. doi:10.5465/amr.2005.15281435

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*(1), 517-543. doi:10.1146/annurev.psych.56.091103.070250

James, E. H., & Wooten, L. P. (2010). *Leading under pressure*. New York, NY: Routledge.

Janz, B. D., Colquitt, J. A., & Noe, R. A. (1997). Knowledge worker team effectiveness: The role of autonomy, interdependence, team development, and contextual support variables. *Personnel Psychology, 50*(4), 877-904. doi:10.1111/j.1744-6570.1997.tb01486.x

Jonsson, G. K., Enguera, M., Blanco-Villasenor, A., Losada, J., Hernandez-Mendo, A., Arda, T., . . . Castellano, J. (2006). Hidden patterns of play interaction in soccer using SOF.CODER. *Behavior Research Methods, 38*(3), 372-381. doi:10.3758/bf03192790

Judge, T. A., & Piccolo, R. F. (2004). Transformational and transactional leadership: A meta-analytic test of their relative validity. *Journal of Applied Psychology, 89*(5), 755-768. doi:10.1037/0021-9010.89.5.755

Jung, D. I., & Avolio, B. J. (2000). Opening the black box: An experimental investigation of the mediating effects of trust and value congruence on transformational and transactional leadership. *Journal of Organizational Behavior, 21*(8), 949-964. doi:10.1002/1099-1379(200012)

Kanki, B. G., Folk, V. G., & Irwin, C. M. (1991). Communication variations and aircrew performance. *International Journal of Aviation Psychology, 1*(2), 149-162. doi:10.1207/s15327108ijap0102_5

Karau, S. J., & Williams, K. D. (1993). Social loafing: A meta-analytic review and theoretical integration. *Journal of Personality and Social Psychology, 65*(4), 681-706. doi:10.1037/0022-3514.65.4.681

Kauffeld, S., & Meyers, R. A. (2009). Complaint and solution-oriented circles: Interaction patterns in work group discussions. *European Journal of Work and Organizational Psychology, 18*(3), 267-294. doi:10.1080/13594320701693209

Kean, S., Haycock-Stuart, E., Baggaley, S., & Carson, M. (2011). Followers and the co-construction of leadership. *Journal of Nursing Management, 19*(4), 507-516. doi:10.1111/j.1365-2834.2011.01227.x

Kelley, R. E. (1988). In praise of followers. *Harvard Business Review, 66*(6), 141-148.

Kolbe, M., Grote, G., Waller, M. J., Wacker, J., Grande, B., Burtscher, M. J., & Spahn, D. R. (2014). Monitoring and talking to the room: Autochthonous coordination patterns in team interaction and performance. *Journal of Applied Psychology, 99*(6), 1254-1267. doi:10.1037/a0037877

Kolbe, M., Künzle, B., Zala-Mezö, E., Burtscher, M. J., Wacker, J., Spahn, D. R., & Grote, G. (2010). The functions of team monitoring and 'talking to the room' for performance in anesthesia teams. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 54*(12), 857-861. doi:10.1177/154193121005401211

Kozlowski, S. W. J., Chao, G. T., Grand, J. A., Braun, M. T., & Kuljanin, G. (2013). Advancing multilevel research design: Capturing the dynamics of emergence. *Organizational Research Methods, 16*(4), 581-615. doi:10.1177/1094428113493119

Kozlowski, S. W. J., Grand, J. A., Baard, S. K., & Pearce, M. (2015). Teams, teamwork, and team effectiveness: Implications for human systems integration. In D. Boehm-Davis, F. Durso, & J. Lee (Eds.), *The handbook of human systems integration*. Washington, DC: APA.

Kozlowski, S. W. J., & Ilgen, D. R. (2006). Enhancing the effectiveness of work groups and teams. *Psychological Science in the Public Interest, 7*(3), 77-124. doi:10.1111/j.1529-1006.2006.00030.x

Kozlowski, S. W. J., & Klein, K. J. (2000). A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes. In S. W. J. Kozlowski & K. J. Klein (Eds.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions* (pp. 3-90). San Francisco, CA: Jossey-Bass.

Leach, D. J., Rogelberg, S. G., Warr, P. B., & Burnfield, J. L. (2009). Perceived meeting effectiveness: The role of design characteristics. *Journal of Business and Psychology, 24*(1), 65-76. doi:10.1007/s10869-009-9092-6

Lehmann-Willenbrock, N., & Allen, J. A. (2014). How fun are your meetings? Investigating the relationship between humor patterns in team interactions and team performance. *Journal of Applied Psychology, 99*(6), 1278-1287. doi:10.1037/a0038083

Lehmann-Willenbrock, N., Allen, J. A., & Kauffeld, S. (2013). A sequential analysis of procedural meeting communication: How teams facilitate their meetings. *Jounal of Applied Communication Research, 41*(4), 365-388. doi:10.1080/00909882.2013.844847

Lehmann-Willenbrock, N., Allen, J. A., & Meinecke, A. L. (2014). Observing culture: Differences in U.S.-American and German team meeting behaviors. *Group Processes & Intergroup Relations, 17*(2), 252-271. doi:10.1177/1368430213497066

Lehmann-Willenbrock, N., Chiu, M. M., Lei, Z., & Kauffeld, S. (2013). The upward spirals in team processes: Examining dynamic positivity in problem solving teams. *ESMT Working Paper, 13*(2), 4-49. doi:10.2139/ssrn.2211426

Lehmann-Willenbrock, N., Chiu, M. M., Lei, Z., & Kauffeld, S. (2016). Understanding positivity within dynamic team interactions: A statistical discourse analysis. *Group & Organization Management, 2*, 1-40. doi:10.1177/1059601116628720

Lehmann-Willenbrock, N., Meinecke, A. L., Rowold, J., & Kauffeld, S. (2015). How transformational leadership works during team interactions: A behavioral process analysis. *The Leadership Quarterly, 26*(6), 1017-1033. doi:10.1016/j.leaqua.2015.07.003

Lehmann-Willenbrock, N., Meyers, R. A., Kauffeld, S., Neininger, A., & Henschel, A. (2011). Verbal interaction sequences and group mood exploring the role of team planning communication. *Small Group Research, 42*(6), 639-668. doi:10.1177/1046496411398397

LePine, J. A. (2003). Team adaptation and postchange performance: Effects of team composition in terms of members' cognitive ability and personality. *Journal of Applied Psychology, 88*(1), 27-39. doi:10.1037/0021-9010.88.1.27

LePine, J. A., Hollenbeck, J. R., Ilgen, D. R., Colquitt, J. A., & Ellis, A. (2002). Gender Composition, Situational Strength, and Team Decision-Making Accuracy: A Criterion Decomposition Approach. *Organizational Behavior and Human Decision Processes, 88*(1), 445-475. doi:10.1006/obhd.2001.2986

LePine, J. A., Piccolo, R. F., Jackson, C. L., Mathieu, J. E., & Saul, J. R. (2008). A meta-analysis of teamwork processes: Tests of a multidimensional model and relationships with team effectiveness criteria. *Personnel Psychology, 61*, 273-307. doi:10.1111/j.1744-6570.2008.00114.x

Liden, R. C., Wayne, S. J., & Stilwell, D. (1993). A longitudinal study on the early development of leader-member exchanges. *Journal of Applied Psychology, 78*(4), 662-674. doi:10.1037/0021-9010.78.4.662

Magnusson, M. S. (1996). Hidden real-time patterns in intra-and inter-individual behavior: Description and detection. *European Journal of Psychological Assessment, 12*(2), 112-123. doi:10.1027/1015-5759.12.2.112

Magnusson, M. S. (2000). Discovering hidden time patterns in behavior: T-patterns and their detection. *Behavior Research Methods, Instruments, & Computers, 32*(1), 93-110. doi:10.3758/bf03200792

Magnusson, M. S., Burfield, I., Loijens, L., Grieco, F., Jonsson, G. K., & Spink, A. (2004). *Theme: Powerful tool for detection and analysis of hidden patterns in behavior. Reference manual, Version 5.0*. Wageningen, The Netherlands: Noldus Information Technology bv.

Marks, M. A., Mathieu, J. E., & Zaccaro, S. J. (2001). A temporally based framework and taxonomy of team processes. *Academy of Management Journal, 26*(3), 356-376. doi:10.5465/amr.2001.4845785

Mathieu, J. E., Maynard, M. T., Rapp, T., & Gilson, L. (2008). Team effectiveness 1997-2007: A review of recent advancements and a glimpse into the future. *Journal of Management, 34*(3), 410-476. doi:10.1177/0149206308316061

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

Meindl, J. R. (1990). On leadership: An alternative to the conventional wisdom. In B. M. Staw & L. L. Cummings (Eds.), *Research in organizational behavior* (pp. 159-203). Greenwich, CT: JAI Press.

Meindl, J. R. (1995). The romance of leadership as a follower-centric theory: A social constructionist approach. *The Leadership Quarterly, 6*(3), 329-341. doi:10.1016/1048-9843(95)90012-8

Meindl, J. R., Ehrlich, S. B., & Dukerich, J. M. (1985). The romance of leadership. *Administrative Science Quarterly, 30*(1), 78-102. doi:10.2307/2392813

Mohrman, S. A., Cohen, S. G., & Mohrman, A. M. (1995). *Designing team-based organizations*. San Francisco: Jossey-Bass.

Mullen, B., Salas, E., & Driskell, J. E. (1989). Salience, motivation, and artifact as contributions to the relation between participation rate and leadership. *Journal of Experimental Social Psychology, 25*(6), 545-559. doi:10.1016/0022-1031(89)90005-x

Noldus, L. P., Trienes, R. J., Hendriksen, A. H., Jansen, H., & Jansen, R. G. (2000). The Observer Video-Pro: New software for the collection, management, and presentation of time-structured data from videotapes and digital media files. *Behavior Research Methods, Instruments, & Computers, 32*(1), 197-206. doi:10.3758/bf03200802

Oc, B., & Bashshur, M. R. (2013). Followership, leadership and social influence. *The Leadership Quarterly, 24*(6), 919-934. doi:10.1016/j.leaqua.2013.10.006

Pearce, C. L., & Sims Jr., H. P. (2002). Vertical versus shared leadership as predictors of the effectiveness of change management teams: An examination of aversive, directive, transactional, transformational, and empowering leader behaviors. *Group Dynamics: Theory, Research, and Practice, 6*(2), 172-197. doi:10.1037/1089-2699.6.2.172

Pentland, A. (2012). The new science of building great teams. *Harvard Business Review, 90*(4), 60-69.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879-903. doi:10.1037/0021-9010.88.5.879

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*(1), 86-96. doi:10.1037/0021-9010.91.1.83

Rogelberg, S. G., Scott, C., & Kello, J. (2007). The science and fiction of meetings. *MIT Sloan Management Review, 48*(2), 18-22.

Rogelberg, S. G., Shanock, L. R., & Scott, C. W. (2011). Wasted time and money in meetings: Increasing return on investment. *Small Group Research, 43*(2), 236-245. doi:10.1177/1046496411429170

Romano, N. C., & Nunamaker, J. F. (2001). *Meeting analysis: Findings from research and practice*. Paper presented at the 34th Annual Hawai International Conference on System Sciences, Maui.

Salas, E., Cooke, N. J., & Rosen, M. A. (2008). On teams, teamwork, and team performance: Discoveries and developments. *Human Factors, 50*(3), 540-547. doi:10.1518/001872008x288457

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*(6), 779-802. doi:10.1002/job.220

Shamir, B. (2007). From passive recipients to active co-producers: Followers' roles in the leadership process. In B. Shamir, R. Pillai, M. Bligh, & M. Uhl-Bien (Eds.), *Follower-centered perspectives on leadership: A tribute to the memory of James R. Meindl* (pp. 9-39). Stamford, CT: Information Age Publishing.

Stachowski, A. A., Kaplan, S. A., & Waller, M. J. (2009). The benefits of flexible team interaction during crises. *Journal of Applied Psychology, 94*(6), 1536-1543. doi:10.1037/a0016903

Stasser, G., & Taylor, L. A. (1991). Speaking turns in face-to-face discussions. *Journal of Personality and Social Psychology, 60*(5), 675-684. doi:10.1037/0022-3514.60.5.675

Stewart, G. L., & Barrick, M. R. (2000). Team structure and performance: Assessing the mediating role of intrateam process and the moderating role of task type. *Academy of Management Journal, 43*(2), 135-148. doi:10.2307/1556372

Svennevig, J. (2008). Exploring leadership conversations. *Management Communication Quarterly, 21*(4), 529-536. doi:10.1177/0893318907313717

Uhl-Bien, M. (2006). Relational leadership theory: Exploring the social processes of leadership and organizing. *The Leadership Quarterly, 17*(6), 654-676. doi:10.1016/j.leaqua.2006.10.007

Van de Ven, A. H., Delbecq, A. L., & Koenig, R. J. (1976). Determinants of coordination modes within organizations. *American Sociological Review, 41*, 322-338. doi:10.2307/2094477

Van der Vegt, G. S., & Janssen, O. (2003). Joint impact of interdependence and group diversity on innovation. *Journal of Management, 29*(5), 729-751. doi:10.1016/s0149-2063_03_00033-3

Van der Weide, J. G. (2007). *An explorative video-study of the behaviors of effective middle managers, unpublished doctoral dissertation.* University of Tilburg, the Netherlands.

Vandenberg, R. J., Richardson, H. A., & Eastman, L. J. (1999). The impact of high involvement work processes on organizational effectiveness: A second-order latent variable approach. *Group & Organization Management, 24*(3), 300-339. doi:10.1177/1059601199243004

Vine, B., Holmes, J., Marra, M., Pfeifer, D., & Jackson, B. (2008). Exploring co-leadership talk through interactional sociolinguistics. *Leadership, 4*(3), 339-350. doi:10.1177/1742715008092389

Wageman, R. (1995). Interdependence and group effectiveness. *Administrative Science Quarterly, 40*(1), 145-180. doi:10.2307/2393703

Waller, M. J. (1999). The timing of adaptive group responses to non-routine events. *Academy of Management Journal, 42*(2), 127-137. doi:10.2307/257088

Wang, G., Oh, I., Courtright, S. H., & Colbert, A. E. (2011). Transformational Leadership and Performance Across Criteria and Levels: A Meta-Analytic Review of 25 Years of Research. *Group & Organization Management, 36*(2), 223-270. doi:10.1177/1059601111401017

Zaccaro, S. J., & Bader, P. (2003). E-leadership and the challenges of leading e-teams: Minimizing the bad and maximizing the good. *Organizational Dynamics, 31*(4), 377-387. doi:10.1016/s0090-2616(02)00129-8

Zaccaro, S. J., Rittman, A. L., & Marks, M. A. (2001). Team leadership. *The Leadership Quarterly, 12*(4), 451-483. doi:10.1016/s1048-9843(01)00093-5

Zellmer-Bruhn, M., Waller, M. J., & Ancona, D. (2004). The effect of temporal entrainment on the ability of teams to change their routines. In S. Blount (Ed.), *Research on managing groups and teams* (pp. 135-158). Oxford, UK: Elsevier.

Zijlstra, F. R. H., Waller, M. J., & Phillips, S. I. (2012). Setting the tone: Early interaction patterns in swift-starting teams as a predictor of effectiveness. *European Journal of Work and Organizational Psychology, 21*(5), 749-777. doi:10.1080/1359432x.2012.690399

Appendixes

Appendixes consist of I) interaction patterns observed by content analysis, II) survey questions used for this study, III) definitions and examples of the coded behaviors, IV) summary of articles about patterned interaction, V) descriptive statistics and bivariate correlations of the variables used, VI) regression results and moderation effect of quantitative variables, VII) statistical results of content variables, VIII) moderation effects in figures, IX) random vs. real data distributions, and X) an explanation of how Theme works.

Appendix I

Transact: transactional behavior, transform: transformational behavior, counter: counter-effective behavior, IS: initiating structure behavior and humor. Search requirements were set on: minimum level is two and one pattern must occur in at least 50 percent of the sample. In the table, a distinction is made between the 15 least effective and the 15 most effective teams.

Interaction pattern	Total	15 least effective teams	15 most effective teams
((leader, transact; follower, is)(leader, transform; leader, is))	247	39	45
((leader, transact; follower, is)leader, transform)	207	31	38
((follower, humor: leader, is)follower, is)	197	32	33
(leader, transform(follower, humor; leader, is))	197	39	30
((leader, transact; follower, counter)leader, is)	188	37	26
(follower, counter(leader, is; follower, is))	175	23	23
(follower, is(leader, counter; leader, is))	165	24	23
((leader, is; follower, is)follower, humor)	161	18	28
(follower, humor(leader, is; follower, is))	158	23	27
((leader, transact; follower, is)leader, humor)	156	27	26
((follower, counter; leader, transact)leader, is)	151	28	26
((leader, counter; follower, transact)follower, is)	146	27	13
((follower, transact; leader, is)follower, humor)	144	20	25
(leader, humor(leader, is; leader, transform))	141	23	22
(leader, is(follower, counter; follower, is))	140	22	21
(leader, counter(leader, is; follower, transact))	139	15	14
(follower, transact(follower, transform; follower, is))	139	21	27
(leader, is(leader, transact; leader, humor))	138	25	20
((follower, is; leader, counter)leader, is)	136	19	18
((leader, is; leader, transform)follower, transform)	135	16	24
((leader, transact; follower, is)follower, humor)	126	26	26
(leader, is(follower, transact; leader, transact))	125	26	20
(follower, counter(leader, transact; leader, is))	123	22	21
((follower, is; leader, transact)(leader, is; follower, transact))	123	21	20
((leader, humor; follower, is)leader, is)	122	18	16
((leader, counter; follower, transact)(leader, is; follower, is))	122	15	11
(follower, humor(leader, humor; follower, is))	121	15	18
((leader, is; follower, is)leader, humor)	120	14	22
((follower, transact; leader, is)(follower, is; follower, counter))	118	16	13
(follower, is(leader, transact; follower, humor))	117	22	32
((follower, transact; leader, transact)follower, humor)	112	24	24
((follower, is; leader, transact)(follower, counter; follower, transact))	110	12	19
(leader, humor(leader, transact; follower, humor))	110	18	22
((leader, transact; leader, humor)(follower, is; leader, is))	109	13	14

(follower, counter(leader, is; follower, transact))	107	12	14
(follower, humor(follower, is; follower, transact))	106	6	37
((follower, transact; follower, humor)(leader, transact; leader, is))	105	20	17
((leader, is; leader transform)(leader, transact; follower, humor))	105	17	25
(follower, humor(leader, transform; follower, is))	104	13	19
(follower, transact(follower, counter; leader, transact))	103	15	18
(follower, is(leader, transact; leader, transform))	103	15	21
((leader, transact; follower, counter)(follower, is; leader, is))	103	19	12
(leader, is(leader, transform; follower, transform))	102	10	15
((follower, transact; follower, counter)(follower, humor; leader, is))	102	15	27
((leader, counter; leader, is)leader, transform)	100	15	21
(leader, transform(leader, transact; follower, humor))	100	17	23
((leader, counter; leader, is)(follower, counter; follower, is))	100	18	11
((leader, transform; leader, is)(leader, transact; follower, transact))	99	13	20
((follower, transform; leader, is)leader, transact)	98	23	17
((follower, is; leader, is)leader, humor)	98	14	15
((follower, humor; leader, transform)leader, transact)	97	19	19
((leader, is(follower, transact; leader, transact) follower, is)	97	21	16
((leader, is; follower, is)leader, counter)	96	12	12
(leader, counter(leader, transact; follower, transact))	96	11	17
((follower, counter; leader, transact)leader, counter)	94	22	10
((leader, transact; leader, transform)follower, humor)	93	18	17
((follower, is; leader, counter)leader, transact)	93	21	8
((follower, transform; leader, is)follower, is)	92	14	14
((leader, transact; follower, is)(leader, counter; leader, is))	91	18	9
((follower, transact; leader, transact)leader, humor)	88	13	15
(((leader, counter; follower, transact)follower, is)leader, transact)	88	21	9
((leader, transform; leader, humor)(leader, is; leader, transact))	88	15	13
((leader, counter; follower, is)leader, is)	87	12	11
((leader, transact; follower, is)leader, counter)	87	18	10
((leader, is; follower, counter)follower, is)	87	10	15
((leader, is; follower, is)(leader, transact; leader, humor))	86	7	18
((follower, is; leader, transact)leader, humor)	85	10	16
((follower, transact; follower, humor)(leader, is; leader, transform))	85	14	18
((follower, humor; leader, humor)(leader, transform; leader, is))	85	11	11
(leader, counter(leader, transform; leader, is))	85	10	14
((leader, is(leader, transact; leader, humor))follower, is)	84	12	11
((leader, is; follower, is)(leader, transact; follower, humor))	84	15	17
(((leader, counter; follower, transact)(leader, is; follower, is))leader, transact)	80	15	9
((leader, transform(leader, transact; follower, humor))leader, is)	79	13	18
(((leader, transact; follower, is)leader, counter)leader, is)	79	16	8
(leader, transact(follower, is; leader, counter))	73	13	4

Table 1 - Content of interaction patterns

	Interaction patterns	15 least effective teams
1	~~((leader, transact; follower, is)(leader, transform; leader, is))~~	~~39~~
2	~~(leader, transform(follower, humor; leader, is))~~	~~39~~
3	~~((leader, transact; follower, counter)leader, is)~~	~~37~~
4	~~((follower, humor: leader, is)follower, is)~~	~~32~~
5	~~((leader, transact; follower, is)leader, transform)~~	~~31~~
6	~~((follower, counter; leader, transact)leader, is)~~	~~28~~
7	~~((leader, transact; follower, is)leader, humor)~~	~~27~~
8	((leader, counter; follower, transact)follower, is)	27
9	~~((leader, transact; follower, is)follower, humor)~~	~~26~~
10	(leader, is(follower, transact; leader, transact))	26
11	(leader, is(leader, transact; leader, humor))	25
12	((follower, transact; leader, transact)follower, humor)	24
13	(follower, is(leader, counter; leader, is))	24
14	(follower, counter(leader, is; follower, is))	23
15	((follower, transform; leader, is)leader, transact)	23
	Interaction patterns	15 most effective teams
1	~~((leader, transact; follower, is)(leader, transform; leader, is))~~	~~45~~
2	~~((leader, transact; follower, is)leader, transform)~~	~~38~~
3	(follower, humor(follower, is; follower, transact))	37
4	~~((follower, humor: leader, is)follower, is)~~	~~33~~
5	(follower, is(leader, transact; follower, humor))	32
6	~~(leader, transform(follower, humor; leader, is))~~	~~30~~
7	((leader, is; follower, is)follower, humor)	28
8	(follower, transact(follower, transform; follower, is))	27
9	((follower, transact; follower, counter)(follower, humor; leader, is))	27
10	(follower, humor(leader, is; follower, is))	27
11	~~((leader, transact; follower, is)leader, humor)~~	~~26~~
12	~~((follower, counter; leader, transact)leader, is)~~	~~26~~
13	~~((leader, transact; follower, counter)leader, is)~~	~~26~~
14	~~((leader, transact; follower, is)follower, humor)~~	~~26~~
15	((leader, is; leader transform)(leader, transact; follower, humor))	25

Table 2 - Content of interaction patterns of the 15 least and 15 most effective teams (this table was used to

answer hypothesis 9, a line represents that the interaction pattern is detected in both the most and least effective

teams)

15 least effective teams	Follower	Transform	IS	Transact	Counter	Humor	Leader	Transform	IS	Transact	Counter	Humor
15 most effective teams		Transform	IS	Transact	Counter	Humor		Transform	IS	Transact	Counter	Humor

Figure 5 - Visual overview of the differences of Table 2

Appendix II

Below the survey questions about the reliability of the meeting are presented. These questions were completed by both leader and follower. A Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*) was used and the mean was computed after aggregation at the team level.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
How different was the recorded meeting in comparison with non-recorded meetings?							
How different than normal was your behavior during the recorded meeting?							
How different was the behavior of your leader in comparison to the non-recorded meeting?							

Table 3 - Survey questions to measure the reliability of the meeting

Below the survey questions about the team effectiveness are presented, this survey was sent out to a minimum of one and a maximum of three hierarchical leaders of the teams leaders. A score from 1 (*very ineffective*) to 10 (*very effective*) was used.

	1	2	3	4	5	6	7	8	9	10
This employee is effective										
This employee makes few errors										
This employee delivers high-quality work										
This employee performes continuously on a high level										

Table 4 - Survey questions to measure the team effectiveness

Appendix III

Coded behavior	Dimension	Definition (Bass & Avolio, 1995)	Example from the video (L=Leader; F=Follower)
Transformational behavior	Individualized consideration	Showing interest for the other's feelings or situation; Creating a friendly environment	"Good question" (L) "Yes, John, this is really something for you" (L) "Thanks Peter"(F)
	Intellectual stimulation	Positively stimulating the behavior of each other; Challenging professionally	"I would like to hear your opinion on that matter" (L) "If it is communicated that we cannot manage the workload, what would be the solution in your opinion to solve this problem?" (F)
	Providing positive feedback	Complementing and rewarding the behavior of others	"You did a great job, Marcel" (L) "That's the way of working!" (F)
Counter-effective behavior	Disagreeing	Refute or disagree to others or opposing to others	"I don't agree with you" (L) "That's not my opinion" (F)
	Defending one's own position	Emphasizing own leadership position; Emphasizing own importance	"I am the manager within this organization" (L) "I cannot help it, my boss wants it like that" (F)
	Interrupting	Shortly interrupting someone by speaking while another person is speaking	-
Transactional behavior	Task monitoring	Checking upon the task progress of one's current situation; Referring to previously made agreements with others	"A third notification was also communicated, so then I am wondering whether not much happened in response to the first two notifications?" (L) "How is the action list of you progressing" (F)
	Providing negative feedback	Criticizing the behavior of others or actions from others	"I do not think that this is a good solution" (L) "In August I've send an e-mail with amendments, and I find it sad/regrettable that at least half of the attendees does not know the content of this e-mail" (F)
	Correcting	Imposing someone to conform to norms, values and common procedures	"Yes, but that is the wrong decision" (L) "Now you are talking about a failure fine, however this is a different type of fine" (F)

Table 5 - Examples and definitions of the coded behaviors

Appendix IV

Below an overview of interaction patterns research performed by previous (management) literature. At first, articles using Theme will be

discussed and second, articles using a lag sequential analysis will be point of discussion.

Authors	Method	Setting	Most important findings and contributions
Waller (1999)	Theme	Airline crews engaged in a high-workload flight simulation	The results of Waller's study indicated that although the frequencies, not all the behaviors were associated with crews' performance, the timing of key adaptive behaviors was associated. Only the frequency of information collection activities had a positive relation with performance. The amount of time taken to engage in adaptive responses after non-routine events had a negative association with the performances.
Zijlstra et al. (2012)	Theme	Swift-starting airline crew	The early emergence of specific interaction patterns indicate significant differences between the patterns of effective and ineffective crews. The effective teams exhibited patterns that were more stable in duration, more stable in complexity, and more reciprocal as compared to the exhibited patterns of less effective teams.
Stachowski et al. (2009)	Theme	Nuclear power plant control room crews in simulated crises	Pattern detection software revealed systematic differences among crews in their patterns of interaction. Mean comparisons and analysis indicated that more effective crews exhibited fewer, shorter, and less complex interactions patterns. These results illustrate the limitations of standardized response patterns and highlight the importance of team adaptability.
Lehmann-Willenbrock, Meyers, Kauffeld, Neininger, and Henschel (2011)	Lag sequential analysis	Work group discussions in industrial enterprises	Employing the framework of emotional contagion, this study investigated the link between group interaction sequences and group mood. It is showed that complaining cycles were linked to a passive group mood, and interest-in-change cycles were related to an active group mood. Complaining or interest-in-change cycles were not correlated with the pleasure dimension.
Lehmann-Willenbrock, Allen, et al. (2013)	Lag sequential analysis	Regular team meetings within multiple organizations	Lag sequential analysis revealed that procedural meeting behaviors are sustained by supporting statements within the team interaction process. They promote proactive communication and significantly inhibit dysfunctional meeting behaviors. The more evenly distributed procedural meeting behaviors were across team members, the more team members were satisfied with their

			discussion processes and outcomes.
Lehmann-Willenbrock and Allen (2014)	Lag sequential analysis	Regular organizational team meetings	Humor patterns triggered positive socioemotional communication, procedural structure, and new solutions. At the team level, humor patterns (but not humor or laughter alone) positively related to team performance, both immediately and two years later. Team-level job insecurity climate was identified as a boundary condition.
Lehmann-Willenbrock, Meinecke, Rowold, and Kauffeld (2015)	Lag sequential analysis	Problem-solving team meetings in two organizations	This paper first performed a multilevel analysis and second a lag sequential analysis. Results of the lag sequential analysis revealed that leaders' ideas and solutions triggered subsequent solution statements by team members and inhibited counterproductive communication by team members, such as running off topic, criticizing, or complaining.
Lehmann-Willenbrock, Allen, and Meinecke (2014)	Lag sequential analysis	Meetings between German and U.S. student teams	All teams discussed the same task to consensus. Results from behavioral process analyses showed that German teams focused significantly more on problem analysis, whereas U.S. teams focused more on solution production. In addition, U.S. teams showed significantly more positive socioemotional meeting behavior than German teams. Finally, German teams showed significantly more counteractive behavior such as complaining than U.S. teams.
Lehmann-Willenbrock, Chiu, Lei, and Kauffeld (2013)	Lag sequential analysis	Meetings of 43 problem solving teams	This study found that early positivity and solution-focused interactions increased the likelihood of subsequent positivity. Dynamic speaker switches increased the likelihood of positivity both directly and by magnifying the positive effects of early positivity and solution-focused interactions on subsequent positivity. Logically, greater overall positivity is also linked to greater team performance.
Kolbe et al. (2010)	Lag sequential analysis	Anesthesia teams ($n = 27$) in the clinical setting	Immediate reactions to team monitoring and talking to the room were investigated by performing lag sequential analysis. This paper found that in high performing teams, immediate consequences of team monitoring were speaking-up and providing unsolicited assistance. Talking to the room led to further talking to the room and substituted explicit coordination. The results highlight the relevance of team monitoring and talking to the room for team coordination and performance in dynamic healthcare environments.
Kolbe et al. (2014)	Lag sequential analysis	Anesthesia teams ($n = 27$) performing an induction of general anesthesia in a natural setting	Lag sequential analyses revealed that higher-performing teams were characterized by patterns in which team member monitoring was followed by speaking up, providing assistance, and giving instructions and by patterns in which talking to the room was followed by further talking to the room and not followed by instructions. Higher- and lower-performing teams did not differ with respect to the frequency of team member monitoring and talking to the room occurrence. The results illustrate the importance of patterns of coordination behaviors and showed that the

			interaction patterns, as opposed to the behavior frequencies.
Kauffeld and Meyers (2009)	Lag sequential analysis	Work group discussion in three German industrial enterprises,	Lag sequential analysis results showed that complaining begets further complaining statements, while simultaneously inhibiting the expression of solution-oriented statements. Likewise, when solutions are proposed they are followed by further discussion of solutions. The results point to the importance of structuring statements.

Table 6 - Overview of previous management literature using Theme or lag sequential analysis

Appendix V

Variables	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Team effectiveness	6.96	0.76	-													
2. Work type	1.59	0.49	.131	-												
Controls																
3. Gender	1.34	0.20	-.097	-.130	-											
4. Age	49.31	4.95	.015	.168	.352**	-										
5. Team tenure	3.73	3.04	-.056	-.081	-.297**	.327**	-									
6. Meeting time (in seconds)	4978.36	2014.39	.177	.200*	-.154	-.249**	.084	-								
Quantitative interaction patterns (N = 111)																
7. Number of patterns	4.20	1.30	-.201*	-.291**	-.020	-.108	.054	-.705**	-							
8. Variabililty of patterns	22.18	35.97	.078	-.127	-.009	-.090	.035	-.086	.276**	-						
9. Switches in patterns	1.22	0.56	-.294**	-.319**	.019	-.213*	.037	-.621**	.684**	.328**	-					
10. Level of patterns	2.11	0.56	-.232*	-.290**	.046	-.208*	.012	-.819**	.863**	.351**	.814**	-				
11. Length of patterns	3.24	0.78	-.245*	-.284**	.048	-.204*	.011	-.818**	.854**	.360**	.815**	.994**	-			
Qualitative interaction patterns (N = 98)																
12. Transactional patterns	59.47	37.66	-.126	-.283**	.085	-.179	.080	-.348**	.427**	.311**	.320**	.337**	.346**	-		
13. Tranformational patterns	26.34	22.47	-.068	-.155	.204*	-.180	.021	-.140	.196	.381**	.085	.220*	.240*	.600**	-	
14. Leader's counter effective patterns	19.97	16.20	-.238*	-.134	-.085	-.071	.170	-.310**	.380**	.131	.286**	.237*	.242*	,626**	.233*	-

* Correlation is significant at the .05 level (2-tailed)

** Correlation is significant at the .01 level (2-tailed)

Table 7 - Descriptive statistics and correlations (note that gender is coded as: 1 is male; 2 is female; and that work type is coded as: 1 is procedural; 2 is knowledge-oriented work)

Appendix VI

	R	R²	Adjusted R²	df	F	sig. ANOVA	FΔ	sig. F Change	b	S.E. B	β	t	sig.
Step 1													
Constant	.196	.038	.000	104	.998	.413	.998	.413	7.690	1.102		6.978	
Work type									.166	.156	.108	1.068	.288
Gender									-.546	.406	-.145	-1.345	.182
Age									-.004	.016	-.025	-.226	.822
Team tenure									-.024	.026	-.099	-.917	.361
Step 2													
Constant	.409	.167	.088	104	2.122	.035	2.944	.016	8.354	1.096		7.622	
Work type									.051	.157	.033	.324	.746
Gender									-.566	.392	-.151	-1.443	.152
Age									-.013	.016	-.089	-.817	.416
Team tenure									-.020	.025	-.084	-.811	.419
Number of patterns									.026	.145	.034	.181	.857
Variability of patterns									.135	.078	.175	1.732	.086
Switches within patterns									-.239	.125	-.318	-1.918	.058
Level of patterns									.763	.702	.995	1.086	.280
Length of patterns									-.840	.678	-1.098	-1.240	.218
Step 3													
Constant	.502	.252	.136	104	2.171	.015	2.050	.079	8.108	1.078		7.524	
Work type									.061	.156	.040	.392	.696
Gender									-.540	.389	-.144	-1.388	.168
Age									-.010	.016	-.065	-.594	.554
Team tenure									-.015	.025	-.061	-.595	.554
Number of patterns									-.037	.145	-.048	-.253	.801
Variability of patterns									.138	.079	.179	1.736	.086
Switches within patterns									-.273	.135	-.364	-2.032	.045
Level of patterns									.750	.697	.979	1.076	.285
Length of patterns									-.703	.691	-.918	-1.016	.312
Moderating effect of number of patterns									.152	.142	.186	1.072	.286
Moderating effect of variability of patterns									-.216	.082	-.272	-2.634	.010
Moderating effect of switches within patterns									.105	.145	.133	.726	.470
Moderating effect of level of patterns									-.993	.726	-1.224	-1.368	.175
Moderating effect of length of patterns									.860	.729	1.063	1.180	.241

Table 8 - Regression results quantitative variables and moderation effects

Appendix VII

	R	R²	Adjusted R²	df	F	sig. ANOVA	FΔ	sig. F Change	b	S.E. B	β	t	sig.
Step 1													
Constant	.172	.030	-.001	97	.954	.418	.954	.418	7.574	1.047		7.236	
Gender									-.283	.378	-.083	-.749	.456
Age									-.006	.016	-.042	-.381	.704
Team tenure									.034	.027	.140	1.272	.207
Step 2													
Constant	.332	.110	.052	97	1.878	.093	2.749	.047	7.931	1.029		7.709	
Gender									-.364	.377	-.107	-.965	.337
Age									-.012	.016	-.084	-.761	.449
Team tenure									.048	.027	.196	1.792	.076
Transactional behavior within patterns									.056	.112	.080	.503	.616
Transformational behavior within patterns									-.026	.091	-.037	-.288	.774
Counter effective behavior of the leader within patterns									-.234	.094	-.328	-2.476	.015

Table 9 - Regression results content variables

	Mean			S.D.		S.E. mean			
Effective teams	Least	Most	Δ	Least	Most	Least	Msot	t	sig.
Follower occurrences within an interaction patterns	1.29	2.29	1.00	.76	.76	.29	.29	2.475	.029

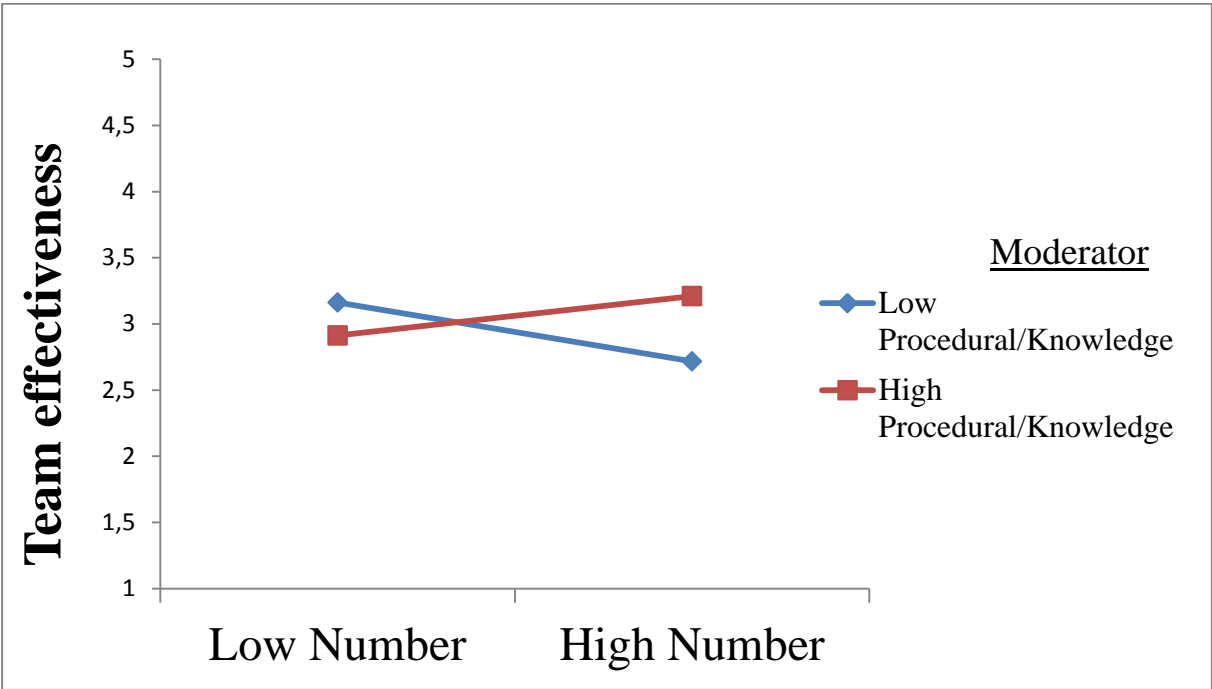*Table 10 - T-test results*

71

Appendix VIII

Figure 6 - The moderation effect of the number of interaction patterns
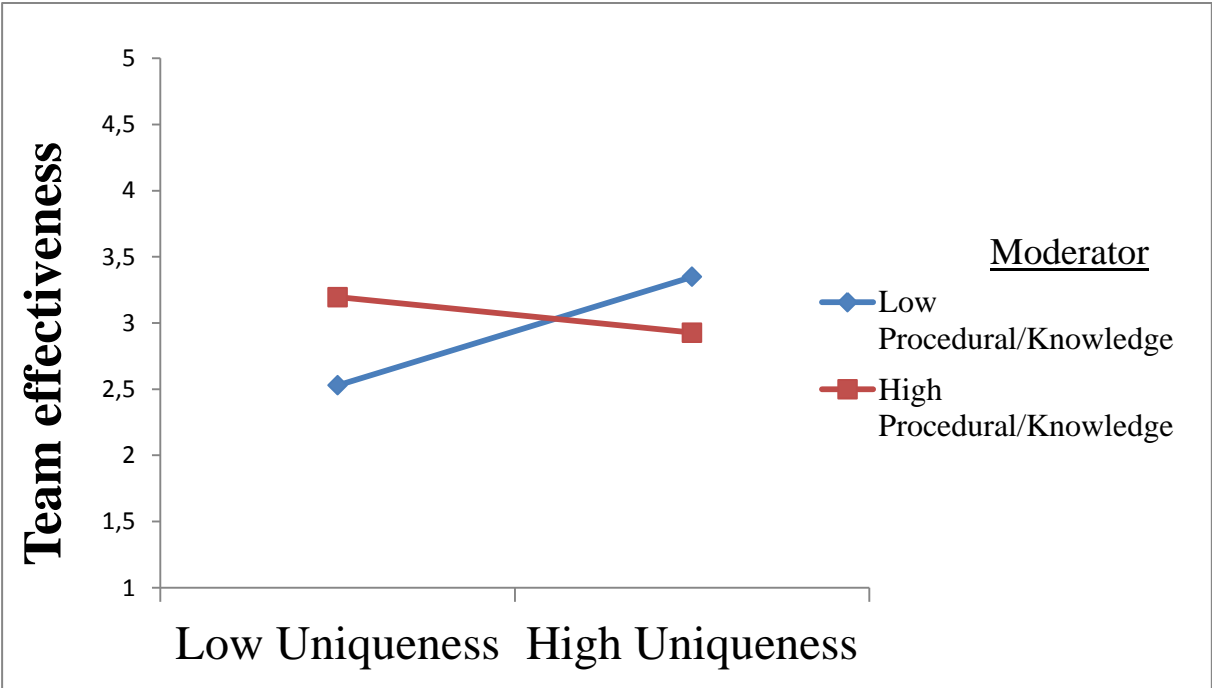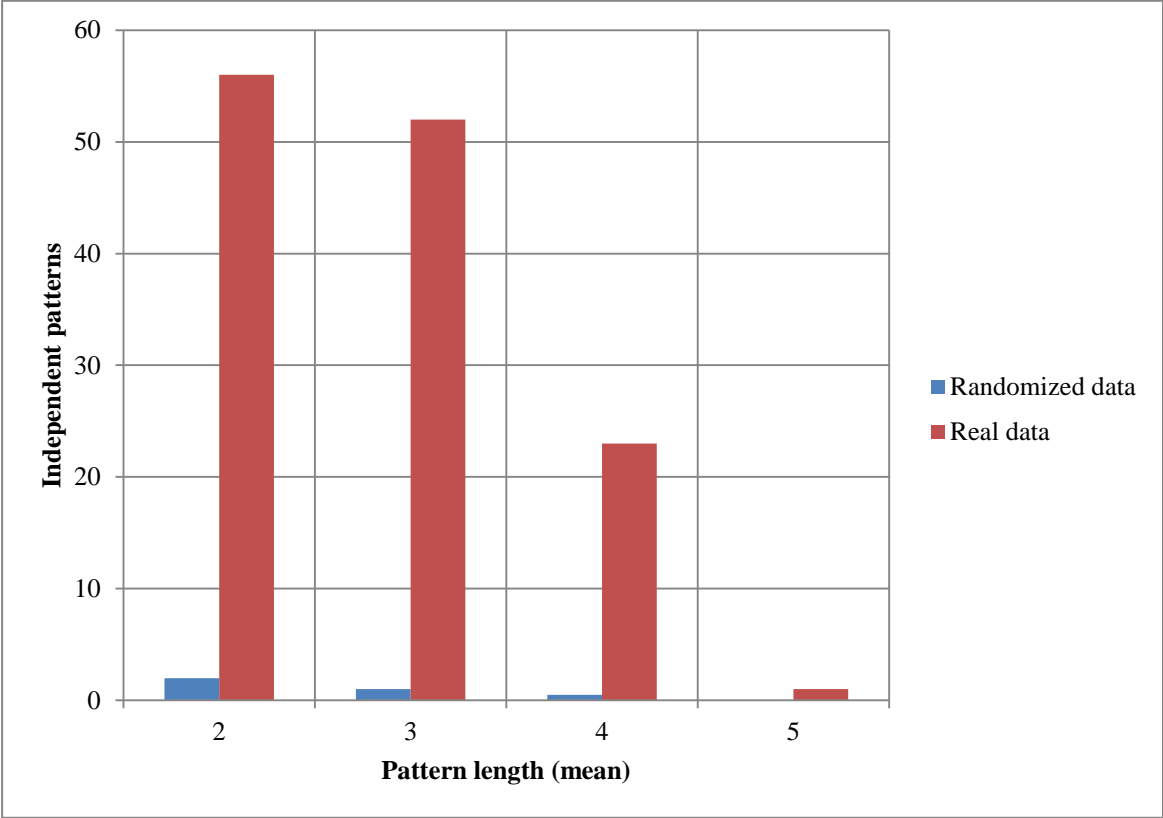

Figure 7 - The moderation effect of the variability (uniqueness) of interaction patterns

Appendix IX

Figure 8 - Pattern length distributions (average for 5 random runs)

The figure stated above, displays a comparison between the real pattern data (as used for this study) and the data as it could be after five random runs (a mean is computed). As observable, the detected patterns will not be detected by randomization. Analysis based on the data used for the qualitative analysis (H6-H9).

Appendix X

"*To use Theme effectively and get the most out of the program, you should understand the underlying model and the detection method. The following description is intended to provide only a broad overview. For more details, see Magnusson (2000).*

At the heart of Theme is a unique algorithm that searches for relationships between events in behavioral data, by taking into account simultaneously: order; relative and real timing; and frequency of these events, as well as their hierarchical structure. It detects patterns as follows:

1. Imagine a simple data set containing multiple occurrences of two different types of event, A and B.

2. Theme tests the null hypothesis that occurrences of A are followed by at least one occurrence of B within a particular approximate distance significantly more often than expected by chance.

3. If such an approximate distance is found, its lower and upper limits form a critical interval (time window), and the relationship between A and B is called a critical interval relationship.

4. For this calculation, Theme assumes as a null hypothesis that A and B are independently distributed and that B has a fixed probability of occurrence per time unit (=NB/T) throughout the continuous observation period (where NB is the number of occurrences of B and T is the duration of the observation period).

5. If such a critical interval relationship is found, a simple pattern (AB) is defined - it occurs wherever an occurrence of A is followed by an occurrence of B within the critical interval.

6. Real data, of course, typically contain many more event types. Thus, in addition to the pattern (AB) being detected, others may also be found - for example, (CD). All occurrences of

these simple patterns become events themselves, and are then added to the data and treated like the initial types of events in the next level of pattern detection.

Theme repeats the procedure above, level by level, searching for critical interval relationships involving the detected patterns. A critical interval relationship may thus be found between pattern AB and event type K, giving rise to the pattern ((AB)K), or between the simple patterns (AB) and (CD), producing the more complex pattern ((AB)(CD)). These may then become parts of still more complex patterns.

    This iterative process continues until Theme has considered all possible combinations of all event types and searched for patterns at all levels. Throughout this process, patterns thus grow in complexity - but some may simply be partial detections of more complex patterns, with one or more elements missing. Such incomplete patterns do not 'survive' and are eliminated. By employing this evolutionary approach to pattern detection, Theme produces the most complete patterns possible - and therefore typically the most interesting ones" (Magnusson et al., 2004, p. 14-15)