Team Adaptation Process:
An Empirical Investigation of its Dynamic and Complex Nature

Inauguraldissertation

zur Erlangung des Doktorgrades der Philosophie

an der Ludwig-Maximilians-Universität München

vorgelegt von

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aus Athen

2018

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Datum der mündlichen Prüfung: 27.02.2018

Abstract

The aim of the present thesis was to empirically investigate the four-phase team adaptation process as suggested in the theoretical model of Rosen, Bedwell, Wildman, Fritzsche, Salas, and Burke (2011) and provide a better understanding of its dynamic and complex nature. Five experimental studies were conducted in an effort to provide evidence with regards to the ways this process is in fact performed, and how it is related to team properties and team adaptive outcomes. In the first two empirical studies presented in *Chapter 2*, the first behavioral instrument for capturing the four-phase team adaptation process as proposed by Rosen et al. (2011) was developed and validated. The four developed behaviorally anchored rating scales (BARS) demonstrated excellent psychometric properties. In the subsequent empirical study presented in *Chapter 3*, the relationship of the overall four-phase team adaptation process with team properties and team adaptive outcomes was investigated for the first time in team adaptation research. Previous adaptation exposure and updated team cognitive structures positively influenced the team adaptation process. The first three team adaptation phases (i.e., situation assessment, plan formulation, plan execution), not the overall process, predicted independently post-change team performance, and previous adaptation exposure reduced the time needed for team decision making for a novel task. In *Chapter 4*, two empirical studies investigated whether teams executed the team adaptation process as Rosen et al.'s model (2011) postulates. The positive relationship among the four team adaptation phases was supported, however, teams performed both theory-conform and theory-non-conform phase sequences. A theory-conform executed team adaptation process was not related to team adaptive performance but instead, theory-non-conform phase sequences and the timing of the executed phases. Overall, the research presented contributes to the field of team adaptation by (1) presenting the first instrument for capturing the overall four-phase team adaptation process, by (2) providing first evidence about the relationships between the team adaptation process, team properties and team adaptive outcomes, by (3) empirically testing for the first time the theoretical team adaptation process model from Rosen et al. (2011) and by extending it based on the evidence found, and finally, by (4) providing empirically validated guidelines and a tool that can assist practitioners to promote the team's ability to adapt.

Zusammenfassung

Teams müssen sich heutzutage permanent an die wechselnden Bedingungen in ihrem Arbeitsumfeld anpassen und die verschiedensten Herausforderungen zielführend überwinden, damit sie und ihre Organisationen erfolgreich bleiben können, um infolgedessen die gewünschten Ergebnisse zu erreichen. Trotz der Relevanz einer erfolgreichen Anpassung seitens der Teams, der derzeitige Forschungsstand zu dem *Team Adaptation Prozess* befindet sich noch auf theoretischer Ebene, während empirische Studien, welche die dynamische und zyklische Natur dieses Konstruktes erfassen, fehlen. Um diese Forschungslücke zu schließen, ist Ziel der vorliegenden Doktorarbeit den vier-phasigen Team Adaptation Prozess anlehnend an dem theoretischen Modell von Rosen, Bedwell, Wildman, Fritzsche, Salas, und Burke (2011) empirisch zu untersuchen, und dadurch die erforderliche Evidenz über den tatsächlichen Ablauf des Prozesses und seinen Zusammenhang mit Team-Eigenschaften und Team-Ergebnisse zu beschaffen. Um ein besseres Verständnis des bisherigen theoretischen Team Adaptation Prozesses zu erzielen, fünf empirische Studien wurden durchgeführt. In den ersten zwei Studien, welche in *Chapter 2* präsentiert werden, wird das erste verhaltensbasierte Instrument zur Erfassung des vier-phasigen Team Adaptation Prozesses, wie von Rosen et al. (2011) vorgeschlagen, entwickelt und validiert. Vier verhaltensverankerte Beobachtungsskalen, welche sowohl das ganze Spektrum des gesamten Prozesses als auch jeder einzelnen Phase abbilden, wiesen ausgezeichnete Gütekriterien auf. In der nachfolgenden Studie, die in *Chapter 3* näher dargestellt wird, wird der Zusammenhang zwischen dem gesamten vier-phasigen Team Adaptation Prozess mit Team-Eigenschaften und Team-Ergebnissen zum ersten Mal in der Team Adaptation Forschung untersucht. Es wurde belegt, dass eine frühere Aussetzung mit mehreren Anpassungsanforderungen und auf den neuesten Stand kognitive Team-Strukturen einen positiven Einfluss auf den vier-phasigen Team Adaptation Prozess ausüben. Zusätzlich haben die ersten drei Team Adaptation Phasen (Situation Assessment, Plan Formulation und Plan Execution) unabhängig voneinander die Team-Leistung vorhergesagt, während die frühere Aussetzung mit mehreren Anpassungsanforderungen die Zeit zur kollektiven Entscheidung

im Rahmen einer neuen Team-Aufgabe positiv beeinflusst hat. In *Chapter 4* untersuchen die letzten zwei empirischen Studien der vorliegenden Dissertation, ob Teams gegenüber einer Anpassungsanforderung einen laut Rosen et al. (2011) Team Adaptation Prozess durchlaufen, und ob ein theorie-konformer durchgeführter Prozess zu einer hohen Team Leistung führt. Der positive Zusammenhang zwischen den vier Phasen des Team Adaptation Prozesses wurde bestätigt. Hingegen konnte dargelegt werden, dass Teams, wenn sie sich anpassen müssen, sowohl theorie-konforme als auch theorie-nicht-konforme Phasen-Sequenzen durchlaufen. Es wurde kein Zusammenhang zwischen einem theorie-konform durchgeführten Team Adaptation Prozess und Team Leistung gefunden, stattdessen war die Team Leistung mit nicht-theorie-konformen Phase-Sequenzen und mit dem Zeitpunkt der durchgeführten Phasen positiv verbunden. Insgesamt leistet die vorliegende Dissertation einen wichtigen Beitrag zu dem Team Adaptation Prozess Forschungsbereich, in dem (1) das erste valide Instrument zur Erfassung des gesamten vier-phasigen Team Adaptation Prozesses, wie von Rosen et al. (2011) vorgestellt, präsentiert wurde, (2) die ersten empirischen Befunde zu dem Zusammenhang des vier-phasigen Team Adaptation Prozesses mit Team-Eigenschaften und Team-Ergebnissen gezeigt wurden, und dementsprechend eine Grundlage für eine Vielzahl an potenziellen Entwicklungen im wissenschaftlichen Bereich geleistet wurde, (3) die erste empirische Untersuchung und Erweiterung des theoretischen Team Adaptation Prozess Modells (Rosen et al., 2011) anhand von Evidenz, welche die wahre Komplexität und Dynamik des Prozesses aufzeigt hat, realisiert wurde, (4) empirisch validierte Richtlinien und ein Tool, welche die Praktiker unterstützen können, um die Anpassungsfähigkeit von Teams zu fördern, vorgestellt wurden, und (5) insgesamt ein tieferes Verständnis für dieses wesentliche und gleichzeitig anspruchsvolle, multidimensionale, und dynamische Phänomen geschaffen wurde.

Acknowledgement

Throughout my dissertation, I have received a lot of support that helped me keep believing in myself and moving forward. Therefore, I would like to thank all the people who were next to me during this demanding but at the same time wonderful journey. First of all, I would like to thank Prof. Dr. Felix C. Brodbeck from the Chair of Economic and Organizational Psychology for his uplifting supervision and mentoring. I thank him for his unconditional support regarding my doctoral thesis, my research stay at the University of Central Florida, and his encouragement to attend conferences all over the world. Moreover, I want to thank him for always challenging me to go one step further, for his outstanding feedback, and for helping me to improve my work anytime he could.

I would also like to thank Prof. C. Shawn Burke from the Institute of Simulation and Training for making me part of her team, for trusting me with a number of research projects, and most importantly for giving me the opportunity to work close to her. Reading her work inspired me to start my PhD in the first place; working with her has been a great experience.

I would also like to thank the whole team of the Chair of Economic and Organizational Psychology for their support and help. Especially, I would like to thank Katharina and Julia for their constructive and critical feedback. Moreover, I would like to thank Prof. Florian Jentsch for his enormous help during the last months of my PhD. Additionally, I would like to thank all my students for their interest in my work and for their contributions.

I would also like to thank my friends, especially Elena, Nefeli, and Jasmin for their support throughout my dissertation no matter what happened. A special thank you goes to Gesa for being both a friend and a mentor, for guiding and helping me since the first day. I also want to thank Olivia for being next to me and for her feedback to parts of this work.

Most importantly, I would like to thank Mrs. Kitty Kyriakopoulos, my family, my stepfather, and my inspiring grandmothers who supported me in every step of the way. I also want to thank Philipp for his enormous support and patience, and for believing in me sometimes even more than I did. Last but not least, I would like to thank my beloved sister, Lilly, who kept me strong and reminded me of who I am, and of course a special thank you to my wonderful parents, Marlena and Dimitris, for their warm support, unconditional love, and for making me the person I am today.

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e.g.	for example
i.e.	that is
RQ	research question

1 General Introduction

My pager went off at 1.18am to inform me of a flat fire at Grenfell Tower. Initially they had six machines there. Then they asked for eight, and then 10, and then 15, 20 and then 25. I'm hearing that on the way there, so it's becoming really clear that we've got quite a serious incident going on. As I was approaching it, I just knew we had probably the job of our lives on the go because already I could see fire from the lower floors and I couldn't believe I was looking at fire to the top floor. I've never seen anything like that, ever. The fire was changing, it was moving rapidly.

This is how the British senior officer Richard Welch described what he and the members of his team were thinking while approaching the major fire at the Grenfwell Tower on 14 June 2017 in London (Khomami, 2017). When faced with this challenge, his team had to successfully adapt to the circumstances by assessing the situation, planning their actions without losing valuable time, and cooperating effectively with each other in order to avoid mistakes and save the building as well as everyone in it. Such unpredictable circumstances are typical for a number of teams such as surgical teams, flight crews, and command teams. Similarly, unstable and disruptive circumstances are very common to many organizations and, consequently, to their teams due to competition, globalization, and technological changes (e.g., Kozlowski & Bell, 2003).

Nowadays, the effectiveness of teams mainly depends on whether they can adapt successfully to changing circumstances, especially as part of organizations that have turned from static to continuously changing systems (Burke, Stagl, Salas, Pierce, & Kendall, 2006). The importance of this team characteristic had been highlighted as essential over four decades ago (e.g., Behling, Coady, & Hopple, 1967). As a result, research has increasingly

focused on this topic and its importance for organizational success (e.g., Kozlowski, Gully, Nason, & Smith, 1999; LePine, 2003; Maynard, Kennedy, & Sommer, 2015). However, the empirical work investigating how teams actually adapt and what mechanisms influence and support these flexible responses, is still limited (Baard, Rench, & Kozlowksi, 2014).

Aiming to contribute to this important gap in the team adaptation research and provide a better understanding of how teams adapt, what mechanisms support teams during this process, and what makes some teams more effective than others in the face of challenging circumstances, the present thesis explores the dynamic process of team adaptation, its phases, team inputs, and team outcomes. Following Rosen et al.'s suggestion (2011), as a first step, a behavioral measurement for the overall team adaptation process is developed and validated. Looking closer and extending previous research that has so far focused only on single process-components (Christian, Christian, Pearce, & Long, 2017), the relationship between the overall team adaptation process to specific team inputs and properties and, in turn, to team outcomes is investigated. Narrowing the focus even further, the way the team adaptation process and its phases are in fact performed, and whether the performed phase-sequence is related to team outcomes is explored responding to the call to investigate this theoretical team phenomenon and to capture team dynamics (Kozlowski, 2015).

My thesis is structured in five chapters. In *Chapter 1*, team adaptation in general and its importance for today's organizations are introduced. In addition, an overview of the theoretical background of the present work is given. Particularly, the process of team adaptation and the theoretical model of the present work are presented. Moreover, the role of team inputs for the team adaptation process and hence, the role of the team adaptation process on team outcomes, are briefly introduced. Finally, the necessity to understand the dynamic nature of the team adaptation process and how it is really performed is shortly explained.

In *Chapter 2*, the first paper of my thesis entitled "*Capturing the Four-Phase Team Adaptation Process: The Development and Validation of Behaviorally Anchored Rating Scales (BARS)*" is presented. In two experimental studies, BARS for each of the four team adaptation process phases are being developed and validated. In order to create an effective method for capturing instances of team adaptation that goes beyond individual member's perception (e.g., Burke et al., 2006), I introduce the first reliable and valid instrument for measuring the overall team adaptation process based on team behaviors that hence, enables its empirical investigation. This team adaptation process metric represents an essential stepping stone for the research conducted in the following chapters.

In *Chapter 3*, the second paper of my thesis entitled "*The Underlying Mechanisms and Outcomes: What promotes and is promoted by the Team Adaptation Process*" is presented. In an experimental study, I take a closer look at the team adaptation process and capture it with the behavioral instrument introduced in the previous chapter. Aiming to increase understanding of the factors that promote a team to function effectively in the face of adaptive demands and thus, successfully perform, the way the overall team adaptation process is influenced by different team properties (i.e., previous exposure to multiple team adaptation requirements, and Transactive Memory Systems development), and how it consequently influences team outcomes (i.e., team adaptive performance and time for collective decision making) is investigated for the first time in team adaptation research (e.g. Maynard et al., 2015). Previous research has so far neglected how the team adaptation process itself is related to former (e.g., prior experience) and later team properties (e.g., post-change team performance) resulting into this mainly theoretical team adaptation process field (e.g., Baard et al., 2014). Building on this research gap, the goal of this chapter is to provide the empirical evidence missing by incorporating the overall team adaptation process.

In *Chapter 4*, the third paper of my thesis entitled "*How Does It Really Unfold over Time? The Dynamic Process of Team Adaptation:*" is presented. The main goal of this paper is to overcome the common phenomenon in team research, where developed team dynamic models are rarely empirically examined (Cronin, Weingart, & Todorova, 2011), and provide first evidence with regard to how the team adaptation process is in fact performed. In two experimental studies, narrowing the scope of my work even further, the team adaptation process is dynamically explored by testing the hitherto theoretical relationship between its four phases and their performed sequence under demanding circumstances (Rosen et al., 2011). Finally, I investigate whether a theory-conform executed team adaptation process supports teams to be more adaptable than others as theory suggest (Burke et al., 2006), and consequently, present these so far missing empirical findings.

In *Chapter 5*, a general discussion of the studies presented in the previous chapters is provided. In particular, the main results are discussed, and the most important contributions to the team adaptation literature and research are being highlighted. Finally, limitations are presented as well as important implications for future research and praxis.

The structure of the thesis is presented in Figure 1.1.

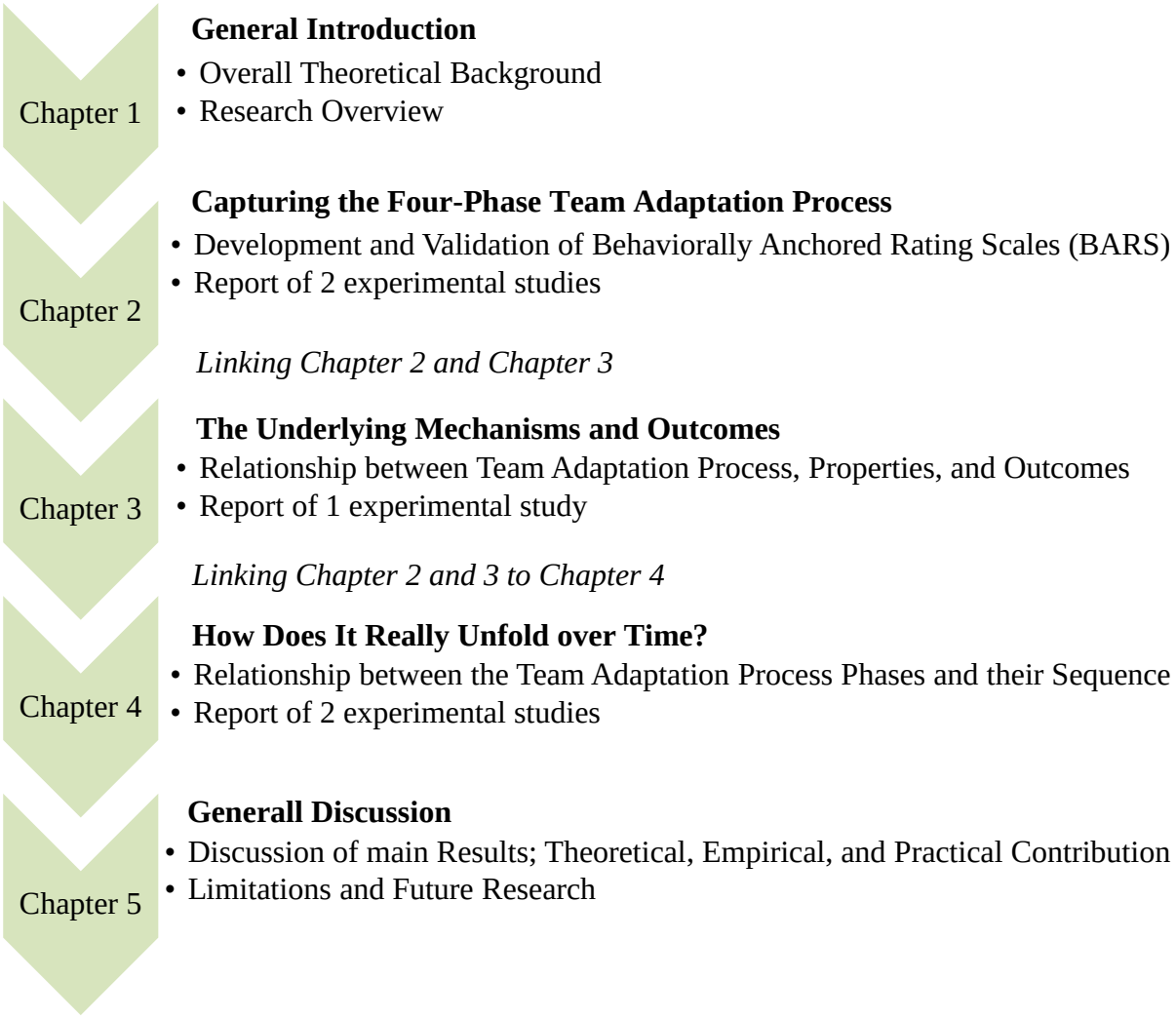

Figure 1.1 Structure of the thesis.

1.1 Theoretical Background

1.1.1 Teams and Team Adaptation

It is widely recognized that the teams' performance has a great impact on organizational success (e.g., Banker, Field, Schroeder & Sinha, 1996). As a consequence, organizations are increasingly structuring work via teams in order to reach desired outcomes (e.g., Katzenbach & Smith, 2015). Similarly, the attention of the research on the prediction of effective team performance and the variables that promote satisfying team outcomes has increased tremendously over the last few decades (e.g., Kozlowski & Ilgen, 2006; Mathieu, Maynard, Rapp, & Gilson, 2008).

Teams, in general, can be defined as "a collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems." (Cohen & Bailey, 1997; p. 241). In addition to this definition, as teams mainly perform within a reflexive and continuously changing environment, in the present work, teams are also perceived as dynamic and complex systems with temporal characteristics. According to Salas, Sims, and Burke (2005), five key team components are nowadays required for successful teamwork and high team effectiveness: team leadership, mutual performance monitoring, backup behavior, team orientation, and team adaptability. The researchers highlight that "…adaptability and team orientation may be most important when the team initially develops a strategy for approaching the team task. Both of these dimensions suggest that team members must be willing to adjust and consider alternative perspectives while developing a plan for future team action." (Salas et al., 2005; p. 590). Supporting this suggestion, research has since emphasized and empirically proven the importance of the team's ability to successfully adapt to any circumstances for the performance of both the team and their organization (e.g., Randall, Resick, & DeChurch, 2011; Stachowski, Kaplan, & Waller, 2009).

Adaptation is, in general, defined as "cognitive, affective, motivational, and behavioral modifications made in response to the demands of a new or changing environment or situational demands" (Baard et al., 2014, p. 50). In the last decades, researchers have approached adaptation from different angles resulting to different concepts and research streams (e.g., Caldwell & O'Reilly, 1982; Kozlowski et al., 1999; Pulakos, Arad, Donovan, & Plamondon, 2000; Rosen et al., 2011). In an effort to organize this differing work, Baard and colleagues (2014) structured it in four distinct theoretical approaches: adaptation as (1) a performance construct (i.e., a set of dimensions that characterize adaptive performance; e.g.,

Pulakos, et al., 2000), (2) as a difference construct (i.e., a set of relatively stable traits; e.g., Ployhart & Bliese, 2006), (3) as a change in performance (i.e., a change in performance from a routine to novel task; e.g., LePine, 2005), and (4) as an emergent process (i.e., a cycle that unfolds over time; e.g., Burke et al., 2006).

In the present thesis, the focus will be on team adaptation as an emergent process. The main reason for this choice is that many theoretical frameworks have been presented describing team adaptation as a dynamic process, however, empirical studies investigating their assumptions, capturing the process, and examining how it is really performed are missing (Baard et al., 2014). Gaining a clearer picture in regard to how the team adaptation process in fact occurs, and how it is related to team adaptive outcomes, is essential not only for advancing team adaptation research but also for supporting organizations to improve their adaptive capacity and consequently their success. As Gevers, Uitdewilligen, and Passos recently suggested (2015), there is a need to "include factors related to teams' ability to adapt, as well as variables that depict the process of adaptation" (p. 648).

1.1.2 Team Adaptation Process

Team adaptation, as a process, occurs when a team faces changing conditions and recognizes the need to address them in order to successfully accomplish its task (Maynard et al., 2015). The team adaptation process describes a dynamic cycle that unfolds over time and is defined as "a change in team performance, in response to a salient cue or cue stream, that leads to a functional outcome for the entire team" (Burke et al., 2006, p. 1190). During the last years, the interest in the team adaptation process has continuously increased, which is evident in the substantial growth on theoretical models describing this phenomenon (Baard et al., 2014).

For instance, in Kozlowski's and colleagues' models (e.g., Kozlowski & Bell, 2008; Kozlowski et al., 1999; Kozlowski, Gully, McHugh, Salas, & Cannon-Bowers, 1996), team

adaptation represents the last phase of a team's developmental progression. Through a series of phases and transitions, the team reaches the final developmental stage, where it continuously improves how it responds and adapts to unpredictable changes and interruptions. Another example represents Burke et al.'s model (2006), where team adaptation is conceptualized as a recursive cycle that constitutes of four phases: situation assessment, plan formulation, plan execution, and team learning. Teams, by performing these four consecutive phases, respond to the circumstances necessitating adaptation and reach an effective team outcome.

In the most recent theoretical model of the team adaptation process, Rosen and colleagues (2011) expand and update the model of Burke's et al. (2006) by providing a more complete picture of the actions and states involved in the process. Rosen et al.'s model (2011) continues to describe the team adaptation process as an adaptive cycle with four consecutive phases (i.e., situation assessment, plan formulation, plan execution, and team learning). In particular, they suggest that the team during *situation assessment* gathers and interprets relevant cues and information from its current situation (e.g., disruptive, novel, or unexpected circumstances). Then, during *plan formulation*, the team, based on the collected information, determines a plan of action that is performed during *plan execution*. Finally, during *team learning*, the team reflects on its previous actions, weaknesses and strengths in order to learn from its experience. These lessons learned influence in turn situation assessment during the next team adaptation process.

These four team adaptation phases are characterized by different team processes (e.g., coordination) that need to be performed to successfully complete each phase (Rosen et al., 2011). Team processes are defined as "members' interdependent acts that convert inputs to outcomes through cognitive, verbal, and behavioral activities directed toward organizing task work to achieve collective goals" (Marks, Zaccaro, & Mathieu, 2001, p. 357). Team

emergent states are also involved in each team adaptation phase (e.g., shared mental models) and serve as inputs and outputs for each of the four phases (Rosen et al., 2011). Team emergent states are defined as "properties of the team that are typically dynamic in nature and vary as a function of team context, inputs, processes, and outcomes" (Marks et al., 2001, p. 357), develop as team members interact.

Rosen et al.'s model (2011) is presented in Figure 1.2.

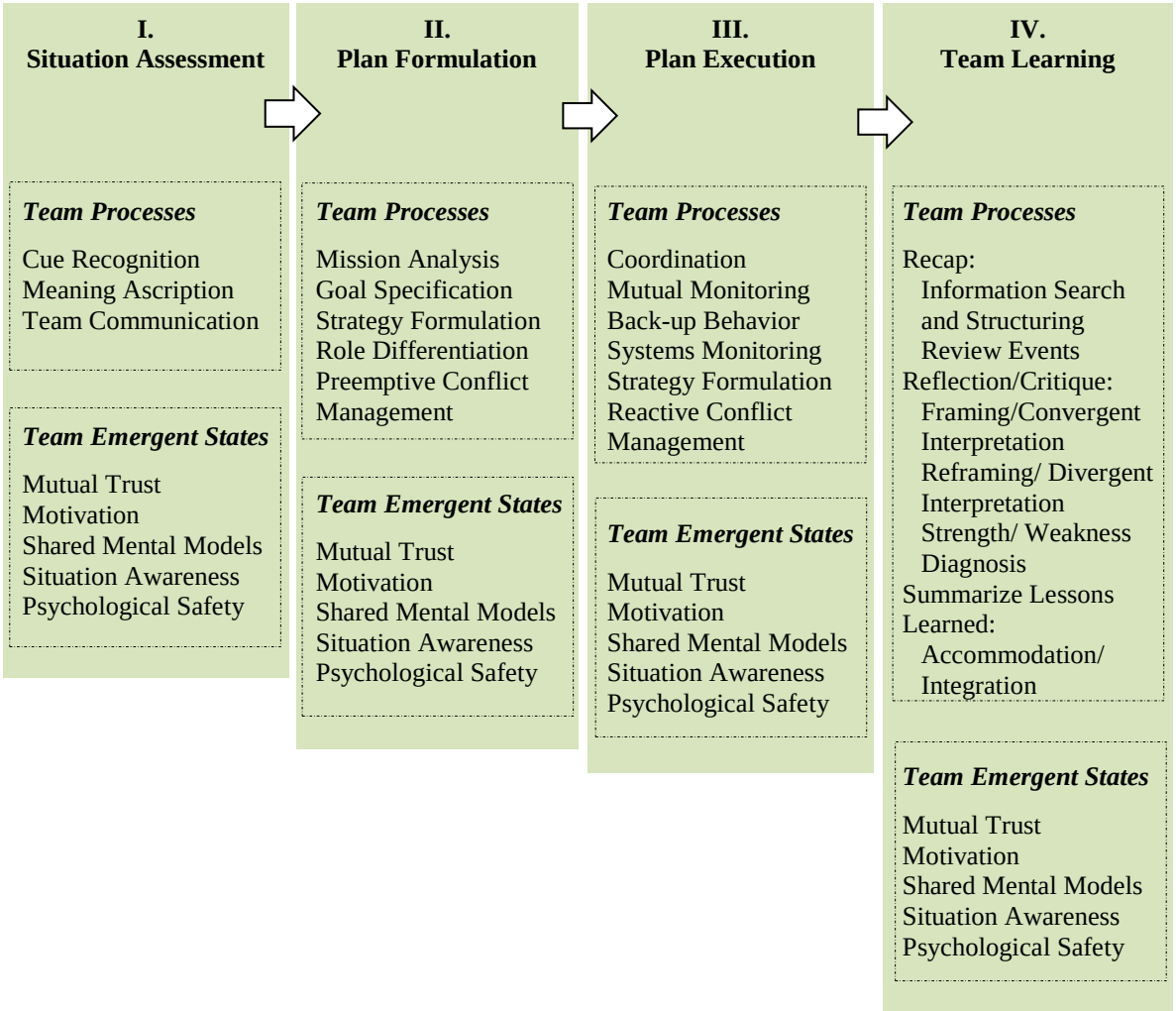

Figure 1.2 The team adaptation process model by Rosen et al. (2011).

The present thesis uses the team adaptation process model by Rosen and colleagues (2011) as its organizing framework for describing and investigating the team adaptation process. The first reason for choosing this model is that it incorporates the latest team

literature and focuses solely on the team adaptation process in contrast to other more general frameworks (e.g., Maynard et al., 2015). The second reason is that it expands the previous model of Burke et al. (2006) based on the taxonomy of team processes by Marks and colleagues (2001) that has been meta-analytically supported (LePine, Piccolo, Jackson, Mathieu, & Saul, 2008). The third and last reason is that the authors provide a series of helpful propositions for measuring this dynamic phenomenon and a number of meaningful suggestions for team adaptation research that according to my opinion need to be followed to make advancements in the team adaptation process field.

Its Measurement. Over the last two decades, researchers have conducted a number of studies in order to examine team adaptation and its impact on team outcomes (see Christian et al., 2017 for meta-analytic review). Despite the numerous and meaningful findings on both research and praxis, none of the empirical work to date has actually measured the team adaptation process itself and how teams actually performed it. The Achilles heel of the team adaptation process construct remains undoubtedly its measurement. As Maynard and colleagues have emphasized (2015), "creating a solid empirical measure of team adaptation is needed for the continued development of this literature" (p.8).

So far, when research has investigated this relevant topic, the construct of team adaptation was not directly assessed. For instance, in many studies when teams performed well after a manipulated task, researchers assumed that this performance enhancement was due to successful adaptation (e.g., Klein, Ziegert, Knight, & Xiao, 2006). Another example represent research studies that have only focused on differences between high- and low-performing teams after adjustments to unexpected challenges (e.g., Waller, 1999). Few exceptions represent the studies that measured some aspects of adaptive behavior or sub-processes involved in the team adaptation process via questionnaires (e.g., Marques-

Quinteiro, Curral, Passos, & Lewis, 2013). Even in these cases, however, the multi-dimensionality, dynamism, and complexity of the team adaptation process were neglected.

It is undeniable for all team researchers, including myself, that in order to move the team adaptation research forward, the next step we have to take is towards the direct assessment of this dynamic phenomenon. Burke and colleagues (2006) made this clear more than ten years ago, when they explicitly wrote that "of primary importance to any future empirical investigations of team adaptation is the creation of adequate measures. Measuring any team-level variable represents a challenge, and creating a method for capturing instances of team adaptation would be no exception." (p. 1203). No matter how challenging this task may be, it represents a fundamental gap in the team adaptation literature that the present work aims to fill with the following research question:

Research Question 1: How can we capture the overall team adaptation process?

Its Team Inputs and Team Outcomes. Recently, two general frameworks were presented incorporating all the work published to date about team adaptation (Christian et al., 2017; Maynard et al., 2015). Within these frameworks, team adaptation is viewed as a dynamic process in line with the team adaptation process models previously described (e.g., Burke et al., 2006; Rosen et al., 2011). In addition, both of these general frameworks, based on the reviewed team adaptation literature, suggest that the team adaptation process is impacted by various team inputs and in turn, influences team adaptive outcomes (i.e., outcomes following change).

Team inputs are typically conceptualized as team compositional factors such as abilities, knowledge and skills (e.g., Maynard et al., 2015). In regard to team adaptation, team experience and team knowledge have been, for example, suggested as supportive

mechanisms for successful adjustments to challenging circumstances (Zaccaro & Bader, 2003). Other supportive team properties represent also team cognitive structures and especially the team's transactive memory systems (TMS), which are defined as "a combination of knowledge possessed by each individual and a collective awareness of who knows what," (Austin, 2003, p. 866). Zajac, Gregory, Bedwell, Kramer, and Salas (2014) argued in their review that for teams to successfully adapt in an unfamiliar situation, team members need to be informed about what knowledge each member holds and how to draw on that knowledge. Similarly, Uitdewilligen Waller, and Pitaru (2013) showed that not only the development of such team cognitive structures but also their update based on the situational demands, is what promotes successful adaptation.

Despite the theoretical and empirical work supporting that team processes are in general influenced by the team's inputs (LePine et al., 2008; Mathieu et al., 2008), empirical work investigating how team properties, such as existing team knowledge and developed team cognitive structures, impact the overall team adaptation process are missing. So far, studies have only investigated the relationship between team properties and single components of the team adaptation process (e.g., communication and coordination under unfamiliar circumstances), neglecting the complete process (for meta-analytic review see Christian et al., 2017). In order to fill this gap in the team adaptation research, the next research question of the present thesis is the following:

Research Question 2: How are team properties related to the overall team adaptation process?

By reviewing previous theoretical and empirical work, Maynard and colleagues (2015) as well as Christian and colleagues (2017) supported that the process of team adaptation results in various team adaptive outcomes. Particularly, Christian et al. (2017) focused on the

positive impact of the team adaptation process on team adaptive performance that in contrast to routine team performance, ‘‘typically emerges as team members engage in different tasks and display different types and amounts of actions during performance,” (Burke et al., 2006, p. 1192) and reflects how effectively teams adjust to unpredictable and unfamiliar demands.

Unfortunately, research supporting the positive relationship between the team adaptation process and team-level outcomes is mainly theoretical (e.g., Burke et al., 2006; Burtscher, Wacker, Grote, & Manswer, 2010; Gorman, Cooke, & Amazeen, 2010; Klein & Pierce, 2001; Marks, Zaccaro, & Mathieu, 2000). Even the studies that empirically support this positive process-outcome relationship have so far investigated single process-components (e.g., coordination and communication) and their impact on team adaptive outcomes (for meta-analytic review see Christian et al., 2017). Similar to the gap regarding the relationship between developed team properties and the overall team adaptation process, the influence of the overall team adaptation process on team adaptive outcomes has been also neglected to date. In order to fill this gap, the third research question of the present thesis is the following:

Research Question 3: How is the overall team adaptation process related to team outcomes?

Its Performance. Researchers have long notated the importance to capture the dynamism of team processes. Unfortunately, organizational psychology is dominated by static designs, and empirical investigations do not seem to reflect the complexity of the team theories and models (Kozlowksi, 2015). Similarly, despite the scholars’ suggestion to consider how time affects theory, and how events actually occur in order to understand how teams perform, research has so far failed to incorporate these factors (Herndon & Lewis, 2015).

These limitations similarly apply to the team adaptation process. According to theory, the team adaptation process represents a dynamic phenomenon, a cycle than unfolds over

time (Baard et al., 2014). This process constitutes of four consecutive phases, and the performance of them enables effective team outcomes under challenging circumstances (Rosen et al., 2011). Despite these suggestions and their application as the theoretical framework of numerous studies, no empirical effort has been so far undertaken to explore how the team adaptation is really performed in the face of an unexpected event (Maynard et al., 2015). Investigating the sequence of team events and experiences is what will enable to understand such complex processes (Herndon & Lewis, 2015). As Rosen et al. (2011) has wisely suggested, we "should not settle for snapshots of performance" (p. 120). Building on this gap in the team adaptation research, in the present work, I focus on the following research question:

Research Question 4: How is the team adaptation process performed?

Burke and colleagues (2006) explicitly propose that a complete team adaptation process leads to "an effective outcome for the entire team" (p. 1990). These researchers together with Rosen and colleagues (2011) argue that teams who perform the four-phase team adaptation process in its suggested sequence will adapt successfully to any circumstances and hence, perform successfully. Studies investigating similar team dynamic phenomena found for instance that communication sequences that included team monitoring and talking to the room were more effective than others under challenging circumstances, and thus leading to high team performance (Kolbe et al., 2014). Investigating sequential communication patterns can be extremely helpful in order to identify the importance of the specific sequences that promote team outcomes and differentiate between high- and low-performing teams (Bowers, Jentsch, Salas, & Braun, 1998).

Despite the significance of such sequential findings for team research and especially for team dynamics, it still remains unclear whether teams who perform the team adaptation

process as theory suggests will reach higher team outcomes, compared to teams who perform a different phase-sequence or even an incomplete team adaptation process. This empirical evidence is nevertheless needed for gaining clearer understanding of the team adaptation process, for designing future team adaptation research, and for planning interventions to promote the teams' and, consequently, their organizations' ability to adapt. In order to fill this gap, the present thesis will focus on the following research question:

Research Question 5: Is a theory-conform phase-sequence more effective than a theory-non-conform team adaptation phase-sequence?

1.2 Research Overview

The primary aim of my thesis is to provide a better understanding of how teams adapt to challenging circumstances and present the first empirical findings with regard to the team adaptation process. With this work, I rise to the occasion, despite the number of challenges related to team dynamics, and make an essential step for moving the team adaptation field forward.

Based on the short review of the team adaptation literature and the research gaps presented in this chapter, the goal of the present thesis is fourth-fold. The first goal is to understand the multidimensionality and complexity of the team adaptation process and, hence, develop an appropriate instrument for measuring the overall process. Building on this first step, the second goal is to provide an insight on which team properties have impact on the overall team adaptation process, and which team adaptive outcomes are in turn influenced by the overall team adaptation process. Narrowing my scope even more, the third goal is to investigate how the team adaptation process and its phases are in fact performed in the face of challenging circumstances. Expanding this, the fourth and last goal is to provide an insight

on why some teams adapt more effectively than others, and investigate whether the phase-sequences that effective teams perform mirror the ones that the theory suggests. In the next chapters, all the previously presented research questions will be addressed as following:

In Chapter 2, the focus is on the first research question (i.e., *How can we capture the overall team adaptation process?*). The complexity for measuring the team adaptation process is being discussed and then the appropriate type of measurement is presented. Next, the development and the successful validation of a behavioral instrument for measuring the overall four-phase team adaptation process are being described. In this chapter, the first valid and reliable instrument for measuring the team adaptation process as suggested by Rosen et al. (2011) is presented.

In Chapter 3, the focus is on the second (i.e., *How are team properties related to the overall team adaptation process?*) and third (i.e., *How is the overall team adaptation process related to team outcomes?*) research question. It is explored how two different team properties (i.e., previous team exposure to multiple team adaptation requirements and TMS development) are related to the overall team adaptation process. In addition, the way the overall team adaptation process influences two different team adaptive outcomes (i.e., team performance and time for collective decision making), is being investigated. Chapter 3 provides the first empirical findings of the overall four-phase team adaptation process with developed team properties and team adaptive outcomes.

In Chapter 4, the focus is on the fourth (i.e., *How is the team adaptation process performed?*) and fifth (i.e., *Is a theory-conform phase-sequence more effective than a theory-non-conform team adaptation phase-sequence?*) research question. The sequence of the performed team adaptation phases and how the phases are related to each other are being investigated. Moreover, it is examined whether high-performing teams differ from low-performing teams in terms of their performed phase-sequence (i.e., theory-conform versus

theory-non-conform phase sequence). Chapter 4 provides the first empirical investigation of the theoretical model of the team adaptation process (Rosen et al., 2011), its phases and their performed sequence.

An overview of the research presented in my thesis, highlighting the different foci and the respective research questions, is presented in Figure 1.3.

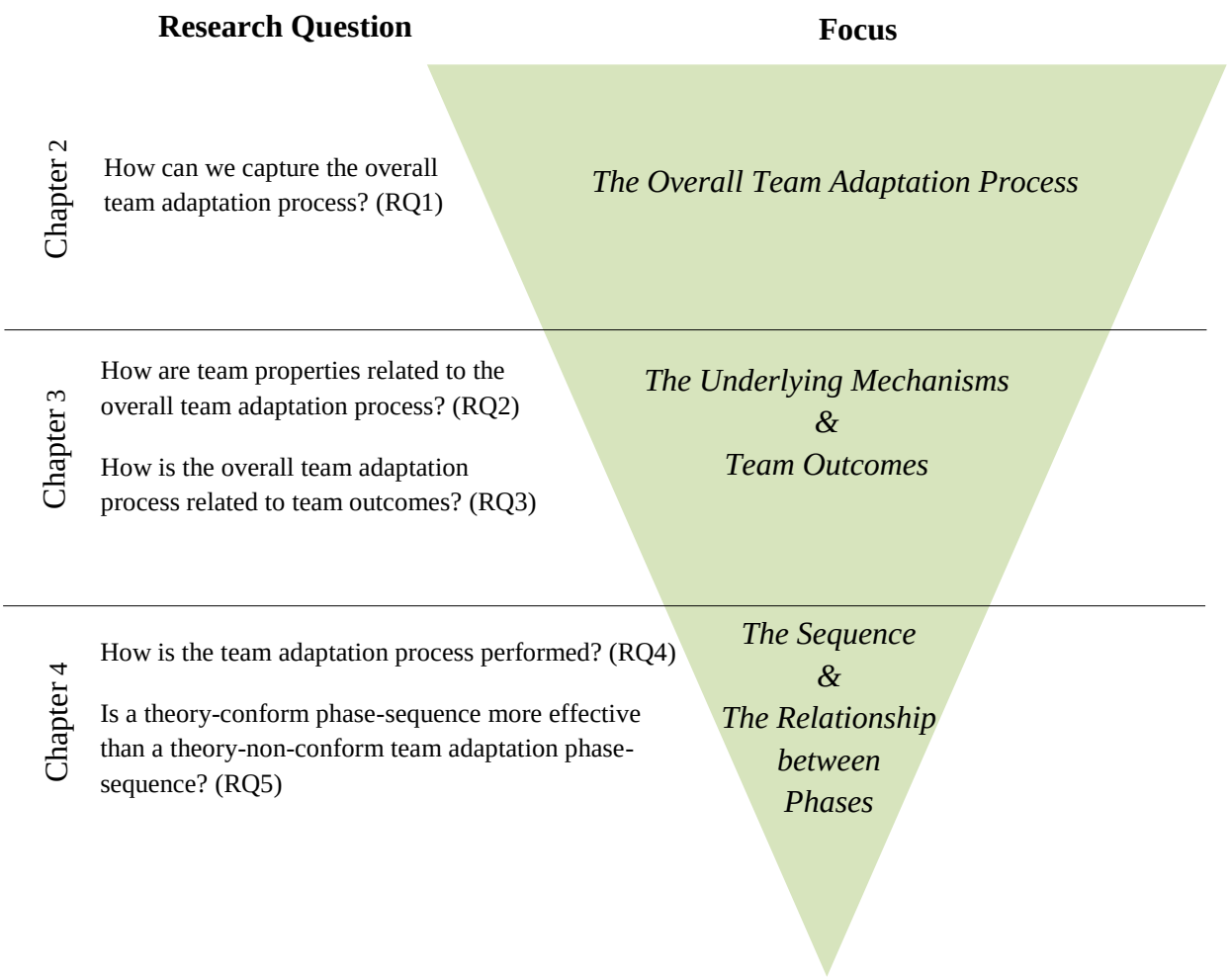

Figure 1.3 Research overview of the present thesis and the respective research questions.

2 Capturing the Four-Phase Team Adaptation Process

The Development and Validation of Behaviorally Anchored Rating Scales (BARS)[1]

2.1 Abstract

As a response to the lack of quantitative and reliable measures of the team adaptation process, the aim of the present study was to develop and validate an instrument for assessing the four phases of the team adaptation process as described by Rosen, Bedwell, Wildman, Fritzsche, Salas, and Burke (2011). Two trained raters and two subject matter expert groups contributed to the development of four behaviorally anchored rating scales (BARS) that span across the spectrum of the team processes involved in each team adaptation phase. To validate the four BARS, two different trained raters assessed independently the team adaptation phases of 66 four-person teams. The validation study provided empirical support for the BARS' psychometric rigor. The BARS measures overcame the common middle anchor problem, showed sensitivity in differentiating between teams and between the four phases, showed evidence for acceptable reliability, construct and criterion validity, and supported the theoretical team adaptation process assumptions. The study contributes to research and praxis by enabling the direct assessment of the overall team adaptation process, thereby facilitating our understanding of this complex phenomenon. This allows the identification of behavioral strengths and weaknesses for targeted team development and comprehensive team adaptation studies.

[1]The two experimental studies presented in this chapter were conducted based on archival data collected at the Munich Experimental Laboratory for Economic and Social Sciences (MELESSA) of Ludwig-Maximilians-Universitaet Muenchen, in Munich, Germany. Professor Felix C. Brodbeck supervised this research and is the second author of this work. When using the term "we", I refer to Felix C. Brodbeck and myself. This work has been presented at the "50th. congress of the Deutsche Gesellschaft für Psychologie" in September 2017 in Leipzig, Germany as well as at "Congress of the European Association of Work and Organizational Psychology" in May 2017 in Dublin, Ireland. An adapted version of this chapter has been submitted to European Journal of Psychological Assessment.

2.2 Introduction

Although teams are not new to organizations, it is mostly over the past few decades that the business world started moving from a more traditional hierarchy to a more team-based design in an effort to remain flexible and competitive (Baker, Day, & Salas, 2006). Today's organizations are facing a number of challenges, such as changing work demands and new technology that require them to adapt in order to remain successful (Burke, Stagl, Salas, Pierce, & Kendall, 2006). Enhancing team adaptation and, thus, team effectiveness can serve as a supporting mechanism for organizations to react appropriately to this changing environment (Salas, Shuffler, Thayer, Bedwell, & Lazzara, 2015).

While the capability of teams to adapt was highlighted as a crucial characteristic of successful teamwork over 60 years ago (e.g., Bush & Hattery, 1956), research on team adaptation has been conducted only over the past two decades. One of the main foci of this work represents the process of team adaptation, evident in the substantial growth of theoretical models as described by Maynard, Kennedy, and Sommer (2015). However, as noted by Baard, Rench, and Kozlowksi (2014) "one key limitation in this area is the lack of empirical investigation" (p. 80). One reason for this limited empirical work represents the lack of a quantitative and reliable measurement of the team adaptation process (Maynard & Kennedy, 2016). Unfortunately, in team research, static designs dominate even when dynamic phenomena are being explored (Kozlowski, 2015).

Building on the necessity "to advance research that captures team dynamics," (Kozlowksi, 2015, p.271), decrease the chasm between theoretical and empirical work on the team adaptation process, and enable a stronger focus on team dynamics within praxis, our aim is to develop and validate a reliable measurement that captures the overall team adaptation process. Specifically, behaviorally anchored rating scales (BARS), an attractive

method for both researchers and practitioners (Debnath, Lee & Tandon, 2015), will be developed and evaluated.

2.3 Theoretical Background

2.3.1 Team Adaptation Process and the Challenge of its Measurement

The role of team adaptation in organizational success has been clearly recognized during the last years (Maynard et al., 2015). Teams represent the main supportive mechanism of today's organizations in dealing with and reacting to challenges and unexpected circumstances. As research suggests, teams are able to effectively assess the environment for changes (e.g., Ancona & Caldwell, 1992), review past events, reflect on previous reactions, and try to apply the best action to any given situation (West & Anderson, 1996).

Team adaptation describes a dynamic process by which a team reacts to an unfamiliar situation. It is defined as "a change in team performance, in response to a salient cue or cue stream that leads to a functional outcome for the entire team" (Burke et al., 2006, p. 1190). According to a recent team adaptation process model, teams undergo four consecutive phases in order to reach an effective outcome after a change has occurred (Rosen, Bedwell, Wildman, Fritzsche, Salas, & Burke, 2011). In *situation assessment*, the team members collect information from the environment in order to gain a better understanding of the challenges they are facing. This information is then used during *plan formulation* in order to create a plan and assign roles and responsibilities. In *plan execution*, the plan is put into action. Finally, during *team learning*, the team reflects on its successes and failures and learns from its actions.

Although theoretical work on the process of team adaptation is growing, empirical studies are unfortunately missing (Baard et al., 2014). As the team adaptation literature recently pointed out, the primary reason for this limited empirical work is the lack of an

appropriate method for capturing the team adaptation process (Maynard & Kennedy, 2016). Until today, empirical studies have not assessed team adaptation directly. For instance, some researchers have manipulated team tasks and then concluded that the reason behind high team performance had to be successful team adaptation (e.g., Klein, Ziegert, Knight, & Xiao, 2006), while others have only investigated differences between high and low performing teams after adapting to an unexpected change (Waller, 1999).

One main reason for the use of indirect assessment is that the development of an empirical measurement of the team adaptation process is extremely challenging. First, the overall team adaptation process, including its four phases and the different team processes involved within each phase, need to be captured. Second, such a measurement has to provide researchers and practitioners with information for diagnosing and evaluating a team's ongoing performance. Third, this information has to be valuable and useful for the team itself in order to improve how it responds to unfamiliar situations. So far, only Rosen and colleagues (2011) have introduced behavioral markers that could serve as the foundation for developing such a measurement. To our knowledge, no one has built on these suggestions or tried to operationalize the overall team adaptation process along the lines of Rosen et al.'s model (2011).

2.3.2 Behaviorally Anchored Rating Scales (BARS)

The behaviorally anchored rating scale technique was introduced by Smith and Kendall (1963) as a more objective methodology for rating performance compare to more traditional forms (e.g., Likert scales). Since its introduction, it represents an important element of today's organizations in terms of its human resource management functions and, consequently, for its success (Debnath et al., 2015). The central characteristic of BARS is that, in order to support raters when assessing different types of behavior and ensure objectivity, they contain a definition of the construct to be observed and specific behavioral

examples for its different manifestation levels (i.e., high, moderate, and low). The relevance of BARS remains essential not only for practitioners but also for researchers evident in the numerous studies that have explored and investigated BARS during the last fifty years (e.g., Hom, DeNisi, Kinicki, & Bannister, 1982; Ohland et al., 2012).

Although BARS have been traditionally used for measuring performance, during the last years, they have been applied in a variety of areas and for measuring constructs other than performance. For instance, they have been used to evaluate team-member performance (Ohland et al., 2012), assessment centers (Schleicher, Day, Mayes, & Riggio, 2002), and structured interviews (Maurer, 2002). Undoubtedly, the primary reason for the BARS' popularity is its numerous advantages. Particularly, the development process is very flexible as different procedures and scaling formats can be used depending on the targeted construct (Debnath et al., 2015). In addition, the scales' behavioral anchors enable a standardized and uniform understanding of the given construct, leading to reduced subjectivity and high consistency among raters (Martin-Raugh, Tannenbaum, Tocci, & Reese, 2016). Empirical studies have also provided support for the BARS' reliability and validity (Harrell & Wright, 1990). Finally, researchers have shown that feedback based on BARS is more acceptable by ratees and more effective in terms of leading to behavioral change compared to other evaluation methods (Hom et al., 1982).

Taking into consideration the successful utilization of BARS in various settings and their numerous advantages, we decided to use this technique to develop and validate a behavioral instrument for each of the four phases of the team adaptation processes as proposed by Rosen and colleagues (2011). We believe that BARS represent the most appropriate method as the scale items can cover the entire spectrum of the different team processes involved in each team adaptation phase. As Landy, Farr, Saal, and Freytag (1976) have highlighted, BARS are a suitable method for measuring multidimensional constructs.

Our goal is to provide a reliable and valid instrument for the direct assessment of the team adaptation process. This will enable not only researchers to conduct comprehensive studies and, thus, gain a better insight of the team adaptation process itself, its inputs and its outcomes, but also enables practitioners to identify specific behavioral strengths and weaknesses of teams, facilitate team adaptation improvement, and develop respective team training programs.

2.4 Study 1

Following the recommendations provided by Rosen et al. (2011), the aim of Study 1 is to develop BARS for the four team adaptation phases that will include both effective and ineffective behaviors of the team processes involved in each phase and, thus, enable the assessment of the entire spectrum of the team adaptation process. Based on the developmental process suggested by Smith and Kendall (1963), we will first define the four team adaptation process phases, then identify observable team adaptation indicators, match the behavioral examples to the team adaptation phases, develop and scale the behavioral anchors, and lastly finalize the four 5-point scale BARS.

2.4.1 Method

Definition of the Team Adaptation Process Phases. Based on an extensive review of the team adaptation literature, we first defined the four phases of the team adaptation process (i.e., situation assessment, plan formulation, plan execution, and team learning). Given that the BARS were developed for German speaking researchers and practitioners, the definitions were in German. These definitions served as guidance for the next development stages illustrating the different team processes involved in each phase; in addition, they served as the description of each phase in the final developed BARS.

Identification of Observable Team Adaptation Indicators. The critical incident methodology was followed in order to develop behavioral anchors for the four team

adaptation phases (Bownas & Bernardin, 1988). Specifically, two trained raters, familiar with the team adaptation literature, reviewed the video recordings of six teams performing a team task under condition variability. These teams, together with 66 more teams, were originally recorded for a laboratory experiment where team adaptation was required (Georganta & Brodbeck, 2016). These recordings provided a suitable source for identifying desirable and undesirable team behaviors illustrating the four team adaptation phases. For this stage, we tried to obtain a range in performance by including high- to low-performing teams. The performance level of each team was unknown to the raters.

The raters watched the video recordings and independently identified behaviors illustrating one of the four team adaptation phases, either at a low, medium, or high level. The goal was to identify behaviors across the entire spectrum of each team adaptation phase and include both effective and less effective behaviors. After the independent analysis was completed, a consensus meeting between the two raters was held that resulted in 82 behavioral examples for all four team adaptation phases. These examples provided the raw material for the initial measure development. In the following step, the wording of these behavioral examples was edited so that they were more concise and grammatically correct.

Matching Behavioral Examples to Team Adaptation Phases. Five SMEs, with research and practical experience on team performance and other related topics, were presented with the 82 behavioral examples (for invitation letter see Appendix A.1.1; for rating-table see Appendix A.1.2). Their task was to indicate independently from one another which team adaptation phase was illustrated by each example. For this *retranslation* (Schwab, Heneman, & DeCotiis, 1975), the definitions of each of the four phases were provided as guidance for classifying the examples. The behavioral examples with the lowest interrater-reliability among SMEs were eliminated. Only those behaviors assigned to a dimension with acceptable agreement (i.e., higher than 70% agreement) were retained for the

scaling phase. At the end of this stage, we had 52 behavioral examples for all four team adaptation phases.

Behavioral Anchor Development and Scaling. Following Landy et al.'s (1976) suggestion, four behavioral examples were chosen for each team adaptation phase based on their interrater reliability values, while ensuring that they covered the breadth of each phase. During the next step, the language of these examples was adjusted into rating scales associated with different points (i.e., low, medium, and high). This resulted in 12 behavioral examples for each of the four phases. Afterwards, five different SMEs, with research and practical experience on team performance and other related topics, were presented with the 48 examples (for invitation letter see Appendix A.1.3; for rating-table see Appendix A.1.4). These SMEs worked independently to place all behavioral examples back into the four team adaptation phases and at either a low, medium, or high anchor of the respective phase. All examples met the predetermined agreement among SMEs. After some minor wording changes based on the SMEs' comments, we completed the development of the four 5-point scale BARS (see Appendix A.1.5). The behavioral examples of low, medium, and high anchors were placed next to the zero-, three-, and five-scale points respectively.

Data Analysis. To calculate the interrater reliability among the two SME groups, Krippendorff's α, a standard reliability measure, was used. Krippendorff's α satisfies all the important criteria for a good analysis of reliability and can be used regardless of the number of observers, level of measurement, sample size, and with or without missing data (Hayes & Krippendorff, 2007). To compute Krippendorff's α, the respective SPSS macro was used (Hayes & Krippendorff, 2007).

2.4.2 Results

The interrater reliability among the first five SMEs, who indicated what team adaptation phase was illustrated by each of the original 82 behavioral examples, was

moderately acceptable (Krippendorff's α = .67; Table 2.1). After eliminating all behavioral examples with a reliability value lower than .70, the interrater-reliability of the remaining 52 behavioral examples was very high (Krippendorff's α = .87; Cicchetti, 1994; Table 2.2).

Table 2.1

Interrater-reliability values among the first group of SEMs for mapping the original 82 and the remaining 52 behavioral examples to the four team adaptation process phases

Krippendorff's α	95% CI	Units	Raters	Pairs
.67	[.61, .73]	82	5	653
.87	[.82, .92]	52	5	470

Table 2.2

Interrater-reliability values among the second group of SEMs for mapping the final 48 behavioral examples to the four team adaptation process phases

Krippendorff's α	95% CI	Units	Raters	Pairs
.91	[.87, .95]	48	5	454

The interrater reliability among the next five SMEs, who indicated what team adaptation phase was illustrated by each of the final 48 behavioral examples, was excellent (Krippendorff's α = .91). The interrater reliability among the same SMEs, who placed the 48 behavioral examples into low, medium, or high anchors, was also very high (Krippendorff's α = .83; Table 2.3).

Table 2.3

Interrater-reliability values among the second group of SEMs for mapping the final 48 behavioral examples to low, medium or high anchors

Krippendorff's α	95% CI	Units	Raters	Pairs
.83	[.76, .89]	48	5	462

2.4.3 Discussion of Study 1

The primary goal of Study 1 was to develop an instrument for the measurement of the overall team adaptation process, as suggested by Rosen and colleagues (2011), and contribute to the direct assessment of this dynamic phenomenon otherwise lacking in empirical studies. Responding to the requirements of the team adaptation literature (Maynard et al., 2015), we successfully developed BARS for each of the four phases that cover the spectrum of the team processes involved within each team adaptation phase. Two trained raters and two five-member SME groups participated in the development of the first instrument for the direct assessment of the overall team adaptation process, taking an important step for advancing both the team adaptation research and practice.

2.5 Study 2

The objective of Study 2 is to evaluate the psychometric characteristics of the developed BARS and provide a reliable instrument for directly measuring the team adaptation process as proposed by Rosen et al. (2011). Specifically, we aim to evaluate the BARS in terms of their sensitivity for differentiating between teams and between the four team adaptation phases. Furthermore, in line with the theory of the team adaptation process (Burke et al., 2006; Rosen et al., 2011), our goal is to examine whether the four team adaptation phases positively influence one another, while still representing four distinct constructs. Our further goal is to establish scale reliability and distinctiveness. Finally, in

order to establish criterion validity, we will investigate the extent to which the BARS measures are related to measures of team performance and the time needed to identify the right team strategy for completing the team task. As in Study 1, for the BARS validation, we will use the data that was originally collected for the previously mentioned team adaptation study (Georganta & Brodbeck, 2016).

2.5.1 Method

Participants. Two hundred sixty-four volunteers, randomly assigned to 66 four-person teams, participated in a laboratory experiment. The majority of participants were female (55%), students (92%), of different ethnic backgrounds (76% German, 10.4% other EU-Country, 13.2% other Non-EU-Country), and with an average age of 25.70 years (*SD* = 7.23).

Task. Four-person teams played a space-themed board game, a simplified version of the game *Space Alert* (Heidelberger Spielverlag, 2008). Each team's goal was to coordinate under stress and time pressure in order to eliminate an external threat and avoid the destruction of their spaceship. In the original study, the teams completed one trial and four regular missions. Each mission consisted of seven rounds while each team-member was allowed to make one move (attack, move, or load energy) per round (for more information see Georganta & Brodbeck, 2016).

For the validation of our BARS, we were interested only in the fourth mission, at the beginning of which, a different circumstantial change was introduced, namely, a different external threat. This new enemy had more powerful properties (life-, defense-, and movement-speed points) than the previous external threat, which attacked the spaceship during the first three missions. Consequently, the teams, in order to successfully complete their task, had to change their strategy, coordinate under new circumstances, and effectively adapt to this unexpected change. Due to the necessity for team adaptation and the

opportunity to observe this dynamic phenomenon within a controlled environment, we decided that these data were suitable for the BARS validation.

Procedure. Two raters, knowledgeable of the team adaptation literature and studies involving similar team processes, were selected for the BARS validation. In order to familiarize themselves with the team task and the newly-developed BARS, they were provided with all of the available material used in the original laboratory experiment. Afterwards, the raters met and discussed the definitions of the four team adaptation phases as well as how each phase was represented within the space-themed board game environment. After these steps were completed, the raters independently watched the six video recordings, which were used for the BARS development in Study 1 and, using the newly-developed BARS, rated how effectively each team adaptation phase was illustrated by each team across the overall mission. Subsequently, the two raters discussed their ratings and the challenges they faced in an effort to achieve a mutual understanding. The material used for this stage is provided in Appendix A.2.1.

After we established initial rater agreement and completed the pilot testing, both raters independently assessed the team adaptation phases of the 66 four-person teams by watching the video recordings of their fourth mission. Specifically, the raters used the developed BARS to measure how effectively each team adaptation phase was illustrated during the mission (i.e., one score for each phase for the overall mission). As soon as the rating was completed, we calculated the interrater-agreement. In order to evaluate whether the BARS measures differentiated between teams and between the four team adaptation phases, we calculated the rating range for each phase and the inter-correlations among the team adaptation phases. Finally, in order to evaluate the BARS criterion validity, we calculated the correlations between each team adaptation phase and team performance, as well as

between each phase and the time needed to identify the right team strategy for successfully completing the mission.

Measures.

Team adaptation phases. Team adaptation phases (i.e., situation assessment, plan formulation, plan execution, and team learning) were measured using the four BARS developed in Study 1. Each phase was measured using a 5-point scale from 0 (*poor illustration of phase*) to 5 (*good illustration of phase*) with behavioral examples in low, medium, and high points.

Team performance. Team performance was objectively measured based on the number of rounds each team needed to successfully complete the mission, ranging on a scale from 0 (*7out of 7 rounds needed*) to 4 (*3 out of 7 rounds needed*). The game was simplified in such a way that at least three rounds were needed to successfully complete the mission. For every additional round needed to successfully complete the mission, the team performance score was decreased by one point.

Time to identify the right team strategy. Time to identify the right team strategy was measured based on the seconds that each team needed to identify the right strategy (i.e., sequence of actions). Specifically, one of the authors, who created the game's missions, watched the video-recordings and measured the time each team needed to identify the right strategy for successful adaptation and mission completion.

Data Analysis. To evaluate the BARS sensitivity for each of the four team adaptation phases, we first calculated the descriptive statistics of the BARS measures in order to examine whether they differentiated between teams, and whether they showed a floor or a ceiling effect. In addition to these statistics, we calculated the inter-correlations among the team adaptation phases to examine whether the BARS measures correlated highly with each other, as suggested by the team adaptation process model (Rosen al., 2011). To measure the

interrater agreement between the two raters, and thereby test the BARS reliability, we calculated interclass correlation coefficients (ICCs) for each team adaptation phase (LeBreton & Senter, 2008). To evaluate the BARS criterion validity, we calculated the correlations between each team adaptation phase and team performance, and between each phase and the time to identify the right team strategy. We expected to find positive and negative relationships respectively, based on past theorizing suggesting that successful team adaptation leads to effective team outcomes (Burke et al., 2006; Rosen et al., 2011).

All analyses were conducted with SPSS (IBM SPSS Statistics Version 23).

2.5.2 Results

For both raters, the measures of each team adaptation phase ranged from 1 to 5 covering the entire rating scale. The overall mean for situation assessment was 3.31 for rater 1 and 3.22 for rater 2. For plan formulation and plan execution the overall mean was 3.15 for rater 1 and 3.03 for rater 2, and 3.16 for rater 1 and 3.00 for rater 2 respectively. The overall mean for team learning was 2.78 for rater 1 and 2.51 for rater 2. The standard deviation across team adaptation phases ranged from 0.97 to 1.31 for rater 1 and from 0.96 to 1.19 for rater 2.

As expected, the inter-correlations among the team adaptation phases were high and positive for rater 1 (r =. 80-.88, $p < .001$) as well as for rater 2 (r =. 49-.79, $p < .001$). In addition, the interrater reliability among the two raters was excellent for situation assessment (ICC = .76) and good for plan formulation (ICC = .68), plan execution (ICC = .67), and team learning (ICC = .65).

As expected, team performance showed a moderate positive correlation with situation assessment (r = .36 for rater 1, r = .37 for rater 2, p <.001), plan formulation (r = .41 for rater 1, r = .34 for rater 2, p <.001), plan execution (r = .50 for rater 1, p <.001; r = .37 for rater 2, p <.05), and team learning (r = .43 for rater 1, p <.001; r = .20 for rater 2, p = .017).

Furthermore, the time to identify the right team strategy showed a moderate positive correlation with situation assessment (r = -.26 for rater 1, p = .032; r = -.38 for rater 2, p <.001), plan formulation (r = -.30 for rater 1, , p = .014; r = -.38 for rater 2, p <.001), plan execution (r = -.38 for rater 1, r = -.42 for rater 2, p <.001) and, team learning (r = -.32 for rater 1, r = -.33 for rater 2, p <.001).

All the results are presented in Table 2.4.

Table 2.4

Means, standard deviations and intercorreltations among study variables

Variables	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Situation Assessment Rater 1	3.32	1.31	-									
2. Plan Formulation Rater 1	3.15	0.98	.83**	-								
3. Plan Execution Rater 1	3.17	0.97	.80**	.87**	-							
4. Team Learning Rater 1	2.79	1.30	.88**	.85**	.86**	-						
5. Situation Assessment Rater 2	3.23	1.20	.62**	.55**	.52**	.51**	-					
6. Plan Formulation Rater 2	3.03	1.02	.48**	.51**	.53**	.50**	.77**	-				
7. Plan Execution Rater 2	3.00	0.96	.48**	.50**	.51**	.48**	.65**	.72**	-			
8. Team Learning Rater 2	2.52	1.08	.53**	.46**	.45**	.49**	.79**	.77**	.66**	-		
9. Team Performance	3.15	0.77	.36**	.41**	.50**	.43**	.37**	.34**	.37**	.29*	-	
10. Time for Team Strategy Identification	146.97	38.35	-.26*	-.30*	-.39**	-.32**	-.38**	-.38**	-.42**	-.33*	-.77**	-

Note. * p < .05, ** p < .001.

2.5.3 Discussion of Study 2

The aim of Study 2 was to examine the psychometric properties of the BARS developed as part of Study 1 and provide both research and praxis a reliable and valid instrument for the measurement of all four phases of the team adaptation process (Rosen et

al., 2011). In accordance with previous BARS' validations (e.g., Ohland et al., 2012), the results indicated that the developed BARS met all the desired criteria. The BARS were sensitive and reliable, in terms of measuring the respective team adaptation phase, providing a range of scores, and showing acceptable standard deviation values for BARS using a 5-point rating scale (Hauenstein, Brown, & Sinclair, 2010). As far as the interrater reliability of the measures is concerned, results showed good to excellent agreement among the two raters on all four team adaptation phases (Cicchetti, 1994). It seems plausible to argue that BARS supported the raters' ability to make a more precise assessment by giving them the option to select from a set of behaviors, instead of letting them decide based only on their own judgment.

Furthermore, the findings supported the BARS' criterion validity by showing the expected relationships between each team adaptation phase and the two criterion measures (MacMillan, Entin, Morley, & Bennett, 2013). In accordance with the team adaptation process model, suggesting that successful team adaptation leads to higher team performance outcomes (Rosen et al., 2011), results showed that all four team adaptation phases correlate positively with team performance and negatively with the time needed for identifying the right team strategy. These relationships are moderately high providing additional evidence for the BARS' construct validity. Finally, the findings showed highly positive relationships among subsequent team adaptation phases confirming these so far theoretical assumptions (Burke et al., 2006; Rosen et al., 2011) and making an important contribution to team adaptation research.

2.6 Overall Discussion

It is widely recognized that team performance has a great impact on organizational success (Salas et al., 2015). A team's capacity to improve, reflect, learn, and adapt represents one of the main strategies for organizations to effectively deal with the dynamism,

complexity, and uncertainty of their environments (Burke et al., 2006). Despite the importance of team adaptation and the growth of theoretical models, describing how the process of team adaptation unfolds over time (e.g., Burke et al., 2006; Rosen et al., 2011), this dynamic phenomenon remains unmeasured. Building on this gap, the aim of the present studies was to provide both research and praxis a reliable instrument for capturing the spectrum of all four phases of the team adaptation process as suggested by Rosen and colleagues (2011).

Taking into consideration previous guiding principles and measurement examples (Rosen et al. 2011), as well as the advantages and the suitability of BARS for capturing such a phenomenon (Debnath et al., 2015), the first team adaptation process measurement was successfully developed and validated. The present study contributes to both research and practice by successfully responding to the latest requirements for direct assessment of the team adaptation process and by empirically supporting the theoretical relationships between the four team adaptation process phases (Baard et al., 2014). In addition, our measurement establishes clear definitions and clarifies differences between team adaptation inputs, process, and outcomes, and, consequently, promotes comprehensive team adaptation studies (Maynard et al., 2015). Finally, it enables the identification of specific behavioral strengths and weaknesses of teams that, consequently, can improve the performance of both teams and their organizations.

2.6.1 Limitations and Future Research

Along with the importance and contribution of the present work, there are further issues to consider and additional steps to take in order to move the team adaptation field forward. As the BARS' development and validation was based mainly on a student sample within a laboratory setting, we encourage researchers to implement our instrument in various settings and with different populations to replicate the psychometric advantages of our BARS and test

the generalizability of our findings. Additionally, as our instrument is only usable with German-speaking population, we encourage the translation of our BARS in other languages and their validation. This will enable the direct measurement of the team adaptation process in different countries and, ideally, facilitate a cross-cultural examination of this dynamic process. However, as Ziegler and Bensch (2013) have highlighted, a clear goal behind a translated measure is required (i.e., purpose, target population, and employment) in order to make the comparison of the assessment methods possible.

Moreover, we suggest that in future research, the relationship between the BARS' values and other measures should be investigated in order to further verify the BARS' construct validity and examine the relationships between each team adaptation phase with different cognitive and affective team states (Burke et al., 2006; Rosen et al., 2011). As the cognitive demands placed on raters when using BARS are high (MacMillan et al., 2013), it is also suggested that raters should take notes during their observations especially when there is a need to observe in real time and more than one team members. This will support the raters' ability to recall relevant information without relying on their memory or on overall impressions (MacDonald & Sulsky, 2009). Furthermore, a computer-based implementation of our BARS is suggested, which in addition to note taking, will allow, for instance, the rating by multiple observers. Such an instrument can also be developed to combine the individual judgements into an overall evaluation for each team adaptation phase, to calculate the interrater agreement, or even to record team behaviors in order to assess them at a later point in time. This computer-based implementation can be also used to train raters in using our BARS, an important prerequisite for reliable and valid behavior assessment (MacMillan et al., 2013).

2.6.2 Practical Implications

Equally important is the practical value of our instrument that can be implemented in a number of management processes and, thus, support teams and organizations to effectively deal with today's challenges. The detailed and effective feedback potential of our BARS represents one of the major advantages that can provide team members with clear and useful information about how to improve individual and team performance (Debnath et al., 2015).

Specifically, our BARS can be implemented as a team development tool for peer- or supervisor-feedback. This developmental feedback can facilitate a better understanding of what constitutes effective and less effective team adaptation behaviors and, thus, encourage the team to improve as a whole. Moreover, it can help the team to develop other team capacities related to team adaptation such as trust and shared mental models (Burke et al., 2006). Similarly, our BARS can be incorporated in team training in order to provide feedback directed at specific behaviors and, consequently, enhance how teams respond to unexpected changes. Team training represents a sufficient method for recognizing when and where there is a need for intervention in order to support the team (Maynard et al., 2015). So far, team training programs have demonstrated utility for supporting team adaptation in a variety of settings (Gorman, Cooke, & Amazeen, 2010). This evidence provides further support for enabling a more targeted improvement of team adaptation.

Our BARS can be also incorporated in personnel selection, for instance, as a rating instrument during a team exercise in order to identify the right individual for a given team. In particular, for the selection of specific team roles, such as the role of the team leader, the implementation of our BARS can be extremely valuable by providing information about whether a person is capable to successfully lead a team in a face of an unexpected event.

2.6.3 Overall Conclusion

The present research, building on the necessity for a direct assessment of the team adaptation process, introduced the first valid and reliable instrument of this dynamic phenomenon as described by Rosen et al. (2011). Specifically, four behaviorally anchored rating scales (BARS) that cover the whole spectrum of each of the four team adaptation phases were developed and successfully evaluated. Their implementation will enable both practitioners and academics to capture the complexity and multidimensionality of the team adaptation process and facilitate the identification of specific behavioral strengths and weaknesses of teams. This will, in turn, improve not only the performance of the team themselves but also of their organizations.

2.7 Linking Chapter 2 and Chapter 3

In Chapter 2, two experimental studies were described addressing the first research question of the present thesis and introducing the first valid behavioral instrument for assessing the overall four-phase team adaptation process as proposed by Rosen and colleagues (2011). Following Rosen et al.'s (2011) measurement guidelines and the need for an effective team adaptation process metric, four BARS were developed and successfully validated. This instrument represents an essential tool for practice to incorporate in team development and team training interventions to improve the team's adaptive capacity. Moreover, it enables research to directly measure the team adaptation process and the effectiveness of its components and hence, conduct comprehensive studies that will provide a better understanding of what promotes and in turn, is promoted by the team adaptation process itself.

Building on this last important contribution of Chapter 2, in the subsequent study presented in Chapter 3, we use the developed behavioral instrument in order to directly measure the team adaptation process and hence, empirically investigate its relationship to

developed team properties and team adaptive outcomes and thus, address the second and third research question of the present thesis. Extending previous research that has so far focused only on single-process components neglecting the four-phase team adaptation process as a whole, the impact of previous exposure to multiple team adaptation requirements and the impact of updated team cognitive structures on the four-phase team adaptation process is investigated. Consequently, the influence of the team adaptation process on team adaptive outcomes is examined. The experimental design of the study presented in Chapter 3 allows obtaining a clearer picture of these unexamined relationships while controlling for extraneous effects.

3 The Underlying Mechanisms and Outcomes

What promotes and is promoted by the Team Adaptation Process[2]

3.1 Abstract

The aim of the present study was to investigate the relationship of team properties and team adaptive outcomes to the overall four-phase team adaptation process, not just to its individual components as previous empirical studies have done to date. In order to achieve this goal, a laboratory experiment with 72 teams performing under unpredictable and novel circumstances was conducted. Results showed that teams with previous team exposure to multiple team adaptation requirements during their task performance exhibited a higher degree of completion of the four-phase team adaptation process and developed more their Transactive Memory Systems (TMS) in the face of new adaptation requirements compared to teams with no previous adaptation exposure. Furthermore, results confirmed the mediating role of the level of TMS development in the positive relationship between previous adaptation exposure and the degree of completion of the four-phase team adaptation process in the face of new adaptation requirements during task performance. Findings also demonstrated that teams with previous adaptation exposure needed less time to make a collective decision for a subsequent novel team task than teams with no previous exposure. Finally, findings showed that the first three team adaptation phases (i.e., situation assessment, plan formulation, and plan execution) independently enhanced post-change team performance and not the overall process as theory postulates. The study contributes to theory and research by providing first empirical findings of the team adaptation process as suggested by Rosen et al. (2011), its inputs and team outcomes based on an investigation of the dynamic and unfolding team behaviors.

[2]The experimental study presented in this chapter was conducted based on data collected at the Munich Experimental Laboratory for Economic and Social Sciences (MELESSA) of Ludwig-Maximilians-Universitaet Muenchen, in Munich, Germany. Professor Felix C. Brodbeck supervised this research and is the second author of this work. When using the term "we", I refer to Felix C. Brodbeck and myself. This work has been presented at the "11th Annual Conference of Interdisciplinary Network of Group Research (INGRoup)" in July 2017 in Helsinki, Finland. An adapted version of this chapter has been submitted to Journal of Organizational Behavior.

3.2 Introduction

Teams, due to their members' broad repertoire of knowledge, experiences, and skills, represent an increasingly important element of today's organizations. In particular, organizations rely on them and their strengths in order to deal with the changing, dynamic, and unpredictable environment in which they are operating (Kozlowski & Bell, 2003). Consequently, teams must be prepared to adjust to rapidly changing performance conditions, an environmental feature underlying the necessity for team adaptation (Burke, Stagl, Salas, Pierce, & Kendall, 2006).

While research on team effectiveness and performance in organizational settings is growing (for review see Mathieu, Maynard, Rapp, & Gilson, 2008), studies addressing which mechanisms enhance successful adaptation, and how teams adapt to novel and challenging circumstances are limited (e.g., Christian, Christian, Pearsall, & Long, 2017; Kozlowski & Ilgen, 2006; Mathieu et al., 2008). As Christian and colleagues (2017) have highlighted, "an important next step is to move beyond routine team performance towards quantifying our understanding of team adaptation to non-routine circumstances" (p. 62). Although recent theoretical frameworks (e.g., Burke et al., 2006; Christian et al., 2017; Maynard, Kennedy, & Sommer, 2015) focus on team adaptation as an unfolding process that is influenced by team team inputs and, in turn, impacts team adaptive outcomes (i.e., outcomes following change), empirical studies have so far neglected the overall team adaptation process and investigated only single team processes, their inputs, and outcomes (Baard, Rench, & Kozlowski, 2014).

The purpose of the present study is threefold based on the need for empirical evidence supporting the overall team adaptation process, as well as its relationship with team properties and outcomes (Maynard et al., 2015). Our first goal is to examine previous exposure to multiple team adaptation requirements as an important input for the team adaptation process, and investigate its advantage over no previous adaptation exposure on

team outcomes when performing under challenging circumstances. Our second goal is to examine the impact of the overall team adaptation process, and its four different phases (Burke et al., 2006; Rosen, Bedwell, Wildman, Fritzsche, Salas, & Burke, 2011), on team adaptive outcomes and to extend previous empirical work that has so far investigated solely the impact of single process-components on team adaptive performance (for meta-analytic review see Christian et al., 2017). In order to provide better insight to the contradictory findings regarding the role of a team's cognitive structure under novel or unexpected circumstances (e.g., Lewis, Belliveau, Herndon, & Keller, 2007), our third goal is to investigate whether previous exposure to multiple team adaptation requirements leads to updated team cognitive structures and whether these, in turn, positively influence the team adaptation process and team outcomes compared to stable team cognitive structures.

3.3 Theoretical Background

Despite the fact that modern day work, across different settings, is mainly performed in teams, very little is known about the underlying mechanisms supporting teams to effectively adapt, and how these mechanisms enable a successful performance under challenging circumstances (Baker, Day, & Salas, 2006; Bigley & Roberts, 2001). As research suggests, teams need to evaluate and analyze situations in order to adjust their cognitive and behavioral processes in the best way possible (Burke et al., 2006; Randall, Resick, & DeChurch, 2011; Uitdewilligen, Waller, & Pitariu, 2013). The ability to change interactions in order to match the demands of the environment and respond effectively is what enables teams to perform at a high level under novel conditions (Gorman, Cooke, & Amazeen, 2010).

Team adaptation, which is conceptualized as "a change in team performance in response to a salient cue or cue stream that leads to a functional outcome for the entire team" (Burke et al., 2006, p. 1990), describes the process that teams undergo in order to successfully operate under conditions never experienced before. According to recent

theoretical frameworks (Maynard et al., 2015; Christian, et al., 2017), the team adaptation process is influenced by various team inputs and developed team properties (e.g., experience and mental models) and, in turn, influences various team outcomes (e.g., team performance). However, these frameworks do not incorporate the team adaptation process as a whole and focus only on some of its components, despite the authors' belief that "an understanding of the adaptive process in general holds value" (Christian et al., 2017, p. 63).

Team adaptation describes a dynamic four-phase process during which a team has to diagnose, interpret, plan, respond to, and learn from challenges it has never faced before in order to highly perform (Rosen et al., 2011). Some research suggests that highly developed teams, in terms of their time working together and experience, are more willing to restructure or even abandon inadequate assumptions in order to adapt to new challenges compared to less developed teams (Avolio, Jung, Murry, & Sivasubramaniam, 1996). This is possibly due to their experience and the fact that learning transfer can occur when overlapping productions between two situations exist (e.g., Anderson, 1993). Nevertheless, it still remains unclear what mechanisms support the ability of teams to successfully perform under challenging circumstances. In the last few years, many empirical studies within the organizational context have used the four-phase team adaptation process model as a theoretical foundation to understand how teams adjust to unexpected circumstantial changes (e.g. Uitdewilligen et al., 2013; Santos, Passos, & Uitdewilligen, 2016). However, this model has not yet been, to our knowledge, explicitly examined in the extent empirical literature.

Taking a step forward, we incorporate the four-phase team adaptation process (Burke et al., 2006; Rosen et al., 2011) in the theoretical framework of team adaptation, as proposed by Maynard and colleagues (2015) and Christian and colleagues (2017), and investigate previous exposure to multiple team adaptation requirements as an influential factor, and team performance and time for collective decision making as the team adaptive outcomes of the

four-phase team adaptation process. Moreover, we explore the role of team cognitive structures (i.e., TMS development) on the overall team adaptation process and on team adaptive outcomes as suggested by team adaptation theory.

3.3.1 Team Adaptation Process

The process of team adaptation is conceptualized as a dynamic cycle that unfolds over time (Baard et al., 2014). According to Rosen et al.'s model (2011), the team adaptation process describes a sequence of the following four phases: situation assessment, plan formulation, plan execution, and team learning. These four consecutive phases include processes such as assessing the environment, sharing information, formulating plans, assigning roles, and reflecting on the team's strengths and weaknesses. It is through these activities that teams can detect changes in the environment, learn about the requirements of each situation, improve their collective understanding, and discover unexpected consequences of previous actions in order to effectively respond to unexpected challenges (Rosen et al., 2011). As the authors highlight, all four phases of the team adaptation process have to be successfully completed in order to achieve a functional outcome. For instance, if a team has not learned from its mistakes and successes (i.e., learning phase), while performing under condition variability, then the team adaptation process is still ongoing and has not been completed (Burke et al., 2006).

Teams will cycle through the team adaptation process every time there is a need to address new, dynamic, or unpredictable conditions (Burke et al., 2006; Kozlowski, Gully, Nason, & Smith, 1999; Rosen et al., 2011). The effectiveness of the team adaptation process and consequently of the team adaptive outcomes will, however, depend on the team's underlying inputs, such as experiences, abilities, and team characteristics (Zaccaro & Bader, 2003). In line with this suggestion and consistent with recent theoretical frameworks (Maynard et al., 2015; Christian et al., 2017), we will investigate whether previous exposure

to multiple team adaptation requirements will promote the level of TMS development and, thus, the four-phase team adaptation process and whether these last team constructs will, in turn, enhance team outcomes in the face of unexpected or novel conditions.

3.3.2 Previous Exposure to Multiple Team Adaptation Requirements

Researchers indicate that team characteristics are essential to understanding variations in team processes and outcomes (Klein & Kozlowski, 2000). Similarly, team inputs and developed team properties, such as team experience, have been proposed to explain variations in team adaptation and, hence, team adaptive outcomes (Maynard et al., 2015). For instance, Christian et al. (2017) recently showed that prior team performance exerted a positive influence on single team processes involved in the team adaptation process. An interesting question that, however, remains unanswered is whether the experience gained by being exposed and by adjusting to multiple team adaptation requirements can enhance the overall team adaptation process and thus, team adaptive performance. It has been suggested that interrupting events can increase the potential for team adaptation allowing a critical reflection and successful adjustment of future strategies and behaviors (Oertel & Antoni, 2015). We, therefore, expect that teams while adjusting to multiple team adaptation requirements will learn to diagnose, interpret, respond, and reflect their situation and its demands in a more effective way than teams with no such adaptation requirements during their performance. Consequently, it is expected that teams with previous exposure to multiple team adaptation requirements will benefit from this team property and perform a more complete team adaptation process under challenging circumstances compared to teams with no previous adaptation exposure. Hence, we suggest the following:

Hypothesis 1: Previous exposure to multiple team adaptation requirements will positively influence the level of completion of the team adaptation process in the face of new adaptation requirements.

3.3.3 Transactive Memory Systems Development

TMS are defined as "the shared division of cognitive labor with respect to encoding, storing, and retrieving knowledge from different but complementary areas of expertise" (Huber & Lewis, 2010, p. 8). According to Wegner (1987), TMS can develop within groups when team members share experiences, interact as a team, and process relevant information together. Therefore, it is expected that teams that gain experience by working together will develop a shared understanding of who knows what and how to benefit from this knowledge for the purpose of their task. In addition, performing a task which can be regarded as "learning by doing" can also establish and reinforce the TMS structure by providing feedback about functioning and performance results of the team (Lewis, Lange, & Gillis, 2005). For instance, Reagans, Argote, and Brooks (2005) showed that experienced surgical teams in working together and performing under stressful and often unexpected circumstances, better matched their members to suitable tasks and knew to whom to go for advice, compared to less experienced teams in working together.

Consistent with the above findings, it is expected that teams while adjusting to multiple team adaptation requirements will develop a better shared understanding of each team member's abilities, will learn how to use this knowledge, and, most importantly, will learn to update their cognitive structure for the purpose of a non-routine condition or task compared to teams with no such adaptation requirements during their performance. As Lewis and Herndon (2011) have suggested, teams that perform under condition variability gain a better

understanding of their individual expertise and a greater confidence of seeking information from the right team members when problems arise. Therefore, we assume the following:

Hypothesis 2: Previous exposure to multiple team adaptation requirements will positively influence the level of TMS development in the face of new adaptation requirements.

As proposed by Rosen et al. (2011), emergent states, such a team's TMS, serve, in turn, as supportive inputs of the four-phase team adaptation process. This recognition of which individual possesses what knowledge can be very beneficial, as individuals are able to take advantage of other team members' expertise in addition to their own personal capabilities (Zhang, Hempel, Han, & Tjosvold, 2007). The relevance of TMS, especially under stressful and changing circumstances, is very high, due to the fact that TMS facilitate the access to the specialized expertise of the team members involved and, thereby, assure the integration of a great amount of reliable and task-related knowledge (Lewis & Herndon, 2011).

TMS represent an important supportive mechanism for all four phases of the team adaptation process. In particular, a high TMS level supports teams during the first team adaptation process phase (i.e., situation assessment) to recognize different cues that are relevant to gain a complete picture of the situation without missing any important information (Zajac, Gregory, Bedwell, Kramer, & Salas, 2014). The differentiated knowledge of each team member is also beneficial during the second team adaptation process phase (i.e., plan formulation). Knowing the expertise of each team member and trusting the reliability of each member's knowledge, which is crucial under unpredictable and novel circumstances, promotes the development of a good and efficient plan (Burke et al., 2006). In addition, by knowing each other's strengths and weaknesses and who is good on what also supports a

successful role and task distribution while formulating the team's plan. A common understanding of who knows what also benefits teams during the third phase of the team adaptation process (i.e., plan execution). For instance, it has been shown that a high TMS level leads to effective coordination and communication among team members (e.g., Marques-Quintero, Curral, Passos, & Lewis, 2013), an important prerequisite when performing under stressful and time-limited circumstances. Similarly, Marks, Zaccaro, and Mathieu (2000) found that this shared understanding of one another's roles and expertise positively influences coordination and respectively team performance. Finally, this shared team cognition supports teams during the final team adaptation process phase (i.e., team learning) to reflect on their previous actions and improve their understanding with regards to their current state (Rosen et al., 2011). For example, Dayan and Basarir (2010) showed that teams with high TMS reflected to a greater extend upon their actions and goals resulting to successful adaptation to the environmental demands.

Under challenging circumstances, updating, in addition to developing, the team's cognitive structure is important to remain effective (Uitdewilligen et al., 2013). For example, teams that rely on cognitive structures that were developed based on established routines and patterns during previous task performance fail to adapt effectively (e.g., Gersick & Hackman, 1990; Stachowski, Kaplan, & Waller, 2009). A more conscious cognitive mode which allows rethinking of former patterns of behavior is what enables a successful adaptation to novel or unfamiliar circumstances (Louis & Sutton, 1991); "it is not similarity or accuracy of mental models per se, but rather the team members' ability to update their mental models in the light of changes in the task situation that is pivotal to team adaptation" (Uitdewilligen et al., 2013; p. 5). Taking into consideration this evidence and aiming to gain a better insight about the contradicting findings with regards to the relationship between cognitive structures and team adaptation, we argue that a high level of TMS development, which is achieved by updating

the team's TMS depending on the representation of the circumstances, will promote the four-phase team adaptation process. Thus, we assume the following:

Hypothesis 3: A high level of TMS development will positively influence the degree of completion of the four-phase team adaptation process in the face of new adaptation requirements.

Taking into consideration the last hypothesis and the two prior hypotheses, we argue that the level of TMS development will mediate the positive relationship between previous exposure to multiple team adaptation requirements and the degree of completion of the four-phase team adaptation process. This suggestion is consistent with empirical studies conducted in the last two decades showing that team emergent states, such as TMS, represent the primary explanatory variables mediating the relationship between team inputs and desirable team outcomes (e.g. Mathieu et al., 2008). Consequently, we propose the following hypothesis:

Hypothesis 4: The level of TMS development will mediate the positive relationship between previous exposure to multiple team adaptation requirements and the degree of completion of the four-phase team adaptation process in the face of new adaptation requirements.

3.3.4 Team Adaptive Outcomes

Team Adaptive Performance. Team variables, such as prior experience and team adaptation related knowledge, although typically conceptualized as input variables, can also improve through team interactions over time (Kozlowski et al., 1999). For example,

empirical and theoretical work on group learning supports the notion that team performance can improve as a function of individual experience in working in a group (e.g., Brodbeck & Greitemeyer, 2000a, b). In addition, it has been argued (Pirolli & Anderson, 1985) and empirically shown (Lee, Bond, Scarbrough, Gillan, & Cooke, 2007) that productions formed during learning become stronger over time improving group performance along a learning curve. Hence, it is expected that teams who gain experience by performing a task multiple times will improve their performance. It has been also suggested that past experience and especially the exploration of alternative solutions promotes the capacity of a team to make needed changes when facing a new challenge (Kozlowski et al.,1999), thereby, improving its performance even when conditions differ across situations. As Lee (1998) has argued, learning transfer can also occur between situations that are not necessarily the same. Specifically, transferring knowledge from one situation to another is successful when similarities across situations are recognized and when prior knowledge and problem-solving strategies are matched to the new problem (Bassok, 1990). For instance, Gentner, Loewenstein, and Thompson (2003) found that comparing two different but analogous negotiation problems supported participants to understand the underlying structure of the problem domain and transfer their knowledge from one problem to the other. These findings are of great importance for teams nowadays, as their primary characteristic is that they must often perform under challenging and continuously changing circumstances (Sundstrom, DeMeuse, & Futrell, 1990). Thus, it is expected that teams who gain experience by performing a task multiple times will improve their performance even if they are exposed to different unpredictable circumstances due to these situations underlying aspect of ‘adapting’. Building on this suggestion, it is expected that teams with previous exposure to multiple adaptation requirements will perform better their task in the face of new challenging

circumstances necessitating adaptation compared to teams with no previous adaptation exposure.

Time for Collective Decision Making. Insufficient time spent exploring ideas and generating alternatives represents an important and very common obstacle that teams nowadays face and need to overcome (e.g. Shen, Chung, Li, & Shen, 2004). Medical action teams, for instance, need to make decisions and operate under time constraints, as loss of time can have detrimental effects for the person receiving medical treatment (Janss, Rispens, Segers, & Jehn, 2012). For decades, reductions in the time required to perform a task have been used as an indicator of learning (e.g., Thurstone, 1919; Graham & Gagne, 1940). In support of this view, Waller, Gupta, and Giambatista, (2004) showed that high performing nuclear teams engaged in less information exchange and interacted for less time than low performing teams while performing a crisis simulation. Moreover, research has argued that the speed to identify unfamiliar and novel circumstances and to generate appropriate responses is related to how successful team adaptation is performed (Smith-Jentsch, Johnson, & Payne, 1998; Waller, 1999).

Based on the previous argument that knowledge transfer can also occur between different situations, as long as some similarities between them are identified (Lee, 1998), we argue that teams with previous exposure to multiple team adaptation requirements will use the strategies and capabilities developed while performing under condition variability in performing a new and demanding team task, which due to its novelty represents a new challenge requiring adaptation. Particularly, we expect that teams with previous exposure to multiple team adaptation requirements will benefit from what they learned while adapting to different unexpected challenges and, in turn, when performing a new and different task under stressful and time constraints, will adjust more effectively to this novelty and, thus, spend less

time making a collective decision compared to teams with no previous team adaptation exposure.

Based on the above arguments that previous exposure to multiple team adaptation requirements will positively impact team adaptive outcomes when facing new adaptation requirements either in the form of an unexpected change during task execution or in the form of a novel team task, we assume the following:

Hypothesis 5a: Previous exposure to multiple team adaptation requirements will positively influence team performance in the face of new adaptation requirements.

Hypothesis 5b: Previous exposure to multiple team adaptation requirements will positively influence the time for collective decision making for a novel team task.

According to the team adaptation process model (Burke et al., 2006; Rosen et al., 2011), the overall team adaptation process with all its phases, serves as the main mechanism needed to perform successfully in the face of an unexpected or new situation. In accordance with this argument, a number of studies have demonstrated the positive relationship between team adaptive behaviors and team-level outcomes, such as team performance (e.g., Maynard et al., 2015). For instance, LePine (2003) reported one of the first studies that found a positive relationship between role structure adaptation and collective decision-making performance. Additionally, in a recent meta-analytic review, Christian and colleagues (2017) found that communication, coordination, stimulus-specific action, learning behavior, and plan formulation, which represent essential components of the team adaptation process, were strongly and positively related to team adaptive performance. On the contrary, research has shown that teams who rely on existing routines without discussing their relevance or

applicability (Gersick & Hackman, 1990) and without planning their strategy (Hackman & Morris, 1975), fail to focus on relevant information in the face of a new or unexpected event (Henry, 1995) and, consequently, fail to successfully adapt to the changing circumstances. Taking into consideration these suggestions and the need to extend these findings by incorporating the overall team adaptation process, we argue that teams that carry out a complete four-phase team adaptation process will perform better under challenging and novel circumstances than teams with a partially-completed or incomplete team adaptation process.

Team cognitive structures in general and the development of TMS in particular also represent an important supportive mechanism for team outcomes and team effectiveness (e.g., Ellis, 2006; Rau, 2005). For instance, Uitdewilligen and colleagues (2013) showed that team mental model updating based on task changes is particularly beneficial for team adaptive performance. Accurate team cognition, which enables the provision of information without explicit requests, is also beneficial, leading to time reduction in team interaction when challenges arise (Stout, Cannon-Bowers, Salas, & Milanovich, 1999). For instance, research suggests that under demanding circumstances teams with TMS complete their task in a shorter amount of time compare to teams with no TMS (Ren, Carley, & Argote, 2006). When conditions change, team members learn to be flexible, to reach for different information from each other, and update their knowledge (e.g., McNeese & Pfaff, 2012). These updated team cognitive structures lead, in turn, to adaptive success (Christian, Pearsall, Christian, & Ellis, 2014). Based on these findings and suggestions, we argue that teams with a high level of TMS development will reach higher team outcomes in the face of an unexpected or novel situation compare to teams with a lower level of TMS development.

Considering the above arguments as well as the current state of theory and research, it is expected that the degree of completion of the team adaptation process as well as the level of TMS development will positively impact team adaptive outcomes in the face of new

adaptation requirements either in the form of an unexpected change during task execution or in the form of a novel team task. Hence, we propose:

Hypothesis 6a: The degree of completion of the team adaptation process will positively influence team performance in the face of new adaptation requirements.

Hypothesis 6b: The degree of completion of the team adaptation process will positively influence the time for collective decision making for a novel team task.

Hypothesis 6c: The level of TMS development will positively influence team performance in the face of new adaptation requirements.

Hypothesis 6d: The level of TMS development will positively influence the time for collective decision making for a novel team task.

Taking into consideration the prior hypotheses, and the suggested positive impact of previous exposure to multiple team adaptation requirements on the degree of completion of the team adaptation process and level of TMS development, we argue that the two latest team constructs will mediate the positive relationship between previous exposure to multiple team adaptation requirements and team adaptive outcomes (i.e., team performance, time for collective decision making).

This suggestion is consistent with general team adaptation frameworks that propose the team adaptation process as the mediator between team inputs and team adaptive outcomes (Christian et al., 2017; Maynard et al., 2015), a proposal that so far remains uninvestigated. Similarly, within the team adaptation literature, team cognitive structures, serve not only as

an input to team adaptation process (e.g., Resick et al., 2010) but also as a mediator between team inputs and team adaptive outcomes (e.g., Maynard et al., 2015). Hence, we propose the following hypotheses:

Hypothesis 7a: The degree of completion of the team adaptation process will mediate the positive relationship between previous exposure to multiple team adaptation requirements and team performance under challenging circumstances requiring team adaptation.

Hypothesis 7b: The degree of completion of the team adaptation process will mediate the positive relationship between previous exposure to multiple team adaptation requirements and time for collective decision making for a new task requiring team adaptation.

Hypothesis 7c: The level of TMS development will mediate the positive relationship between previous exposure to multiple team adaptation requirements and team performance under challenging circumstances requiring team adaptation.

Hypothesis 7d: The level of TMS development will mediate the positive relationship between previous exposure to multiple team adaptation requirements and time for collective decision making for a new task requiring team adaptation.

Aiming to obtain a clearer picture of these unexamined relationships and controlling for extraneous effects, a laboratory experiment, incorporating many of the situational characteristics experienced by modern teams (e.g., unpredictable, stressful, and time-limited circumstances) will be conducted. In Figure 3.1 our theoretical model and hypotheses are illustrated.

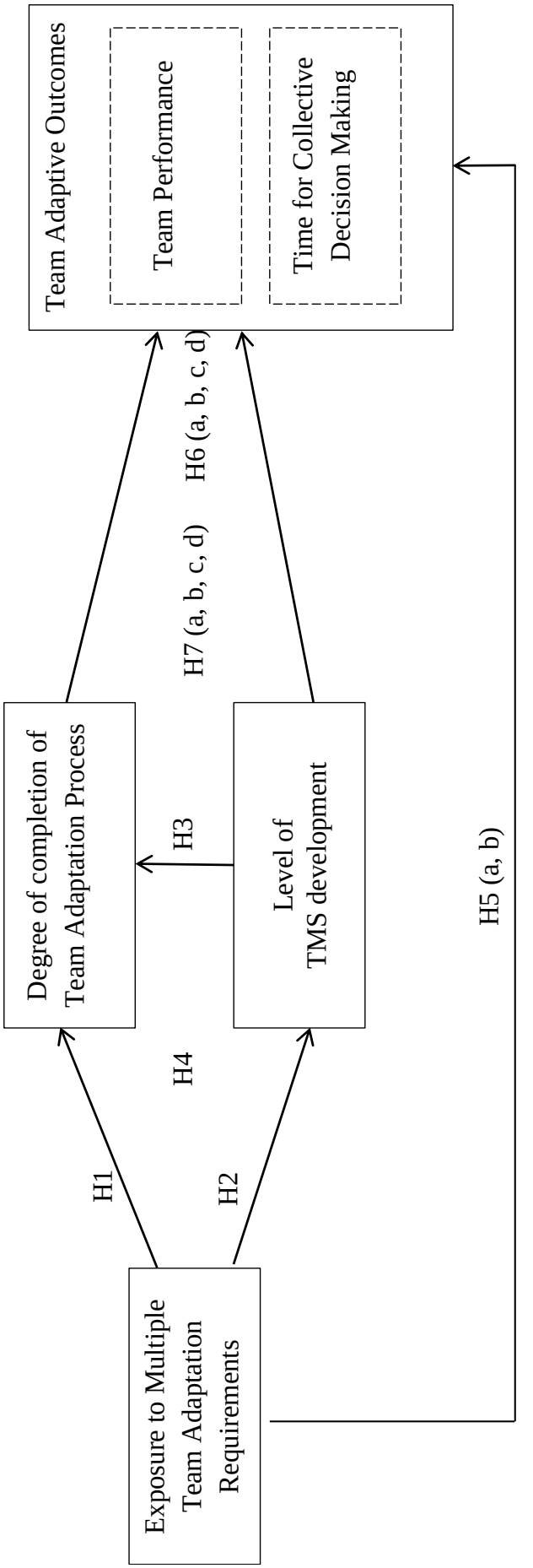

Figure 3.1 Theoretical model of the study.

3.4 Method

3.4.1 Participants

An a priori power analysis using G*Power (version 3.1.9.2; Faul & Erdfelder, 1992) with a power level of .95, $p < .05$ alpha criterion, with an assumed medium to large effect size (see Resick, Murase, Bedwell, Sanz, Jiménez, & DeChurch, 2010), revealed that a sample size of 36 teams for each of the two conditions is sufficient (Faul, Erdfelder, Lang, & Buchner, 2007). Hence, 288 volunteers randomly assigned to 72 four-person teams performed a space-themed team game. The majority of participants were female (55.2%), students (92%), of different ethnic backgrounds (76% German, 10.4% other EU-Country, 13.2% other Non-EU-Country), and with an average age of 25.74 years (*SD* = 7.36). Participants were compensated for their participation by payment of 4.00€ per person and could earn up to 20.00€ per person based on their team's performance.

3.4.2 Tasks

We tried to overcome typical drawbacks of a laboratory study by creating similar conditions to the ones in which teams nowadays are operating: stressful circumstances, interdependence among team members, and high cognitive demands for team activities. Four-person teams performed a space-themed board game, which was developed based on the board game *Space Alert* (Heidelberger Spielverlag, 2008). We simplified the original version so that the participants would understand the team task and its rules within a short amount of time (i.e., one external threat, seven one-minute rounds, one of four possible moves per round, and same abilities for all team members). For the purpose of our task, each team needed to defend its spaceship while it was being attacked by an external threat. The external threat had specific properties (i.e., life-, defense-, and movement-speed points). The team had seven minutes (one minute per round) to eliminate the external threat and protect the spaceship. The team members were randomly assigned to a different color and were

located at the spaceship's deck. Each team member was allowed to make one move (i.e., attack, move, navigate, or load energy) per round. In every round, the external threat made steps towards the spaceship while attacking the spaceship's guns and/or the spaceship's resources (first reducing their energy and then destroying them). The team's goal was to eliminate the external threat as fast as possible. The team members had to coordinate with each other to decide who will go where and what actions will be performed in order to destroy the external threat and avoid the spaceship's explosion. The task was performed under stress and time pressure (recorded voice informed when a round was over and counted down the seconds before spaceship explosion). Each team had to complete one trial and four regular missions.

After the missions were completed, each team had to perform a new team task. We developed a team-decision making task (see Appendix B.1) based on the team building exercise *Moon Landing* (Knox, 2008). The team was informed that it just completed an unsuccessful crash-landing that destroyed part of their spaceship. Their lives were in danger; the spaceship was about to explode. Each team member was given a list of 15 items that could be helpful for survival. The team had to collectively select 7 items that were most important for survival and put them in order of priority. During the second team task, an alarm was going off to increase the stress level.

3.4.3 Procedure

A between-subjects design was used to manipulate the exposure to team adaptation requirements. Upon arrival, participants were randomly assigned to a position on a four-person team, which resulted in 72 teams. Teams were randomly assigned to either the experimental or the control group, with 36 teams in each condition. Before entering the laboratory, all participants signed the participation form, in which anonymity and voluntariness were ensured (for study's ethical approval see Appendix B.2).

At the beginning of the experiment, a 10-minute video illustrating the rules of the first team task was presented to both conditions (see Appendix B.3). To ensure that all participants had acquired a basic level of knowledge for the team task, a trial mission, in which all teams were treated identically, was completed. Another important goal during the trial mission was for teams to develop a strategy that would enable them to successfully complete the following missions. After the trial mission was completed, the instructor answered questions related to the team task, only by reproducing the information already presented in the video to assure that all teams were provided with the same information. Participants were also provided with a one-page summary of the team task's rules (see Appendix B.4). All 72 teams were accompanied by the same instructor (see Appendix B.5 for instructor guidelines).

Both groups completed four missions of the first team task (see Appendix B.6). In the first three missions, the control group performed the team task without any disruptions and was, therefore, able to use the strategy developed during the trial mission. On the contrary, the experimental group, at the beginning of its first three missions, was faced with an unexpected change necessitating the need to adjust the strategy developed during the trial mission as this was no longer efficient. Hence, the experimental group had to adapt in order to successfully complete its missions. A different unexpected change was introduced at the beginning of each of the first three missions (i.e., reduction of resources, loss of team-members, and a different way to operate the spaceship's guns). The experimental group consisted of three subgroups; the order of the unexpected change was different for each subgroup in order to control for sequence effects. At the beginning of the fourth mission, a different unexpected change was introduced to both groups. Specifically, a more powerful external threat with different properties (i.e., life-, defense-, and movement-speed points) was attacking the spaceship. Both groups (i.e., experimental and control group) had to adapt in order to defend their spaceship and successfully perform the fourth and last mission. All

unexpected changes were chosen from a category scheme of team adaptation triggers (e.g., team member loss, limited resources, and change in preconditions) that was developed by Georganta, Wölfl, and Brodbeck (2016).

After each mission (i.e., trial and four regular missions), team members completed a questionnaire measuring their TMS. The last questionnaire also included demographic questions (see Appendix B6).

After all missions were completed, all 72 teams continued with a second novel team task. During the second task, all team-members were given a list of 15 items that could be helpful for survival, in the event of an unsuccessful crash-landing and imminent spaceship explosion. Each team had to come to consensus, collectively choose seven items, and put them in ranking order. The time that each team needed make a collective decision was measured.

During the first and second team task, an alarm was going off in order to increase the stress level and time pressure. The entire study lasted about one hour. All 72 teams were videotaped throughout the entire experiment. At the end of the experiment, team members were thanked for their participation and compensated by payment based on the team's performance during the first team task. Table 3.1 illustrates the design of the overall study.

Table 3.1

Overview of study design for the experimental and the control group

	1st Task					2nd Task
	Trial Mission	Mission 1, 2, and 3		Mission 4		
		No Team Adaptation	Team Adaptation required	No Team Adaptation	Team Adaptation required	
Experimental Group	x		x		x	x
Control Group	x	x			x	x

3.4.4 Measures

Team Performance. Team Performance was objectively measured based on the number of rounds the teams needed to successfully complete each of the four missions. The game was simplified in such a way so that a minimum of three out of seven rounds were needed to successfully complete one mission and achieve the highest team performance score (see Appendix B7). For every additional round that a team needed to complete the mission, the team performance score was reduced by one point. Team performance scores ranged on a scale from 0 (i.e., 7 out of 7 rounds needed to complete mission) to 4 (i.e., 3 out of 7 rounds needed to complete mission).

Team Adaptation Process. Team Adaptation Process was measured by two raters using Behaviorally Anchored Rating Scales (BARS) for each of the four phases of the team adaptation process (Georganta, Merk, & Brodbeck, 2016; Georganta, Blum, & Brodbeck, 2017). The BARS included effective (e.g., '*The team assigns unexpected changes their respective significance*', and '*Team members take into account the consequences of their steps when formulating their plan'*) and ineffective behavioral examples (e.g., '*Team members take into account the consequences of their steps when formulating their plan.*', and '*Team members do not recognize the mistakes in their previous actions.*') of the overall

spectrum of each team adaptation phase, as suggested by Rosen and colleagues (2011). The two raters watched the video recordings of the fourth mission of each team and independently rated the four team adaptation phases as demonstrated during the overall fourth mission. The interrater reliability among the two raters was excellent for situation assessment (ICC = .79) and good for plan formulation (ICC = .68), plan execution (ICC = .67), and team learning (ICC = .70). After completing their rating, the raters discussed their differing coded phases and came to consensus. Each phase was measured using a 5-point scale ranging from 1 (*poor illustration of phase*) to 5 (*good illustration of phase*) with behavioral examples of low, medium, and high anchors placed next to the zero-, three-, and five-scale points respectively.

Transactive Memory Systems. Transactive Memory Systems were measured using 8 items from the specialization and credibility subscale from Lewis's (2003) TMS scale (α = .72 at T0, α = .80 at T1, α = .80 at T2, α = .82 at T3, α = .85 at T4). The coordination subscale was not included in the questionnaire, as coordination was measured as a team process incorporated in the BARS scale of the third team adaptation phase (i.e., plan execution). Given that the participants were living in Germany, the TMS scale was translated into German following the back-translation strategy to guarantee the accuracy of translation (Campbell, Brislin, Stewart, & Werner, 1970). The scale was measured using a 5-point Likert scale ranging from 1 (*totally disagree*) to 5 (*totally agree*).

Time for collective decision making. Time for collective decision making during the second team task was measured in seconds based on the time each team needed to collectively select 7 out of 15 items and prioritize them.

3.4.5 Data Analysis

All analyses were conducted on the team-level. In order to do so, we aggregated the individual responses of TMS using the mean of the individuals for each team, a common method reported in the literature (e.g. Mathieu et al., 2008). The within-group agreement and

reliability were assessed with the r_{WGJ} and the ICC*(2)*, which indicate that team members have similar perceptions. The ANOVA and the ICC*(1)* specifies whether there is sufficient variance between the teams. All estimates (see Table 3.2) were within the expected range and implied acceptable levels of agreement (for ICC see LeBreton & Senter, 2008; for r_{WGJ} see Cohen, Doveh, & Eick, 2001).

To test our hypotheses, all analyses were conducted with SPSS (IBM SPSS Statistics Version 23). For mediation analysis, the Process Macro (Hayes, 2013) was used. Figure 3.2 illustrates the time of the assessed variables for the purpose of hypothesis testing.

Table 3.2

Within-group agreement and between group variance of Transactive Memory Systems

							$r_{WG(J)}$	
Variable	ICC(1)	ICC(2)	*F*	*p*	η^2	*M*	*Median*	*N(Teams)<.70*
TMS (Trial Mission)	0.11	0.32	1.47	0.02	0.33	0.89	0.91	3
TMS (Mission 1)	0.07	0.22	1.28	0.09	0.30	0.87	0.92	5
TMS (Mission 2)	0.04	0.15	1.18	0.18	0.28	0.87	0.92	4
TMS (Mission 3)	0.04	0.14	1.16	0.21	0.28	0.89	0.93	3
TMS (Mission 4)	0.01	0.05	1.05	0.38	0.26	0.86	0.91	5

Note. Teams = 72. TMS = Transactive Memory Systems, ICC = interclass correlation coefficients; $r_{WG(J)}$ = interrater agreement index.

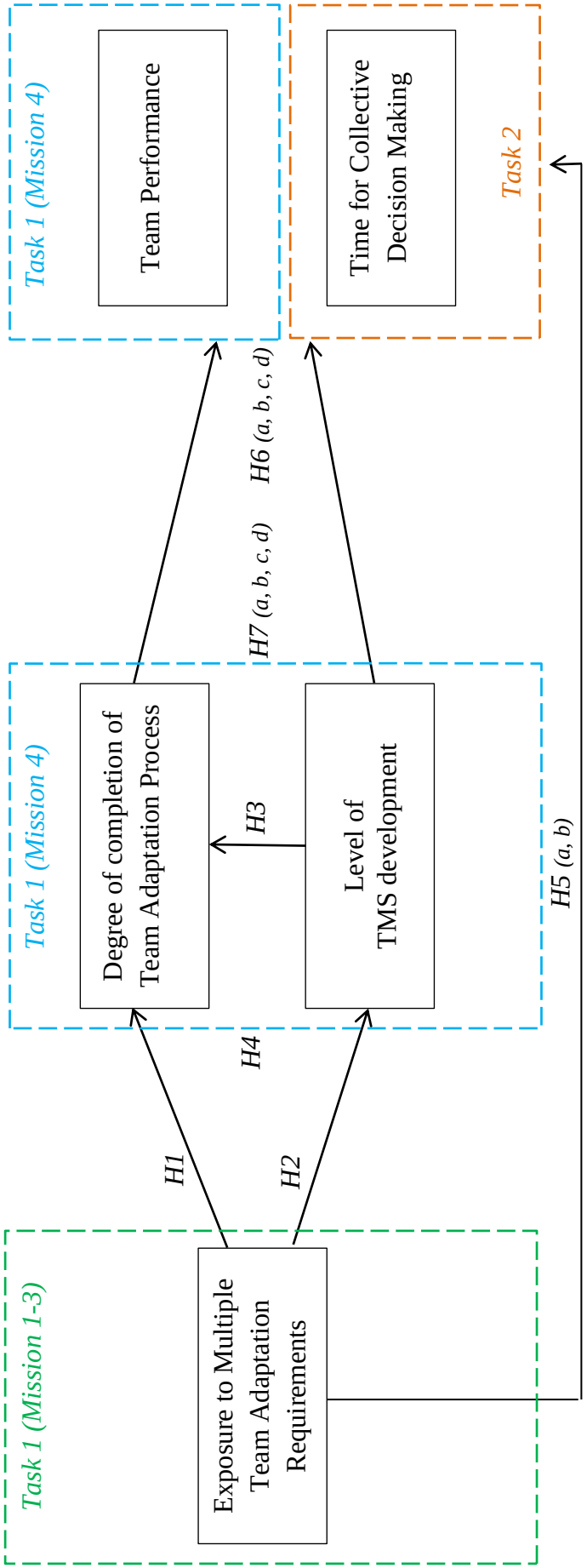

Figure 3.2 Overview of the timing that the study's variables were measured for hypothesis testing.

3.5 Results

3.5.1 Preliminary Analysis

Following the suggestion that a team has to undergo all four phases of the team adaptation process in order to respond effectively to a challenging situation (e.g., Burke et al., 2006), the degree of completion of the team adaptation process was measured by calculating the product of all team adaptation process phases (i.e., situation assessment*plan formulation*plan execution*team learning). We decided to calculate the product instead of the sum, based on the theoretical suggestion that all four phases need to be performed to successfully adapt. Therefore, if one of the four phases is not demonstrated, the degree of completion of the team adaptation process will be zero. In order to test our assumptions regarding the level of TMS development, the difference between the level of TMS before and after each mission was calculated (e.g. TMS mission 2 – TMS mission 1 = TMS development during mission 2).

Means, standard deviations, and correlations between the study variables are presented in Table 3.3.

Table 3.3

Means, standard deviations and intercorrelations for study variables

Variables	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Group	0.50	0.50	-																		
2. Situation Assessment (M4)	3.38	1.32	.12	-																	
3. Plan Formulation (M4)	3.06	1.01	.11	.49**	-																
4. Plan Execution (M4)	3.04	0.94	.10	.49**	.72**	-															
5. Team Learning (M4)	2.57	1.09	.14	.55**	.78**	.68**	-														
6. Team Adaptation Process (M1)	27.81	48.20	-	.16	.34*	.19	.27	-													
7. Team Adaptation Process (M2)	42.06	46.20	-	.51**	.70**	.66**	.70**	.14	-												
8. Team Adaptation Process (M3)	50.00	54.98	-	.49**	.72**	.61**	.74**	.30	.75**	-											
9. Team Adaptation Process (M4)	34.29	46.52	.23*	.64**	.75**	.72**	.78**	.19	.71**	.80**	-										
10. TMS Development (M1)	0.34	0.24	-.10	.02	.01	.00	.02	-.28	-.19	-.16	.06	-									
11. TMS Development (M2)	0.20	0.22	-.23	-.33**	-.22	-.20	-.18	.08	.22	.12	-.16	-.16	-								
12. TMS Development (M3)	0.16	0.16	-.20	.14	.05	.11	.06	.25	.17	.33*	.07	-.21	-.18	-							
13. TMS Development (M4)	0.01	0.18	.26*	.14	.19	.18	.30**	-.17	.06	.07	.29*	-.04	-.29*	-.13	-						
14. Team Performance (Trial M)	2.56	1.02	.08	.16	.04	-.11	.17	-.04	.08	.03	.03	.02	-.11	.04	.06	-					
15. Team Performance (M1)	3.36	0.77	.14	-.01	.17	.17	.10	.17	.25	.25	.13	.08	-.02	.04	-.18	-.04	-				
16. Team Performance (M2)	3.71	0.62	-.02	.07	.03	.05	.13	.14	.22	.12	.04	-.07	.26*	.07	-.19	-.07	.22	-			
17. Team Performance (M3)	3.72	0.51	-.05	-.01	.00	.00	-.09	.18	.00	.25	.02	-.09	.05	.24*	-.23*	-.11	.36**	.36**	-		
18. Team Performance (M4)	3.14	0.84	.00	.25*	.25*	.29*	.20	.25	.05	.05	.20	.08	-.27*	.12	.07	.06	.01	.02	-.14	-	
19. Time for Collective Decision	210.34	115.95	-.33**	-.08	-.08	.08	.03	-.06	.00	.05	-.03	.20	.13	.00	-.20	.16	-.05	-.19	-.03	-.18	-

Note. * $p < .05$. ** p <001. M = Mission, TMS = Transactive Memory Systems

3.5.2 Hypothesis Testing

In order to examine whether previous exposure to multiple team adaptation requirements positively influenced the degree of completion of the four-phase team adaptation process (i.e., Hypothesis 1) and the level of TMS development (i.e., Hypothesis 2) when facing new adaptation requirements, independent sample t-tests were conducted. Results showed that teams with previous exposure to multiple team adaptation requirements demonstrated a higher degree of completion of the team adaptation process ($t(70) = -2.02$, $p = .047$) and a higher level of TMS development ($t(70) = -2.26$, $p = .026$) than teams with no previous adaptation exposure during the fourth mission of task 1. Hence, Hypothesis 1 and Hypothesis 2 were supported.

To investigate whether the level of TMS development positively influenced the degree of completion of the team adaptation process in the face of adaptive demands (i.e., Hypothesis 3), a simple linear regression was calculated. A significant regression equation was found ($F(1,71) = 6.46$, $p = .013$) with an R^2 of .07, illustrating that the level of TMS development positively influenced the degree of completion of the team adaptation process during the fourth mission of task 1, supporting Hypothesis 3.

Mediated regression analysis demonstrated that previous exposure to multiple team adaptation requirements was positively associated with the degree of completion of the four-phase team adaptation process during the fourth mission of task 1($B = 21.69$, $t = 2.02$, $p = .047$), and that the level of TMS development significantly mediated this relationship with a positive indirect effect ($B = 63.97$, $t = 2.11$, $p = .038$); a bootstrap 95% CI around the indirect effect did not contain zero (1.23, 19.03). Hence, Hypothesis 4 was supported (Table 3.4).

Table 3.4

Mediation effects of TMS development on the relationship between previous team adaptation exposure and the degree of development of the team adaptation process, N = 72

		95% CI	
Effect	*b*	Lower	Upper
Total	21.69	0.28	43.10
Direct	15.69	-5.95	37.35
Indirect (mediation)	5.99	1.23	19.03

In order to investigate whether previous exposure to multiple team adaptation requirements positively impacted team adaptive outcomes (i.e., Hypothesis 5a, Hypothesis 5b), independent sample t-tests were conducted. Analysis revealed no significant differences in team performance between teams with and teams without previous adaptation exposure during the fourth mission of task 1 ($t(70) = -.30$, $p = .762$), rejecting Hypothesis 5a. With regard to the time for collective decision making, significant results were found ($t(70) = 2.99$, $p = .004$). Teams with previous exposure to multiple team adaptation requirements were significantly faster ($M = 171.56$, $SD = 74.30$) than teams with no previous adaptation exposure in making a collective decision during the second novel team task ($M = 249.11$, $SD = 136.59$), supporting Hypothesis 5b.

To test whether team adaptive outcomes were positively influenced by the degree of completion of the team adaptation process (i.e., Hypothesis 6a, Hypothesis 6b) and the level of TMS development (i.e., Hypothesis 6c, Hypothesis 6d), simple regression analyses were calculated. Non-significant relationships were found between team adaptive outcomes and the degree of completion of the team adaptation process ($F(1,71)=2.96$, $p = .090$, $R^2 = .04$ for team adaptive performance; $F(1,71)=0.07$, $p = .786$, $R^2 = .00$ for time for collective decision

making) as well as the level of TMS development ($F(1,71)=0.32$, $p = .569$, $R^2 = .00$ for team adaptive performance; $F(1,71)=2.89$, $p = .093$, $R^2 = .04$ for time for collective decision making). Thus, Hypotheses 6a, 6b, 6c, and 6d were not supported.

Due to the above non-significant relationships, the hypotheses suggesting that the degree of completion of the team adaptation process and the level of TMS development mediate the positive relationship between previous adaptation exposure and team adaptive outcomes (i.e., Hypothesis 7a-d) were not tested.

In Figure 3.3, the supported and rejected hypotheses are demonstrated. Overall, we found that previous exposure to multiple team adaptation requirements positively influenced the degree of completion of the team adaptation process (i.e., H1), the level of TMS development (i.e., H2), and the time for collective decision making in the face of new adaptation requirements (i.e., H5b). Moreover, results showed that the level of TMS development mediated the positive relationship between previous adaptation exposure and the degree of team adaptation completion (i.e., H3, H4). In contrast to expectations, the overall four-phase process and the level of TMS development were not related to team adaptive outcomes (i.e., H6a-d; H7a-d). Finally, previous team adaptation exposure was not related to team adaptive performance when facing new adaptive demands (i.e., H5a).

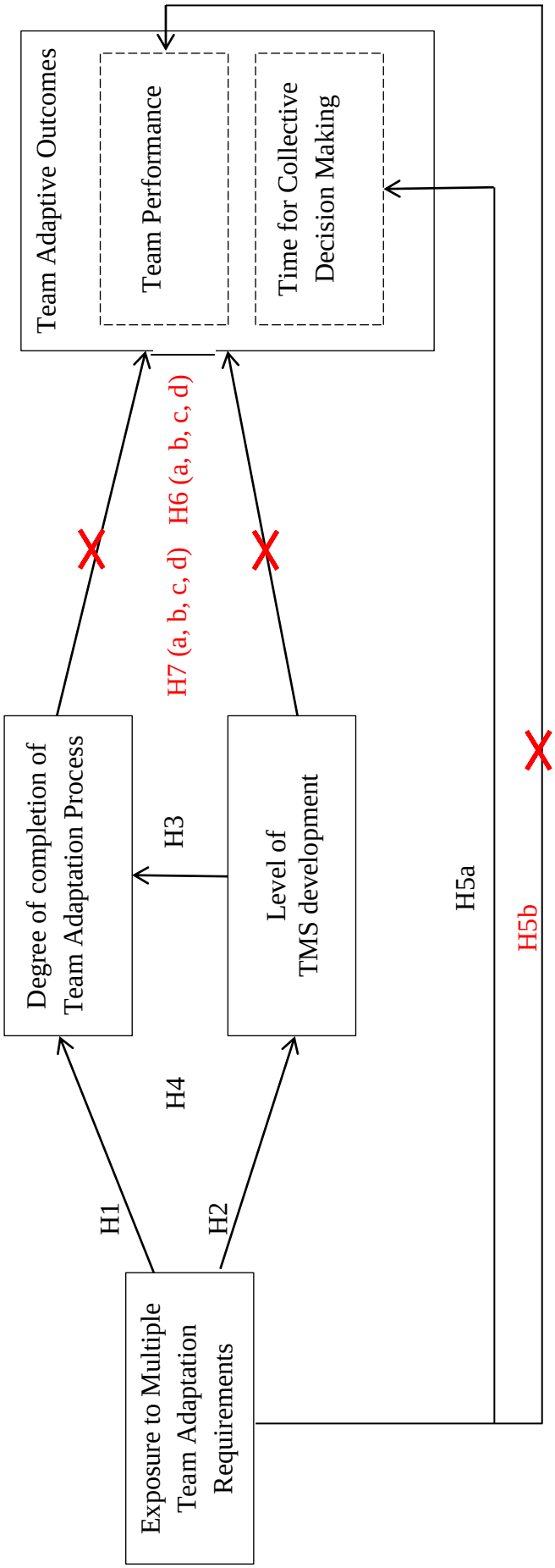

Figure 3.3 Illustration of the supported and rejected hypotheses.

3.5.3 Additional Analysis

Based on our theoretical and empirical rational (e.g., Kozlowski et al., 1999), it was expected that the experimental group will improve its performance while adjusting to multiple team adaptation requirements from the first until the fourth mission of task 1. Therefore, additional analysis was conducted. A significant difference in the experimental group's team performance between successive missions was found ($F(1,35) = 10.32$, $p = .003$) with a large effect size ($\eta^2 = .22$; Cohen, 1992). Overall, the team performance increased descriptively while adjusting to team adaptation requirements from the first until the third mission. Team performance was significantly higher in the first mission than in the trial mission ($p = .002$). Between the first and second mission and between the second and third mission there were no significant differences ($p = 1.000$). In contrast to our expectations, in the fourth mission the experimental group's team performance was significantly lower than in the third mission ($p = .048$).

The control group improved its team performance while performing the same task multiple times from the trial until the third mission of task 1. These results supported our expectations that team performance improves by gaining task-related experience (e.g., Lee et al., 2007). A significant difference in team performance between the four missions of task 1($F(1,35) = 13.70$, $p = .001$) with a large effect size ($\eta^2 = .28$) was found. The control group's team performance was significantly higher in the first than in the trial mission ($p = .023$), and higher in the second than in the first mission ($p = .008$). Between the second and third mission there was no significant difference ($p = 1.000$). In the fourth mission, team performance was significantly lower than in the third mission ($p = .008$), when the control group needed to respond to adaptation requirements for the first time, in line with our assumptions.

We performed additional analysis to examine how the level of TMS development changed over the four consecutive missions of task 1 for both the experimental and the control group. It was expected that the experimental group from the first to the fourth mission of task 1 will improve its level of TMS development while adjusting to multiple team adaptation requirements and consequently, while learning to update its team cognitive structure depending on the representation of the circumstances. Similarly, it was expected that the control group will improve the level of TMS development while performing the same task multiple times from the first to the third mission of task 1 and thus, develop a stable team cognitive structure for the purpose of this task. Furthermore, it was expected that the level of TMS development will decrease in the face of team adaptation requirements during the fourth, as the control group's stable cognitive structure will no longer be applicable.

There was a significant difference in the level of TMS development over the four missions for both the experimental ($F(1,35) = 10.61$, $p < .001$; $\eta^2 = .23$) and the control group ($F(1,35) = 58.66$, $p < .001$; $\eta^2 = .62$). For the experimental group, the level of TMS development was positive during each mission of task 1 ($M = .05$-$.31$, $SD = .02$-$.03$). Pairwise comparisons indicated no significant differences between the first and the second mission ($p = .054$). The level of TMS development was higher in the third than in the second mission ($p = .049$), and higher in the fourth than in the third mission ($p = .035$), supporting our expectations. Regarding the control group, the level of TMS development was positive from the first to the third mission ($M = .19$-$.36$, $SD = .02$-$.03$). Pairwise comparisons indicated no significant difference between the first and the second mission ($p = .062$), and between the second and the third mission ($p = .051$). During the fourth mission of task 1, the level of TMS development, when the control group had to adapt for the first time, was negative ($M = -.36$, $SD = .03$) and significantly lower than in the third mission ($p < .001$), as we assumed.

Additional analysis was performed to examine whether the team adaptation phases promoted independently the team adaptive outcomes, as previous research has demonstrated the positive influence of single process-components on team outcomes (e.g., Christian et al., 2017). Team performance during the fourth mission of task 1 was independently predicted by situation assessment ($F(1,71) = 4.94$, $p = .029$, $R^2 = .06$), plan formulation ($F(1,71) = 4.91$, $p = .030$, $R^2 = .06$), and plan execution ($F(1,71) = 6.62$, $p = .012$, $R^2 = .08$). A non-significant regression equation was found for team learning with an R^2 of .04 ($F(1,71) = 3.05$, $p = .085$). Regarding the time for collective decision making during the subsequent novel task, non-significant regression equations were found for situation assessment ($F(1,71) = 0.47$, $p = .494$, $R^2 = .00$), plan formulation ($F(1,71) = 0.40$, $p = .527$, $R^2 = .07$), plan execution ($F(1,71) = 0.40$, $p = .527$, $R^2 = .00$), and team learning ($F(1,71) = 0.08$, $p = .771$, $R^2 = .00$).

Figure 3.4 illustrates the significant relationships between the investigated variables.

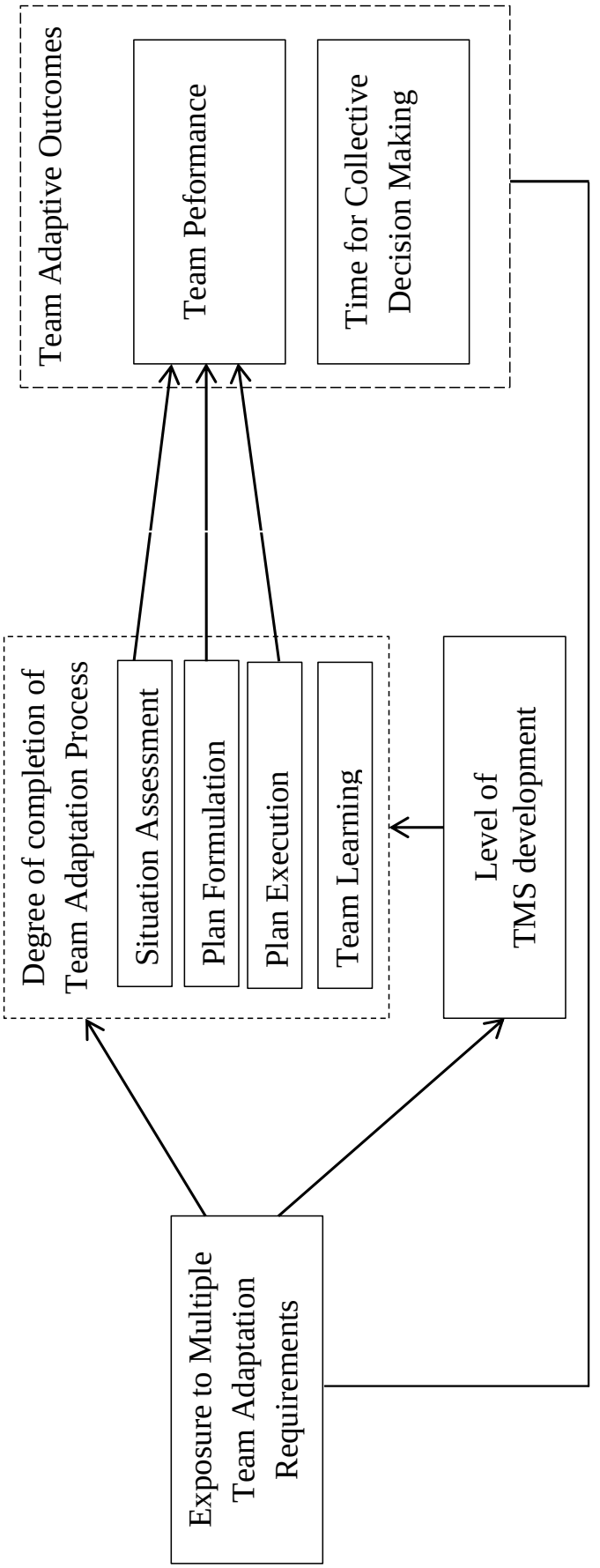

Figure 3.4 Illustration of significant relationships.

3.6 Discussion

In the last twenty years, researchers have turned their focus towards team adaptation as an essential performance criterion not only for teams but also for the organization itself (e.g., Burke et al., 2006). In recent reviews, team adaptation is considered as a process that is influenced by different team inputs and results in team adaptive outcomes (Christian et al., 2017; Maynard et al., 2015), however, these relationships remain to date theoretical. Responding to the need for empirical advancement incorporating the overall team adaptation process as suggested by Rosen et al. (2011), our study investigated for the first time the relationship of the four-phase team adaptation process with team properties (e.g., previous exposure to multiple team adaptation requirements) and team adaptive outcomes (i.e., team performance, time for collective decision making). Moreover, we provided evidence with regards to the positive impact of updated team cognitive structures (i.e., level of TMS development) in the face of adaptation requirements, clarifying these so far contradictory findings (e.g., Lewis et al., 2007).

One of the main contributions of our study is that teams with previous exposure to multiple team adaptation requirements performed a more complete team adaptation process in the face of new adaptation requirements compared to teams with no previous adaptation exposure. One possible explanation for these results is that teams while adjusting to multiple adaptation requirements and hence, due to a continuation of practicing this adaptation-procedure, learned to perform in a more effective and coordinated way despite the stressed and unexpected conditions (Gorman, Cooke, Pedersen, Winner, Andrews, & Amazeen, 2006). These findings support suggestions in the team development literature highlighting the need to focus more on the underlying processes and skills when training teams (e.g., Kraiger, Ford, & Salas, 1993). For instance, in a recent study, it was shown that US Navy command and control teams achieved more effective post-training outcomes when they

participated in team self-correction methods while facing unexpected events, compared to teams that participated in more traditional training sessions (Smith-Jentsch, Cannon-Bowers, Tannenbaum, & Salas, 2008). Our findings expand previous research by showing that teams do not necessarily have to adhere to a set of prescribed roles but instead should adjust their roles and structures based on the circumstances. Thereby, we illustrate that effective team adaptation can be achieved not only by participating in training, which is often time consuming and cannot cover the whole breadth of unpredictable events, but also by gaining knowledge and experience in adapting as a team.

A further valuable contribution of this study is that teams with previous exposure to multiple team adaptation requirements displayed a higher level of TMS development, which, in turn, led to a more complete team adaptation process, compared to teams with no previous adaptation exposure in the face of new team adaptation requirements. Particularly, the level of TMS development was negative for teams with no previous exposure to adaptation requirements and lower than the level of TMS development during their previous missions, where no adaptation was needed. It is possible that these teams (i.e., teams with no previous adaptation exposure) regressed to a more standard TMS while gaining task related knowledge supporting their routine task. This TMS possibly did not allow more conscious cognitive activity that is needed for unexpected circumstantial changes (Prince & Salas, 2000). Consequently, these teams, when exposed to unexpected circumstances for the first time, relied on their existing knowledge structures, falling back on habitual routines, instead of sharing new information and producing different ideas (e.g., Gersick & Hackman, 1990). During non-routine events, continuous updating of TMS, not only the creation of TMS, is necessary in order to adapt effectively (Waller & Uitdewilligen, 2008). As shown in a recent study, teams that were able to update their mental model when adapting to changes showed higher team performance compared to teams that did not illustrate team mental model

updating (Uitdewilligen et al., 2013). Our findings provide a clearer picture of the contradicting evidence, as far as the role of team cognitive structures under novel circumstances is concerned, by showing that updated cognitive structures are beneficial while stable cognitive structured can be detrimental for teams under demanding circumstances.

In contrast to our expectations, teams with previous exposure to multiple team adaptation requirements did not demonstrate higher team performance scores compared to teams with no previous adaptation exposure during the last mission of task 1. One possible explanation for this finding is that the unexpected change introduced at the beginning of the fourth mission was perceived as negative or harmful by the teams with previous adaptation exposure - due to its higher complexity compared to the unexpected changes introduced in the three previous missions - and was, therefore, associated with disengagement and negative team outcomes (Pearsall, Ellis, & Stein, 2009; Podsakoff, LePine, & LePine, 2007). Nevertheless, team adaptation experience was found to be beneficial in the face of new adaptive demands. Specifically, our results demonstrated that teams improved their performance while adjusting to different adaptation requirements over the first three consecutive missions of task 1. On the contrary, teams that were not facing different adaptation requirements during the first three missions decreased their team performance in the fourth mission of task 1 when exposed to unexpected circumstances for the first time. This performance drop was probably shown due to the lack of experience in performing the team task while adaptation is required. These results are of great importance, as they empirically support that teams can learn to adapt by restructuring and modifying existing patterns and solutions and, thus, leading to successful performance when new challenges arise (Kozlowski, Watola, Jensen, Kim, & Botero, 2009).

One more significant contribution of the present study is the demonstration that teams with previous exposure to multiple team adaptation requirements during their task

performance (i.e., Mission 1-4 from task 1) were able to transfer their adaptive skills and capabilities to a subsequent novel team task and reach high team outcomes. Specifically, these last teams needed less time to make a collective decision under stressful and time-limited circumstances compared to teams with no previous adaptation exposure. It seems plausible to argue that teams with previous adaptation exposure found similar 'adaptive' features between the unexpected challenges faced during the first task's missions and the challenge of performing a novel task afterwards and consequently, recognized what prior knowledge and problem-solving strategies had to be transferred in the subsequent team task to successfully adapt to its requirements (e.g., Reeves and Weisberg 1994). As a result, they spent less time for making a collective decision than teams with so similar adaptation experience. This finding is in line with previous research that has examined reductions in time as an indicator of learning (e.g., Graham & Gagne, 1940). Another possible explanation is that teams with previous adaptation exposure recovered from their prior decrement in performance (i.e., fourth mission of task 1 due to negative and harmful perceptions of the unexpected change) and thus, adjusted effectively to the novel circumstances of the subsequent team task (Singley & Anderson, 1989). In support of this argumentation is Anderson's theory of learning transfer (1982, 1983) which highlights that a decline in performance can occur in the face of highly challenging circumstances, however, subsequent improvement will take place. Lee et al. (2007), for instance, found that performance decreased when experienced teams in executing demanding tasks changed physical context; nevertheless, their performance recovered soon reaching high outcomes. Overall, this time-advantage resulting from team adaptation experience is of great importance for teams nowadays, as both unpredictability and time pressure are very common characteristics within the organizational setting.

One more interesting finding was that, in opposition to theoretical suggestions (Burke et al., 2006), the degree of completion of the overall four-phase team adaptation process was not related to team adaptive outcomes (i.e., team performance, time for collective decision making). As illustrated in Figure 4, only the first three team adaptation phases (i.e., situation assessment, plan formulation, and plan execution) independently enhanced post-change team performance. One possible explanation is that not all four-phases need to be executed to the same extent to reach high team adaptive outcomes; some team adaptation phases might be more advantageous than others depending on the nature of the adaptive requirements. Maynard and colleagues (2015) recently argued that both the origin (i.e., task- or team-based) and the severity of the team adaptation trigger impact the team adaptation process and in turn, team adaptive outcomes. Another possible explanation is that the fourth phase of the team adaptation process (i.e., team learning) due to the short nature of the missions and due to the differing adaptive requirements was not able to develop to the same extent as the first three team adaptation phase and consequently, to be equally beneficial. As Christian and colleagues have highlighted "for temporary stimuli, learning behavior is less useful because the situation will soon return to its previous state" (2017, p. 66). One more explanation is that due to our observational measure, mainly the explicit and not the implicit team learning was captured. This may have resulted into an incomplete picture of the actual team learning phase and hence, no relationship with team adaptive outcomes was found. As research has shown, knowledge derived from implicit learning can be extremely helpful when solving problems and when making decisions under novel circumstances (e.g., Reber, 1989). To conclude, these results are of great importance as they represent the first evidence of this so far theoretical relationship between the four-phase team adaptation process and post-change team performance demonstrating that a high degree of completion of the overall team adaptation process may not always guarantee high team adaptive outcomes.

Overall, our study responded successfully to the necessity to improve our understanding with regards to ‘‘what mechanisms underlie that particular form of adaptation” (Baard et al., 2014; p. 89) and provided empirical evidence with regards to what promotes and what is promoted by the four-phase team adaptation process as proposed by Rosen and colleagues (2011). As our findings illustrate, team adaptation and how teams respond in the face of adaptation requirements is more complex than what theory suggests.

3.6.1 Limitations, Strengths and Implications for Future Research

Several limitations should be taken into account when interpreting our results. Although laboratory experiments are capable of making large contributions to the study of teams (Driskell & Salas, 1992; Weaver, Bowers, Salas, & Cannon-Bowers, 1995), the external validity of the present findings is questionable, as the feeling of real stress, which represents one of the main characteristics of teams nowadays, was possibly missing. It is suggested that in future research, team adaptation and previous exposure to multiple adaptation requirements should be examined in field studies with real teams in order to shed light on the generalizability of the present findings. Another possible limitation of this research is that due to the short nature of the study, which resulted into a team’s total lifespan of only one hour, the current findings are not representative for teams with a long history together (Hackman & Morris, 1975). Additionally, this short lifespan may have limited the complexity of the team’s shared cognition, thus impacting the relationships among variables. It is suggested that in future research team members that have been working for a long time together should be also investigated.

One more possible limitation may represent the conclusions drawn about the overall TMS construct despite the fact that two out of three TMS dimensions, similar to previous studies (e.g., Anderson & Lewis, 2014), were measured. To this respect, it is suggested that future research should directly measure this team-variable, overcoming the limitations of self-

assessment and partial measurement. Moreover, considering the non-significant findings between the last phase of the team adaptation process (i.e., team learning) and team performance, it is plausible to argue that this lack of significance was due to the assessment of solely explicit team learning. As previously explained, teams also learn implicitly through their activities (Argote, 1993). Consequently, it is suggested that future research should measure both explicit and implicit learning in order to investigate the impact of team learning on team adaptive outcomes. Furthermore, it is suggested, as we focused only on the time for collective decision making, that future research should, in addition to time, measure the quality of the team's decisions. As argued by Eisenhardt (1999), "the ability to make fast, widely supported, and high-quality strategic decisions on a frequent basis is the cornerstone of effective strategy" (p. 65). Finally, it is suggested that future research should consider other statistical techniques (e.g., latent growth modeling) in order to capture the changes in the team adaptation process and TMS as well as their progression over time while at the same time control for the variance that attributes from repeated assessments of the same construct.

Despite these limitations, we believe that the study captured to a large extent the psychological realism of situations that many teams nowadays experience. This was achieved with the following conditions: First, task performance took place under time pressure and time constraints resulting to stressful conditions evident in the team member's verbal and mimic expressions (e.g., high talking speed, assessing remaining time, and quickly organizing cards). Second, team members were highly interdependent and had to successfully coordinate with each other to achieve high outcomes, a fact that was reflected in team members' support to one another to execute the right actions (e.g., helping each other to find the right card, explaining purpose behind actions). Third, similar challenges with the ones that actual teams face were introduced (e.g., member loss, limited resources, and change in preconditions) increasing the realism of the adaptive demands. Fourth, during the

experiment, team members communicated with each other face-to-face, similar to real team projects, unlike many laboratory studies where computer games or simulations are used (e.g., Randall et al., 2011; Santos, Uitdewilligen, & Passos, 2015). Fifth, team members were compensated for their participations based on the team's performance, a reward resulting to increased motivation for successful task completion similar to real conditions.

The laboratory context also enabled us to control extraneous effects and to obtain a clearer picture of these hitherto theoretical relationships. Additionally, as it has been suggested, we examined team effectiveness by examining two different team-level outcomes (i.e., team performance and time for collective decision making; Hackman, 1987; Kozlowski & Bell, 2003). Furthermore, we collected data using different sources (e.g., questionnaire and BARS-scales) reducing the potential for common-method bias (Podsakoff, MacKenzie, & Podsakoff, 2012), and most importantly we measured actual behavior, one of the biggest strengths of laboratory studies (Colquitt, 2008). To conclude, we believe that the current study provided an appropriate approach for examining for the first time the overall team adaptation process and its relationship to team properties and team adaptive outcomes in the face of adaptation requirements.

3.6.2 Practical Implications

The present study advanced our understanding with regards to the importance of specific mechanisms that can support the teams' ability to operate successfully under dynamic and complex situations due to, for instance, increasing competition, globalization, and technological changes. Specifically, we found that teams can benefit from previous exposure to multiple team adaptation requirements when performing under challenging circumstances in terms of their degree of completion of the team adaptation process, level of TMS development, and time for collective decision making. Therefore, the constitution of teams with a stable composition during the team's life cycle is suggested. This stability,

while adjusting to multiple team adaptation requirements, will provide the team the capability to diagnose, interpret, and respond effectively to challenges that they have never faced before. In turn, these developed capabilities will provide the team with the appropriate cognitive structure and coordination patterns for fast and collaborative actions. As a stable composition for teams nowadays is not always possible, due to the creation of teams together for a single event (e.g., project teams), it is alternatively suggested that teams should have at least one experienced team member, ideally at the leadership position. Research has shown that highly experienced individuals are able to generalize their teamwork knowledge to new situations in which they find themselves (Rentsch, Heffner, & Duffy, 1994).

Moreover, considering the possible negative impact of the perception of an unexpected change as a threat on team performance, team briefings and trainings could be used to foster teams to embrace these changes as a challenge and as an opportunity to learn and develop. As this way of thinking may be sometimes difficult under extremely challenging circumstances, team leaders should try to manage the negative effects of such stressors, for instance, by helping the team to maintain a high level of efficacy and potency during team adaptation. This sense of confidence regarding the capabilities of the team has been found to be positively related to team performance (Gully, Incalcaterra, Joshi, & Beaubien, 2002) and team satisfaction (e.g., De Jong, De Ruyter, & Wetzels, 2005).

Finally, findings showed that while adjusting to adaptation requirements, it is necessary to not only develop a shared understanding of who knows what but also to update the team's cognitive structure based on the situational demands in order to complete a successful team adaptation process under challenging circumstances. Therefore, in addition to techniques for development of the team's shared cognition, such as cross-training (Volpe, Cannon-Bowers, Salas, & Spector, 1996), the team should be guided and supported by a means of a facilitator (e. g., team leader) to reconstruct its representation when facing novel or unpredictable

circumstances, for instance, by encouraging feedback and active information exchange and by establishing a positive climate for discussion. In addition, to avoid stable cognitive structures, it is suggested that teams should have at least one team member or a person outside the team that questions the team's ideas and assumptions and promotes the team to reflect on its way of operating and thinking. For instance, Lewis and colleagues (2007) found that that a simple intervention supporting the team leader to reflect on its team cognitive structure was extremely beneficial for knowledge integration and team performance.

3.6.3 Conclusion

In line with the need for a better understanding of the mechanisms leading to effective team adaptation, our study provided the first empirical findings of the overall four-phase team adaptation process, its team properties, and team adaptive outcomes. Specifically, we showed the positive impact of previous exposure to multiple team adaptation requirements to the overall-four phase team adaptation process and to the time for collective decision making in the face of new adaptation requirements. Moreover, we provided empirical evidence of the positive effect of the first three team adaptation phases on team adaptive performance. Finally, our study provided us with clearer insight to the benefits of an updated cognitive structure when adapting to unexpected circumstances. The present study contributed to the team adaptation research field and found promising results necessitating further investigation.

3.7 Linking Chapter 3 to Chapter 4

The empirical study presented in Chapter 3 provided first findings with regard to the relationship of the overall four-phase team adaptation process as proposed by Rosen and colleagues (2011) with developed team properties and team adaptive outcomes. The team adaptation theory was supported to a great extent, for instance, by showing, the positive impact of developed team properties (i.e., previous adaptation exposure, updated team cognitive structures) on the team adaptation process. However, findings also demonstrated

that the first three team adaptation phases, and not the overall team adaptation process, promoted independently team adaptive performance in contrast to theoretical suggestions (Burke et al., 2006). Therefore, it seems plausible to argue that team adaptation theory in general and the team adaptation process model in particular may not totally reflect the complexity of how the team adaptation process is in fact executed and how the process in turn, influences team adaptive outcomes.

Aiming to explore these last findings and gain a clearer picture of the complex nature of the team adaptation process, two experimental studies are presented in Chapter 4 addressing the last two research questions of the present thesis. In the first cross-sectional multilevel field study, the relationship between the four phases of the team adaptation process will be investigated providing insight to these hitherto theoretical relationships. In the second experimental study, the dynamic nature of the team adaptation process will be explored by investigating the actual sequence of the executed team adaptation phases. Specifically, it will be investigated whether the identified sequences are in alignment with the theoretical team adaptation process model (Rosen et al., 2011), and whether they are associated with high team adaptive outcomes compared to non-theory-conform sequences as theory suggests (Burke et al., 2006).

4 How Does It Really Unfold over Time?

The Dynamic Process of Team Adaptation[3]

4.1 Abstract

The capacity of teams to adapt is increasingly important for an organisation's success. Whereas several theoretical models have been developed to describe the process of effective team adaptation, empirical research supporting those models is missing. The present work examines the relationships between the four team adaptation phases and their sequence (i.e., situation assessment → plan formulation → plan execution → team learning) during the process of team adaptation and explores whether high- and low-performing teams differ in their performed phase sequences. In the course of a cross-sectional field study and a laboratory study, data was collected from 23 teams and 70 teams, respectively. Results from random intercept models confirmed that the team adaptation process consisted of four consecutive phases that positively influence each other. Plan formulation mediated the positive relationship between situation assessment and plan formulation, while team learning was independently related to all three previous phases. Sequence analysis supported the theory-conform two- and three-phase sequences, while showing that plan formulation, plan execution, and team learning were also followed by other phases. High-performing teams did not perform significantly more theory-conform phase sequences than low-performing teams; differences in team performance were related to theory-non-conform phase sequences (e.g., team learning → plan formulation → plan execution) and to the timing of the performed phases. Our research is the first empirical work testing the theoretical model of team adaptation process and illustrating its actual complexity.

[3] The first experimental study presented in this chapter was conducted based on data collected during an engineering course of the Technical University of Munich, while the second study was conducted based on archival data collected at the Munich Experimental Laboratory for Economic and Social Sciences (MELESSA) of Ludwig-Maximilians-Universitaet Muenchen, in Munich, Germany. Professor Felix C. Brodbeck, Dr. Katharina G. Kugler, and Dr. Julia M. Reif supervised this research and are the second, third, and fourth author, respectively. When using the term "we", I refer to my three co-authos and myself. This work has been presented at the "Industrial/Organizational & Organizational Behavior Conference" in February 2017 in Houston, Texas. An adapted version of this chapter has been submitted to European Journal of Work and Organizational Psychology.

4.2 Introduction

In order to deal with change, unforeseen events, complex tasks, and uncertainty, today's organisations often rely on teams in order to respond to these demanding circumstances (Kozlowski, Gully, Nason, & Smith, 1999). Teams are thus, frequently confronted with unexpected challenges and have to respond appropriately to various novel conditions (Uitwilligen, Waller, & Pitaru, 2013). In this respect, teams' capacity to be adaptive represents a crucial factor for organizations' success (Kozlowski, Watola, Jensen, Kim, & Botero, 2009).

Over the past two decades, researchers have stressed the importance of team adaptation. Both the growing amount of theoretical models describing team adaptation (e.g., Burke, Stagl, Salas, Pierce, & Kendall, 2006; Christian, Christian, Pearsall, & Long, 2017; Kozlowksi et al., 1999; Maynard, Kennedy, & Sommer, 2015; Rosen, Bedwell, Wildman, Fritzsche, Salas, & Burke, 2011) as well as the empirical work in this domain (e.g., Santos, Passos, & Uitdewilligen, 2016; Svedrup, Schei, & Tjolsen, 2017; Wiedow & Konradt, 2010) suggest a positive relationship between team adaptation and different team-level outcomes. Despite the increasing theoretical and empirical interest in team adaptation, the dynamic of the actual team adaptation process "…is too often viewed as occurring within a 'black box' that goes unmeasured" (Maynard et al., 2015, p. 8). Indeed, empirical studies on team adaptation focus mainly on the outcome of team adaptation (e.g., Chen, Thomas, & Wallace, 2005; Resick, Murase, Bedwell, Sanz, Jiménez, & DeChurch, 2010). The extant articles describing the entire team adaptation *process* are exclusively theoretical; research investigating the team adaptation process and *how* it unfolds is missing (Baard, Rench, & Kozlowski, 2014). So far, only single phases of the team adaptation process have been empirically investigated, thus neglecting the overall team adaptation process (Ellwart, Happ, Gurtner, & Rack, 2015; Van den Heuvel, Alison, & Power, 2014).

To provide a better understanding of the ways teams adapt, we present two studies investigating the phases of the team adaptation process and their performed sequence as specified in the theoretical model presented by Rosen et al. (2011). In the first study, we focus on the relationship between the four team adaptation phases, while in the second study we investigate how the phases are in fact performed, and the way the performed phase-sequences are related to team performance.

4.3 Theoretical Background and Propositions

4.3.1 Team Adaptation

Team adaptation has been conceptualized in various ways depending on the adopted perspective (Baard et al., 2014), such as a change in team performance (*performance change approach*) or as a set of individual characteristics that promote team members to adjust effectively (*individual difference construct approach*). According to the *process approach*, team adaptation is a dynamic process that unfolds over time (Burke et al., 2006; Kozlowski et al., 1999; Rosen et al., 2011) and is conceptualized as "a change in team performance, in response to a salient cue or cue stream that leads to a functional outcome for the entire team" (Burke et al., 2006, p. 1990).

In the present study, we focus on the team adaptation process. The process of team adaptation describes different actions that a team performs in response to a change in the environment, task, or the team itself (Baard et al., 2014). Although different frameworks of team adaptation processes have been proposed (e.g., Burke et al., 2006; DeShon, Kozlowski, Schmidt, Milner, & Weichmann, 2004; Kozlowski et al., 1999), the present research is based on the theoretical model of Rosen and colleagues (2011). This model represents the most recent and comprehensive model of the team adaptation process, expanding on the framework of Burke et al. (2006) and incorporating the team process framework of Marks, Mathieu, and Zaccaro (2001). Rosens et al.'s (2011) model focuses on the mechanisms of

team adaptation by specifying the phases of the adaptation process as well as emergent states necessary for the team to adapt.

Based on the general framework of team processes described by Marks and colleagues (2001; for a meta-analysis see LePine, Piccolo, Jackson, Mathieu, & Saul, 2008), Rosen et al.'s (2011) model describes team adaptation as a dynamic cycle of four consecutive phases. During the first phase of the team adaptation cycle, *situation assessment*, the team gathers and interprets information related to the change or unexpected event that is used in the next phase, *plan formulation*, to generate a course of action. After *plan execution*, where the formulated plan is carried out, the team reflects on past events and learns from its experiences during the last phase, *team learning*. During each phase, specific team emergent states support the team's ability to effectively cope with their changing environment.

A great number of empirical work has used this four-phase model as its guiding theoretical framework (e.g, Randall, Resick & DeChurch, 2011; Sander, van Doorn, van der Pal, & Zijlstra, 2015; Santos et al., 2016), but so far only two studies have empirically investigated the phases of the team adaptation process. Specifically, Ellwart and colleagues (2015) developed a structural online team adaptation intervention that consisted of three moderated sessions, in line with a few phases of the team adaptation process (i.e., individual situation awareness, team situation awareness, and plan formulation). They showed that the intervention supported virtual teams' ability to reduce their information overload and improve their team mental model while performing an interdependent decision-making task. In another study, Van den Heuvel, Alison, and Power (2014) coded the first three team adaptation phases (i.e., situation assessment, plan formulation, and plan execution) while a police officer team was performing a negotiation simulation exercise, and afterwards, assessed the coping strategies used within each team adaptation phase. Despite the important contributions of this work, none of the above studies explored the way the actual team

adaptation process takes place in response to an unexpected change, how the team adaptation phases relate to one another, and whether a theory-conform phase sequence leads to positive team outcomes as theory suggests (Burke et al., 2006; Rosen et al., 2011).

We conducted two studies with the goal of empirically capturing the nature of the team adaptation process, testing the theoretical assumptions regarding the phase sequence of the team adaptation cycle (Rosen et al., 2011), and gaining a better understanding of what makes a team effective when faced an unexpected event. The first study, focusing on the relationship between the four team adaptation phases, is a cross-sectional field study with student teams working on product development projects over the course of eight weeks. The second study, focusing on the executed phase-sequences and the way these sequences are related to team performance, is a laboratory study with ad hoc teams performing under unexpected challenges. We contribute to the field of team adaptation by providing a first empirical examination of the phases and phase sequences of the team adaptation process and by investigating its relationship to team performance. Finally, by exploring the way teams adapt in the face of an unexpected event, our research can be used to develop and train teams in order to improve their capacity to effectively adjust to challenging circumstances.

4.3.2 The Four-Phase Team Adaptation Process

As outlined above, the team adaptation process is conceptualized as a sequence of the following four phases occurring cyclically: situation assessment, plan formulation, plan execution, and team learning (Rosen et al., 2011). This four-phase team adaptation process occurs when a team recognizes the need to adapt to a disruption in an ongoing process (i.e., novel situation, unexpected change, or failure), and serves as a supporting mechanism to effectively address challenging circumstances (Burke et al., 2006).

Situation assessment, the first phase of the team adaptation process, refers to the process of information gathering during which the team scans the environment for cues that

possibly affect its goals, mission, and task execution (Rosen et al., 2011). Specifically, team members monitor the environment, detect cues that disturb any ongoing processes, and try to estimate their meaning and consequences for the current situation in order to generate initial solutions (Burke et al., 2006; Gutwin & Greenberg, 2004). Research supports the importance of situation assessment for team success by showing that, for example, the time invested into cue identification and generation of responses is related to the subsequent success of team adaptation (Waller, 1999). Another example shows that situation awareness is positively related to team planning behaviors (Garbis & Waern, 1999) and to effective decision-making (Wright & Endsley, 2008). Having identified the cues that require an adaptive response and having reached a shared understanding of the environment and its challenges, the team needs to prepare its subsequent steps.

During *plan formulation,* the second phase of the team adaptation process (Rosen et al., 2011), the team formulates alternative plans, sets goals, decides on a course of action, and clarifies roles and responsibilities based on current environmental characteristics and on previous actions (Burke et al., 2006; Stout & Salas, 1993). The team generates a plan that supports their ability to adapt and achieve desired outcomes (Zajac, Gregory, Bedwell, Kramer, & Salas, 2014). Waller (1999), for example, showed that teams, who engaged in planning behaviors, outperformed teams who did not engage in similar actions during a non-routine event. Furthermore, planning behaviors have been showen to positively impact the subsequent coordinated information exchange and task execution (Hertel, Geister, & Konradt, 2005).

After plan formulation, the team members ideally continue with *plan execution* - the third phase of the team adaptation process. Plan execution, represents the actual performance phase (Rosen et al., 2011). During this phase, team members actively engage in a number of activities (i.e., mutual monitoring, communication, and back-up behavior) aiming to

successfully execute the plan formulated in the previous phase. Team members can coordinate their actions explicitly (e.g., communicating the following steps to the team members) as well as implicitly (e.g., relying on shared mental models to anticipate the needs of their teammates; Rosen et al., 2011). As empirical work shows, coordinated actions support the team's performance when there is a need to adapt (Entin & Serfaty, 1999).

The final phase of the team adaptation process is *team learning* (Rosen et al., 2011), which can be defined as a change in team-level knowledge guiding future team behaviour (Ellis, Hollenbeck, Ilgen, Porter, West, & Moon, 2003). During the team learning phase, the team reflects on its previous actions and builds a common understanding of the team's strengths and weaknesses (Rosen et al., 2011). The team's goal is to improve their understanding of the current situation, and determine the consequences of previous actions and how any unintended consequences could have been prevented. As a result, the team can benefit from this knowledge in future situations (London, Polzer, & Omoregie, 2005). These learning behaviours support the team's ability to change and improve its way of operating, an important requirement for successful team adaptation (Kozlowski & Bell, 2008). To complete the team adaptation process, all four team adaptation phases must take place.

Based on the conceptualization of the team adaptation process as a sequence of the phases (Rosen et al., 2011) and empirical findings detailed above, we propose the following:

Proposition 1: When adapting to a new or unexpected event, there is a positive relationship between each of the following variables: situation assessment, plan formulation, plan execution, and team learning. In addition to the positive relationship to each other, the variables occur in the following sequence: situation assessment → plan formulation → plan execution → team learning.

According to the team adaptation process model (Burke et al., 2006; Rosen et al., 2011), all four phases support teams' ability to react successfully to a new or unexpected situation. Specifically, multiple studies have provided empirical evidence for the positive impact of each team adaptation phase on team adaptive outcomes. For example, Bristowe and colleagues (2012) showed that a clear understanding of the nature of the emergency, such as its impact on the team task (i.e., situation assessment), represents an important prerequisite for effective teamwork (Bristowe et al., 2012). Waller (1999) found that the formulation of a plan supports the team's ability to succeed after a non-routine event has been introduced. Similarly, Christian and colleagues (2014) showed that the team's ability to respond immediately to a given challenge represents a precondition for successful team adaptation, findings that demonstrate the importance of plan execution. Moreover, Kozlowski and Bell (2008) found that team learning, in particular learning behaviours such as evaluation of previous performance and developing new strategies based on reflections of previous mistakes, promoted team adaptation and, in turn, the team's performance. Taking into consideration the above findings and the suggestion that all team adaptation phases contribute to a team's successful adaptation (Burke et al., 2006), we propose:

Proposition 2: After a new or unexpected event, teams that show situation assessment → plan formulation → plan execution → team learning perform better than teams that show a different or an incomplete phase sequence.

4.3.3 Overview of the Present Research

We conducted two studies to test our propositions. In the first study, we empirically tested the relationship between the four phases of the team adaptation process. Specifically, we asked 23 student teams three times during a long-term project about all phases of the team

adaptation process. Due to the fact that team adaptation occurred at unpredictable points during the project, we collapsed the three points of measurement in a multi-level design (i.e., individuals nested in teams and in time-points), resulting in a cross-sectional investigation with 69 teams. In the second laboratory study, with a sample of 70 teams, we observed the team adaptation process as it unfolded over time and examined the relationship between the different phase sequences and team performance. By combining these studies, we intend to provide the first empirical evidence of the theoretical team adaptation process model, thereby looking inside the 'black box' of this dynamic process.

4.4 Study 1

To test Proposition 1, we conducted a field study with 23 teams. The student teams worked on a long-term project, and at three points in time, we measured the four phases of the team adaptation process. Using a multi-level design (i.e., individuals nested in teams and in time-points), we treated each time point separately and, thus, pooled the data of all three time points resulting in a cross-sectional design.

In order to explore the relationship between the four phases of the team adaptation process (i.e., Proposition 1), we selected specific constructs to function as parameters for the four phases of the team adaptation process (Burke et al., 2006; Rosen et al., 2011).

Specifically, we captured situation assessment by the concept of *strategic scanning*. Strategic scanning refers to the team's capacity to scan its environment and identify cues that require an adaptive response (Parker & Collins, 2010). As Crant (2000) highlights, strategic scanning supports the team's effectiveness in a frequently changing environment.

We captured plan formulation by the concept of *team reflexivity*, which describes "the extent to which group members overtly reflect upon the group's objectives, strategies, and processes and adapt them to current or anticipated endogenous or environmental circumstances" (West, 1996, p. 559). Hence, team reflexivity helps teams to be aware of

their actions' consequences and, consequently, find better solutions to challenges. This process has been shown to be positively related to team effectiveness (Hoegl & Parboteeah, 2006).

As the coordination of actions between team members represents a main requirement for successful plan implementation (Marks et al., 2001), we selected *coordination* as an indicator for plan execution. Coordination involves activities within determined temporal boundaries (e.g., Salas, Sims & Burke, 2005) that significantly contribute to a team's high performance when adapting (Entin & Serfaty, 1999).

Finally, we captured *team learning* with a respective team learning scale (Edmondson, 1999). Team learning incorporates reflection on previous experiences, discussion of mistakes, and interpretation of actions and their consequences in order to improve future teamwork (Rosen et al., 2011).

Building on the proposition presented previously and focusing on investigating the relationship between the four team adaptation phases, we hypothesize:

Hypothesis 1a: When adapting to a new or unexpected event, there is a positive relationship between each of the following variables: strategic scanning, team reflexivity, coordination, and team learning.

Hypothesis 1b: When adapting to a new or unexpected event, the variables mentioned in Hypothesis 1a occur in the following sequence (i.e., mediation model): strategic scanning → team reflexivity → coordination → team learning.

4.4.1 Method

Procedure. The subjects of this study were members of student teams who worked on a product development task over eight weeks. Due to the complexity of the task (i.e., design and development of a new product for recycling purposes from an engineering perspective), the interdependence among team members, and the constant need to adapt to changing demands (e.g., adjustment of idea to available resources, limited budget, change of original plan due to existing product), we found these teams to be appropriate for exploring the team adaptation process. At three points in time during the project (T1 = second week; T2 = fifth week; T3 = eighth week), we assessed all four team adaptation phases (i.e., strategic scanning, team reflexivity, coordination, and team learning). Additionally, at every point in time, we asked how often teams had encountered incidences during the past 2 weeks that required them to adjust their way of operating (see Appendix C.1.2). Due to the fact that team adaptation occurred at unpredictable points during the project (teams worked independently and had to adjust to changes as they happened), we did not use the different time points for longitudinal investigation. Instead, we pooled all three time points to increase our N and the power of the study.

In order to match the participants' questionnaires, while ensuring their anonymity, a unique code was generated for each individual participant and each team.

Participants. The 23 student teams (M = 4.00 individuals per team, MIN = 3.00 individuals per team, MAX = 9.00 individuals per team, SD = 1.80 across T1, T2 and T3) were recruited from an engineering program at a German university. Some participants did not complete all three questionnaires. As we were interested in collecting information about the teams and not about the individual, we used all the data collected from teams with at least three team-members completing all three questionnaires (N = 103 individuals at T1, N = 101 individuals at T2 and N = 93 individuals at T3). The majority of participants were male

(81%), with an average age of 19.55 years (*SD* = 2.24). The descriptive statistics with regard to the number of individuals per team, described above, also refer to the individuals from teams with at least three team-members completing all three questionnaires. Participants who completed all questionnaires were paid 10 Euros (for study's ethical approval see Appendix C.1.1).

Measures. Given that the participants were studying in Germany, all scales were translated into German following the "translation and back-translation" strategy (Campbell, Brislin, Stewart, & Werner, 1970). All scales were measured using a 5-point Likert scale ranging from 1 (totally disagree) to 5 (totally agree).

Strategic scanning. Strategic scanning was measured using a 3-item scale adapted from Parker and Collins (2010), which showed satisfactory reliability scores (α = .78 at T1, α = .83 at T2, α = .85 at T3).

Team reflexivity. Team reflexivity was assessed with 5 items derived from Hoegl and Paroteeah (2006). Whereas reliability was satisfactory at T2 (α = .78) and T3 (α = .79) at T3), reliability was slightly lower at T1 (α = .65). As reliability at T1 could not be improved by the removal of items, we used the scale despite its rather low reliability.

Coordination. Coordination was measured using the respective 4-item subscale adapted from Lewis's (2003) scale of transactive memory systems. The scale was reliable (α = .70 at T1, α = .78 at T2, α = .68 at T3).

Team learning. Team learning was assessed with 7 items developed by Edmondson (1999). As the reliability analysis did not reveal satisfying results, we removed four items from the scale. The final scale consisted of the following three items: "Team members go out and get all the information they possibly can from others-such as customers, or other parts of the organisation.", "This team frequently seeks new information that leads us to make important changes." and "People in this team often speak up to test assumptions about issues

under discussion.". The three items were adapted for the purpose of the study (e.g., "customers" was replaced by "tutors") and showed the following reliabilities: α = .66 at T1, α = .72 at T2, α = .64 at T3.

Incidents leading to change. Given that team adaptation is a reaction to an incident, we measured the number of incidents that led to a change in the team during the last two weeks using the item "How many incidents that led to a change within your team, took place during the last two weeks?". Participants answered the question on a 5-point scale ranging from 1 (none) to 5 (a lot).

Data analyses. As mentioned previously, the data was analysed by using the multi-level approach. The analysis was conducted on the individual level. In our multi-level model, the individuals were nested in teams, on the one hand, and in time points, on the other hand.

In order to examine the relationships between the team adaptation phases, we ran random intercept models with R version 3.3.2 (2014) using the lmer function from the lme4 package (Bates & Maechler, 2009) and applying the mixed-model formula suggested by Bates, Mächler, Bokler and Walker (2014). For calculating the marginal (i.e., for fixed factors) and conditional R squared (i.e., for fixed and random factors) for our model, we used the r.squaredGLMM function from the MuMln package (Bartón, 2015). Following Hofmann and Gavin's (1998) suggestion, we standardized all team adaptation phases prior to analysis (see Appendix C.1.3 for R-code).

4.4.2 Results

Preliminary Analysis. In general, teams experienced incidences that required changing their workflow at T1 (*M* = 1.90, *SD* = .51), at T2 (*M* = 1.77, *SD* = .44) and at T3 (*M* = 1.53, *SD* = .43). As a result, teams were required to adapt during their project. Only 1 team did not indicate having experienced incidences requiring adaptation. However, taking

into consideration the challenging and complex nature of the project, and the information provided from the team's tutors, we believe that this team faced challenges without being aware of them and, therefore, was included in the analysis. In order to examine whether the selected parameters for each phase of the team adaptation process could be considered as four separate factors, exploratory factor analysis (EFA) was performed with oblimin rotation (see Supplemental Material). Elbow-criteria favored a four-factor solution for T1, T2, and T3. Eigenvalue-criterion >1 suggested a four-factor solution at T1 and T3, and a three-factor solution for T2 (Appendix C1.4)

Hypothesis Testing. Means, standard deviations, and correlations between the study variables for each separate time point are presented in Table 4.1.

Table 4.1

Means, standard deviations, reliability estimates, and intercorrelations for study variables

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Group	28.39	15.62																
2. Number of Incidents (T1)	1.90	0.51	-.26															
3. Situation Assessment (T1)	2.76	0.36	.07	.16	(.78)													
4. Plan Formulation (T1)	3.58	0.29	-.14	-.25	.49*	(.65)												
5. Plan Execution (T1)	3.41	0.34	-.28	.21	.29	.34	(.70)											
6. Team Learning (T1)	3.34	0.33	.10	-.12	.66**	.68**	.19	(.66)										
7. Number of Incidents (T2)	1.77	0.44	-.11	.42*	.15	-.16	-.06	-.04										
8. Situation Assessment (T2)	2.75	0.50	-.05	-.21	.59**	.64**	.31	.54**	-.15	(.83)								
9. Plan Formulation (T2)	3.40	0.43	-.36	.00	.46*	.61**	.34	37	-.29	.65**	(.78)							
10. Plan Execution (T2)	3.41	0.42	-.04	-.29	-.04	.29	.34	.14	-.53**	.39	.57**	(.79)						
11. Team Learning (T2)	3.22	0.44	-.04	.06	.67**	.49*	.18	.51*	-.02	.69**	.67**	.37	(.72)					
12. Number of Incidents (T3)	1.53	0.43	-.40	.25	-.18	-.02	-.27	.07	.36	-.13	-.29	-.38	-.19					
13. Situation Assessment (T3)	2.98	0.51	.13	-.12	.49*	.55**	.21	.47*	-.11	.76**	.67**	.31	.65**	-.28	(.85)			
14. Plan Formulation (T3)	3.39	0.39	-.30	-.12	.45*	.60**	.18	.37	-.13	.48*	.73**	.23	.57**	-.31	.50*	(.79)		
15. Coordination (T3)	3.52	0.41	-.06	.07	.38	.26	.15	.22	-.43*	.42*	.73**	.65**	.61**	-.44*	.42*	.53**	(.68)	
16. Team Learning (T3)	3.21	0.37	.01	-.06	.52*	.64**	.16	.65**	-.18	.58**	.73**	.48*	.77**	-.20	.66**	.51*	.68**	(.64)

Note. * $p < .05$. ** $p < .001$

In order to test Hypothesis 1, we first explored the relationship between the first and second phase of team adaptation (i.e., situation assessment in the form of strategic scanning and plan formulation in the form of team reflexivity) and found that strategic scanning was positively related to team reflexivity ($\beta = .21$, $p < 0.01$). When analysing the relationship between the second and third phase of team adaptation (i.e., plan formulation in the form of team reflexivity and plan execution in the form of coordination), team reflexivity was positively related to coordination ($\beta = .48$, $p < 0.01$). Exploring the relationship between the last two phases of team adaptation (i.e., plan execution in the form of coordination and team learning), we found that coordination was positively related to team learning ($\beta = .38$, $p < 0.01$). When examining the relationship between the first and third phase of team adaptation (i.e., situation assessment in the form of strategic scanning and plan execution in the form of coordination), strategic scanning was positively related to coordination ($\beta = .15$, $p < 0.01$). Exploring the relationship between the first and the fourth phase of team adaptation (i.e., situation assessment in the form of strategic scanning and team learning), strategic scanning was positively related to team learning ($\beta = .37$, $p < 0.01$). Finally, we examined the relationship between the second and fourth phase of the team adaptation process (i.e., plan formulation in the form of team reflexivity and team learning) and found that team reflexivity was positively related to team learning ($\beta = .62$, $p < 0.01$). Thus, Hypothesis 1a was supported.

In order to test Hypothesis 1b, we first explored the relationship between the first three team adaptation phases (i.e., situation assessment, plan formulation, and plan execution). We found that strategic scanning significantly predicted coordination ($\beta = .15$, $p < 0.01$), and that team reflexivity fully mediated this relationship, with a positive indirect effect ($\beta = .45$, $p < 0.01$) and with the direct path from situation assessment on coordination being no longer significant ($\beta = .05$, $p = 0.20$). Following the Monte Carlo Method (Selig & Preacher, 2008),

we found that a bootstrap 95% CI around the indirect effect did not contain zero (.04, .13). We then explored the relationship between all four team adaptation phases (i.e., situation assessment, plan formulation, plan execution, and team learning). After testing for mediation from strategic scanning through team reflexivity and through coordination to team learning, the direct path from strategic scanning to team learning remained significant (β = .23, p < 0.01). Conducting a multiple regression, we found that team learning was independently and significantly predicted by strategic scanning (β = .37, p < 0.01), team reflexivity (β = .62, p < 0.01), and coordination (β = .38, p < 0.01). Thus, Hypothesis 1b was partially supported. The results are presented in Table 4.2 and Table 4.3.

Table 4.2

Hierarchical analysis predicting plan formulation

Steps and predictor variable	β	*SE β*	*t*	$R^2_{GLMM(m)}$	$R^2_{GLMM(c)}$
Step 1:					
Situation Assessment	0.15**	0.04	3.66	0.04	0.14
Step 2:					
Situation Assessment	0.05	0.04	1.33		
Plan Formulation	0.45**	0.05	7.93	0.22	0.29

Note.* p < .05. ** p < .001.

Table 4.3

Hierarchical analysis predicting team learning

Steps and predictor variable	β	*SE β*	*t*	$R^2_{GLMM(m)}$	$R^2_{GLMM(c)}$
Step 1:					
Situation Assessment	0.37**	0.04	9.08	0.22	0.27
Step 2:					
Situation Assessment	0.25**	0.03	6.88		
Plan Formulation	0.51**	0.05	9.85	0.43	0.44
Step 3:					
Situation Assessment	0.25**	0.03	6.70		
Plan Formulation	0.45**	0.05	7.99		
Plan Execution	0.12	0.05	2.41	0.45	0.47

Note.* $p < .05$. ** $p < .001$.

4.4.3 Discussion

The aim of Study 1 was to explore the relationship between the four team adaptation phases as suggested in the theoretical team adaptation process model of Rosen et al. (2011). Our findings confirmed the model's suggestions that the team adaptation phases are positively related to each other. Moreover, supporting our predictions, we showed the following mediation effect: situation assessment (i.e., assessed with strategic scanning) → plan formulation (i.e., assessed with team reflexivity) → plan execution (i.e., assessed with coordination). Contradicting our predictions, we did not find that the sequence continued onto team learning. Instead, all of the first three team adaptation phases (i.e., situation assessment, plan formulation, and plan execution) individually contributed to the team learning phase (i.e., all positively and independently related to team learning in a multiple

regression). These last results are in line with the suggestion that team members, due to their interdependence, improve how they interact with each other and enhance their effectiveness as a whole through various team processes (Salas, Dickinson, Converse, & Tannenbaum, 1992) and not only through team processes involved during plan execution as the team adaptation process model suggests (Burke et al., 2006; Rosen et al., 2011).

However, the present study had some limitations. First, our sample size was quite small, which is a common drawback of team studies. Second, the team members' perceptions were used to measure the four team adaptation phases, raising concerns about common method bias (Conway & Lance, 2010). Third, we captured the team adaptation phases at three single points in time and not continuously, which is unfortunate given that team adaptation describes an unfolding dynamic process (Kozlowski et al., 1999). Our results, however, provide the first empirical support for the relationship between the phases of the team adaptation process model. In addition, these findings were collected from student teams that were comparable to project teams in real work settings. Nevertheless, we believe that it is important to extend the empirical basis of our findings by using a larger sample size, different methods, and another setting that allows observations of the way the phase-sequences unfold in real time to provide stronger empirical support for the team adaptation process model.

4.5 Study 2

The aim of Study 2 was to explore the team adaptation phase sequence after an unexpected event and, thus, to capture the overall four-phase team adaptation process. Moreover, in an effort to improve our understanding of team performance when facing unexpected events, we investigated differences in phases and phase sequences between high- and low-performing teams. Finally, we also wanted to address the limitations of Study 1 by

collecting data from a larger sample size, by measuring the four team adaptation phases with behavioral observations, and by capturing the dynamic nature of the team adaptation process.

To achieve these goals, we conducted a laboratory study with 70 teams playing a space-themed board game. While performing, all teams experienced an unexpected event. We coded the sequence of the performed team adaptation phases after the unexpected event, based on the teams' communication and behaviour, which allowed representation and analysis of temporal dynamics (i.e., the emergence and effects of patterns). Unlike cross-sectional and repeated-measures designs (Herndon & Lewis, 2015), sequence methods can be used to capture a team's behaviour in its continuity as opposed to isolated single events (Aisenbrey & Fasang, 2010).

Specifying the propositions presented previously, for the purpose of Study 2, we pose the following hypotheses. The first set of hypotheses addresses the sequence of two team adaptation phases.

Hypothesis 1c: When adapting to an unexpected event, teams will run through the following sequences of the team adaptation phases more often than by chance alone: situation assessment → plan formulation; plan formulation → plan execution; plan execution → team learning; team learning → situation assessment.

Hypothesis 1d: When adapting to an unexpected event, teams will run through the following sequences of team adaptation phases more often than through any other sequences of the same phases: situation assessment → plan formulation; plan formulation → plan execution; plan execution → team learning; team learning → situation assessment.

Hypothesis 2a: When adapting to an unexpected event, high-performing teams will run through the following sequences of team adaptation phases more often than low-performing teams: situation assessment → plan formulation; plan formulation → plan execution; plan execution → team learning; team learning → situation assessment.

The next set of hypotheses addresses the sequences of three phases of the team adaptation process:

Hypothesis 1e: When adapting to an unexpected event, teams will run through the following sequences of team adaptation phases more often than by chance alone: situation assessment → plan formulation → plan execution; plan formulation→ plan execution → team learning; plan execution → team learning → situation assessment.

Hypothesis 1f: When adapting to an unexpected event, teams will run through the following sequences of team adaptation phases more often than through any other sequences of the same phases: situation assessment → plan formulation → plan execution; plan formulation→ plan execution → team learning; plan execution → team learning → situation assessment.

Hypothesis 2b: When adapting to an unexpected event, high-performing teams will run through the following sequences of team adaptation phases more often than low-performing teams: situation assessment → plan formulation → plan execution; plan formulation→ plan execution → team learning; plan execution → team learning → situation assessment.

4.5.1 Method

Participants. We randomly assigned 288 participants to 72 four-member teams. The majority of participants was female (56%) and students (92%), of different national backgrounds (76% German, 13.7% other EU-Countries, 10.3% Non-EU-Countries), and with an average age of 25.71 years (*SD* = 7.23). Participants were compensated with four Euros and could additionally earn up to 20 Euros based on their team's performance.

Procedure. We used data that were originally collected for the purpose of another study (see Georganta & Brodbeck, 2016[4]). In this study, four-member teams played a simplified version of *Space Alert* (Heidelberger Verlag, 2008), a space-themed board game. The team members had to coordinate with each other under time pressure, protect their spaceship, and eliminate an external threat. The 72 teams performed one trial mission and four standard missions. Each mission consisted of seven one-minute rounds; during each round, each team member could perform one action (i.e., attack, move, navigate, or load energy). All missions were video-recorded.

For Study 2, we used only the fourth mission's video recordings and team performance data for the following reasons: during the first three standard missions, half of the teams experienced changes, whereas the other half of the teams experienced no changes while performing; the effect of different changes versus no changes during the first three rounds was, however, not the focus of Study 2 (for these results see Georganta & Brodbeck, 2016). In contrast, in the fourth mission all teams experienced the same unexpected event, which was a new event to all teams. The reaction to this new and unexpected event in the fourth mission represented the basis for the analysis in the current study; no difference

[4] The data for the current paper came from a dataset that was originally collected for Georganta's and Brodbeck's study (2016). The current study, however, targets the complete team communication and behaviors and thus, the sequence of the team adaptation phases during the task mission, in contrast to Georganta's and Brodbeck's study (2016) where the team adaptation phases were measured as demonstrated during the overall mission. Team performance is used in both studies. There is no other overlap between these two studies in terms of hypotheses or studied variables.

between the two experimental groups was found in terms of their performance during the fourth mission (t (70) = -.30, p = .762). We excluded two teams due to poor sound quality in their video recordings. Therefore, our final dataset contained 280 individuals in 70 four-member teams.

For the coding described below, we transcribed the team members' communication during the fourth mission (see Appendix C.2.1).

Measures.

Team Adaptation Phases. Two raters, knowledgeable of the team adaptation literature, independently coded the team adaptation phases of eight teams, by using the transcribed communication and by watching corresponding video recordings. By using the video recordings, raters were also able to code team-member behaviours that were not explicitly expressed. Definitions and behavioural examples of the Behaviorally Anchored Rating Scales for measuring the four team adaptation phases were used as guidance (Georganta, Merk, & Brodbeck, 2016; Georganta, Blum, & Brodbeck, 2017). In this way, we obtained 494 coded incidents with a good interrater-reliability among the raters (Krippendorff's Alpha = .69; Cicchetti, 1994). After this step, the raters discussed their differing coded incidents, came to a consensus, and achieved a mutual understanding. As a next step, following the same procedure, the raters independently coded the team adaptation phases of the remaining 64 teams that resulted in 2.740 coded incidents. The interrater-agreement among the raters was excellent (Krippendorff's Alpha = .86). All remaining disagreements were resolved via discussion (Appendic C.2.2).

When teams remained in one phase (i.e., several statements that were directly following each other indicating the same phase), all statements of that phase were summarized and represented by one code. This procedure resulted in 1.734 team-level coded phases. Examples of the coded incidents are presented in Table 4.4.

Table 4.4

Definitions of team adaptation phases and examples of statements

Team Adaptation Phase	Definition	Examples
Situation Assessment	During situation assessment, the team members scan the environment to gather information, to identify relevant cues and to recognize the significance of the cues. This phase evokes increased awareness of the information that concerns the team's goals, mission, or accomplishment of the team task. During situation assessment, the team tries to gauge the consequences of the current situation.	"You are now in the middle, which means that you can load energy." "It (the threat) has still five life points." "Exactly, one of the two guns is not blocked.'
Plan Formulation	During plan formulation, based on the information previously assessed, the team develops a plan of action. The team prioritizes its actions, sets goals, and clarifies the team roles and responsibilities within the course of action.	"You should move to the bottom, I will stay here and you should move to the right so we can shoot from there during the next round." " We should shoot first so then we can load with energy the top of our spaceship." " You should stay here, because this gun will work again and then I can load it with energy."
Plan Execution	During plan execution, the plan is executed in order to achieve the team's goal. Plan execution involves behaviors such as monitoring, communication, leadership and coordination.	"I am loading energy." "We are shooting together to damage the threat." "I am staying where I am, and I am navigating."
Team Learning	During team learning, team members reflect on results, discuss and learn from their own successes, errors and/or unexpected outcomes. The team discovers the consequences of previous actions, the mechanisms by which unintended consequences can be prevented and the manner in which courses of action can be revised.	"I think that it would be more effective if we shoot from the bottom." " Don't do that again. It won't bring us anything." " This will not help, we already shot with two points and it (the threat) was able to defend without any damage."

Note. Definitions based on the BARS-scales from Georganta et al. (2016).

Team Performance. Team performance was measured based on the number of rounds each team needed to successfully complete the fourth mission. At least three out of seven rounds were needed to successfully complete the mission. Teams received the highest performance score when they completed the mission in three out of seven rounds. For each additional round that the teams needed to complete the mission, the team performance score was reduced by one point. Team performance scores ranged on a scale from 4 (i.e., task completed in third round) to 0 (i.e., task completed in seventh round).

Data Analysis. We investigated the frequency of theory-conform (e.g., situation assessment → plan formulation, also see hypotheses) and theory-non-conform phase-sequences (e.g., situation Assessment → plan execution, also see hypotheses) with lag sequential analysis. We also compared the frequency of theory-conform versus theory non-conform sequences between high- and low-performing teams.

Lag sequential analysis allows for examining patterns in sequentially coded events. With this analysis, it is possible to determine which of these patterns occur more or less often than others or than random occurrence and to relate such patterns to outcome variables such as performance (Bakeman & Gottman, 1986; Bakeman & Quera, 2011; Kolbe et al., 2014). Based on the formula suggested by Bakeman and Gottman (1986, p.140), at least 153 coded phases were required to perform our analysis, a number that we exceeded with our 1.734 coded-phases.

To investigate whether the expected two-phase sequences occurred significantly more often than by chance alone, we performed a log-linear analysis with the following generated sequence matrix: 4 Antecedent Phase categories (i.e., situation assessment, plan formulation, plan execution, and team learning) x 4 Consequence Phase 1 categories (i.e., situation assessment, plan formulation, plan execution, and team learning).

To investigate whether the expected three-phase sequences occurred significantly more often than by chance alone, we performed a log-linear analysis with the following generated sequence matrix: 4 Antecedent Phase categories x 4 Consequence Phase 1 categories x 4 Consequence Phase 2 categories (i.e., situation assessment, plan formulation, plan execution, and team learning). For example of sequence matrix see Appendix C.2.3.

To compare high-performing and low-performing teams with respect to the frequency of theory-conform phase sequences, a 20-percentile split was performed. Similar splits were conducted in previous studies (e.g., Bowers, Jentsch, Salas, & Brown, 1998; Grote, Kolbe, Zala-Mezö, Bienefeld-Seall & Künzle, 2010). Fourteen teams were in the bottom 20th percentile (i.e., team performance < 3; $M = 1.79$, $SD = 0.15$) and 27 teams were in the top 20th percentile (i.e., team performance > 3; $M = 4.00$, $SD = 0.00$); the groups differed significantly in their performance ($t(39) = -20.11$, $p < 0.01$).

To investigate whether theory-conform two-phase sequences occurred significantly more often than by chance alone for both high- and low-performing teams, we performed a log-linear analysis with the following generated sequence matrix: 2 Group (high- and low-performing group) x 4 Antecedent Phase categories x 4 Consequence Phase 1 categories. To investigate whether theory-conform three-phase sequences occurred significantly more often than by chance alone for high- and low-performing teams, we performed a log-linear analysis with the following generated sequence matrix: 2 Group (high- and low-performing group) x 4 Antecedent Phase categories x 4 Consequence Phase 1 categories x 4 Consequence Phase 2 categories.

To investigate whether theory-conform two- and three-phase sequences were performed significantly more often than theory-non-conform phase sequences and to investigate whether high-performing teams performed significantly more often theory-conform two- and three-phase sequences than low-performing teams, transition frequencies were determined for all

possible two- and three-phase sequences and *z* statistics were applied. All analyses were calculated with SPSS (IBM SPSS Statistics Version 24).

4.5.2 Results

Two-Phase Sequences. *Z* scores indicated that situation assessment was followed by plan formulation ($z = 4.63$, $p < .001$), plan formulation was followed by plan execution ($z = 4.50$, $p < .001$), plan execution was followed by team learning ($z = 2.95$, $p = .003$), and team learning was followed by situation assessment ($z = 3.21$, $p = .001$) significantly more often than by chance alone. Thus, Hypothesis 1c was supported.

To test whether the above theory-conform two-phase sequences were performed significantly more often than theory-non-conform two-phase sequences, chi-square analyses were performed. Results showed that situation assessment was significantly more often followed by plan formulation than by another team adaptation phase ($\chi^2(1)$ 123.84, $p < .001$), as expected. There was no significant difference between plan formulation being followed by plan execution than by another team adaptation phase ($\chi^2(1)$ 1.15, $p = .282$), in contrast to our expectations. Plan execution was significantly more often followed by another team adaptation phase than by team learning ($\chi^2(1)$ 225.62, $p < .001$) and team learning was significantly more often followed by another team adaptation phase than by situation assessment ($\chi^2(1)$ 29.51, $p < .001$), in contrast to our assumptions. Hence, Hypothesis 1d was only supported for the sequence situation assessment → plan formulation.

Three-Phase Sequences. *Z* scores indicated that situation assessment was followed by plan formulation that was followed by plan execution ($z = 4.06$, $p < .001$), plan formulation was followed by plan execution that was followed by team learning ($z = 2.63$, $p = .009$) and team learning was followed by situation assessment that was followed by plan formulation ($z = 3.07$, $p = .002$) significantly more often than by chance alone. Thus, Hypothesis 1e was supported.

To test whether the above theory-conform three-phase sequences were performed significantly more often than theory-non-conform three-phase sequences, chi-square analyses were performed. In contrast to our expectations, situation assessment followed by plan formulation was not significantly more often followed by plan execution than by another team adaptation phase ($\chi^2(1) = 1.93$, $p = .165$). Moreover, plan formulation followed by plan execution was not significantly more often followed by team learning but was instead significantly more often followed by plan formulation than any other team adaptation phase ($\chi^2(1) = 6.82$, $p = .009$). Team learning followed by situation assessment was significantly more often followed by plan formulation than by another team adaptation phase ($\chi^2(1)=17.16$, $p < .001$) as expected. Thus, Hypothesis 1f was only supported for the sequence team learning → situation assessment → plan formulation.

The frequencies for all possible two- and three-phase sequences and their z values are presented in Table 4.5 and Table 4.6.

Table 4.5

Z values for the two-phase team adaptation sequences

	Consequence 1											
	Situation Assessment			Plan Formulation			Plan Execution			Team Learning		
Antecedent	*z*	*p*	*n*	*z*	*p*	*n*	*z*	*p*	*n*	*z*	*p*	*n*
Situation Assessment	0.00	1.000	0	4.63	0.000	355	3.41	0.001	63	3.24	0.001	51
Plan Formulation	4.50	0.000	293	0.00	1.000	0	4.50	0.000	305	3.62	0.000	85
Plan Execution	3.77	0.000	102	4.27	0.000	210	0.00	1.000	0	2.95	0.003	33
Team Learning	3.21	0.001	48	3.62	0.000	84	2.95	0.003	33	0.00	1.000	0

Note. N = 70 Teams.

Table 4.6

Z values for the three-phase team adaptation phase sequences

	Consequence 2											
	Situation Assessment			Plan Formulation			Plan Execution			Team Learning		
Antecedent → Consequence 1	*z*	*p*	*n*	*z*	*p*	*n*	*z*	*p*	*n*	*z*	*p*	*n*
Situation Assessment → Situation Assessment	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Situation Assessment → Plan Formulation	4.01	0.000	148	0.00	1.000	0	4.06	0.000	162	3.08	0.002	41
Situation Assessment → Plan Execution	2.17	0.030	11	3.03	0.002	37	0.00	1.000	0	1.03	0.299	2
Situation Assessment → Team Learning	2.34	0.019	13	2.90	0.004	31	1.47	0.140	4	0.00	1.000	0
Plan Formulation → Situation Assessment	0.00	1.000	0	4.29	0.000	217	3.21	0.001	48	2.83	0.005	29
Plan Formulation → Plan Formulation	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Plan Formulation → Plan Execution	3.66	0.000	90	4.06	0.000	157	0.00	1.000	0	2.63	0.009	23
Plan Formulation → Team Learning	2.72	0.006	24	3.05	0.002	38	2.69	0.007	23	0.00	1.000	0
Plan Execution → Situation Assessment	0.00	1.000	0	3.56	0.000	78	1.94	0.052	8	2.34	0.019	15
Plan Execution → Plan Formulation	3.67	0.000	91	0.00	1.000	0	3.67	0.000	92	2.80	0.005	27
Plan Execution → Plan Execution	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Plan Execution → Team Learning	2.10	0.035	10	2.34	0.019	14	1.74	0.080	6	0.00	1.000	0
Team Learning → Situation Assessment	0.00	1.000	0	3.07	0.002	39	1.47	0.140	4	1.62	0.140	5
Team Learning → Plan Formulation	3.07	0.002	39	0.00	1.000	0	2.88	0.004	32	2.28	0.022	13
Team Learning → Plan Execution	0.67	0.501	1	2.28	0.022	13	0.00	1.000	0	1.85	0.064	6
Team Learning → Team Learning	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0

Note. $N = 70$ Teams.

High- and Low-performing Teams.

Two-Phase Sequences. *Z* scores indicated that situation assessment was followed by plan formulation ($z = 3.85$, $p < .001$ for high-performing teams; $z = 3.70$, $p < .001$ for low-performing teams), plan formulation was followed by plan execution ($z = 3.75$, $p < .001$ for high-performing teams; $z = 3.64$, $p < .001$ for low-performing teams), and team learning was followed by situation assessment ($z = 2.39$, $p = .017$ for high-performing teams; $z = 3.43$, $p = .015$ for low-performing teams) significantly more often than by chance alone for both high- and low-performing teams.

Plan execution was followed by team learning significantly more often than by chance alone only for high-performing teams ($z = 2.43$, $p = .015$). However, in contrast to our expectations, situation assessment followed by plan formulation ($\chi^2(1) = 1.40$, $p = .235$), plan formulation followed by plan execution ($\chi^2(1) = 0.84$, $p = .356$), plan execution followed by team learning ($\chi^2(1) = 1.41$, $p = .234$) was not performed significantly more often for high- than low-performing teams. Moreover, team learning followed by situation assessment was performed significantly less often for high- than low-performing teams ($\chi^2(1) = 5.38$, $p = .020$), in contrast to our expectations. Thus, Hypothesis 2a was not supported.

Results also showed that high-performing teams performed after team learning significantly more often plan formulation ($\chi^2(1) = 17.55$, $p < .001$) and plan execution ($\chi^2(1) = 12.13$, $p < .001$) than low performing teams, findings that were not expected.

Three-Phase Sequences. *Z* scores indicated that situation assessment was followed by plan formulation that was followed by plan execution ($z = 3.20$, $p = .001$ for high-performing teams; $z = 3.01$, $p = .001$ for low-performing teams), and that team learning was followed by situation assessment that was followed by plan formulation ($z = 2.23$, $p = .026$ for high-performing teams; $z = 2.02$, $p = .022$ for low-performing teams) significantly more often than by chance alone for both high- and low-performing teams. Plan formulation followed by

plan execution that was followed by team learning was significantly more often performed than by chance alone only for high-performing teams ($z = 2.17$, $p = .030$). However, in contrast to our expectations, situation assessment followed by plan formulation that was followed by plan execution ($\chi^2(1) = 0.56$, $p = .451$), plan formulation followed by plan execution that was followed by team learning ($\chi^2(1) = 1.69$, $p = .192$) was not significantly more often performed for high- than low-performing teams. Moreover, plan execution followed by team learning significantly less often followed by situation assessment than by another team adaptation phase ($\chi^2(1) = 6.85$, $p = .008$), in contrast to our expectations. Thus, Hypothesis 2b was not supported.

Results also showed that team learning followed by plan formulation that was followed by plan execution was significantly more often performed than chance alone for high-performing teams ($z = 2.43$, $p = .015$). This three-phase sequence (i.e., team learning → plan formulation → plan execution) was significantly more often performed by high- than low-performing teams (χ^2 (1) = 4.24, $p = .039$), findings that were not expected.

The frequencies for all possible two- and three-phase sequences for high- and low-performing teams and their z values are presented in Table 4.7 and Table 4.8.

Table 4.7

Z values for the two-phase team adaptation phase sequences for high- and low-performing teams

	Consequence 1											
	Situation Assessment			Plan Formulation			Plan Execution			Team Learning		
Antecedent	*z*	*p*	*n*	*z*	*p*	*n*	*z*	*p*	*n*	*z*	*p*	*n*
High-performing Teams												
Situation Assessment	0.00	1.000	0	3.85	0.000	119	2.69	0.007	23	2.72	0.006	24
Plan Formulation	3.78	0.000	106	0.00	1.000	0	3.75	0.000	102	2.92	0.003	32
Plan Execution	2.95	0.003	33	3.49	0.000	70	0.00	1.000	0	2.43	0.015	16
Team Learning	2.39	0.017	15	3.05	0.002	38	2.43	0.015	16	0.00	1.000	0
Low-performing Teams												
Situation Assessment	0.00	1.000	0	3.70	0.000	95	2.39	0.017	15	2.17	0.030	12
Plan Formulation	3.56	0.000	76	0.00	1.000	0	3.64	0.000	86	2.55	0.011	19
Plan Execution	2.78	0.005	26	3.38	0.001	61	0.00	1.000	0	1.85	0.064	7
Team Learning	2.43	0.015	16	2.47	0.013	17	1.47	0.140	4	0.00	1.000	0

Note. $N = 27$ High-performing Teams, $N = 14$ Low-performing Teams.

Table 4.8

Z values for the three-phase team adaptation phase sequences for high- and low-performing teams

	Consequence 2											
	Situation Assessment			Plan Formulation			Plan Execution			Team Learning		
Antecedent → Consequence 1	*z*	*p*	*n*	*z*	*p*	*n*	*z*	*p*	*n*	*z*	*p*	*n*
High-performing Teams												
Situation Assessment → Situation Assessment	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Situation Assessment → Plan Formulation	3.30	0.001	56	0.00	1.000	0	3.20	0.001	47	2.43	0.015	16
Situation Assessment → Plan Execution	1.28	0.198	3	2.34	0.019	14	0.00	1.000	0	1.03	0.299	2
Situation Assessment → Team Learning	1.74	0.080	6	2.34	0.019	13	1.28	0.198	3	0.00	1.000	0
Plan Formulation → Situation Assessment	0.00	1.000	0	3.53	0.000	73	2.47	0.013	17	2.34	0.019	15
Plan Formulation → Plan Formulation	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Plan Formulation → Plan Execution	2.85	0.004	29	3.23	0.001	49	0.00	1.000	0	2.17	0.030	11
Plan Formulation → Team Learning	1.85	0.064	7	2.39	0.017	15	2.10	0.035	10	0.00	1.000	0
Plan Execution → Situation Assessment	0.00	1.000	0	2.75	0.006	25	0.67	0.501	1	1.85	0.064	7
Plan Execution → Plan Formulation	2.88	0.004	30	0.00	1.000	0	2.92	0.003	32	1.94	0.052	8
Plan Execution → Plan Execution	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Plan Execution → Team Learning	1.03	0.299	2	1.94	0.052	8	1.28	0.198	4	0.00	1.000	0
Team Learning → Situation Assessment	0.00	1.000	0	2.23	0.026	12	1.03	0.299	2	0.67	0.501	1
Team Learning → Plan Formulation	2.43	0.015	16	0.00	1.000	0	2.43	0.015	17	1.62	0.104	5
Team Learning → Plan Execution	0.67	0.501	1	1.85	0.064	7	0.00	1.000	0	1.28	0.198	2
Team Learning → Team Learning	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0

Low-performing Teams												
Situation Assessment → Situation Assessment	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Situation Assessment → Plan Formulation	3.01	0.003	36	0.00	1.000	0	3.26	0.001	51	1.94	0.052	8
Situation Assessment → Plan Execution	1.03	0.299	2	2.17	0.030	11	0.00	1.000	0	1.28	0.198	3
Situation Assessment → Team Learning	1.28	0.198	3	1.94	0.052	8	0.00	1.000	0	0.00	1.000	0
Plan Formulation → Situation Assessment	0.00	1.000	0	3.35	0.001	58	2.34	0.019	14	1.74	0.080	6
Plan Formulation → Plan Formulation	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Plan Formulation → Plan Execution	2.72	0.006	24	3.23	0.001	49	0.00	1.000	0	1.62	0.104	5
Plan Formulation → Team Learning	1.94	0.052	8	1.94	0.052	8	1.28	0.198	3	0.00	1.000	0
Plan Execution → Situation Assessment	0.00	1.000	0	2.66	0.008	22	0.67	0.501	1	1.03	0.299	2
Plan Execution → Plan Formulation	2.80	0.005	27	0.00	1.000	0	2.75	0.006	25	2.02	0.042	9
Plan Execution → Plan Execution	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Plan Execution → Team Learning	1.62	0.104	5	1.63	0.673	1	0.67	0.501	1	0.00	1.000	0
Team Learning → Situation Assessment	0.00	1.000	0	2.28	0.022	13	0.00	1.000	0	1.28	0.198	3
Team Learning → Plan Formulation	2.02	0.042	9	0.00	1.000	0	1.74	0.080	6	1.03	0.299	2
Team Learning → Plan Execution	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	1.03	0.299	2
Team Learning → Team Learning	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0

Note. N = 27 High-performing Teams, N = 14 Low-performing Teams.

Additional Analyses. In contrast to our expectations, high- performing teams did not significantly differ from low-performing teams in their performed theory-conform phase sequences but instead in performed theory-non-conform phase sequences. In order to investigate in more detail the differences between high- and low-performing teams with respect to their performed sequences and gain better understanding of these unexpected findings, we split the overall communication of each team into the first- and second-half of the mission.

During the first-half of the mission, high performing teams performed significantly more situation assessment ($\chi^2(1) = 5.76$, $p = .016$) and plan formulation ($\chi^2(1) = 4.23$, $p = .040$) than low-performing teams. There were no significant differences in any two-phase sequences between the two groups. With regards to three-phase sequences, situation assessment followed by plan formulation was significantly more often followed by situation assessment than by any other team adaptation phase for high- than low-performing teams ($\chi^2(1) = 4.08$, $p = .043$). There were no significant differences in any other three-phase sequences between the two groups.

In the second half, high-performing teams exhibited significantly more plan formulation ($\chi^2(1) = 4.22$, $p = .040$) and team learning ($\chi^2(1) = 4.24$, $p = .039$) than low-performing teams. There were no significant differences in any two- or three- phase sequences between the two groups.

The frequencies for all possible two- and three-phase sequences and their z values for the first- and second-half of both high- and low-performing teams are presented in Table 4.9 until Table 4.12.

Table 4.9

Z values for the two-phase team adaptation phase sequences for high- and low-performing teams during first half

	Consequence 1											
	Situation Assessment			Plan Formulation			Plan Execution			Team Learning		
Antecedent	*z*	*p*	*n*	*z*	*p*	*n*	*z*	*p*	*n*	*z*	*p*	*n*
High-performing Teams												
Situation Assessment	0.00	1.000	0	3.49	0.000	71	2.28	0.022	13	2.02	0.042	9
Plan Formulation	3.37	0.001	60	0.00	1.000	0	3.35	0.001	58	2.10	0.035	10
Plan Execution	2.66	0.008	22	3.07	0.002	39	0.00	1.000	0	1.97	0.052	8
Team Learning	1.62	0.105	5	2.39	0.017	15	1.28	0.198	3	0.00	1.000	0
Low-performing Teams												
Situation Assessment	0.00	1.000	0	3.30	0.001	54	1.78	0.081	6	1.28	0.198	4
Plan Formulation	3.12	0.002	41	0.00	1.000	0	3.20	0.001	47	2.10	0.035	10
Plan Execution	2.39	0.017	15	2.95	0.003	33	0.00	1.000	0	1.47	0.140	4
Team Learning	1.97	0.052	8	1.85	0.064	7	0.67	0.501	1	0.00	1.000	0

Note. N = 27 High-performing Teams, N = 14 Low-performing Teams.

Table 4.10

Z values for the two-phase team adaptation phase sequences for high- and low-performing teams during second half

	Consequence 1											
	Situation Assessment			Plan Formulation			Plan Execution			Team Learning		
Antecedent	*z*	*p*	*n*	*z*	*p*	*n*	*z*	*p*	*n*	*z*	*p*	*n*
High-performing Teams												
Situation Assessment	0.00	1.000	0	3.21	0.001	49	2.10	0.035	10	2.34	0.019	14
Plan Formulation	3.15	0.002	44	0.00	1.000	0	3.12	0.002	42	2.55	0.011	19
Plan Execution	2.71	0.030	11	2.90	0.004	30	0.00	1.000	0	2.03	0.042	9
Team Learning	2.03	0.042	9	2.59	0.009	20	2.23	0.026	12	0.00	1.000	0
Low-performing Teams												
Situation Assessment	0.00	1.000	0	3.12	0.002	42	2.03	0.042	10	1.94	0.052	8
Plan Formulation	3.01	0.003	35	0.00	1.000	0	3.08	0.002	40	2.03	0.042	9
Plan Execution	2.17	0.030	11	2.83	0.005	28	0.00	1.000	0	1.28	0.198	3
Team Learning	1.94	0.052	8	2.10	0.035	10	1.28	0.198	3	0.00	1.000	0

Note. $N = 27$ High-performing Teams, $N = 14$ Low-performing Teams.

Table 4.11

Z values for the three-phase team adaptation phase sequences for high- and low-performing teams during first half

	Consequence 2											
	Situation Assessment			Plan Formulation			Plan Execution			Team Learning		
Antecedent → Consequence 1	*z*	*p*	*n*	*z*	*p*	*n*	*z*	*p*	*n*	*z*	*p*	*n*
High-performing Teams												
Situation Assessment → Situation Assessment	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Situation Assessment → Plan Formulation	3.01	0.003	37	0.00	1.000	0	2.83	0.005	28	1.85	0.064	7
Situation Assessment → Plan Execution	1.03	0.299	2	2.02	0.042	9	0.00	1.000	0	1.03	0.299	2
Situation Assessment → Team Learning	1.28	0.198	3	1.74	0.081	6	0.00	1.000	0	0.00	1.000	0
Plan Formulation → Situation Assessment	0.00	1.000	0	3.17	0.002	44	2.10	0.035	10	1.62	0.105	5
Plan Formulation → Plan Formulation	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Plan Formulation → Plan Execution	2.59	0.009	20	2.95	0.003	33	0.00	1.000	0	1.62	0.105	5
Plan Formulation → Team Learning	1.28	0.198	3	1.47	0.140	4	1.28	0.198	3	0.00	1.000	0
Plan Execution → Situation Assessment	0.00	1.000	0	2.47	0.013	17	0.67	0.673	1	1.47	0.140	4
Plan Execution → Plan Formulation	2.43	0.015	16	0.00	1.000	0	2.62	0.009	21	1.03	0.299	2
Plan Execution → Plan Execution	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Plan Execution → Team Learning	0.67	0.501	1	1.62	0.105	5	1.03	0.299	2	0.00	1.000	0
Team Learning → Situation Assessment	0.00	1.000	0	1.47	0.140	4	0.67	0.501	1	0.00	1.000	0
Team Learning → Plan Formulation	1.94	0.052	8	0.00	1.000	0	1.74	0.081	6	0.67	0.501	1
Team Learning → Plan Execution	0.00	1.000	0	1.03	0.299	2	0.00	1.000	0	0.67	0.501	1
Team Learning → Team Learning	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0

Low-performing Teams												
Situation Assessment → Situation Assessment	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Situation Assessment → Plan Formulation	2.51	0.012	18	0.00	1.000	0	2.92	0.003	32	1.47	0.140	4
Situation Assessment → Plan Execution	1.03	0.299	2	1.47	0.140	4	0.00	1.000	0	1.25	0.198	3
Situation Assessment → Team Learning	1.25	0.198	3	1.28	0.198	6	0.00	1.000	0	0.00	1.000	0
Plan Formulation → Situation Assessment	0.00	1.000	0	2.97	0.003	34	1.74	0.081	6	1.03	0.299	2
Plan Formulation → Plan Formulation	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Plan Formulation → Plan Execution	2.34	0.019	14	2.88	0.004	30	0.00	1.000	0	1.28	0.198	3
Plan Formulation → Team Learning	1.62	0.105	5	1.47	0.140	4	0.67	0.501	1	0.00	1.000	0
Plan Execution → Situation Assessment	0.00	1.000	0	2.34	0.019	14	0.00	1.000	0	0.67	0.501	1
Plan Execution → Plan Formulation	2.34	0.019	14	0.00	1.000	0	2.28	0.022	13	1.74	0.081	6
Plan Execution → Plan Execution	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Plan Execution → Team Learning	1.28	0.198	3	1.63	0.673	1	0.00	1.000	0	0.00	1.000	0
Team Learning → Situation Assessment	0.00	1.000	0	1.74	0.081	6	0.00	1.000	0	0.00	1.000	0
Team Learning → Plan Formulation	1.74	0.081	6	0.00	1.000	0	0.67	0.501	1	0.00	1.000	0
Team Learning → Plan Execution	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.67	0.501	1
Team Learning → Team Learning	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0

Note. N = 27 High-performing Teams, N = 14 Low-performing Teams.

Table 4.12

Z values for the three-phase team adaptation phase sequences for high- and low-performing teams during second half

	Consequence 2											
	Situation Assessment			Plan Formulation			Plan Execution			Team Learning		
Antecedent → Consequence 1	*z*	*p*	*n*	*z*	*p*	*n*	*z*	*p*	*n*	*z*	*p*	*n*
High-performing Teams												
Situation Assessment → Situation Assessment	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Situation Assessment → Plan Formulation	2.55	0.011	20	0.00	1.000	0	2.55	0.011	19	2.03	0.042	9
Situation Assessment → Plan Execution	0.67	0.501	1	1.62	0.104	5	0.00	1.000	0	0.00	1.000	0
Situation Assessment → Team Learning	1.28	0.198	3	1.85	0.064	6	1.28	0.198	3	0.00	1.000	0
Plan Formulation → Situation Assessment	0.00	1.000	0	2.86	0.004	28	1.85	0.064	7	1.94	0.051	9
Plan Formulation → Plan Formulation	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Plan Formulation → Plan Execution	2.03	0.042	9	2.39	0.017	15	0.00	1.000	0	1.74	0.080	6
Plan Formulation → Team Learning	1.47	0.140	4	2.03	0.042	9	1.74	0.080	7	0.00	1.000	0
Plan Execution → Situation Assessment	0.00	1.000	0	1.94	0.051	9	0.00	1.000	0	1.28	0.198	3
Plan Execution → Plan Formulation	2.34	0.019	14	0.00	1.000	0	2.17	0.030	11	1.62	0.104	5
Plan Execution → Plan Execution	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Plan Execution → Team Learning	0.67	0.501	1	1.28	0.198	3	1.03	0.299	2	0.00	1.000	0
Team Learning → Situation Assessment	0.00	1.000	0	1.85	0.064	7	0.67	0.501	1	0.67	0.501	1
Team Learning → Plan Formulation	1.94	0.051	8	0.00	1.000	0	2.03	0.042	9	1.28	0.198	3
Team Learning → Plan Execution	0.67	0.501	1	1.47	0.140	5	0.00	1.000	0	0.67	0.501	1
Team Learning → Team Learning	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0

Low-performing Teams												
Situation Assessment → Situation Assessment	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Situation Assessment → Plan Formulation	2.52	0.012	18	0.00	1.000	0	2.59	0.009	20	1.47	0.140	4
Situation Assessment → Plan Execution	0.00	1.000	0	1.85	0.064	7	0.00	1.000	0	0.00	1.000	0
Situation Assessment → Team Learning	1.28	0.198	3	1.62	0.104	5	0.00	1.000	0	0.00	1.000	0
Plan Formulation → Situation Assessment	0.00	1.000	0	2.72	0.006	24	1.94	0.051	8	1.47	0.140	4
Plan Formulation → Plan Formulation	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Plan Formulation → Plan Execution	2.10	0.035	10	2.55	0.011	19	0.00	1.000	0	1.03	0.299	2
Plan Formulation → Team Learning	1.28	0.198	3	1.47	0.140	4	1.03	0.299	2	0.00	1.000	0
Plan Execution → Situation Assessment	0.00	1.000	0	1.94	0.051	8	0.67	0.501	1	0.61	0.501	1
Plan Execution → Plan Formulation	2.89	0.022	13	0.00	1.000	0	2.23	0.026	12	1.28	0.198	3
Plan Execution → Plan Execution	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0
Plan Execution → Team Learning	1.03	0.299	2	0.00	1.000	0	0.67	0.501	1	0.00	1.000	0
Team Learning → Situation Assessment	0.00	1.000	0	1.85	0.064	7	0.00	1.000	0	0.67	0.501	1
Team Learning → Plan Formulation	1.28	0.198	3	0.00	1.000	0	1.62	0.104	5	1.03	0.299	4
Team Learning → Plan Execution	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.67	0.501	1
Team Learning → Team Learning	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0	0.00	1.000	0

Note. N = 27 High-performing Teams, N = 14 Low-performing Teams.

4.5.3 Discussion

The aim of Study 2 was to capture the overall team adaptation process, explore whether teams perform the sequence of the team adaptation phases as suggested in the team adaptation process model of Rosen et al. (2011), and investigate the possible differences between high- and low-performing teams in terms of their performed phase sequences.

The present study contributes to the theoretical team adaptation process field, by empirically supporting the suggested two-phase (i.e., situation assessment → plan formulation, plan formulation → plan execution, plan execution → team learning, and team learning → situation assessment) and three-phase sequences (i.e., situation assessment → plan formulation → plan execution, plan formulation → plan execution → team learning, and team learning → situation assessment → plan formulation) that teams perform in the face of an unexpected event. Extending the theoretical model of Rosen and colleagues (2011), we also found, in contrast to our expectations, that plan formulation, plan execution, and team learning can be followed by other team adaptation phases in addition to their according-to-theory subsequent phases.

In contrast to our assumptions, both high- and low-performing teams performed significantly more often than by chance alone theory-conform phase sequences, without any significant differences between the two groups. Expanding the theoretical suggestion that a successful performance of all four phases is sufficient for high team outcomes when adapting to circumstantial changes (Burke et al., 2006), we found significant differences between high- and low-performing teams with regards to specific team adaptation phases and theory-non-conform team adaptation phase sequences. Specifically, our results showed that team learning was significantly more often followed by plan formulation and by plan execution and less often by situation assessment for high- than low-performing teams. This is possibly due to the fact that success in changing environments requires not only recognizing the need

for change and reflecting on previous actions but most importantly the actual implementation of this knowledge into action (Edmondson, 2002).

Additionally, we found that during the first half of the mission, high-performing teams performed significantly more situation assessment and plan formulation compared to low-performing teams. Moreover, for high-performing teams, situation assessment followed by plan formulation was significantly more often followed by situation assessment than by any other phase than for low-performing teams. During the second-half of the mission, high-performing teams performed significantly more plan formulation and team learning than low-performing teams.

Considering the dynamic nature of team adaptation, we provided empirical support of the team adaptation process model (Burke et al., 2006; Rosen et al., 2011) and expanded it by illustrating the complexity of how this process really unfolds over time. In addition, we responded to the need for a better understanding of the overall team adaptation process and of the factors that support teams to successfully perform in the face of unexpected events.

4.6 General Discussion

The goal of the present work was to overcome the common phenomenon in team research, where developed team dynamic models are rarely empirically examined (Collins, Gibson, Quigley, & Parker, 2016) and to provide insights into the team adaptation process. With our studies, we provide the first empirical support of the positive relationships and sequences between the different phases (i.e., situation assessment → plan formulation → plan execution → team learning) involved in the team adaptation process (Burke et al., 2006; Rosen et al., 2011). In addition to this contribution, our findings illustrate that the theoretical four-phase team adaptation process does not reflect the complexity of how the team adaptation process really unfolds over time. When there is a need to adapt, teams also

execute theory-non-conform phase sequences while an according-to-theory executed phase sequence does not guarantee a successful adaptive performance.

One of our main contributions is that, in addition to the empirical support of the four-phase process, our findings extend these theoretical suggestions by revealing that teams, in the face of an unexpected event, do not always perform the team adaptation phases in the according-to-theory order. For instance, we showed that team learning was not always followed by situation assessment but also by plan formulation and plan execution. These findings are, however, in line with the notion of team learning as a process. During team learning, teams evaluate and reflect on their past actions, and as an immediate response, it is very likely that this knowledge will improve and guide their next steps (Rench, 2014; Santos et al., 2016). Reflecting on team's actions, questioning goals, and recognizing mistakes and weaknesses can positively influence different team processes and hence, the team's effectiveness (e.g., Van den Bossche et al., 2006). As Buchanan and Huczynski have highlighted (1997, p.107), learning "comprises the process of acquiring knowledge through experience, which leads to a change in behavior", an argument which is not limited only to scanning behaviours (i.e., situation assessment) but also extends to the team's overall functioning.

Another interesting finding is that teams moved to plan execution after plan formulation and then moved again backwards to plan formulation. Marks and colleagues (2001), more than 15 years ago, suggested that teams can move back and forward between action phases (e.g., coordination and monitoring) and transition phases (e.g., planning). Similarly, non-sequential models of team development have long suggested that teams shift between different developmental stages depending on temporal or structural issues (e.g., De-Sanctis & Poole, 1994; Gersick, 1991) and do not necessarily develop progressively. One possible explanation of our findings is that after plan execution, the teams went back to a

different type of planning process (e.g., reactive planning) compared to the previous planning process (e.g., contingency planning). It is possible that while teams were executing their original plan, they realized that some adjustments were needed, such as redistribution of roles and responsibilities, and, therefore, turned back to plan formulation possibly in the form of reactive planning. Reactive planning, which describes the team's on-the-fly planning in response to changing circumstances (Marks et al., 2011), has been found to be more strongly related to coordination and performance compared to deliberate or contingency planning, which take place at the beginning (DeChurch & Haas, 2008).

Filling an essential gap in the team adaptation research with regards to the uninvestigated relationship between the actual team adaptation process and performance, our findings reveal that executing a theory-conform phase sequence does not ensure a successful team adaptive performance. For instance, in high-performing teams, team learning was significantly more often followed by plan formulation and by plan execution and less often by situation assessment than in low-performing teams. One possible explanation is that the evaluation that took place during team learning resulted in different conclusions about where the team stands, and how it performed so far and, thus, in different next steps for high- and low-performing teams. As Rench has argued (2014), the feedback received during team learning impacts to which previous phase the team will shift back. Hence, we believe that high-performing teams shifted back to planning based on the knowledge collected during team learning to change their strategy or reframe their goal, or continued with executing their plan. On the contrary, low-performing teams based on the knowledge collected during team learning possibly realized that their situation was originally not diagnosed appropriately and, therefore, had to shift back to an earlier phase than high-performing teams (i.e., situation assessment) and scan again their environment in order to be able to move forward. Another possible explanation is that high-performing teams were more open about admitting their

mistakes and questioning their practices during team learning that, in turn, enabled them to realize where they stand and implement any necessary changes. On the contrary, low-performing teams may not have openly discussed what went well or poorly in order to effectively adjust their plans and actions and, therefore, went back to situation assessment to look again for what they have may possibly missed, instead of moving directly into action.

Another interesting finding is that, during the first half of the task, high-performing teams performed significantly more situation assessment than low performing teams. These results also support the above-mentioned arguments that low-performing teams did not appropriately diagnose their situation after the change was introduced. It is possible that high-performing teams, shortly after the introduction of the unexpected change, gained a more complete picture of the situational demands and how these demands should be translated in their plans and actions in contrast to low-performing teams. Situation assessment represents an important prerequisite in any performance situation (Patrick, James, Ahmed, & Halliday, 2006), and, especially under challenging circumstances, not only assessing the environment but also being aware of the significance of the current conditions is needed to avoid poor outcomes (e.g., Cooper, Endacott, & Cant, 2010).

Overall, the current work represents one of the first attempts to advance our understanding with regards to the team adaptation process. This research has found promising results reflecting the complexity of how the team adaptation process really unfolds over time. Based on the fact that this complexity has been so far neglected, we believe that an extension of the model capturing all possible phase sequences and illustrating their multiple occurrences is needed. In particular, the theoretical model should take into consideration the fact that teams can go back to a previous phase during the same team adaptation process. Moreover, the impact of moving to a previous phase on team outcomes should be taken into account. Finally, we believe that the model should also incorporate the

aspect of time and highlight the different impact that team adaptation phases can have on team outcomes depending on the team's life- or task-cycle.

4.6.1 Limitations and Future Research

Despite the promising results of the present research, some critical remarks should be taken into account when planning future studies. In particular, the task and laboratory setting of Study 2 may limit the generalizability of our findings due to the lack of external validity, although, it was appropriate in order to address these hitherto theoretical assumptions while minimizing extraneous effects. Counterbalancing this limitation, Study 1 mirrored, to a great extent, organisational conditions. Nevertheless, we believe that future research should investigate the team adaptation phases, their relationship and sequence within the organisational setting, while capturing the dynamic team adaptation process with behavioural observations and self-assessment measures.

Another limitation for both our studies is that we did not capture the team adaptation process across a longer period of time. The results of Study 2, regardless of the short team task, did reveal some significant differences with regards to the importance of some team adaptation phases and their performed order in the first compared to second half of the team task, however, without capturing the overall picture. Future research should investigate the team adaptation process longitudinally, for instance, by continuously observing and collecting data from teams working towards an important and challenging deadline. As Walls and Schafer (2006) have suggested, there is a need for ‘‘intensive’’ longitudinal designs with a number of measurements.

One important limitation is that our studies preclude the possibility of determining causality. Specifically, in Study 1 we were not able to capture the dynamism of the team adaptation process and, consequently, draw any conclusions with regards to the causal relationships between the team adaptation phases. Similarly, in Study 2, we were not able to

determine whether, for instance, situation assessment during the first-half of the task led to high team performance, or whether because the teams performing well engaged early in scanning behaviours. Taking into consideration these restrictions, it is suggested that future research should clarify these directions by collecting longitudinal data while assuring that the measured phases reflect the same team adaptation process.

A further limitation is that we only captured the phases performed and not their quality or specific content. For instance, the multidimensionality of team planning was neglected, although empirical findings have shown the importance of reactive planning compared to deliberate or contingency planning under novel or unexpected circumstances (DeChurch & Haas, 2008). Moreover, Mathieu and Schulze (2006) showed that the quality of formulated plans can directly promote team performance. Similarly, proper phraseology to communicate to team members can also enhance team performance (Smith-Jentsch, Johnston, & Payne, 1998). Taking this evidence into consideration, we believe that future research should capture the quality and content of the performed team adaptation phases and investigate their impact on successful team adaptation.

Finally, we suggest that future studies should measure the teams' emergent states, such as team psychological safety, team trust and shared mental models, in addition to the team adaptation phases, as research has continuously shown its relevance when adapting to challenging circumstances. In support of this view, Christian and colleagues (2017) showed that team cognition was strongly related to team adaptive performance in a recent meta-analytic review.

4.6.2 Practical Implications

Given the importance of team adaptation in today's organizations, the present study can provide unique insights into how to support teams when facing new challenges. Specifically, we believe that teams should be encouraged, for instance by their leader, to assess extensively

their environment, their situation, and impact on their task immediately after a change has been introduced. This immediate assessment will help them achieve as soon as possible a clear picture with regards to what they are facing and support them moving forward. In addition to this, teams should be encouraged to reflect openly about their previous actions and identify mistakes and weaknesses and then use this knowledge directly into plan formulation and execution. Moreover, we believe that, during the team's life span, team leaders should support a positive team adaptation culture and a safe environment in order for team members to openly share their concerns. This protected environment will, in turn, lead to a better understanding of each situation and to a more transparent and constructive way in dealing with it. Making team members feel secure and capable of changing their behaviours, even when these behaviours contradict the expectations or goals, leads to positive team outcomes (e.g., Edmondson, 1999; Schaubroeck, Lam, & Peng, 2011). Finally, these suggestions could be incorporated within team development or training interventions given the empirical support of these interventions to promote effective teamwork (Day, Gronn, & Salas, 2004).

4.6.3 Conclusion

With our work – a cross-sectional field and a laboratory study – we contribute to both team adaptation theory and research by providing the first empirical support of the positive relationships between the four phases of the team adaptation process and their performed sequence under challenging circumstances. In addition to this contribution, we expand these so far theoretical assumptions by showing that teams perform both theory-conform and theory-non-conform phase sequences when adapting to an unexpected change. Moreover, we contradict the theoretical suggestions by showing that executing a theory-conform phase sequence does not guarantee high team outcomes; performance differences are related to the timing of the performed phases and to theory-non-conform phase sequences. Finally, our

research contributes to the team adaptation practice by providing a better insight into how to improve the teams' capacity to successfully adapt.

5 General Discussion

The general purpose of my thesis was to provide a better understanding of the way teams function when confronted with unexpected and novel circumstances, and a better understanding of the reasons why some teams are more effective than others in the face of such adaptive demands. Specifically, my goal was to empirically investigate the so far theoretical four-phase team adaptation process as suggested by Rosen et al. (2011) and provide evidence in regard to its suitability for describing and explaining this complex and relevant phenomenon. In the three previous chapters (i.e., Chapter 2-4), five empirical studies were presented contributing to this purpose. The aim of the general discussion is to offer a general overview of these five studies and their results as well as their contribution as a whole to the team adaptation theory, research, and practice.

Firstly, I will summarize the main results of the three previous chapters addressing the five research questions of this thesis. Secondly, I will emphasize the contributions of my work to the team adaptation theory and research. Thirdly, I will discuss the limitations of the present thesis and the implications for future research and practice[5].

5.1 Summary of the Research

Change is an ever-present reality especially in modern organizations that are faced with high levels of unpredictability, complexity, and instability. As a result, teams represent the organizations' basic element to deal with these challenges (Mathieu, Hollenbeck,van Krippenberg, & Ilgen, 2017). To support teams and consequently, their organizations to successfully respond to these demands, this thesis aimed to capture, comprehend, and explain how the process of team adaptation is in fact performed. Team adaptation, as a process, describes the adjustments of a team in response to unfamiliar or unexpected circumstances that differ from a team's original requirements and execution strategy (e.g., Maynard et al.,

[5] In the general discussion I will generally use the term „I". However, when talking about a specific study, I will switch to the term „we", which refers to the respective co-authors as provided in the previous chapters.

2015). The empirical work presented in this thesis sought to investigate the team adaptation process as described in the most recent theoretical model (Rosen et al., 2011) and to examine its hitherto theoretical relationships with other team constructs such as previous team adaptation exposure and post-change team performance.

In Chapter 2, two empirical studies were presented for addressing the first research question and, hence, for capturing directly the overall four-phase team adaptation process as proposed by Rosen et al. (2011). Four behaviorally anchored rating scales (BARS) were developed and successfully validated to capture the multidimensionality and complexity of the team adaptation process. By using this instrument, in Chapter 3, one empirical study was presented for addressing the second and the third research question of this thesis and thus for investigating how the team adaptation process is influenced by team properties and how the team adaptation process influences in turn team outcomes. The first empirical findings of the overall four-phase team adaptation process as proposed by Rosen et al. (2011) and its relationship to developed team properties and team adaptive outcomes were found. Building on this evidence, in the following studies of Chapter 4, the fourth and fifth research question of my thesis were addressed by investigating whether the team adaptation process is performed as a sequence of four consecutive phases as Rosen et al. suggest (2011), and whether this process is in turn advantageous for team adaptive performance (e.g., Burke et al., 2006). Results confirmed that the phases are executed in the according-to-theory order; however, findings demonstrated that teams also perform theory-non-conform phase sequences. Post-change performance was related to the timing of the performed phases and to theory-non-conform phase-sequences.

Overall, the results confirmed the positive relationship between the four phases of the team adaptation process (i.e., Study 2, Study 4). Additionally, findings supported the positive impact of previous adaptation exposure and updated team cognitive structures to the four-

phase team adaptation process (i.e., Study 3). However, results highlighted that the actual team adaptation process is more complex than theory suggests, as teams performing all possible phase sequences, both theory-conform and theory-non-conform when adapting (i.e., Study 5). Finally, some but not all team adaptation phases and phase-sequences were related to high team adaptive outcomes, in contrast to theoretical suggestions (i.e., Study 3, Study 5).

The present thesis provided the first empirical findings of the four-phase team adaptation process model (Rosen et al., 2011) from both laboratory and field studies. The cross-sectional design allowed us to examine the basic relationships of our variables, while the experimental design allowed us to draw causal conclusions. The developed and validated behavioral instrument for capturing the overall four-phase team adaptation process, enabled us to capture the team process behaviors as well as the dynamism and multidimensionality of this phenomenon. In Table 5.1, a detailed overview of the research questions, goals and propositions, main results and contributions of this thesis is presented.

Table 5.1
Overview of the research conducted and summary of the five experimental studies

	Chapter 2 Capturing the Four-Phase Team Adaptation Process		**Chapter 3** The Underlying Mechanisms and Outcomes	**Chapter 4** How Does It Really Unfold Over Time?	
	Study 1	**Study 2**	**Study 3**	**Study 4**	**Study 5**
Research Question					
	How can we capture the overall team adaptation process?		How are team properties related to the overall team adaptation process? How is the overall team adaptation process related to team outcomes?	How is the team adaptation process performed? Is a theory-conform phase-sequence more effective than a theory-non-conform team adaptation phase-sequence?	
Goal/Propositions					
	Development of an instrument for directly measuring the overall four-phase team adaptation process as suggested by Rosen et al. (2011)	Validation of the psychometric properties of the developed instrument for capturing the four-phase team adaptation process.	Previous exposure to multiple team adaptation requirements promotes the overall team adaptation process that, in turn, promotes team adaptive outcomes in the face of new adaptation requirements. Updated team cognitive structures mediate this positive relationship.	Team adaptation phases positively influence each other and occur in the following sequence: situation assessment → plan formulation → plan execution → team learning.	Theory-conform phase sequences occur significantly more often than theory-non conform. High-performing teams perform significantly more theory-conform phase sequences than low-performing teams in the face of adaptation requirements.
Data Collection					
	Archival Analysis	Archival Analysis	Laboratory Experiment	Cross-sectional field study	Archival Analysis
Sample Size					
Teams (Individuals)	6 (24)	66 (264)	72 (288)	23 (103)	70 (280)
Main Results					
	Behaviorally Anchored Rating Scales (BARS) were developed for each of the four team adaptation phases that span across the spectrum of the behaviors involved in the team adaptation process.	The four BARS met successfully all psychometric criteria (i.e., sensitivity, inter-rater reliability, criterion and construct validity).	Previous adaptation exposure positively influenced the degree of completion of the team adaptation process. The degree of TMS development mediated this positive relationship. The first three team adaptation phases independently predicted team adaptive performance. Previous adaptation exposure positively influenced the time for collective decision making for a novel team task.	Positive relationship between the four team adaptation phases. Plan formulation mediated the positive relationship between situation assessment und plan formulation. Team learning was independently predicted from all previous team adaptation phases.	Teams executed theory-conform and theory-non-conform phase-sequences in the face of adaptation requirements. Some theory-non-conform phase sequences were more frequently performed than theory-conform. High-performing teams differed from low-performing team in theory-non-conform phase-sequences and in their executed timing.
Contribution					
	Development of first behavioral instrument that directly measures the four-phase team adaptation process as suggested by Rosen et al. (2011).	First reliable and valid instrument for measuring all four phases of the team adaptation process as suggested by Rosen et al. (2011).	First empirical investigation of the overall four-phase team adaptation process as suggested by Rosen et al. (2011) and its relationship to team properties (i.e., previous adaptation exposure, TMS development) and team adaptive outcomes.	First empirical evidence of the relationship between the four team adaptation phases as proposed by Rosen et al. (2011). Extension of theoretical model by showing that the last team adaptation phase (i.e., team learning) is independently predicted by all three previous phases.	First empirical investigation of how the team adaptation process is in fact performed. Team adaptation process is more complex than what Rosen et al. (2011) suggest. Team adaptive performance is related to theory-non-conform phase-sequences and on the timing of the executed phases.

5.2 Contributions

5.2.1 Support and Extension of the Team Adaptation Process Model

The research presented in this thesis supported to a great extent the team adaptation theory in general (e.g, Christian et al., 2017) and the theoretical model of the team adaptation process in particular (Burke et al., 2006; Rosen et al., 2011). For instance, we found a positive relationship between the four team adaptation phases (Rosen et al., 2011) and showed that updated team cognitive structures represent the mediating mechanism in the positive relationship between developed team properties and the process itself (e.g., Ren & Argote, 2011; Uitdewilligen et al., 2013). However, it was also demonstrated that the team adaptation process model of Rosen et al. (2011) does not adequately reflect how the team adaptation process is in fact performed.

In the face of adaptation requirements, teams performed all possible phase-sequences, and not only theory-conform. Moreover, neither theory-conform phase sequences nor a complete team adaptation process guaranteed high team adaptive outcomes; different phases and phase-sequences were positively related to team outcomes depending on the time performed. Therefore, it seems reasonable to argue that some phases or phase-sequences are more supportive than others, depending on the situational demands (e.g., adaptation trigger) or on the timing of the executed team actions (e.g., first-half of team task). Ilgen, Hollenbeck, Johnson, and Jundt (2005) argued that the timing of team behaviors and not just the executed behaviors are crucial for improving team performance. Overall, the results of this thesis highlight the need to extend the team adaptation process model of Rosen et al. (2011) based on the empirical findings that our studies provided. Building on this evidence, an extended working model of the team adaptation process is presented (Figure 5.1).

In this working model, the team adaptation process is still constituted of four phases (i.e., situation assessment, plan formulation, plan execution, and team learning) that are

positively related to each another. Extending existing models (Burke et al., 2006; Rosen et al., 2011), it is also suggested that the team adaptation phases are performed multiple times and are executed in all possible phase-sequence combinations within the same team adaptation cycle. Similarly to general team adaptation frameworks (e.g., Maynard et al., 2015), it is supported that team inputs including developed team properties influence the overall team adaptation process.

Regarding the role of emergent states (e.g., TMS development), it is suggested that they have an impact on the team adaptation process and are, in turn, affected by the team's adjustment to the circumstantial changes and, thus, by the team adaptation process itself. As Marks et al. (2000) have argued, team emergent states serve as both inputs and outputs of team processes. In line with research conducted to date (e.g., Mathieu et al., 2008) and with our evidence, it is also suggested that the emergent states represent the mediating mechanism between team inputs and the team adaptation process.

As far as the impact of the team adaptation process on team adaptive outcomes (e.g., post-change team performance) is concerned, it is suggested that this relationship is moderated by the timing of the executed phases and the nature of the change that triggers the need to adapt (i.e., adaptation trigger). In support of the last suggestion, there are recent meta-analytic findings demonstrating the moderating role of the adaptation trigger between single team adaptation process-components and team adaptive performance (Christian et al., 2017).

I strongly believe that the working model illustrated below mirrors successfully the complexity of the team adaptation process while at the same time provides a straight-forward framework for upcoming studies to build on. This model should guide future research to examine the relationships proposed, so that in the next years, empirical papers do not lag behind theoretical ones in testing team dynamics (Mathieu et al., 2017).

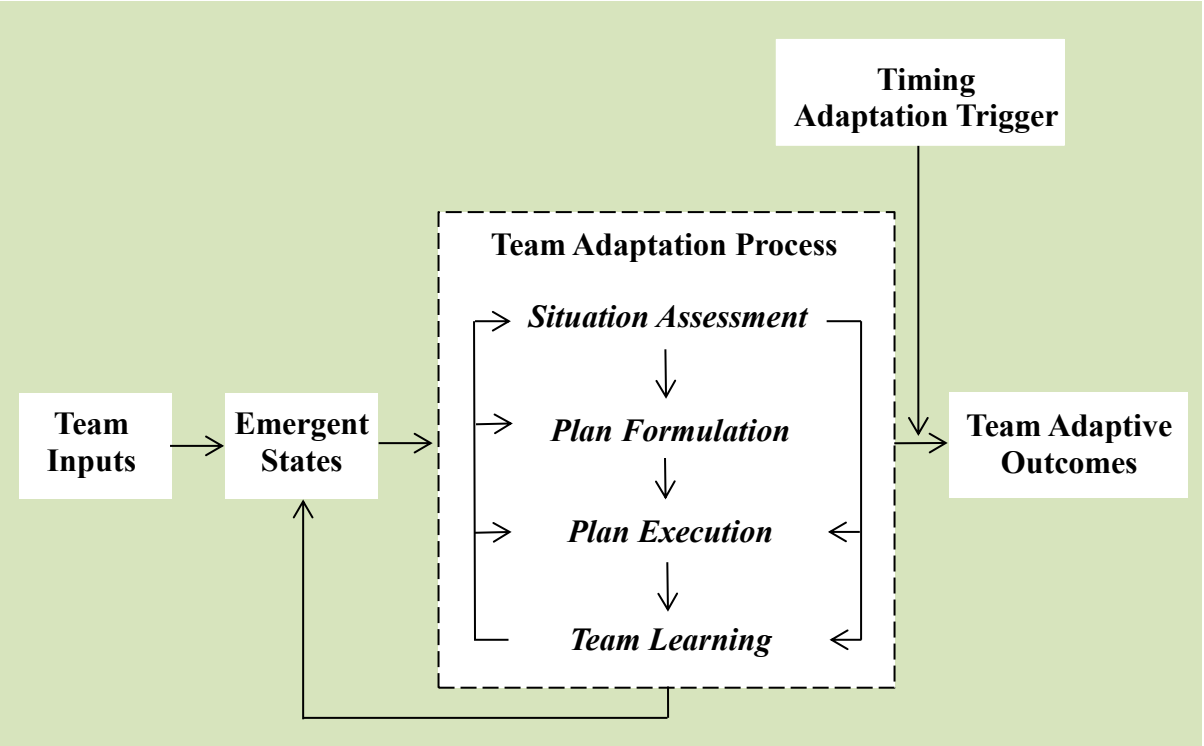

Figure 5.1 Working model of the team adaptation process.

5.2.2 Methodological Advances

My thesis presented the first valid instrument for measuring the overall four-phase team adaptation process as suggested by Rosen and colleagues (2011). The development of our BARS represents an important methodological advancement for the team adaptation research as with retrospective self-reports the team adaptation was in fact missing (e.g., Maynard et al., 2015). With our instrument, researchers can observe teams over time and capture their behaviors in a reasonable way so that no important information is overlooked. This behavioral instrument not only enables the meaningful measurement of behaviors based on observation and judgment (MacMillan, Entin, Morley, & Bennett, 2013), but also the investigation of the team adaptation process as a whole, for example, as a mediating variable in studies of team adaptive outcomes and overall performance (e.g., Svedrup, Schei, & Tjølsen, 2017). By using our behavioral instrument, in addition to existing questionnaires, researchers can, from now on, adopt the triangulation approach and capture in multiple

methods (i.e., behavioral and self-assessment) the team adaptation process, providing better understanding of this construct (Rosen et al., 2011).

In the research conducted in this thesis, further advances for examining the team adaptation process are achieved. Specifically, a multi-level model, incorporating data from three different time points while taking into consideration the individual responses, was analyzed. This complex analysis enabled us to present the first empirical support of the positive relationship among the four team adaptation phases. As Cronin and colleagues have highlighted (2011), only with such multi-level analyses, researchers can reasonably examine team dynamics and the complexity of such phenomena. Moreover, in order to capture the way teams do in fact adapt, another complex approach was adopted. Specifically, sequence analysis was performed for the first time in team adaptation research. This analysis enabled us to identify the order of team behaviors while teams adapted, and analyze their sequence as well as their influence on team adaptive performance (Herndon & Lewis, 2015).

To conclude, it is suggested that future research should apply our behavioral instrument to directly assess the team adaptation process and perform similar complex analyses to provide more empirical evidence and a clearer picture of the challenging team adaptation process construct.

5.2.3 Capturing Dynamism and Complexity

The work presented in this thesis captured team constructs in a dynamic way and not as static phenomena like the majority of team research (Mathieu et al., 2017). Specifically, in my research it is taken into account and examined how earlier team adaptation exposure, team cognitive structures, team adaptation processes, and team performance impacted future team properties, while at the same time it was investigated how these team variables changed and developed over time (Mathieu & Rapp, 2009). Additionally, continuous data, in form of video and audio recordings, was collected and analyzed in order to map the dynamics of team

processes. Empirical techniques, such as sequence methods, were adopted to capture and investigate the natural sequence of team adaptation phases, their differences between teams, and their relation to team outcomes (e.g., Herndon & Lewis, 2015). Finally, our behavioral instrument enabled to capture the multi-phasic nature of this dynamic phenomenon, comprehend its complexity and draw conclusions not only about how effective each of its team adaptation phases were executed, but also about the team adaptation process as a whole.

5.2.4 Construct Clarification

So far, studies have captured the team adaptation process in various ways, making it difficult to integrate their findings and draw general conclusions about how the process is in fact executed (Cronin et al., 2011). As Baard and colleagues (2014) have recently argued, the conceptualization and assessment of adaptation has been diverse resulting in "a vibrant, yet chaotic, line of inquiry; progress has been stymied" (p.81). To overcome this lack of agreement, throughout my work, the definition of the team adaptation process and the conditions that teams adapted to, were clear and up-to-date. In addition, I provided a clear distinction between the team adaptation *process* and the *outcome* of the team adaptation process (i.e., team adaptive outcomes), a quality that is often missing in team adaptation studies. Finally, with the developed behavioral instrument and its implementation in my studies, the team adaptation process, its dynamism and multidimensionality, were directly captured leading to clear conclusions about the causes and effects of this phenomenon. These steps resulted into clarifying this construct-confusion and to a unified assessment of the team adaptation process. I hope that future research will continue from this point forward and advance the understanding of team adaptation by using an agreed conceptualization and direct process-assessment.

5.3 Limitations and Implications for Future Research

The studies presented in this thesis found some promising results and made important contributions to both team adaptation theory and research. However, the work conducted has still some limitations that should be taken into account and hence addressed by future research.

5.3.1 Future Research Overcoming General Limitations

Combination of Assessment Methods. In this thesis, different types of measurement approaches were adopted in order to assess the team adaptation process and its phases (i.e., self-assessment, behavioral-assessment). Despite the fact that the various approaches concluded into similar findings (e.g., positive relationship between team adaptation phases), I still believe that each one of them captured a different type of phase-quality. While with behavioral observation the continuity of team activities is captured without interrupting the team's performance, self-report measures are more suitable for capturing the team member's perceptions.

By using our behavioral instrument, we only assessed the performed activities and explicit expressions of the team members. This however, does not necessarily mean that if for example team learning behaviors were not observed, the team and its members did not learn. Teams learn also implicitly through their activities (Argote, 1993). In support of this argumentation, there are previous findings demonstrating that knowledge obtained through implicit learning is helpful under demanding circumstances (e.g., Reber, 1989). Research also recently showed that the effect of both subjective and objective measures of team variables predicts team performance (Hamilton, Mancuso, Mohammed, Tesler, & McNeese, 2017).

Based on the above considerations, I suggest that future research should measure the team adaptation process and its four phases by combining self-report and observational measures in order to fully comprehend the team adaptation process.

Cross-level Examination. In our empirical studies, the focus was only on team-level constructs in order to investigate the team adaptation process. However, in order to fully understand such phenomena, factors from both higher and lower level of analysis (i.e., individual, organization) should be also acknowledged and studied (e.g., Cronin et al., 2011). The process of team adaptation is "a multilevel phenomenon that emanates as team members and teams recursively display behavioral processes" (Burke et al., 2006, p. 1192). For instance, individual-level properties such as cognitive ability (e.g., Randall et al., 2011), team member flexibility (e.g., Chang, Wong, Li, Lin, & Chen, 2011) and individual adaptability (e.g., Ployhart & Bliese, 2006), have been shown to influence that team's ability to adapt. Similarly, organizational-level constructs also shape the way teams respond to adaptation requirements. For example, work by Ren, Kiesler and Fussel (2008) demonstrated that the way organizations manage their information influences how teams perform under risky and challenging circumstances.

In addition to the impact of individual and organizational elements on team adaptation, in future research, it should be taken onto consideration the impact of the team adaptation process itself on lower- and higher-level constructs. Despite the fact that such empirical work is missing (Maynard et al., 2015), the influence of team adaptation on the individual, such as its satisfaction and well-being, is extremely important and thus gain some attention. Moreover, the effect of team adaptation on its environment should also be taken into consideration. For instance, the way the team adaptation process of one team is performed may influence the performance of other teams within the organization or even of the organization itself. Researchers have continuously suggested that that the team's

performance and ability to adapt promotes the organizational success (e.g., Burke et al., 2006); however, empirical work supporting this argument is still missing. To conclude, I strongly encourage researchers to consider and examine the cross-level implications of team adaptation and adopt a more comprehensive approach to capture its dynamism and impact.

Longitudinal Investigation. Our results have demonstrated that the relationship between team adaptation phases and phase-sequences with team adaptive outcomes sometimes depends on the timing of the performed team actions (e.g., first-half of team task). This evidence was, however, found within a limited temporal scope (i.e., single task performance). Additionally, only the short-term consequences of the team adaptation process on team adaptation outcomes were investigated, while long-term effects were neglected. The above results are certainly valuable, but should be interpreted carefully. The team adaptation process is a dynamic phenomenon that evolves over time, and therefore, longitudinal investigation of the short- versus long-term impact of its phases and of the team adaptation process as a whole, should be conducted to advance the field of team dynamics.

In support of the above argumentation is, for instance, previous research showing that planning upfront was strongly related to coordination at an early time period, whereas reactive planning was more relevant at a later stage of team performance (DeChurch & Haas, 2008). Mathieu and Rapp (2009) also demonstrated that early effective planning promoted team performance at a later point in time, while Kennedy and McComd (2014) found that shifts between transition processes (i.e., tactical strategy, mission analysis, and goal specification) improved team performance when executed in the first half of team collaboration. The role of a team's life cycle in the relationship between the team adaptation process and other variables should be also considered; different team actions and behaviors might be advantageous depending on the team's developmental stage (e.g., Kozlowski et al., 1999; Marks et al., 2001).

Overall, it is suggested that future research should consider and examine these temporal relationships among team adaptation phases and how they relate to other team properties in order to inform team adaptation theory about such timing effects.

Generalizability. The first empirical findings of the four-phase team adaptation process as suggested by Rosen et al. (2011), presented in this thesis, are valid to inform both team adaptation theory and research. However, further empirical investigations are needed in order to ensure their generalizability. While I acknowledge the value of combining field and laboratory study designs, given that these two approaches complement each other, it is important that future research should examine and assess the team adaptation process with teams consisting of working adults and operating within an organizational setting. Despite that fact that conclusions were drawn from teams with different life-spans (e.g., one hour, eight weeks), teams working for a long time together (e.g., at least a year) were not considered. I do believe that empirical investigations of the team adaptation process incorporating teams with high team familiarity and experience in working together, would be extremely valuable. Consequently, it is suggested that future research should focus more on teams operating within organizational settings and working for a long time together to ensure the generalizability of the evidence presented.

5.3.2 Future Research Addressing Working Model on Team Adaptation Process

In the following section, I will discuss how future research should build on the working model proposed and consequently, gain greater understanding of the team adaptation process.

Emergent States. In line with previous theoretical and empirical work (e.g., Burke et al., 2006), the developed working model illustrates the central role of team emergent states for the team adaptation process. Team emergent states, which are defined as "properties of the team that are typically dynamic in nature and vary as a function of team context, inputs, processes, and outcomes" (Marks et al., 2001, p. 357), have continuously proven their

importance for successful team functioning (e.g.,Coultas, Driskell, Burke, & Salas, 2014). However, in the present thesis I only focused on TMS and their valuable role for the team adaptation process (e.g. Uitdewilligen et al., 2013). Consequently, it is suggested that future research should also focus on other team cognitive states such as shared mental models that have proven to be beneficial for team processes and outcomes (e.g., DeChurch & Mesmer-Magnus, 2010).

Team affective states while teams adapt to challenging circumstances should also be investigated. For instance, team psychological safety, which is defined as "a shared belief that the team is safe for interpersonal risk taking" (Edmondson 1999, p. 354) enables conditions, like openly discussing about mistakes and exploring new ways to respond to situational demands that promote successful team adaptation (e.g., Hood, Bachrach, Zivnuska, & Bendoly, 2016). Mutual trust, which is defined as a "shared belief that team members will perform their roles and protect the interests of their teammates" (Salas et al., 2005, p. 561) also positively influences team processes and outcomes (e.g., Lin & Huang, 2010). It represents one of the basic ingredients for team learning (Lee, Gillespie, Mann, & Wearing, 2010), supporting team members to share their opinions openly and reflect on the team's problems (Rusman, van Bruggen, Sloep, & Koper, 2010).

In addition to the impact of team emergent states on the team adaptation process, my working model suggests, in line with previous theoretical and empirical work (e.g., Maynard et al., 2015), that the team adaptation process is in turn, critical for the development of such team properties. In support of this argumentation is the work of Ellwart and colleagues (2015), demonstrating the significant improvement of team mental models due to high team situation awareness. Similarly, Nguyen and Rosen (2009) have argued that "trust development is a mutual learning process of the parties" (p.165). During the process of team learning, information is shared and this helps the team realize the consequences of its

previous actions and understand by which mechanisms these actions were driven; this information exchange describes an important determinant of interpersonal trust (Fisman & Khanna, 1999).

Based on the above arguments and on our empirical findings, it is suggested that future research should give a greater attention to the relationship between team emergent states and the team adaptation process, and investigate their reciprocal influence over time.

Timing. Building on our preliminary findings, which demonstrated that different phases and phase-sequences are related to team adaptive performance depending on the stage of the performed task, my working model illustrates that the timing of such team actions will moderate the relationship between the team adaptation process and team adaptive outcomes. For instance, previous research has suggested that teams, when facing demanding situations, need to focus first on scouting their environment and its challenges, behaviors incorporated in the first team adaptation phase (i.e., situation assessment), in order to develop the respective skills and abilities to respond effectively (e.g., Ancona &Caldwell, 1990). Hence, future research could, for example, investigate whether situation assessment is more beneficial for team adaptive outcomes when performed extensively at an earlier than at a later stage of the team adaptation cycle.

Another interesting aspect that future research should investigate is the role the team's developmental stage can play in the face of adaptation requirements; different team adaptation phases and phase-sequences may be relevant along different points in time. For example, Kozlowski et al. (1999) have argued that team behaviors involved in the third team adaptation phase (i.e., plan execution), such as mutual monitoring, are more beneficial for successful team adaptation at a later than at an earlier team developmental stage. Thus, upcoming studies could, for instance, investigate whether high plan execution is more

supportive for team adaptation outcomes at a later than at an earlier team developmental phase.

Team researchers have continuously highlighted, and I personally support their view, that empirical research should consider such temporal relationships (e.g., Mathieu et al., 2017). Christian and colleagues have recently argued that "future studies should incorporate models of time and team development into research on adaptation" (2017, p. 77) to advance the team adaptation field. I agree with these positions and advise future research to explore these timing effects by using the developed working model of the team adaptation process.

Adaptation Trigger. One more important variable that has not been given the respective attention throughout my thesis was the type of the adaption trigger. Adaptation triggers are defined as "those cues that others have acknowledged and can prompt teams to pursue modifications in order to complete their task" (Maynard et al., 2015; p.2). Many team researchers have highlighted the need to incorporate the impact of adaptation triggers in the team adaptation research in order to fully understand this complex phenomenon (e.g, Baard et al., 2014). For instance, in case of a member loss, the importance and the role of this person will impact which team adaptation phases and phase-sequences are going to be more crucial to successfully respond to the circumstances. If the team member's criticality and consequently the adaptation trigger's extent is high, then it can be assumed that the team will need to focus more on the first two team adaptation phases (i.e., situation assessment, plan formulation) to understand the unexpected situational demands, plan its next steps, and re-allocate its roles. In case of the loss of a new team member, the team will probably need to focus more on directly distributing this member's tasks to the rest of the team without losing too much energy and time in planning and assessing extensively the situation.

Supporting these suggestions are also recent meta-analytic findings demonstrating the moderating role of the origin (i.e., internal versus external) and the duration of the team

adaptation trigger in the relationship between team processes, such as team communication and coordination, and team adaptive performance (Christian et al., 2017). Overall, it is suggested that future research should explore the impact of the nature of the adaptation trigger and whether it represents a moderating mechanism, as recent evidence and the developed working model on the team adaptation process propose.

5.4 Implications for Practice

In this section, I will discuss the researcher's implications for practice. The following implications are primarily drawn from the findings of the present thesis. Some aspects may also derive from further empirical evidence that was not explicitly addressed in my studies.

The results of my empirical work demonstrated the positive impact of previous exposure to multiple team adaptation requirements on the team adaptation process and on team adaptive performance. These findings can be of great use for organizations in order to improve their team's ability to adapt. More specifically, it is suggested that team training programs should be implemented so that teams perform multiple times under demanding circumstances and thus, gradually gain team adaptation experience. Previous research has shown that process-training programs such as procedural training (e.g., Hockey, Sauer, & Wastell, 2007) or team-interaction training (Marks et al., 2000), are very beneficial in the face of challenging circumstances compared to more traditional team trainings (e.g., Gorman et al., 2010). Such process-trainings focus on general skills and mechanisms (i.e., learning the procedure or how to work as a team) and not on specific rules and tasks, a feature that can support teams to learn to adapt effectively while gaining team adaptation experience.

In the present thesis, the advantage of updated team cognitive structures in the face of adaptation requirements has been also illustrated. I firmly believe that organizations should build on these findings and support the team's cognitive flexibility, for example, through simulation-based trainings. During such team trainings, various conditions can be simulated,

demanding different types of team strategies and adaptive responses (Cannon-Bowers, Burns, Salas, & Pruitt, 1998). Well-crafted scenarios will support teams in creating a common ground, learning which individual possesses what knowledge, and finally, improving and updating the team's cognitive competencies based on situational demands (Salas, Rosen, Held, & Weissmuller, 2009).

The research conducted also demonstrates the positive influence of the first team adaptation phase (i.e., situation assessment) on team adaptive outcomes when performed early in the team adaptation cycle. Building on this evidence, it is suggested that organizations should incorporate contrasting cases within simulation-based trainings to enhance such team assessing behaviors. This method has been found to improve noticing, scanning, and differentiating skills by comparing between cases (e.g., Fowlkes, Norman, Schatz, & Stagl, 2009). Such contrasting strategies can promote team members to recognize when cues signal the need to adapt, and thus, support teams in learning to assess effectively the challenges they are facing (e.g., Burke et al., 2006).

Overall, it is recommended that during team training sessions, our developed BARS should be implemented to capture the four-phase team adaptation process and to consequently inform teams about their effective and ineffective actions. Feedback with the support of our behavioral instrument will enable a guided practice for teams, making the most out of the time and energy invested on team training.

The role of the leader is also critical in promoting the team's adaptive capacity (e.g., Day, Gronn, & Salas, 2006). Consequently, the team leader is encouraged to continuously scan the team's environment, evaluate the executed team processes and support the effective performance of team actions (e.g., Morgeson et al., 2010). It is also suggested that the team leader should hold team briefings to reflect on the team's current situation and to prepare for possible adjustments by providing relevant information. Such sense-making functions will

promote team adaptive performance (Dunford & Jones, 2000). Finally, the team leader should be prepared to assist the team in the face of challenging circumstances and ensure a shared representation of the adaptive demands among team members (e.g., Maynard et al., 2015).

5.5 Conclusion

The present thesis has contributed to the gap between team adaptation process theory and research, and has provided the first empirical findings of this essential phenomenon for both team and organizational success. Based on the conducted research, I can conclude that the four-phase team adaptation process as described by Rosen and colleagues (2011) is in fact more complex and dynamic than theory suggests. The overall four-phase team adaptation process can be promoted by previous team adaptation experience and updated team cognitive structures, while it can enhance team adaptive outcomes, but not necessarily as a whole; different team adaptation phases and phase-sequences can be more beneficial, sometimes due to their timing.

Throughout my thesis, a number of empirically validated guidelines as well as a validated tool have been provided that can assist both researchers and practitioners to further understand and improve the team's adaptive capacity. My thesis contributed (1) on a methodological level by presenting the first behavioral instrument for directly measuring the four-phase team adaptation process, (2) on a theoretical level by testing the hitherto four-phase team adaptation model of Rosen et al. (2011) and extending it based on the evidence found, and finally (3) on an empirical level by offering the first findings of this unfolding process over a diverse set of studies, methods, and statistical analyses.

Change und unpredictability are an ever-present reality not only for modern organizations but also in modern society. Consequently, the importance of my thesis should not be limited to the organizational context. Team adaptation represents an essential

component for the successful operation of different types of teams in various settings. The presented evidence, implications, and guidelines are equally important to teams such as the firefighter teams mentioned at the beginning of this thesis that had to adapt to the demanding circumstances during the fire at the Grenfwell Tower. As London's fire brigade chief, Dany Cotton, described (Thomson, & Sylvester, 2017):

We are not robots by any stretch of the imagination but we had been trained to know what to do: make a plan, remain calm and professional…You don't have to be big and burly - it's about teams doing the jobs and using the equipment….How they interact is what matters…A lot of firefighters will say to you 'I was just doing my job' but actually they weren't just doing their job that night. They were doing an extraordinary job.

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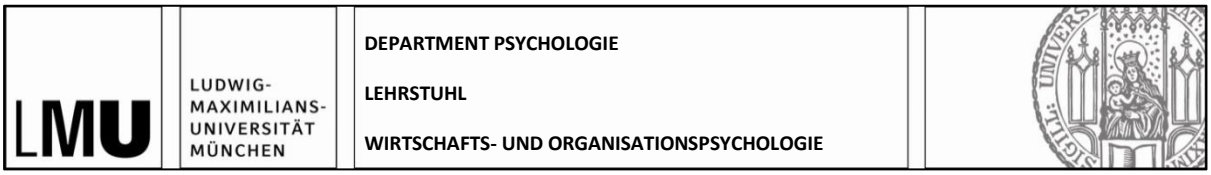
Appendix: Table of Contents

Appendix A: Chapter 2

A1. Study 1

A.1.1 Invitation to first group of subject-matter-experts



München, 03. November 2015

Sehr geehrte Professoren und MitarbeiterInnen,

Vielen Dank, dass Sie sich bereit erklärt haben, Frau Eleni Georganta und mich in unserer aktuellen Forschungsarbeit zu unterstützen.

Als spannendes Forschungsfeld der Wirtschafts- und Organisationspsychologie wird dem Thema Team Adaptation in den letzten Jahren zunehmend mehr Bedeutung und Aufmerksamkeit gewidmet.
Im Rahmen meiner Bachelorarbeit habe auch ich meinen inhaltlichen Schwerpunkt in diesem Bereich gesetzt. Ich befasse mich zusammen mit Frau Georganta mit der Entwicklung eines Messinstruments für den Team Adaptation Prozess in Form von Behaviorally Anchored Rating Scales (BARS).

Laut Schwab, Heneman und DeCotiis (1975) werden bei dieser Erfassungsmethode zunächst Urteile von ausgewählten Experten eingeholt. Diese Einschätzungen sollen schließlich die Entscheidungsgrundlage dafür bilden, welche Beispiele in die finale Skala aufgenommen werden. Es würde mich sehr freuen, wenn Sie dazu mit Ihren persönlichen Beurteilungen beitragen würden.

Anbei finden Sie eine Excel-Tabelle mit folgenden Inhalten:

- Im ersten Tabellenblatt finden Sie die Definitionen vier verschiedener Zustände eines Teams. Bitte lesen Sie sich diese Beschreibungen zunächst aufmerksam durch!

- Das zweite Tabellenblatt umfasst insgesamt 82 Aussagen, die Sie dann bitte jeweils den vier Zuständen aus Tabellenblatt 1 zuordnen.
- Sie können dabei auch die Möglichkeit wählen, dass ein Beispiel zu keiner der vier Beschreibungen passt („keine Zuordnung“).
  Bitte geben Sie Ihre persönliche Einschätzung durch die entsprechende Abkürzung in der zweiten Spalte der Tabelle an.
- Die dritte Spalte lässt Platz für Ihre individuellen Kommentare oder Verbesserungsvorschläge zu den einzelnen Beispielen - Ihre Anmerkungen sind sehr erwünscht und willkommen!

Bitte senden Sie die bearbeitete Excel-Datei bis **spätestens 07. November 2015** an meine Email-Adresse: **Merk_Stephanie@gmx.de** und an die Email-Adresse von Frau Georganta: **Eleni.Georganta@psy.lmu.de** zurück.

Bei Fragen können Sie mich jederzeit kontaktieren.

Abschließend möchte ich mich nochmals recht herzlich für Ihre Unterstützung bedanken. Ich weis Ihre Mithilfe wirklich sehr zu schätzen!

Mit freundlichen Grüßen

Merk Stephanie
Bachelorstudentin Psychologie

Schwab, D. P., Heneman, H. G., & DeCotiis, T. A. (1975). Behaviorally anchored rating scales: A review of the literature. *Personnel Psychology*, *28*(4), 549-562.doi: 10.1111/j.1744-6570.1975.tb01392.x

A.1.2 To be coded behavioral examples by first group of SMEs

Definitionen

Team Learning (TL)

Beim Team Learning reflektieren die Teammitglieder über vergangene Ereignisse und lernen aus eigenen Erfahrungen. Dabei wird das Wissen auf Teamebene im Hinblick auf zukünftiges Verhalten richtungsweisend verändert.

Plan Execution (PE)

Plan Execution umfasst die erfolgreiche Umsetzung des Handlungsplans, um schließlich das Gruppenziel zu erreichen.

Situation Assessment (SA)

Beim Situation Assessment registriert das Team veränderungsrelevante Hinweisreize in der Umwelt und misst diesen ihre Bedeutung zu. Insbesondere werden diejenigen Informationen verstärkt wahrgenommen, welche die Ziele, Mission oder Aufgabenbewältigung des Teams betreffen. Das Team versucht dabei, die Konsequenzen der gegenwärtigen Entwicklung abzuschätzen und Lösungen für Probleme zu generieren.

Plan Formulation (PF)

Auf Basis der eingeordneten Informationen erarbeitet das Team einen Handlungsplan. Dabei werden auch die Gruppenziele festgelegt, sowie individuelle Erwartungen und Verantwortlichkeiten der Teammitglieder geklärt.

Beispiel	Zuordnung (TL/PE/SA/PF/ keine Zuordnung)	Kommentare / Verbesserungsvorschläge
Das Team diskutiert als Gruppe im Detail über ihr mögliches Handeln.		
Das Team stimmt die einzelnen Handlungsschritte aufeinander ab.		
Das Team ordnet Veränderungen die entsprechend richtige Bedeutung zu.		
Die Zielrelevanz einzelner Handlungsschritte geht nicht deutlich aus dem Plan hervor.		
Das Team erkennt die eigenen Erfolge.		
Die Teammitglieder klären sich gegenseitig nicht über Fehler im Denken auf.		
Die Teammitglieder entwickeln ihren Handlungsplan sicher und bestimmt.		
Das Team geht nicht auf die eigenen Stärken und Schwächen ein.		
Das Team legt eine Abfolge mehrerer Handlungen fest.		
Das Team hält sich an den entwickelten Handlungsplan.		
Den Teammitgliedern sind die Fehler in ihren Handlungen nur teilweise bewusst.		
Die Teammitglieder deuten Fehler im Handeln eines anderen nur an.		
Das Team registriert eingetretene Veränderungen aufmerksam.		
Das Team berücksichtigt die Gruppenaufgabe im Rahmen der Handlungsdurchführung.		
Der Handlungsplan widerspricht der Gruppenaufgabe.		
Die Teammitglieder klären sich gegenseitig nicht über Fehler im Handeln auf.		
Das Team setzt den entwickelten Handlungsplan Schritt für Schritt um.		
Die Teammitglieder konzentrieren sich auf elementare Informationen, die einen Einfluss auf ihre Aufgabe haben könnten.		
Den Teammitgliedern fällt es schwer, sich mit den eigenen Stärken und Schwächen auseinander zu setzen.		
Der entwickelte Handlungsplan weist jeden Teammitglied seine Rolle und Aufgabe eindeutig zu.		
Das Team ist sich der eigenen Erfolge nicht immer sicher.		
Der Handlungsplan wird für alle Gruppenmitglieder klar festgelegt.		
Die Teammitglieder begründen ihre Handlungen und informieren die anderen über den Zweck ihrer Aktion.		
Das Team hat einen Überblick über die Aufgabe und deren Fortschritt.		
Der Handlungsplan informiert nur unvollständig über den Zweck der einzelnen Schritte.		
Die Teammitglieder stimmen ihre individuellen Handlungen optimal aufeinander ab.		
Das Team schätzt die Konsequenzen des eigenen Handelns falsch ab.		
Es wird nicht allen Teammitgliedern eine entsprechende Rolle zugewiesen.		

Der entwickelte Handlungsplan gibt keinen Aufschluss über die entsprechenden Rollen oder Aufgaben der Teammitglieder.		
Das Team identifiziert keine zielführende Strategie.		
Den Teammitglieder sind die Fehler in ihren Handlungen nicht bewusst.		
Die Teammitglieder machen gegenseitig Vorschläge für mögliches Handeln.		
Die Sinnhaftigkeit einzelner Handlungen findet im Team nur manchmal Beachtung.		
Das Team ist sich bei der konkreten Umsetzung des Handlungsplans nicht immer sicher.		
Die Teammitglieder richten sich bezüglich ihrer Handlungsschritte fragend an das Team.		
Das Team reflektiert über die eigenen Stärken und Schwächen.		
Die Teammitglieder deuten Fehler im Denken eines anderes nur an.		
Das Team entwickelt zwar einen Handlungsplan, ist sich aber möglicher Alternativen nicht bewusst.		
Das Team findet in seinen Handlungen keine erfolgsversprechende Routine.		
Dem Team fällt es schwer, die Bedeutung der eingetretenen Veränderungen abzuschätzen.		
Die Teammitglieder entwickeln ihren Handlungsplan sehr unsicher und zweifelnd.		
Das Team stellt die vereinbarten Handlungsschritte in Frage.		
Die Teammitglieder berücksichtigen zutreffend die Konsequenzen ihrer Handlungsschritte bei der Formulierung ihres Plans.		
Das Team erkennt die eigenen Erfolge nicht.		
Die Teammitglieder versuchen, ihre Fehler bei nachfolgenden Handlungen zu vermeiden.		
Das Team ignoriert Informationen, die darauf hinweisen, dass sich etwas an der Aufgabe oder Gruppenarbeit verändert hat.		
Nur wenige Handlungsschritte der einzelnen Teammitglieder sind aufeinander abgestimmt.		
Das Team entwickelt verschiedene Handlungspläne.		
Es entsteht kein klarer Handlungsplan.		
Teammitglieder sind in ihren eigenen Handlungsschritten unsicher.		
Bei der Festlegung des Handlungsplans werden eventuelle Veränderungen während der Gruppenaufgabe berücksichtigt.		
Das Team übersieht eingetretene Veränderungen.		
Es findet zwischen den Teammitgliedern eine eindeutige Rollenzuweisung während der Entwicklung des Handlungsplans statt.		
Der Handlungsplan legt kein Gruppenziel fest.		
Das Team ist sich bezüglich der Umsetzung der Aufgabe unsicher.		
Die Entwicklung des Handlungsplans informiert nicht über den Grund einzelner Aktionen.		
Die individuellen Handlungen der Teammitglieder ergänzen sich nicht gegenseitig.		
Das Team kann den aktuellen Stand der Aufgabe nicht überblicken.		
Das Team identifiziert eine erfolgsversprechende Routine.		
Das Team deutet relevante Hinweise falsch.		

Die Zielrelevanz einzelner Handlungen findet im Team nur manchmal Beachtung.		
Die Teammitglieder können ihre Handlungen nicht konkret und nachvollziehbar durchführen.		
Der entwickelte Handlungsplan gibt Aufschluss über den Zweck der einzelnen Handlungen.		
Die Teammitglieder lernen aus den Fehlern und wenden dieses Wissen bei zukünftigen Handlungen an.		
Der Handlungsplan wird an Veränderungen der Situation optimal angepasst.		
Die Teammitglieder lernen nicht aus den eigenen Fehlern.		
Die Teammitglieder erkennen die Fehler in ihren bisherigen Handlungen.		
Die Teammitglieder konzentrieren sich auf Informationen, die nicht direkt mit der Gruppenaufgabe zusammenhängen.		
Das Team führt Handlungen aus, die dem entwickelten Handlungsplan widersprechen.		
Das Team wägt Sinnhaftigkeit verschiedener Handlungspläne ab.		
Die Teammitglieder achten bei der Bestimmung des Handlungsplans nicht auf dessen Konsequenzen.		
Das Team behält stets den Überblick über die verschiedenen Handlungsschritte.		
Das Team kann die eigene Situation nicht richtig einordnen.		
Das Team kann den entwickelten Handlungsplan nicht in die Tat umsetzen.		
Das Team klärt nur einzelne Aktionen ohne die Zusammenhänge zu beachten.		
Die einzelnen Handlungen der Teammitglieder sind widersprüchlich.		
Das Team kann die eigene Situation korrekt erfassen.		
Das Team hat keinen Überblick über die einzelnen Handlungsschritte und deren Zusammenhänge.		
Das eigene Fehlverhalten des Teams beeinflusst zukünftige Handlungspläne nicht.		
Das Team erkennt eine zielführende Strategie.		
Die Teammitglieder weisen sich gegenseitig auf fehlerhafte Handlungen hin.		
Das Team wägt Zielrelevanz verschiedener Handlungspläne ab.		

A.1.3 Invitation for second group of subject-matter-experts

LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN
DEPARTMENT PSYCHOLOGIE
LEHRSTUHL
WIRTSCHAFTS- UND ORGANISATIONSPSYCHOLOGIE

München, 12. November 2015

Sehr geehrte Professoren und MitarbeiterInnen,

Vielen Dank, dass Sie sich bereit erklärt haben, Frau Eleni Georganta und mich in unserer aktuellen Forschungsarbeit zu unterstützen.

Als spannendes Forschungsfeld der Wirtschafts- und Organisationspsychologie wird dem Thema Team Adaptation in den letzten Jahren zunehmend mehr Bedeutung und Aufmerksamkeit gewidmet.
Im Rahmen meiner Bachelorarbeit habe auch ich meinen inhaltlichen Schwerpunkt in diesem Bereich gesetzt. Ich befasse mich zusammen mit Frau Georganta mit der Entwicklung eines Messinstruments für den Team Adaptation Prozess in Form von Behaviorally Anchored Rating Scales (BARS).

Laut Schwab, Heneman und DeCotiis (1975) werden bei dieser Erfassungsmethode Urteile von ausgewählten Experten eingeholt. Diese Einschätzungen sollen schließlich die Entscheidungsgrundlage dafür bilden, welche Beispiele in die finale Skala aufgenommen werden. Es würde mich sehr freuen, wenn Sie dazu mit Ihren persönlichen Beurteilungen beitragen würden.

Anbei finden Sie eine Excel-Tabelle mit folgenden Inhalten:

- Im ersten Tabellenblatt finden Sie die Definitionen vier verschiedener Zustände eines Teams. Bitte lesen Sie sich diese Beschreibungen zunächst aufmerksam durch!
- Das zweite Tabellenblatt umfasst insgesamt 48 Aussagen, die Sie dann bitte jeweils den vier Zuständen aus Tabellenblatt 1 zuordnen.

- Sie können dabei auch die Möglichkeit wählen, dass ein Beispiel zu keiner der vier Beschreibungen passt („keine Zuordnung“).
  Bitte geben Sie Ihre persönliche Einschätzung durch die entsprechende Abkürzung in der zweiten Spalte der Tabelle an.
- In der dritten Spalte erfolgt die Einordnung der Beispiele hinsichtlich ihrer Ausprägung. Bitte entscheiden Sie, ob das Beispiel einer hohen, moderaten oder niedrigen Ausprägung der Zustandsbeschreibung entspricht und tragen sie dementsprechend die Zahl 5, 3 oder 1 in die Spalte ein.
- Die vierte Spalte lässt Platz für Ihre individuellen Kommentare oder Verbesserungsvorschläge zu den einzelnen Beispielen - Ihre Anmerkungen sind sehr erwünscht und willkommen!

Bitte senden Sie die bearbeitete Excel-Datei bis **spätestens 16. November 2015** an meine Email-Adresse: [redacted] und an die Email-Adresse von [redacted] zurück.

Bei Fragen können Sie mich jederzeit kontaktieren.

Abschließend möchte ich mich nochmals recht herzlich für Ihre Unterstützung bedanken. Ich weis Ihre Mithilfe wirklich sehr zu schätzen!

Mit freundlichen Grüßen

[redacted]

Schwab, D. P., Heneman, H. G., & DeCotiis, T. A. (1975). Behaviorally anchored rating scales: A review of the literature. *Personnel Psychology*, *28*(4), 549-562.doi: 10.1111/j.1744-6570.1975.tb01392.x

A.1.4 To be coded behavioral examples by second group of SMEs

Definitionen

Team Learning (TL)

Beim Team Learning reflektieren die Teammitglieder über vergangene Ereignisse und lernen aus eigenen Erfahrungen. Dabei wird das Wissen auf Teamebene im Hinblick auf zukünftiges Verhalten richtungsweisend verändert.

Plan Execution (PE)

Plan Execution umfasst die erfolgreiche Umsetzung des Handlungsplans, um schließlich das Gruppenziel zu erreichen.

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Beim Situation Assessment registriert das Team veränderungsrelevante Hinweisreize in der Umwelt und misst diesen ihre Bedeutung zu. Insbesondere werden diejenigen Informationen verstärkt wahrgenommen, welche die Ziele, Mission oder Aufgabenbewältigung des Teams betreffen. Das Team versucht dabei, die Konsequenzen der gegenwärtigen Entwicklung abzuschätzen und Lösungen für Probleme zu generieren.

Plan Formulation (PF)

Auf Basis der eingeordneten Informationen erarbeitet das Team einen Handlungsplan. Dabei werden auch die Gruppenziele festgelegt, sowie individuelle Erwartungen und Verantwortlichkeiten der Teammitglieder geklärt.

Beispiel	Zuordnung (TL/PE/SA/PF/keine Zuordnung)	Kommentare / Verbesserungsvorschläge
Das Team diskutiert als Gruppe im Detail über ihr mögliches Handeln.		
Das Team stimmt die einzelnen Handlungsschritte aufeinander ab.		
Das Team ordnet Veränderungen die entsprechend richtige Bedeutung zu.		
Die Zielrelevanz einzelner Handlungsschritte geht nicht deutlich aus dem Plan hervor.		
Das Team erkennt die eigenen Erfolge.		
Die Teammitglieder klären sich gegenseitig nicht über Fehler im Denken auf.		
Die Teammitglieder entwickeln ihren Handlungsplan sicher und bestimmt.		
Das Team geht nicht auf die eigenen Stärken und Schwächen ein.		
Das Team legt eine Abfolge mehrerer Handlungen fest.		
Das Team hält sich an den entwickelten Handlungsplan.		
Den Teammitgliedern sind die Fehler in ihren Handlungen nur teilweise bewusst.		
Die Teammitglieder deuten Fehler im Handeln eines anderen nur an.		
Das Team registriert eingetretene Veränderungen aufmerksam.		
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Der Handlungsplan widerspricht der Gruppenaufgabe.		
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Das Team setzt den entwickelten Handlungsplan Schritt für Schritt um.		
Die Teammitglieder konzentrieren sich auf elementare Informationen, die einen Einfluss auf ihre Aufgabe haben könnten.		
Den Teammitgliedern fällt es schwer, sich mit den eigenen Stärken und Schwächen auseinander zu setzen.		
Der entwickelte Handlungsplan weist jeden Teammitglied seine Rolle und Aufgabe eindeutig zu.		
Das Team ist sich der eigenen Erfolge nicht immer sicher.		
Der Handlungsplan wird für alle Gruppenmitglieder klar festgelegt.		
Die Teammitglieder begründen ihre Handlungen und informieren die anderen über den Zweck ihrer Aktion.		
Das Team hat einen Überblick über die Aufgabe und deren Fortschritt.		
Der Handlungsplan informiert nur unvollständig über den Zweck der einzelnen Schritte.		
Die Teammitglieder stimmen ihre individuellen Handlungen optimal aufeinander ab.		
Das Team schätzt die Konsequenzen des eigenen Handelns falsch ab.		
Es wird nicht allen Teammitgliedern eine entsprechende Rolle zugewiesen.		
Der entwickelte Handlungsplan gibt keinen Aufschluss über die entsprechenden Rollen oder Aufgaben der Teammitglieder.		
Das Team identifiziert keine zielführende Strategie.		
Den Teammitglieder sind die Fehler in ihren Handlungen nicht bewusst.		
Die Teammitglieder machen gegenseitig Vorschläge für mögliches Handeln.		
Die Sinnhaftigkeit einzelner Handlungen findet im Team nur manchmal Beachtung.		
Das Team ist sich bei der konkreten Umsetzung des Handlungsplans nicht immer sicher.		
Die Teammitglieder richten sich bezüglich ihrer Handlungsschritte fragend an das Team.		
Das Team reflektiert über die eigenen Stärken und Schwächen.		
Die Teammitglieder deuten Fehler im Denken eines anderes nur an.		
Das Team entwickelt zwar einen Handlungsplan, ist sich aber möglicher Alternativen nicht bewusst.		
Das Team findet in seinen Handlungen keine erfolgsversprechende Routine.		
Dem Team fällt es schwer, die Bedeutung der eingetretenen Veränderungen abzuschätzen.		
Die Teammitglieder entwickeln ihren Handlungsplan sehr unsicher und zweifelnd.		
Das Team stellt die vereinbarten Handlungsschritte in Frage.		
Die Teammitglieder berücksichtigen zutreffend die Konsequenzen ihrer Handlungsschritte bei der Formulierung ihres Plans.		
Das Team erkennt die eigenen Erfolge nicht.		
Die Teammitglieder versuchen, ihre Fehler bei nachfolgenden Handlungen zu vermeiden.		
Das Team ignoriert Informationen, die darauf hinweisen, dass sich etwas an der Aufgabe oder Gruppenarbeit verändert hat.		
Nur wenige Handlungsschritte der einzelnen Teammitglieder sind aufeinander abgestimmt.		
Das Team entwickelt verschiedene Handlungspläne.		
Es entsteht kein klarer Handlungsplan.		
Teammitglieder sind in ihren eigenen Handlungsschritten unsicher.		
Bei der Festlegung des Handlungsplans werden eventuelle Veränderungen während der Gruppenaufgabe berücksichtigt.		
Das Team übersieht eingetretene Veränderungen.		
Es findet zwischen den Teammitgliedern eine eindeutige Rollenzuweisung während der Entwicklung des Handlungsplans statt.		
Der Handlungsplan legt kein Gruppenziel fest.		
Das Team ist sich bezüglich der Umsetzung der Aufgabe unsicher.		
Die Entwicklung des Handlungsplans informiert nicht über den Grund einzelner Aktionen.		
Die individuellen Handlungen der Teammitglieder ergänzen sich nicht gegenseitig.		
Das Team kann den aktuellen Stand der Aufgabe nicht überblicken.		
Das Team identifiziert eine erfolgsversprechende Routine.		
Das Team deutet relevante Hinweise falsch.		
Die Zielrelevanz einzelner Handlungen findet im Team nur manchmal Beachtung.		
Die Teammitglieder können ihre Handlungen nicht konkret und nachvollziehbar durchführen.		
Der entwickelte Handlungsplan gibt Aufschluss über den Zweck der einzelnen Handlungen.		
Die Teammitglieder lernen aus den Fehlern und wenden dieses Wissen bei zukünftigen Handlungen an.		
Der Handlungsplan wird an Veränderungen der Situation optimal angepasst.		
Die Teammitglieder lernen nicht aus den eigenen Fehlern.		
Die Teammitglieder erkennen die Fehler in ihren bisherigen Handlungen.		
Die Teammitglieder konzentrieren sich auf Informationen, die nicht direkt mit der Gruppenaufgabe zusammenhängen.		
Das Team führt Handlungen aus, die dem entwickelten Handlungsplan widersprechen.		
Das Team wägt Sinnhaftigkeit verschiedener Handlungspläne ab.		
Die Teammitglieder achten bei der Bestimmung des Handlungsplans nicht auf dessen Konsequenzen.		
Das Team behält stets den Überblick über die verschiedenen Handlungsschritte.		
Das Team kann die eigene Situation nicht richtig einordnen.		
Das Team kann den entwickelten Handlungsplan nicht in die Tat umsetzen.		
Das Team klärt nur einzelne Aktionen ohne die Zusammenhänge zu beachten.		
Die einzelnen Handlungen der Teammitglieder sind widersprüchlich.		
Das Team kann die eigene Situation korrekt erfassen.		
Das Team hat keinen Überblick über die einzelnen Handlungsschritte und deren Zusammenhänge.		
Das eigene Fehlverhalten des Teams beeinflusst zukünftige Handlungspläne nicht.		
Das Team erkennt eine zielführende Strategie.		
Die Teammitglieder weisen sich gegenseitig auf fehlerhafte Handlungen hin.		

A.1.5 Final BARS

Phase 1 - Situation Assessment

Beim Situation Assessment registriert das Team veränderungsrelevante Hinweisreize in der Umwelt und misst diesen ihre Bedeutung zu.
Insbesondere werden diejenigen Informationen verstärkt wahrgenommen, welche die Ziele, Mission oder Aufgabenbewältigung des Teams betreffen. Das Team versucht dabei, die Konsequenzen der gegenwärtigen Entwicklung abzuschätzen und Lösungen für Probleme zu generieren.

5	Das Team erfasst seine gegenwärtige Situation. Das Team ordnet Veränderungen die entsprechende Bedeutung zu. Das Team registriert alle eingetretenen Veränderungen aufmerksam. Die Teammitglieder achten aufmerksam auf Informationen, die einen Einfluss auf ihre Aufgabe haben könnten.
4	Das Team zeigt Verhaltensweisen, die sowohl bei 5 als auch bei 3 beschrieben werden.
3	Das Team erfasst teilweise seine gegenwärtige Situation. Das Team beschäftigt sich manchmal mit der Bedeutung der eingetretenen Veränderungen. Das Team erfasst zum Teil die eingetretenen Veränderungen. Die Teammitglieder beachten manchmal Informationen, die direkt mit der Gruppenaufgabe zusammenhängen.
2	Das Team zeigt Verhaltensweisen, die sowohl bei 3 als auch bei 1 beschrieben werden.
1	Im Team erfolgt keine Erfassung der gegenwärtigen Situation. Das Team überlegt nicht, welche Bedeutung die aufgetretenen Veränderungen für die Aufgabe haben könnten. Das Team übersieht eingetretene Veränderungen. Das Team ignoriert Informationen, die ihre Aufgabe beeinflussen.

Phase 2 – Plan Formulation

Auf Basis der eingeordneten Informationen erarbeitet das Team einen Handlungsplan. Dabei werden auch die Gruppenziele festgelegt, sowie individuelle Erwartungen und Verantwortlichkeiten der Teammitglieder geklärt.

5	Das Team entwickelt verschiedene Handlungspläne. Das Team legt eine Abfolge mehrerer Handlungen fest. Die Teammitglieder berücksichtigen die Konsequenzen ihrer Handlungsschritte bei der Formulierung ihres Plans. Es findet zwischen den Teammitgliedern eine eindeutige Rollenzuweisung während der Entwicklung des Handlungsplans statt.
4	Das Team zeigt Verhaltensweisen, die sowohl bei 5 als auch bei 3 beschrieben werden.
3	Alternative Handlungspläne werden angedeutet. Das Team plant partiell eine Abfolge mehrerer Handlungen. Die Konsequenzen des Handlungsplans werden bei dessen Entwicklung zum Teil beachtet. Vereinzelt wird Teammitgliedern während der Entwicklung des Handlungsplans eine eindeutige Rolle zugewiesen.
2	Das Team zeigt Verhaltensweisen, die sowohl bei 3 als auch bei 1 beschrieben werden.
1	Das Team entwirft keine alternativen Handlungspläne. Das Team organisiert keine Abfolge mehrerer Handlungsschritte. Die Teammitglieder achten bei der Entwicklung des Handlungsplans nicht auf dessen Konsequenzen. Während der Entwicklung des Handlungsplans erfolgt keine eindeutige Rollenzuweisung.

Phase 3 – Plan Execution

Plan Execution umfasst die Umsetzung des Handlungsplans, um schließlich das Gruppenziel zu erreichen.

5	Das Team hält sich an den entwickelten Handlungsplan. Das Team setzt den entwickelten Handlungsplan Schritt für Schritt um. Die Teammitglieder werden über die Absicht hinter den einzelnen Handlungsschritten informiert. Die Umsetzung des Handlungsplans erfolgt ohne Unterbrechungen.
4	Das Team zeigt Verhaltensweisen, die sowohl bei 5 als auch bei 3 beschrieben werden.
3	Das Team hält sich zum Teil an den entwickelten Handlungsplan. Das Team setzt den entwickelten Handlungsplan stellenweise Schritt für Schritt um. In manchen Fällen erfahren die Teammitglieder die Absicht hinter den einzelnen Handlungsschritten. Die konkrete Umsetzung des Handlungsplans erfolgt unvollständig.
2	Das Team zeigt Verhaltensweisen, die sowohl bei 3 als auch bei 1 beschrieben werden.
1	Die Teammitglieder vollziehen Handlungsschritte, die nicht im entwickelten Plan enthalten sind. Das Team setzt die ausgearbeiteten Handlungsschritte in einer abweichenden Reihenfolge um. Die Teammitglieder klären die anderen nicht über die Absicht hinter ihren einzelnen Handlungsschritten auf. Die konkrete Umsetzung des Handlungsplans findet nicht statt.

Phase 4 – Team Learning

Beim Team Learning reflektieren die Teammitglieder über vergangene Ereignisse und lernen aus eigenen Erfahrungen. Dabei wird das Wissen auf Teamebene im Hinblick auf zukünftiges Verhalten richtungsweisend verändert.

5	Das Team erkennt die eigenen Erfolge. Das Team reflektiert über die eigenen Stärken und Schwächen. Die Teammitglieder erkennen die Fehler in ihren bisherigen Handlungen. Die Teammitglieder lernen aus den Fehlern und übertragen dieses Wissen auf zukünftige Handlungen.
4	Das Team zeigt Verhaltensweisen, die sowohl bei 5 als auch bei 3 beschrieben werden.
3	Das Team erkennt zum Teil die eigenen Erfolge. Die Gruppe reflektiert teilweise über die eigenen Stärken und Schwächen. Den Teammitgliedern sind die Fehler in ihren Handlungen nur teilweise bewusst. Vereinzelt lernen die Teammitglieder aus ihren Fehlern und übertragen dieses Wissen auf zukünftige Handlungen.
2	Das Team zeigt Verhaltensweisen, die sowohl bei 3 als auch bei 1 beschrieben werden.
1	Das Team erkennt die eigenen Erfolge nicht. Das Team beschäftigt sich nicht mit den eigenen Stärken und Schwächen. Die Teammitglieder erkennen die Fehler in ihren bisherigen Handlungen nicht. Die Teammitglieder lernen nicht aus den eigenen Fehlern.

A.2 Study 2

A.2.1 Coded team adaptation phases by raters

10KGA	0	3	05:37	5	4	4	4		5	4	4	4	Baseline
11KGA	0	3	02:18	3	2	3	2		4	4	3	3	Situation einigermaßen erfasst und nicht nur am Anfang (positiv) Bedeutung der Veränderung bewusst aber nicht sehr aufmerksam auf Infos achten, Abfolge mehrerer Handlungen - mehrere Pläne nicht sehr eindeutige Rollenzuweisung, zum Teil Handlungsplan durchgeführt, unvollständige Durchführung
13KGA	0	3	01:00	3	3	4	2	erfasst nur teilweise die gegenwärtige Situation, überlegen sich aber nicht unebdingt, welche Bedeutung die Situation hat (erst später); plant partiell einen Plan, aber keine alternativen Handlungspläne, Konsequenzen werden z.T. bedacht; kaum TL weil sie Fehler nicht unbedingt erkennen, überlegt nicht, wer wo am besten ist und welche Stärken und Schwächen die jeweiligen Spieler haben	2	3	3	3	Bedeutung der gegenwärtigen Situation nicht verstanden, Handlungsplan entickelt ohne Konsequenzen klar sind, keine eindeutige Rollenzuweisung, Plan nicht Schritt für Schritt umgesetzt, Absicht nicht immer bewusst, bin mir nicht sicher über Team Learning eventuell auch eine 2
14EGA1	1	3	00:30	4	2	3	2	erfasst gegenwärtige Situation, entwickelt aber nicht unbedingt darauf aufbauend einen Plan mit Handlungsalternativen, nur vereinzelt Rollenzuweisung, achten bei Plan nicht auf dessen Konsequenzen, insgesamt sehr durchschnittliche Leistung	3	3	3	2	Baseline
15EGA1	1	3	05:20	2	3	3	3	erfasst teilweise Situation, aber versteht Konsequenzen für Planung nicht immer, plant Abfolge mehrerer Handlungen, eindeutige Rollenzuweisung, hält sich an Plan, TL ganz gut, erkennen Fehler und lernen daraus, erkennen zT Stärken und Schwächen und Erfolge, wirken total unkoordiniert, planen nur teilweise und führen einfach irgendwelche Schritte aus	5	4	4	4	Baseline

1KGA	0	4	02:40	2	3	3	2		1	3	3	2	keine Erfassung der gegenwärtigen Situation, neue Bedrohung wird nicht thematisiert, Plan entwickelt aber nicht Schritt für Schritt umgesetzt, keine Reflektion oder Diskussion der Erfolge oder Schwächen
20EGA2	1	3	15:00	5	4	4	4	Team erfasst Situation und Bedeutung der Veränderungen, achten aufmerksam auf wichtige Informationen, plant partiell eine Abfolge mehrerer Handlungspläne, eindeutige Rollenzuweisung, setzt Plan um, informiert Rest über Absichten, hält sich an den Plan, erkennt eigene Erfolge und Stärken und Schwächen, sehr kommunikativ und teamfähig	5	4	4	4	Rollenzuweisung nicht immer klar, nicht immer Plan Schritt für Schritt umgesetzt, nicht sehr start über Schwächen reflektiert
21EGA3	1	3	04:53	4	5	4	5	Situation wird teilweise erfasst, beachten manchmal Informationen die wichtig sind, Rollenzuweisung, Abfolge mehrerer Handlungen werden festgelegt, berücksichtigen auch die Konsequenzen, reflektieren über Möglichkeiten und somit über Stärken und Schwächen, werden immer besser in der Kommunikation	5	5	5	5	nicht sehr sicher über Team Learning - ich konnte alle Verhaltensbeispiele nicht asuwerten, weil sie nicht vorhanden waren
22EGA3	1	2	15:43	5	5	4	4	erfasst gegenwärtige Situation, registriert die eingetretenen Veränderungen, entwickeln eine Abfolge mehrerer Handlungen und beachten auch teilweise die Konsequenzen, hält sich an den Plan und setzt ihn um, teilweise informieren über Absichten, erkennt eigene Fehler und überlegt wo Stärken und Schwächen liegen und handelt dementsprechend	5	5	4	5	manchmal Unterbrechung beim Plan - eventuell aber auch eine 5 in Plan Execution
23EGA3	1	3	05:31	3	3	3	3	erfasst gegenwärtige Situation, beschäftigt sich mit der Bedeutung der Veränderung, alternative Pläne werden nur angedeutet, berücksichtigen aber Konsequenzen ihrer Handlungsschritte, plant auch eine Abfolge von Handlungen, setzt den Plan dann stellenweise um, reflektieren teilweise über Fehler, Stärken und Schwächen, erkennen Fehler am Ende, dass sie zu viel geschossen haben	2	2	2	1	erfasst zum Teil die gegenwärtige Situation, partielle Abfolge mehrerer Schritte, machmal eindeutige Rollen, manchmal Absicht der Handlungen bewusst, konkrete Umsetzung des Plan ist unvollständig,
24EGA3	1	4	00:18	4	4	5	3	erfasst Situation, diskutiert über Konsequenzen, überlegt was man in der nächsten Phase tun kann, Abfolge mehrerer Handlungen werden festgelegt, Mitglieder erfahren, was die Absichten sind, Der Handlungsplan wird umgesetzt, TL: erkennt zum Teil die eigenen Erfolge, reflektiert über Stärken und Schwächenw, Fehler oder Ideen werden diskutiert	5	4	4	4	Konsequenzen der Handlungsschritte nicht immer berücksichtigt, nicht immer eindeutige Rollenzuweisung, konkrete Umsetzung des Plans erfolgt unvollständig, lernen aus Fehler und übertragen dieses Wissen auf letzte Phase, Stärken und Schwächen teilweise reflektiert - eventuell eine 5 in Team Learning

26KGB	0	2 + 3	17:06	3	3	3	2	Team erfasst Situation nur teilweise, die Konsequenzen werden teilweise bedacht, Team plant partielle Abfolge von Handlungsschritten, legt aber keine Gruppenziele fest, alternative Handlungspläne werden nicht bedacht, Team führt Plan dann aus und einzelne Mitglieder erfahren manchmal die Absicht hinter den Schritten, TL: das Team reflektiert nicht viel über vergangene Ereignisse und verändert das Wissen nicht auf Teamebene um richtungsweisend zu handeln, manchmal sind dem Team Stärken und Schwächen der einzelnen Spieler bewusst	2	3	3	1	erfasst zum Teil die eingetretende Veränderung, partiell eine Abfolge mehrere Handlungen, keine Alternativpläne, Konsequenzen zum Teil erfasst, nicht immer eindeutige Rollen, teilweise Erklärung über Absicht
27KGB	0	3	07:29	4	3	3	2	Das Team erfasst die Veränderung in der Situation und misst ihr auch die entsprechende Bedeutung bei, formuliert einen Plan, deutet aber nur wenig Alternativen an, eine Person des Teams versthet nicht wirklich, was sie tun soll, Konsequenzen des Plans werden teilweise beachtet, Team hält sich dann zT an den entwickelten Plan, aber Umsetzung meist nicht vollständig, TL:reflektiert kaum, erkennt keine Fehler und erkennt Stärken und Schwächen nur teilweise	4	4	4	3	erfasst gegenwärtige Situation, manchmal die Bedeutung der Veränderung, beachtet manchmal Infos die mit Veränderung zu tun haben, keine verschiedene Pläne, aber Abfolge mehrerer Handlungen, nicht immer eindeutige Rollenzuweisung, Plan nicht ohne Unterbrechung, Teammitglieder nicht immer über die Absicht der Handlungen informiert, nicht sicher über Team Learning
28KGB	0	3	10:42	4	3	4	3	erfasst schnell die Situation, versucht Lösungen für die Probleme zu finden, ordnet aber nicht die entsprechende Bedeutung zu den Veränderungen zu, Team plant partielle Abfolge von Handlungen, Alternativen werden angedeutet, berücksichtigen Konsequenzen nur zum Teil, hält sich an den Plan, setzt ihn stellenweise Schritt für Schritt um, manchmal auch Erläuterungen der Absicht dahinter, TL:erkennt Erfolge zT, reflektiert teilweise über Stärken und Schwächen	3	3	3	2	zum Teil gegenwärtige Situation und ihre Bedeutung erfasst, manchmal auf Informationen beachtet die mit Aufgabe zu tun haben, Abisicht der Handlungen nicht immer klar, Plan stellenweise Schritt für Schritt umgesetzt, zum Teil Erkennung der eigenen Erfolge, Fehler teilweise bewusst
29KGB	0	2	16:05	1	2	2	2	handeln, abre erfassen Situation bzw. Veränderung nicht wirklich, überlegen nicht welche Bedeutung die Veränderung für die Planung und das Team hat, planen teilweise eine Abfolge, aber entwickeln diese nicht auf dessen Konsequenzen, keine alternativen Handlungspläne, Team hät sich zT an den Plan, aber eine konkrete Umsetzung findet nicht statt, kommen durcheinander, TL: erkennen teilweise Fehler aber beschäftigen sich nicht mit Stärken und Schwächen, lernen nicht aus Fehlern	1	2	2	1	Team beachtet keine Konsequenzen seiner Handlungen, nicht immer eindeutige Rolle, manchmal Abfolge mehrerer Handlungen, manchmal Schritte nicht Teil des Plans waren, Absicht hinter der Handlungen nicht bewusst, Handlungsschritte weichen manchmal von uhrsprünglichen Idee ab
2EGA1	1	3	09:02	4	4	4	4		4	3	4	3	Bedorhung wurde thematisiert aber nicht ihre Bedeutung, Konsequenzen der Handlungen nicht allen bewusst, ein bisschen unsicher bei Plan Formulation und bei Team Learning
30KGB	0	3	11:08	3	3	4	3	erfasst teilweise die gegenwärtige Situation, beschäftigt sich teils mit der Bedeutung der Veränderung, registriert Veränderungen aufmerksam und erkennt Möglichkeiten für die Mission, plant eine Abfolge von Handlungen, bedenkt Konsequenzen, Alternativen werden nur angedeutet, Umsetzung des Handlungsplans erfolgt, Absichten werden mitgeteilt, TL: erkennen Fehler im Denken, Stärken und Schwächen, kommunizieren gut und reflektieren teilweise	5	5	5	5	erfasst seine gegenwärtige Situation, achtet auf Informationen, entwickelt Handlungsplan aus mehreren Schritten, Absicht ist klar, Umsetzung des Plans wie geplant, Konsequenzen bewusst, eindeutige Rollenzuweisung, reflektiert über Stärken und Schwächen in dem am Anfang über die Karten geredet wird, die jede Person hat, erkennen von Erfolg, wenn sie schon früher wissen, dass sie gewinnen werden
31KGB	0	3	02:43	3	2	3	1	Team erfasst Situation teilweise, beachtet manchmal Infos die mit der Gruppenaufgabe zusammenhängen, PF eher nicht so ausgeprägt, da keine Kommunikation über Handlungsplan, keine Alternativen, Konsequenzen nur zT bedacht, PE ok, Team hält sich an Plan, manchmal auch Erklärung der Absichten, TL Team reflektiert eigentlich gar nicht, teilweise vllt. Bewusstsein von Stärken und Schwächen aber keine Kommunikation darüber	5	5	5	5	erfasst gegenwärtige Situation und alle wichtige Informationen, ordnet entsprechende Bedeutung zu, eindeutige Rollenzuweisung, verschiedene Pläne, Konsequenzen der Handlungen sind klar, Team hält sich an entwickelten Handlungsplan, Teammitglieder über Absicht informiert, Plan Schritt für Schritt umgesetzt, Team erkennt Erfolge, Reflektiert über Handlungen

31KGB	0	3	02:43	3	2	3	1	Team erfasst Situation teilweise, beachtet manchmal Infos die mit der Gruppenaufgabe zusammenhängen, PF eher nicht so ausgeprägt, da keine Kommunikation über Handlungsplan, keine Alternativen, Konsequenzen nur zT bedacht, PE ok, Team hält sich an Plan, manchmal auch Erklärung der Absichten, TL Team reflektiert eigentlich gar nicht, teilweise vllt. Bewusstsein von Stärken und Schwächen aber keine Kommunikation darüber	5	5	5	5	erfasst gegenwärtige Situation und alle wichtige Informationen, ordnet entsprechende Bedeutung zu, eindeutige Rollenzuweisung, verschiedene Pläne, Konsequenzen der Handlungen sind klar, Team hält sich an entwickelten Handlungsplan, Teammitglieder über Absicht informiert, Plan Schritt für Schritt umgesetzt, Team erkennt Erfolge, Reflektiert über Handlungen
32KGB	0	4	01:50	1	2	2	1	SA: Team erfasst Situation nicht wirklich, überlegt nicht, welche Bedeutung die Veränderung für die Planung und das Ziel hat, PF: plant eine Abfolge mehrerer Handlungsschritte, aber denkt an keine Konsequenzen, PE: hält sich an Plan, klären andere nicht über Absicht hinter Handlungsschritten auf, planen irgendwie in der Situation und nicht im Voraus, TL: reflektieren gar nicht, beschäftigen sich nicht mit den Stärken und Schwächen und auch nicht mit Fehlern	3	3	4	3	nicht sicher über Auswertung dieses Teams - Absicht der Handlungen manchmal bewusst, Team hält sich zum Teil an entwickelten Handlungsplan, Team reflektiert teilweise über Stärken und Schwächen, und erkennt zum Teil die eigenen Erfolge
33KGB	0	3	13:08	2	1	2	1	SA: Team erfasst teilweise Situation, überlegt nicht welche Bedeutung die Veränderungen haben könnten, PF: Team entwirft keine alternativen Handlungspläne, keine Organisation mehrerer Handlungsabfolgen, PE: hält sich an kurzfristig gemachten Plan, Umsetzung nicht Schritt für Schritt, TL: Team reflektiert gar nicht	3	3	3	2	Absicht hinter den Handlungen nicht immer bewusst, Plan stellenweise Schritt für Schritt umgesetzt, manchmal eigene Erfolge erkennen, teilweise reflektieren über Stärken und Schwächen
34KGB	0	2	14:00	2	2	2	1	SA: Team erfasst teilweise die Situation, denkt nicht immer darüber nach was die Veränderung bedeutet, versteht Spiel nicht wirklich, PF: versucht partiell zu planen, Konsequenzen werden nicht bedacht, keine Alternativen, PE: keine konkrete Umsetzung eines Plans, alle handeln ohne Koordination, manchmal wird Absicht hinter Schritten klar, TL: reflektiert nicht	2	2	1	1	manchmal Bedeutung der Veränderung erfasst, manchmal Infos die damit zusammenhängen gesammelt, keine Rollenzuweisung, keine alternative Handlungspläne, partiell Abfolge mehrerer Handlungen, vereinzelt Rollen zugeteilt,
35KGB	0	3	01:30	3	3	3	2	SA: erfasst Situation teilweise, erfasst zT die eingetretenen Veränderungen sowie deren Bedeutung; PF: Andeutung alternativer Pläne, plant eine Abfolge, vereinzelt Rollenzuweisung, PE: Team hält sich zT an den Plan, Kommunikation der Absicht in manchen Fällen, TL: reflektieren wenig, erkennen Möglichkeiten von Positionen, kein Lernen aus Fehlern	3	3	4	3	manchmal Unterbrechung beim Plan, nicht immer über Absicht informiert, Erkennt teilweise Fehler und Erfolge, teilweise Reflektion über Stärken und Schwächen
36KGB	0	3	06:24	2	2	3	3	SA: anfangs Erfassung der Situation, aber dann im Verlauf nicht wirklich verstanden, Team bedenkt nicht welche Bedeutung die Veränderungen haben, PF: alternative Pläne nur angedeutet, Konsequenzen werden aber nicht bedacht, Abfolge mehrerer Schritte wird geplant, PE: Team hält sich an den Plan, Absicht wird stellenweise mitgeteilt, TL: lernen vereinzelt aus ihren Fehlern, erkennen teilweise Stärken und Schwächen	2	1	1	1	beachten manchmal Informationen die mit der Veränderung zu tun haben, erfassen zum Teil eingetretende Veränderung, Konsequenzen gar nicht geachtet, keine alternative Handlungpläne, keine eindeutige Rollenzuweisung,
37EGB1	1	3	07:51	3	3	3	3	SA: Team erfasst die Situation, beschäftigt sich manchmal mit der Bedeutung der eingetretenen Veränderungen, achten auf Infos die Einfluss auf Aufgabe haben können, PF: Alternativen werden angedeutet, Konsequenzen werden zT bedacht, Rollenzuweisung vereinzelt, PE: Team setzt Plan stellenweise Schritt für Schritt um, hält sich an den Plan, informieren über Absichten, TL: erkennt zT eigene Erfolge, reflektiert teilweise über Stärken und Schwächen, auch Reflektion über Fehler teilweise	3	3	3	3	so wie in der Skalen beschrieben

38EGB1	1	2	24:07	2	2	3	2	SA: am Anfang gar keine Erfassung der Situation/Veränderung, bessert sich dann, beschäftigt sich dann manchmal mit der Bedeutung der Veränderungen, PF: Team deutet Alternativen an, plant aber keine Handlungsabfolge, keine eindeutige Rollenzuweisung im Vorfeld, Kosequenzen werden nicht bedacht, PE: setzen dann in der Phase das um, was sie tun wollen, Absicht wird nur manchmal kommuniziert, TL: Team reflektiert wenig bis kaum über Stärken und Schwächen, Fehler werden nicht bedacht	2	2	3	2	erfasst teilweise seine gegenwärtige Situstion und derer Bedeutung, keine Abfolge mehrerer Hadnlungen, manchmal über alternative Pläne gesprochen, manchmal Rollenzuweisung, reflektieren manchmal über Stärken und Schwächen, lernen teilweise aus ihren Fehlern
39EGB1	1	3	10:39	3	3	4	3	SA: erfasst teilweise die Situation, beschäftigt sich manchmal mit den Veränderungen und deren Bedeutung, erfasst zT eingetretene Veränderungen, PF: Alternativen werden angedeutet, partielle Planung von Handlungen, Konsequenzen werden zT bedacht, vereinzelt Rollenzuweisung, PE: hält sich an Plan, setzt Plan um, Absicht wird teilweise erklärt, TL: erkennt zT Erfolge, reflektieren auch über mögliche Stärken und Schwächen, erkennen eher wenig die Fehler	3	3	3	2	teilweise mit Stärken und Schwächen beschäftigt, erkennen zum Teil eigene Erfolge
3KGA	0	2	08:50	5	4	4	4		5	4	4	3	Informationen über gegenwärtige Situation und ihrer Bedeutung mehrmals gesammelt, Konsequenzen und eindeutige Zuweisung sind nicht sehr klar vorhanden, beim Handlungsplan manche Schritte werden nicht wie geplant umgesetzt, zum Teil halten des ursprünglichen Plans
40EGB1	1	3	04:43	3	3	3	3	SA: nehmen Informationen auf, erfassen Situation teilweise, verstehen nicht bzw. nur teilweise welche Bedeutung die Veränderungen haben, PF: Rollenzuweisung, plant teilweise eine Abfolge an Handlungsschritten, Konsequenzen werden zT bedacht, Alternativen werden angedeutet, PE: Team hält sich an den Plan, manchmal erfahren Teammitglieder die Absicht, Handlungsplan wird stellenweise Schritt für Schritt umgesetzt, TL: Team erkennt zT Fehler, reflektiert teilweise über Stärken und Schwächen	5	4	4	4	nicht immer eideutige Rollenzuweisung, keine Entwicklung verschiedener Handlungspläne, konkrete Umsetzung unvollständig, entwickelter Plan nicht Schritt für Schritt umgesetzt, nicht sicher über Team Learning - eventuell auch eine 3
41EGB2	1	3	06:37	4	4	4	4	SA: erfassen Situation, ordnen manchmal Veränderung die entsprechende Bedeutung zu, registrieren Veränderungen, PF: Team entwickelt Handlungsplan und deutet Alternativen an, Konsequenzen werden zT bedacht, PE: Team hält sich an den Plan, setzen ihn Schritt für Schritt um, manchmal wird Absicht erläutert, TL: Team reflektiert über Fehler, Stärken und Schwächen, überlegen ob Schritte sinnvoll sind oder nicht, erkennen zT eigene Erfolge, lernen vereinzelt aus Fehlern	5	4	4	5	nicht immer eindeutige Rollenzuweisung, einige alternative Pläne, Umsetzung des Plan wird manchmal unterbrochen, Plan nicht immer Schritt für Schritt umgesetzt, Erkennung über Erfolge, Reflektion von Stärken und Schwächen
42EGB2	1	3	08:43	2	2	2	1	SA: Team erfasst teilweise die Situation, überlegt nicht welche Bedeutung die aufgetretene Veränderung haben könnte, beachten manchmal Informationen die direkt mit der Gruppenaufgabe zusammenhängen, PF: Team entwirft keine Alternativen, Abfolge wird nicht wirklich geplant, Konsequenzen werden nur zT bedacht, keine eindeutige Rollenzuweisung, PE: vollziehen Schritte, die nicht im Plan sind, klären andere nicht über Absichten auf, teilweise Umsetzung des Plans, TL: erkennt Erfolge nicht, beschäftigt sich nicht mit Stärken und Schwächen, erkennen Fehler nicht	2	2	3	2	beachten manchmal Informationen die mit Veränderung zu tun haben, teilweise gegenwärtige Situation erfassen, manchmal Rollen zugewiesen, partiell Anfolge mehrerer Handlungen, Fehler in den Handlungen teilweise bewusst, erkennen zum Teil eigene Erfolge
43EGB2	1	4	05:33	2	1	1	1	SA: Situation wird nur anfangs erfasst, danach keine Beachtung der Veränderungen und deren Bedeutung, PF: keine Alternativen, kein Plan, keine Beachtung der Konsequenzen, keine Rollenzuweisung, PE: jeder führt eigenständig irgendwelche Schritte durch, keine konkrete Umsetzung oder Absprache, TL: kein reflektieren und kein lernen aus den Erfahrungen	1	1	1	1	zu streng? Ich denke, dass jeder für sich was gemacht hat, und dass es irgendwie geklappt hat
44EGB2	1	3	10:31	3	2	2	3	SA: Team erfasst teilweise die Situation, erfasst zT die eingetretenen Veränderungen, beachten manchmal wichtige Infos, PF: keine Alternativen, plant partiell Abfolge mehrerer Handlungen, Konsequenzen werden teilweise bedacht, keine eindeutige Rollenzuweisung, PE: Team führt Plan durcheinander durch, klären nur zT über Absicht auf, hält sich zT an den Plan, TL: erkennt zT die Erfolge und die Fehler, reflektieren teilweise Stärken und Schwächen	2	2	2	1	teilweise Veränderung erfasst, partiell Abfolge einiger Handlungen, Konsequenzen nicht immer bewusst, Schritt durchgeführt die nicht zum uhrsprünglichen Plan gehören, Absicht der Hadnlungen ist nicht immer klar, keine Reflektion über Stärken und Schwächen, Erfolge werden nicht erkannt
45EGB3	1	3	08:44	3	3	2	2	SA: teilweise Erfassung der Situation, beschäftigt sich manchmal mit der Bedeutung der Veränderungen, PF: plant partiell eine Abfolge, deutet Alternativen an, manchmal Rollenzuweisung, PE: klären andere über Absicht auf, ausgearbeitete Handlungsschritte werden durcheinander irgendwie umgesetzt, nicht ganz konkret, TL: erkennen zT Erfolge, relektieren aber nicht über Fehler, wenig über Stärken und Schwächen	4	4	4	4	nicht immer auf alle Informationen geachtet, aber gegenwärtige Situation und ihre Bedeutung erfasst, Rollen sind klar, verschiedene Pläne, partiell Abfolge mehrerer Handlungen, über Team Learning nicht sehr sicher

44EGB2	1	3	10:31	3	2	2	3	SA: Team erfasst teilweise die Situation, erfasst zT die eingetretenen Veränderungen, beachten manchmal wichtige Infos, PF: keine Alternativen, plant partiell Abfolge mehrerer Handlungen, Konsequenzen werden teilweise bedacht, keine eindeutige Rollenzuweisung, PE: Team führt Plan durcheinander durch, klären nur zT über Absicht auf, hält sich zT an den Plan, TL: erkennt zT die Erfolge und die Fehler, reflektieren teilweise Stärken und Schwächen	2	2	2	1	teilweise Veränderung erfasst, partiell Abfolge einiger Handlungen, Konsequenzen nicht immer bewusst, Schritt durchgeführt die nicht zum uhrsprünglichen Plan gehören, Absicht der Hadnlungen ist nicht immer klar, keine Reflektion über Stärken und Schwächen, Erfolge werden nicht erkannt
45EGB3	1	3	08:44	3	3	2	2	SA: teilweise Erfassung der Situation, beschäftigt sich manchmal mit der Bedeutung der Veränderungen, PF: plant partiell eine Abfolge, deutet Alternativen an, manchmal Rollenzuweisung, PE: klären andere über Absicht auf, ausgearbeitete Handlungsschritte werden durcheinander irgendwie umgesetzt, nicht ganz konkret, TL: erkennen zT Erfolge, relektieren aber nicht über Fehler, wenig über Stärken und Schwächen	4	4	4	4	nicht immer auf alle Informationen geachtet, aber gegenwärtige Situation und ihre Bedeutung erfasst, Rollen sind klar, verschiedene Pläne, partiell Abfolge mehrerer Handlungen, über Team Learning nicht sehr sicher
46EGB3	1	3	07:29	2	1	2	2	SA: erfasst teilweise Situation, überlegt aber nicht welche Bedeutung die Veränderungen haben könnten, erfassen zT die eingetretenen Veränderungen, keine gute Taktik, PF: keine Alternativen, organisiert keine Abfolge mehrerer Handlungsschritte, achten nicht auf Konsequenzen, PE: führen alle Schritte ohne wirklichen Plan aus, Umsetzung findet nicht konkret statt, halten sich zT an Plan, TL: erkennen zT Stärken und Schwächen, lernen nicht aus Fehlern, erkennen auch keine Fehler	3	2	2	2	Konsequenzen der Handlungen nicht immer bewusst, keine eindeutige Rollen zugewiesen, Absicht hinter den Hadnlugen nicht immer klar, Handlungsschritte in einer abweichenden Form, zum Teil an entwickelten Handlungsplan, manchmal aus Fehlern lernen, manchmal Erkennung der eigenen Fehlern
47EGB3	1	3	04:17	2	3	3	2	SA: gegenwärtige Situation wird teilweise erfasst, überlegt nicht, welche Bedeutung Veränderungen haben, erfassen Veränderungen, PF: keine alternativen Handlungspläne, keine Organisation einer Handlungsabfolge, Konsequenzen werden teilweise beachtet, PE: vollziehen Schritte ohne Plan, in manchen Fällen Aufklärung über Absicht, TL: reflektieren teilweise über Stärken und Schwächen, erkennen Fehler nicht, lernen nicht aus Fehlern	4	4	4	4	keine alternative Handlungspläne, partiell Abfolge von Handlungen, in manchen Fällen sind Mitglieder über die Absicht hinter ihrer Handlung bewusst, Umsetzung des Plan manchmal mit Unterbrechung, Reflektion über Stärken und Schwächen (z.B. welche Karten die haben), Erkennen von Erfolg (Person in letzter Runde realisiert, dass wenn sie auch schiesse wird das Team gewinnen), Fehler in
48EGB3	1	3	04:36	4	3	3	2	SA: erfasst teilweise gegenwärtige Situation, ordnet Veränderungen Bedeutung zu, registrieren Veränderungen zT, PF: alternative Pläne werden angedeutet, plant partiell eine Abfolge, Konsequenzen werden zT bedacht, PE: Team hält sich zT an den Plan, setzt Handlungsplan Schritt für Schritt um, TL: erkennen zT Erfolge, lernen vereinzelt aus Fehlern, Fehler auch nur teilweise bewusst, reflektieren über Stärken und Schwächen	5	4	4	4	alternative Handlungspläne entwickelt aber nicht immer Abfolge mehrerer Handlungen, nicht immer eindeutige Rollenzuweisung, Plan wird manchmal unterbrochen, Erfolge werden erkannt, teilweise über Stärken und Schwächen reflektiert, teilweise aus Fehlern lernen
49KGC	0	3	01:00	4	4	3	3	SA: Situation wird erfasst, manchmal Beschäftigung mit Bedeutung der Veränderungen, achten aufmerksam auf Informationen, die Einfluss haben, PF: Alternativen werden angedeutet, plant Abfolge mehrerer Handlungen, Konsequenzen werden zT bedacht, PE: Team hält sich an den Plan, Umsetzung stellenweise Schritt für Schritt, TL: erkennen Erfolge, denken über Stärken und Schwächen der einzelnen Spieler nach, erkennen Fehler teilweise	4	3	3	3	nicht auf alle Informationen geachtet, die einen Einfluss auf Aufgabe haben, Konsequenzen nur teilweise bewusst, nicht immer eindeitige Rollen, Absicht hinter den Handlungen nicht immer bewusst,
4KGA	0	3	02:14	4	2	3	2		5	5	4	4	Information über Bedrohung gesammelt, mehrere Schritte vom Handlungsablauf entwickelt, und diese zum Teil umgesetzt - ab dritter Runde ein bisschen unklar welche Handlunlgen durchgeführt werden müssen
50KGC	0	2	01:06	4	4	3	3	SA: erfasst gegenwärtige Situation, ordnet Veränderungen Bedeutung zu, manchmal Missverständnisse, PF: Team entwickelt Plan, deutet Alternativen an, Konsequenzen werden zT bedacht, PE: hält sich zT an den Plan, konkrete Umsetzung unvollständig, Absicht wird kommuniziert, TL: erkennt Erfolge, reflektiert teilweise über Stärken und Schwächen, lernen vereinzelt aus Fehlern	3	3	3	2	manchmal sind Fehler bewusst, manchmal beschäftigen sich mit Stärken und Schwächen
51KGC	0	2	12:30	2	3	3	1		1	3	3	1	Baseline

50KGC	0	2	01:06	4	4	3	3	SA: erfasst gegenwärtige Situation, ordnet Veränderungen Bedeutung zu, manchmal Missverständnisse, PF: Team entwickelt Plan, deutet Alternativen an, Konsequenzen werden zT bedacht, PE: hält sich zT an den Plan, konkrete Umsetzung unvollständig, Absicht wird kommuniziert, TL: erkennt Erfolge, reflektiert teilweise über Stärken und Schwächen, lernen vereinzelt aus Fehlern	3	3	3	2	manchmal sind Fehler bewusst, manchmal beschäftigen sich mit Stärken und Schwächen
51KGC	0	2	12:30	2	3	3	1		1	3	3	1	Baseline
52KGC	0	2 + 3	18:26	2	2	2	1	SA: Situation wird nur teilweise erfasst, Beudeutungen nicht bedacht, erfassen zT eingetretene Veränderungen, PF: keine Alternativen, plant partiell Abfolge, keine Konsequenzen bedacht, PE: Team hält sich zT an den Plan, handeln aber irgendwie ohne Struktur, TL: reflektieren nicht, kommunizieren kaum	2	2	2	1	Erfassung zum Teil der gegenwärtigen Situation, nicht Informationen gesammelt die mit der Aufgabe zu tun haben, sehr wenig Bedeutung der Veränderung erfasst, nicht auf Konsequenzen geachtet, keine Abfolge mehrerer Handlungen, zum Teil Konsequenzen beachtet, unvollständige Umsetzung des Plans, Absicht hinter den Handlungen nicht immer bewusst,
53KGC	0	3	00:17	4	3	2	3	SA: Situation wird erfasst, Veränderungen werden realisiert, manchmal werden wichtige Informationen beachtet, PF: Andeutung alternativer Pläne, Abfolge wird partiell geplant, Konsequenzen zT bedacht, PE: Team hält sich an den Plan, aber chaotische Durchführung und somit keine konkrete Umsetzung, TL: erkennt zT eigene Erfolge, reflektieren über Stärken und Schwächen, Fehler teilweise bewusst	5	4	4	4	verschiedene Handlungspläne aber nicht immer mit eindeutigen Rollen verbunden, Abfolge mehrerer Handlungen festgelegt, Konsequenzen fast immer berücksichtigt, konkrete Umsetzung des Plans manchmal mit Unterbrechung, stellenweise Plan Schritt für Schritt umgesetzt, erkennen von eigenen Erfolge, teilweise Reflektion über Stärken und Schwächen, erkennen Fehlern in eigenen
54KGC	0	2 + 3	13:26	1	2	1	1	SA: verstehen Situation nicht zu Beginn, nehmen Veränderung und deren Bedeutung nicht wahr, ignoriert Infos, PF: Team versucht Handlungsschritte zu planen, keine Alternativen, kein Beachten der Konsequenzen, keine Rollenzuweisung, PE: führen irgendwelche Schritte durch, ohne konkrete Umsetzung, keine Reihenfolge, reden aneinander vorbei, TL: reflektieren nicht, erkennen Fehler nicht, lernen nicht aus Fehlern	2	1	1	1	teilweise Erfassung der gegenwärtigen Situation, nicht überlegt welche Beudetung die Veränderung hat, keine Abfolge mehrerer Handlungen, kein Plan, nicht über Absicht der Handlungen geklärt, Handlungsschritte die nicht im Plan waren, keine konkrete Umsetzung eines Plans, keine Erkennung von Erfoglen, keine Erkennung von Fehlern, keine Reflektion über Stärken oder Schwächen, nicht von Fehlern gelernt
55KGC	0	2	09:48	2	1	1	2	SA: teilweise wird Situation erfasst, keine Überlegung bzgl. Bedeutung der Veränderungen, beachten manchmal Infos, die wichtig sind, PF: keine Alternativen, keine Abfolge mehrerer Schritte, keine Beachtung der Konsequenzen, PE: keine Aufklärung, keine Struktur, keine konkrete Umsetzung, panlos, TL: erkennen Fehler nicht, kommunizieren wenig, reflektieren nur teilweise über Stärken und Schwächen	4	4	4	4	nicht auf alle registrierten Veränderung aufmerksam registriert, Abfolge mehrerer Hanldungen festgelegt, nicht immer eindeutige Rollenzuweisung, nicht immer Bedeutung klar, verschiedene Hanldungspläne entwickelt, nicht Absich hinter den Handlungen immer klar,

56KGC	0	2	06:10	5	4	4	3	SA: erfasst teilweise die Situation, erfasst eingetretene Veränderungen, achten aufmerksam auf Infos, PF: plant partiell Abfolge von Schritten, Alternativen werden angedeutet, Konsequenzen werden bedacht, PE: hält sich an Plan, stellenweise Schritt für Schritt Umsetzung, Absicht wird genannt, konkrete Umsetzung eher unvollständig, TL: Team erkennt zT die Erfolge, diskutieren viel und verbessern sich, erkennen Stärken und Schwächen teils, Fehler teilweise bewusst. NB: Veränderung, weil Team sehr gut.	5	4	4	4	nicht verschiedene Handlungspläne, nicht immer eindeutige Rollenzuweisung, konkrete Umsetzung des Plan manchmal mit Unterbrechung, erkennen von Stärken und Schwächen, teilweise reflektieren von Schwächen
57KGC	0	3	00:58	4	4	4	3	SA: diskutieren teils was die Bedeutung der Veränderung ist, erfassen Situation teilweise, beachten nur manchmal Infos, die Aufgae beeinflussen, PF: plant partiell eine Abfolge, Alternativen werden angedeutet, Konsequenzen teilweise bedacht, PE: Team hält sich an den Plan, Absicht wird teils kommuniziert, konkrete Umsetzung unvollständig, TL: reflektieren teilweise über Stärken und Schwächen, erkennen Fehler vereinzelt	3	3	3	3	Bedeutung der Veränderung teilweise erfasst, nicht auf alle Informationen geachtet, partiell Abfolge mehrerer Handlungen, nicht immer eindeutige Rollen, Konsequenzen der Handlungen nicht immer bewusst, Absicht hinter den Handlungen nicht immer bewusst, Plan teilweise Schritt für Schritt umgesetzt, nicht immer eigene Erfolge erkannt, teilweise Stärken und Schwächen reflektiert
58KGC	0	2	03:00	3	4	3	3	SA: anfangs gute Erfassung der Situation, dann im Verlauf der Spiel etwas weniger, manchmal Beschäftigung mit der Bedeutung der Veränderungen, PF: Alternativen nur angedeutet, planen partiell eine Abfolge, beachten Konsequenzen zT, PE: Team hält sich an Plan, stellenweise Schritt für Schritt Umsetzung, TL: erkennen zT Erfolge und Stärken und Schwächen, teilweise Fehler bewusst, vereinzelt lernen aus Fehlern	5	5	5	5	
59KGC	0	2	15:50	4	3	3	4	SA: erfassen gegenwärtige Situation, beschäftigen sich teils mit Bedeutung der Veränderung, registrieren Veränderungen, PF: Alternativen werden angedeutet, mehrere Handlungen geplant, Konsequenzen teils bedacht, vereinzelt Rollenzuweisung, PE: hält sich an den Plan, setzen Plan Schritt für Schritt um, TL: reflektieren viel über Stärken und Schwächen, erkennen Fehler, lernen vereinzelt daraus	3	3	3	2	erkennen teilweise Fehler in ihren Handlungen, reflektieren manchmal über Stärken und Schwächen (was die Karten bedeuten), erkennen keine Erfolge, lernen nicht aus eigenen Fehlern
60KGC	0	2	00:46	5	4	2	4	SA: teilweise wird die Situation erfasst, Beschäftigung mit Bedeutung teilweise, PF: berücksichtigen Konsequenzen, legen Abfolge mehrererer Handlungen fest, deuten Alternativen an, PE: klappt in einer Phase gar nicht, ansonsten halten sie sich zT an Plan, konkrete Umsetzung unvollständig, manchmal Absicht erklärt, TL: erkennen Stärken und Schwächen, lernen aus Fehlern teils, erkennen teils Fehler	5	5	4	5	Veränderung und ihre Bedeutung erfasst, alternative Hanldlugspläne, eindeutige Rollen, Plan nicht vollständig durchgeführt weil Zeit vergangen ist, Absicht hinter Handlugnen ist bewusst, Plan fast wie geplant durchgeführt, erkennen von Erfolgen und Fehlern, aus Fehlern gelernt (die sagen ok jetzt müssen wir schneller machen)
61EGC1	1	3	01:45	5	4	3	3	SA: das Team erfasst die gegenwärtige Situation (am Anfang zwar keine klare Absprache darüber, aber man merkt, dass zwei es verstehen), ordnen teilweise den Veränderungen auch die richtige Bedeutung zu, erfassen die eingetretenen Veränderungen, PF: planen eine Abfolge, Konsequenzen werden zT bedacht, vereinzelt Rollenzuweisung, PE: Team hält sich an den Plan, stellenweise Schritt für Schritt Umsetzung, TL: erkennen zT Erfolge und gute Lösungen, Stärken und Schwächen in manchen Positionen	4	3	4	4	nicht auf alle Informationen geachtet, die einen Einfluss auf Aufgabe haben, nicht viele alternative Pläne, Konsequenzen werden nicht immer berücksichtigt, nicht so eindeutige Rollenzuweisung, Mitglieder nicht über Absicht informiert, Team hält sich an entwickelten Hadnlungsplan, Erfolge erkannt aber nicht über Stärken und Schwächen viel reflektiert

62EGC1	1	3	06:02	2	3	2	1	SA: Team erfasst teils die Situation, versteht aber nicht alles, überlegt nicht welche Bedeutung die Veränderung haben könnte, übersieht Veränderungen, PF: keine Alternativen, planen partiell Abfolge, beachten Konsequenzen nicht, PE: halten sich zT an Plan, abweichende Reihenfolge, keine konkrete Umsetzung, TL: lernen nicht aus Fehlern, erkennen keine Stärken und Schwächen bzw. wenn dann viel zu spät	1	2	2	1	keine Erfaasung der Veränderung und ihrer Bedeutung, partiell Abfolge von Hadnlungen, keine alternative Pläne, Konsequenzen werden nicht beachtet, Schritte durchgeführt die nicht im Plan gehören, Teammitglieder informieren nicht über Absicht ihrer Hadnlungen, keine Reflektion, Kein Lernen von Fehlern (zwei mal nacheinander von unten geschossen obwohl es nicht bringt), beschäftigen sich
63EGC1	1	2	06:12	4	4	4	4		4	5	4	5	Baseline
64EGC1	1	3 + 4	10:10	4	4	3	3	SA: erfasst Situation teils, manchmal auch Bedeutungszuweisung der Veränderung, PF: wenig Alternativen, plant Abfolge mehrerer Handlungsschritte, Konsequenzen werden zT bedacht, PE: konkrete Umsetzung unvollständig, stellenweise Schritt für Schritt Umsetzung, TL: reflektieren teilweise, Fehler nicht bewusst	5	5	5	5	Alternative Pläne angedeutet, Konsequenzen bei Planetnwicklung berücksichtigt, Abfolge mehrerer Schritte, eindeutige Rollen, Plan Schritt für Schritt umgesetzt, Teammitglieder informieren über Absicht, Team erkennt Erfolge (dass sie gewinnen werden), reflektieren über Stärken und Schwächen (welche Karten jeder Person hat und Position um die beste Strategie zu finden)
65EGC2	1	3	01:55	5	4	4	3	SA: Situation wird gut erfasst, beschäftigen sich mit der Bedeutung und den eingetretetenen Veränderungen PF: keine Alternativen, entwerfen Plan, Konsequenzen teils bedacht, PE: hält sich zT an den Plan, Umsetzung teils Schritt für Schritt, TL: reflektieren teilweise über Stärken und Schwächen, teils Bewusstsein für Fehler	5	5	5	5	Veränderung und ihrer Beduetung erfasst, aufmerksam Informationen gesammelt die Einfluss auf Aufgabe haben, verschiedene Handlungspläne entwickelt, Konsequenzen hinter Handlungen werden berücksichtigt, eindeutige Rollen, Plan wird wie geplant umgesetzt, alle über Absicht der Handlungen informiert, Erfolge werden erkannt, reflektion über bisherigen Handlungen - Stärken und
66EGC2	1	3	05:25	4	4	3	3	SA: Team erfasst die gegenwärtige Situation, ordnet den Veränderungen die entsprechende Bedeutung zu, beachten manchmal Informationen die direkt mit Gruppenziel zusammenhängen, PF: Alternativen werden angedeutet, entwickeln Handlungsplan, berücksichten teils Konsequenzen, PE: halten sich an Plan, teils schrittweise Umsetzung, TL: reflektieren, erkennen Fehler teils, erkennen Möglichkeiten	5	5	5	5	Veränderung und ihre Bedeutung erfasst, verschiedene Pläne entwickelt, Abfolge mehrerer Handlungen, klare Rollenzuweisung, Plan wie diskutiert durchgeführt, Absicht hinter Handlungen bekannt, Plan wird Schritt für Schritt umgesetzt, Erfolge erkannt, über Strärken und Schwächen reflektiert
67EGC2	1	2	12:39	5	5	5	4	SA: super, versteht gegenwärtige Situation, kalkuliert auch Schutzpunkte mit ein, ordnet auch den Veränderungen die entsprechende Bedeutung zu, PF: entwickeln Plan, deuten Alternativen an, sind sich der Konsequenzen bewusst, PE: halten sich an Plan, Schrittweise Durchführung, TL: reflektieren, überlegen was am sinnvollsten ist, erkennen teils Stärken und Schwächen und Erfolge	5	5	5	5	Veränderung und ihre Bedeutung erkannt, Informationen gesammelt die einen Einfluss auf Aufgabe haben, Plan formuliert, mehrere Schritte geplant, Konsequenzen der Handlungen berücksichtigt, Plan Schritt für Schritt umgesetzt, Teammitglieder über Absicht hinter Handlungen informiert, Umsetzung des Plan ohne Unterbrechung, erkennen von Erfolg, Reflektion über Stärken

68EGC2	1	2	10:25	2	3	2	1	SA: teilweise wird die Situation erfasst ,aber kein Verständnis der Bedeutung der aufgetretenen Veränderungen, PF: Alternativen wenn überhaupt angedeutet, planen partiell, vereinzelt Rollenzuweisung, PE: vollziehen Handlungsschritte teils nach Plan, teils abweichend und ohne Überlegung, TL: reflektieren nicht, lernen nicht aus Fehlern	3	2	2	2	teilweise Veränderung und ihre Bedeutung erfasst, nicht auf alle Informationen geachtet die einen Einfluss auf die Aufgabe haben, Konsequenzen der Handlungen werden zum teil erfasst, alternative Handlungspläne angedeutet, keine eindeutige Rollenzuweisung, Teammitglieder vollziehen Schritte die nicht im entwickelten Plan erhalten sind, teilweise über Absicht informiert, unvollständige
69EGC3	1	4	01:20	5	4	4	4	SA: erfassen Situation, erkennen auch im Laufe des Spiels die Bedeutung der eingetretenen Veränderungen, PF: deuten Alternativen an, entwickeln Plan, beachten Konsequenzen, PE: halten sich an den Plan, konkrete Umsetzung nicht vollständig, mehr so aus der Situation heraus, TL: lernen aus Fehlern und erkennen Stärken und Schwächen (v.a. am Ende)	5	4	4	5	Erfassung gegenwärtiger Situation und ihrer Bedeutung, alternative Handlungspläne diskutiert, nicht immer eindeutige Rollenzuweisungen, Abfolge mehrerer Hadnlungen, Absicht hinter den Handlungen bekannt, Umsetzung des Plan fast ohne Unterbrechung, an Plan gehalten, Stärken reflektiert, Erfolge erkannt
6KGA	0	3	02:46	5	4	4	4		5	4	4	4	ein bisschen undeutige Konsequenzen der Handlungen und nicht so eindeutig wer was macht, Handlungsplan stellenweise Schritt für Schritt um, unvollständige Umsetzung des Plans,
70EGC3	1	3	02:51	3	2	2	2	SA: verstehen Veränderung nicht, erfassen Situation nur oberflächlich und teilweise, PF: keine Alternativen, planen partiell, beachten Konsequenzen des Plans teilweise aber liegen oft falsch, PE: führen dann andere Dinge aus als vorher geplant, weil sie nicht alles beachtet haben, keine konkrete Umsetzung, TL: erkennen zT Erfolge aber lernen nicht aus Fehler bzw. nehmen Fehler nicht wahr (wenn nur vereinzelt), Stärken und Schwächen werden auch nicht wahrgenommen	2	2	2	2	teilweise Erfassung der gegenwärtigen Situation, nicht die Bedeutung der Veränderung überlegt, manchmal Informationen die einen Einfluss auf Aufgabe haben gesammelt, keine eindeutige Rollenzuweisung, partiell Abfolge mehrerer Handlungen, Konsequenzen von Hadnlungen manchmal verstanden, Handlungsschritte durchgefürt die nicht geplannt waren, Teammitglieder klären nicht
71EGC3	1	3 + 4	09:02	3	2	1	1	SA: erfassen Situation nur teilweise und auch nicht richtig, Bedeutungen der Veränderungen sind nicht wirklich klar, PF: Konsequenzen werden nicht beachtet, keine Alternativen, machen einfach irgendwas ohne wirklich vorher etwas geplant zu haben, PE: führen einfach Schritte durch ohne genau zu überlegen, kein Aufklären usw., TL: reflektieren nicht, erkennen nicht was sie falsch gemacht haben	2	3	2	1	gegenwärtige Situation teilweise erfasst, die Bedeutung der Veränderung würde nicht überlegt, Konsequenzen von Handnlugen teilweise geachtet, teilweise eindeutige Rollen, alternative Pläne werden angedeutet, Schritte durchgeführt die nicht im Plan waren, Teammitglieder sind teilweise über Absicht der Handlungen informiert, unvollständige Umsetzung des Plans, keine Reflektion über Stärken und Schwächen
72EGC3	1	3 + 4	10:47	5	4	4	4		5	5	4	3	Baseline
7KGA	0	3	03:30	2	2	3	1		2	2	3	2	gegenwärtige Situation ein bisschen verstanden, kein wirkliches Plan, nur einige Vorschläge, diese werden nicht Schritt für Schritt umgesetzt, keine klare Rollenzuweisung, Absicht der Handlungen ist der Gruppe nicht bewusst, erkennt einbisschen die Erfolge

7KGA	0	3	03:30	2	2	3	1		2	2	3	2	gegenwärtige Situation ein bisschen verstanden, kein wirkliches Plan, nur einige Vorschläge, diese werden nicht Schritt für Schritt umgesetzt, keine klare Rollenzuweisung, Absicht der Handlungen ist der Gruppe nicht bewusst, erkennt einbisschen die Erfolge
8KGA	0	3	13:48	4	4	3	4		2	2	2	2	nur besprochen, dass eine Kanone blockiert sein wird, keine Entwicklung vom Plan, manchmal einige Schritte besprochen und teilweise Rollenzuweisung, Handlungen durchgeführt ohne dass diese bewusst sind, Absicht der Handlungen nicht klar, ein bisschen über Fehler von erster Phase gelernt - schneller danach aggiert und mehrere gleichzeitig geschossen
9KGA	0	2	03:15	4	4	4	3		3	3	3	2	Abfolge mehrerer Handlungen aner kein Alternativplan, partiell einige Handlungen geplant,

16EGA2	1	4	03:26	1	2	3	1		5	4	4	5	klare Bedeutung der gegenwärtigen Situation, mehrmals diskutiert, was die neue Bedrohung bedeutet, Handlungsablauf aus mehreren Schritten entwickelt aber nicht sehr klare Rollenverteilung, Plan umgesetzt aber nicht immer Schritt für Schritt, reflektiert über jetzige Situation, Stärke und Schwäche bewusst (z.b. ich schisse nicht, weil kein Sinn da nur wenig Schusskraft)
17EGA1	1	3	13:26	5	4	5	4	erfasst gegenwärtige Situation und verteilt sich oben, registriert Veränderungen, entwickelt Handlungsplan, hält sich an Plan, informiert andere Mitglieder, Umsetzung Schritt für Schritt, insegsamt sehr gute Leistung, Team wirkt bedacht und strukturiert, TL: erkennt Stärken und Schwächen, auch zT eigene Erfolge	5	4	4	4	nicht eindeutige Rollenzuweisung, nicht Schritt für Schritt Plan umgesetzt, vielleicht auf eine 5 in Team Learning - reflektieren Stärken und Schwächen, sehen den Erfolg

Appendix B: Chapter 3

B.1 Novel subsequent task


NASA-Weltraumspiel

Ihre Überlebenschance hängt davon ab,
ob Sie in diesem Spiel die richtigen Ausrüstungsgegenstände
für eine Mondexpedition auswählen können

<u>Situationsbeschreibung:</u>

Ihr Raumschiff hat auf dem Mond gerade eine Bruchlandung gebaut. Eigentlich sollten Sie ihr Mutterschiff treffen, das sich 200 Meilen entfernt auf der hellen (der Sonne zugewandten) Seite des Mondes befindet. Die Bruchlandung hat ihr Raumschiff völlig zerstört. Die Überlebenschance für Sie und Ihre Crew hängt davon ab, ob Sie das Mutterschiff erreichen. Von Ihrer Ausrüstung sind nur 15 Gegenstände ganz geblieben. Sie müssen jetzt die Ausrüstungsgegenstände auswählen, die für die Überwindung der 200 Meilen bis zum Standort Ihres Mutterschiffes am wichtigsten sind.

<u>Aufgabestellung:</u>

Ihre Aufgabe besteht darin, die aufgezählten Gegenstände in eine Rangordnung zu bringen. Machen Sie dies für sich, unbeeinflusst von den übrigen Crewmitgliedern. Setzen Sie den Gegenstand, den sie für den Marsch zum Mutterschiff am wichtigsten halten, auf den 1. Rangplatz Ihrer Liste, den zweitwichtigsten an die 2. Stelle und so fort. Der unwichtigste Gegenstand erhält den Rangplatz 15.

Schreiben Sie Ihre Reihung unter die Spalte „persönlich“. Sie haben dafür 5 Minuten Zeit. Nach diesen 5 Minuten müssen Sie gemeinsam mit Ihren Crewmitgliedern eine Team-Rangskala erstellen. Dafür werden Sie 10 Minuten Zeit haben.


NASA- Weltraumspiel
CHECKLISTE für Ihre Rangskala der Ausrüstungsgegenstände:

NASA	Team	persönlich	Ausrüstungsgegenstände	Begründung
			Streichhölzer	
			Lebensmittelkonzentrat	
			50 Fuß Nylonseil	
			Fallschirmseide	
			tragbares Heizgerät	
			zwei Pistolen 0,45 Kal.	
			Trockenmilch	
			zwei 100-Pfund –Tanks Sauerstoff	
			Stelllar- Atlas (Mondkonstellation)	
			sich selbst aufblasendes Lebensrettungsfloß	
			Magnetkompass	
			fünf Gallonen Wasser	
			Signalleuchtkugeln	
			„Erste-Hilfe“- Koffer mit Injektionsnadeln	
			UKW-Sender/ Empfänger (Sonnenenergie)	

B.2 Ethical approval

LMU LUDWIG-MAXIMILIANS UNIVERSITÄT MÜNCHEN

FAKULTÄT FÜR PSYCHOLOGIE UND PÄDAGOGIK
MUNICH CENTER OF THE LEARNING SCIENCES
LEARNING SCIENCES RESEARCH METHODOLOGIES

PROF. DR. MORITZ HEENE

[redacted]

[redacted]

München, 23.10.2015

Ihr Antrag an die Ethikkommission

Liebe [redacted]

die Ethikkommission hat sich in ihrer Sitzung am 19.10.2015 eingehend mit Ihrem Antrag bezüglich des Forschungsprojekts

„Der Team-Adaptations-Prozess: Eine experimentelle Beobachtung und Untersuchung"

beschäftigt. Gemäß §7, Absatz 4 teile ich Ihnen das Votum der Ethikkommission hiermit mit:

Es bestehen keine Bedenken gegen die Durchführung des Forschungsvorhabens.

Mit freundlichen Grüßen

[redacted]

Dienstgebäude
Leopoldstr. 13, Zi. 3520
80802 München

Öffentliche Verkehrsmittel
StadtBus 154, Haltestelle Giselastraße
U-Bahn U3/U6, Haltestelle Giselastraße

Bayerische Landesbank München
Kto. 24 868 BLZ 700 500 00
USt-IdNr. DE 811 205 325

B.3 Presentation with game‘s rules

Spieleinführung

1

Runde

2

Runde

7 Phasen (pro Phase ungefähr 1 Minute)

Jedes Crewmitglied:

5 Karten für 1. bis 3. Phase

&

5 Karten für 4. bis 7. Phase

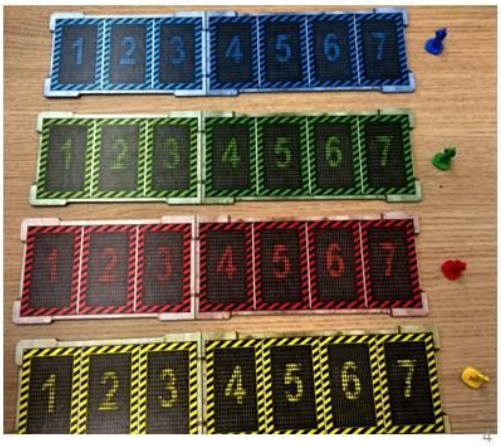
3

Aktionen

1 Karte (Aktion) pro Phase

Mögliche Aktionen

- **Sich bewegen**
- **Schießen**
- **Energie nachladen**
- **Navigieren**



4

Das Raumschiff & Die Crew

5

In der Mitte des Tisches sehen Sie den Raumschiffplan

6

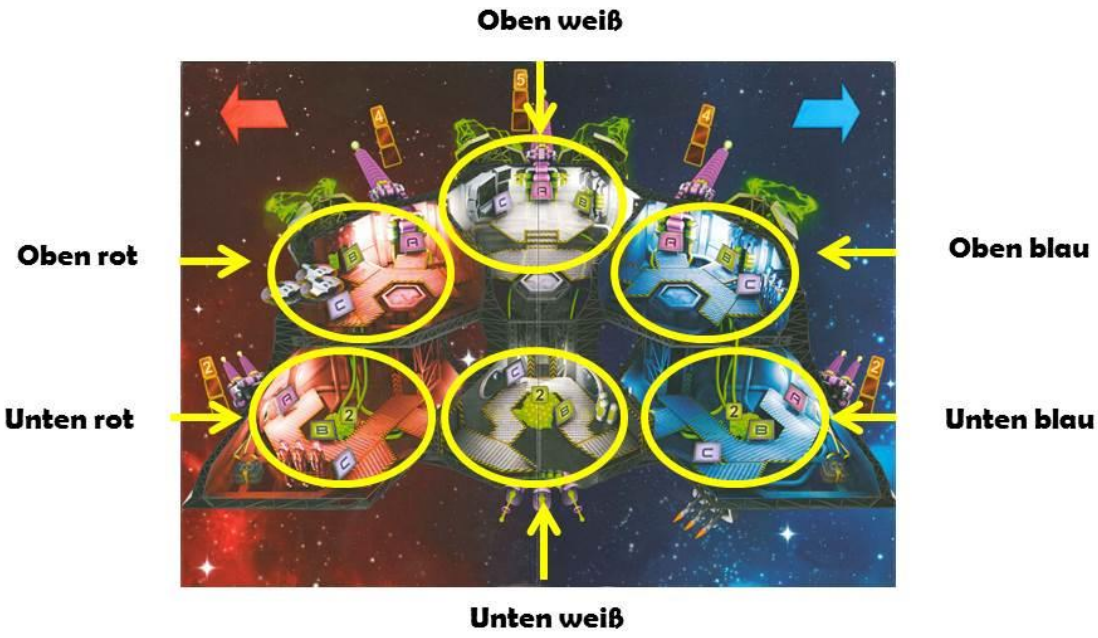
Das Schiff hat zwei Decks ...

Oberdeck

Unterdeck

7

... und 6 Stationen



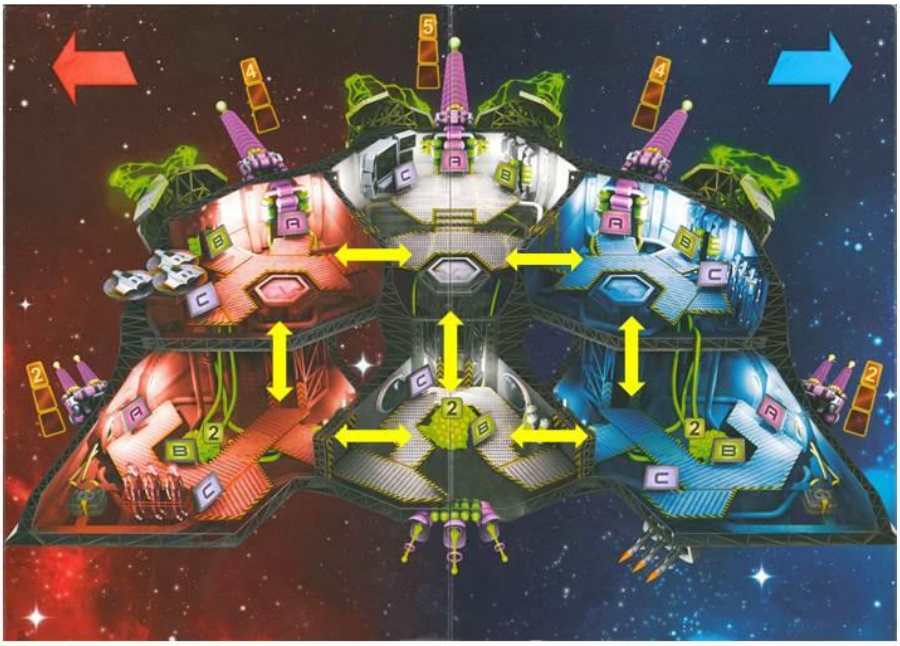
8

Am Anfang jeder Runde stehen alle Crewmitglieder auf der Brücke des Raumschiffes

9

Mit den Lifts können Sie sich zwischen den oberen und unteren Stationen fortbewegen.

Durch Türen sind die Stationen jedes Decks miteinander verbunden.



10

Die Systeme des Raumschiffes

11

Jede Station besitzt drei Systeme ...

Das Waffensystem A
(Schießen)

12

Das Waffensystem A besteht aus 5 Kanonen, die eine Schussstärke von 5, 4 oder 2 haben.

13

Crewmitglieder müssen sich zu der Kanone bewegen, um mit dieser Kanone schießen zu können.

14

Jede Station besitzt drei Systeme ...

Das Energiesystem B
(Energiesteine transportieren)

15

Zu Beginn des Spiels hat jede obere Station einen und jede untere Station zwei Energiesteine.

16

Crewmitglieder müssen sich zu einer Station bewegen, um von dort aus einen Energiestein zu transportieren.

17

Hinweis

Für <u>jeden</u> Schuss wird <u>ein</u> Energiestein verbraucht
(unabhängig von der Stärke der Kanone).

18

Hinweis

Nur wenn es in einer Station
gar keinen Energiestein mehr gibt,
kann man über B einen Energiestein
aus einer anderen Station dorthin
transportieren.

19

Jede Station besitzt drei Systeme ...

Das Navigationssystem C

20

Hinweis

Das Navigationssystem C muss von mindestens 1 Crewmitglied ...

- **einmal bis Aktion 3**
- **und einmal bis Aktion 7**

... aktiviert werden.

Wenn nicht: Raumschiff in höchster Gefahr!

21

Aktionen jedes Crewmitglieds im Raumschiff

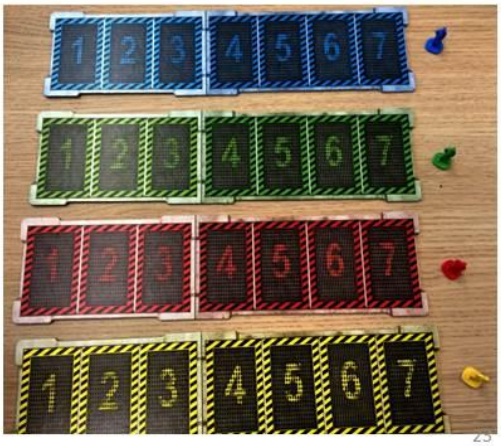
22

Aktionen

1 Karte (Aktion) pro Phase

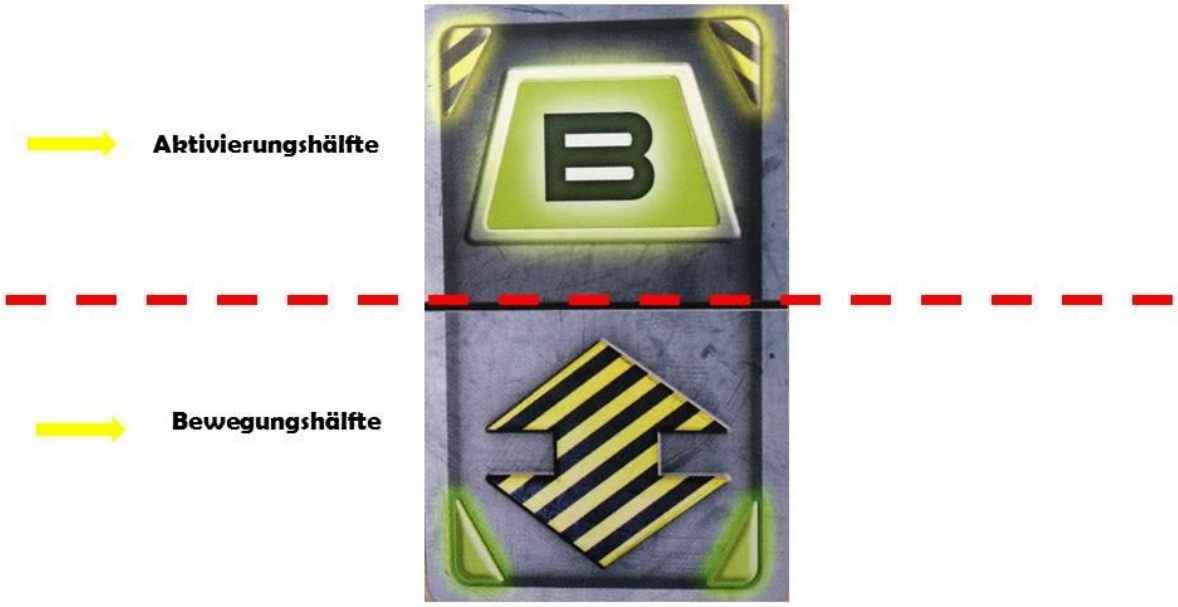
Mögliche Aktionen

- Sich bewegen
- Schießen
- Energie nachladen
- Navigieren



23

Jede Karte ist zweigeteilt,
in eine Bewegungs- und eine Aktivierungshälfte.



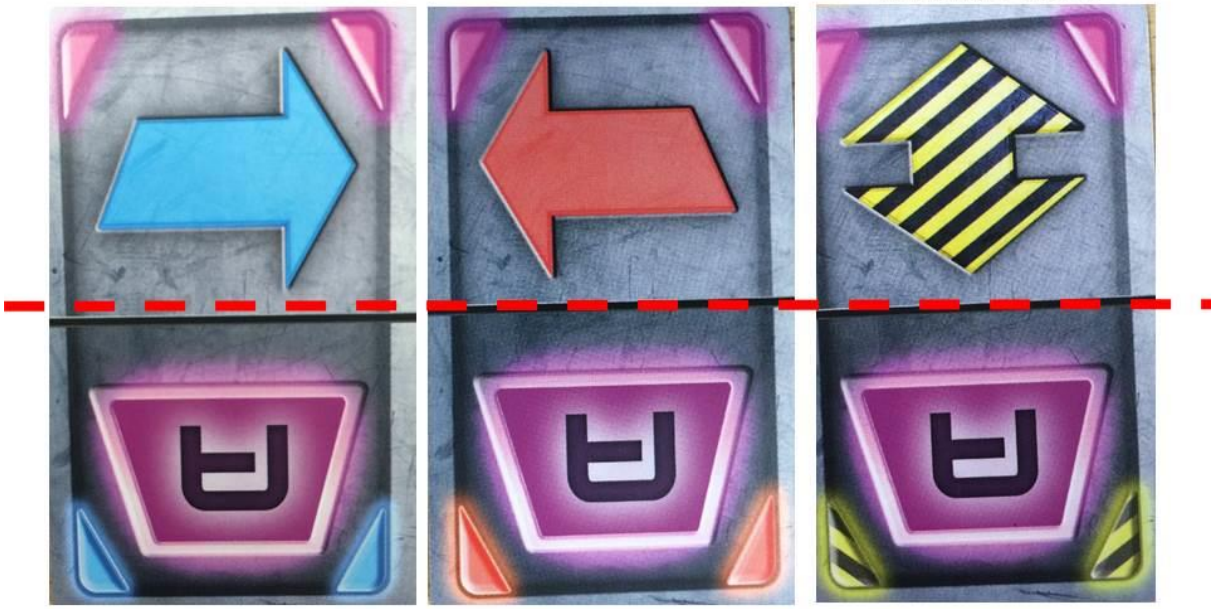
24

Die Bewegungskarten

Bewegung nach rechts

Bewegung nach links

Bewegung nach oben oder unten



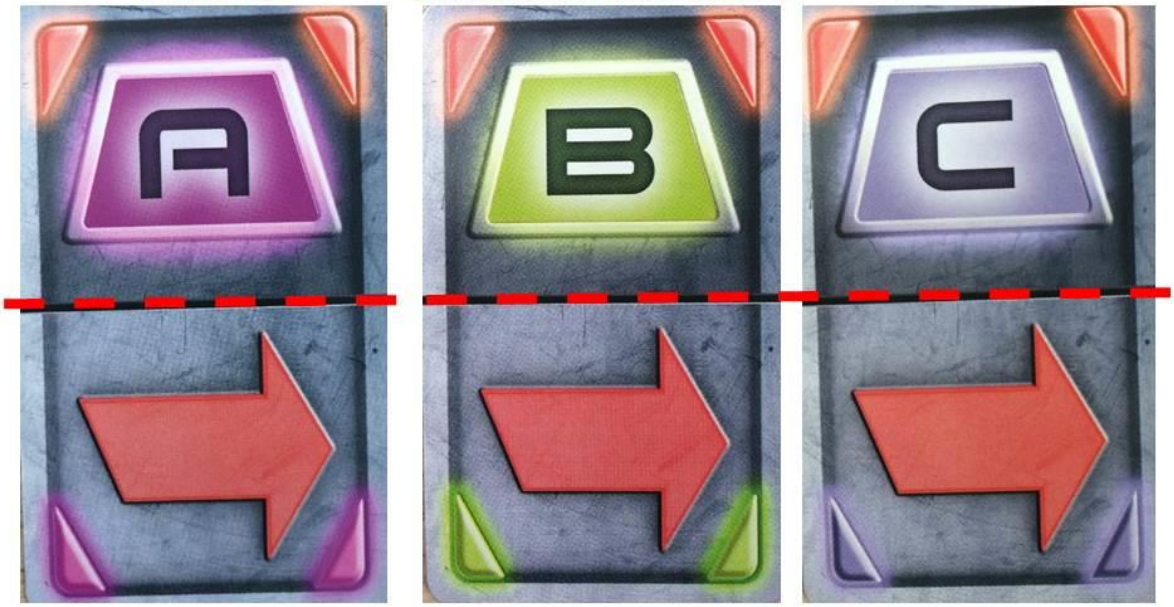
25

Die Aktionskarten

Aktivierung von Waffensystem A (Schießen)

Aktivierung von Energiesystem B (Energiestein transportieren)

Aktivierung von Navigationssystem C (Navigieren)



26

Will man sich nach links bewegen,
legt man die Karte mit der Bewegungshälfte nach oben hin.

Will man in einer Phase nichts tun, legt man einfach keine Karte auf das jeweilige Zahlenfeld.

Will man jedoch die Aktivierungshälfte nutzen, z.B. das Navigationssystem aktivieren, dreht man die Karte so, dass diese Hälfte nach oben zeigt.

Hinweis

Für jede Phase/Aktion ist ungefähr
<u>eine</u> Minute verfügbar!

Sobald die Minute vorbei ist,
darf man die Karte, die man gelegt hat,
nicht mehr verwenden
und nicht mehr verändern.

Die Bedrohung

29

Auftritt der Bedrohung:
Oberhalb des Raumschiffes gibt es drei Terrorbahnen

Linke Terrorbahn

Mittlere Terrorbahn

Rechte Terrorbahn

Die Bedrohung kann entweder ...

auftreten!

30

Die Bedrohung „Jäger“ erscheint immer am Anfang der zweiten Phase.

Der „Jäger“ hat …

31

Hinweis

Die Bedrohung bewegt sich auf der linken, mittleren oder rechten Terrorbahn und kommt nach jeder Phase näher und näher.

Sie müssen die Bedrohung beschießen, um das Raumschiff zu verteidigen.

32

Raumschiff vor Bedrohung beschützen

33

Hinweis

Wenn man die Bedrohung beschießt, muss man die Schussstärke aller Waffen zusammenrechnen, welche die Bedrohung anvisiert haben.

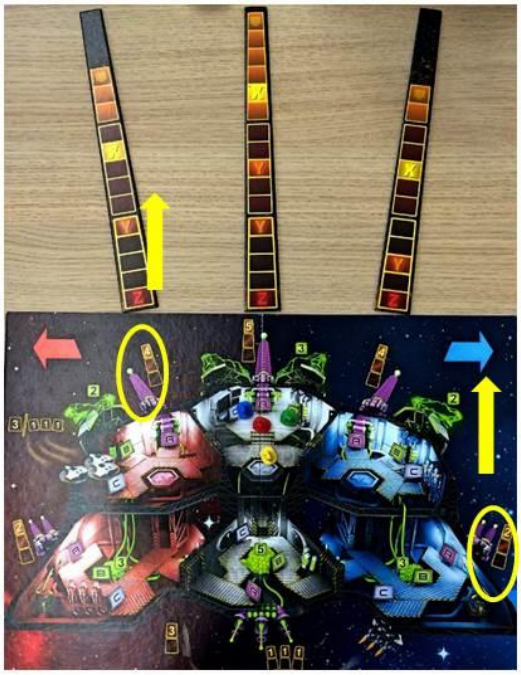
Von dieser Gesamtstärke zieht man die Schutzpunkte der Bedrohung ab.

34

Beispiel:
Wenn zwei Spieler während der Aktion 2 gleichzeitig schießen (Aktivierungshälfte A auf Feld 2 zeigt nach oben), ...

35

... einer von der oberen roten Station (Stärke 4) und einer von der unteren blauen Station (Stärke 2) (gesamte Schussstärke 6), ...



36

... dann werden von der gesamten Schussstärke 2 Schutzpunkte abgezogen ... (Restschussstärke 4)

37

... da die Bedrohung 8 Lebenspunkte hat, wird sich die Bedrohung in der dritten Phase mit 4 Lebenspunkten vorwärts bewegen.

38

Hinweis

Es kann von jeder Station gegen die Bedrohung geschossen werden,

unabhängig davon, auf welcher Terrorbahn (linke, mittlere, rechte) die Bedrohung erscheint und sich bewegt.

39

Angriff der Bedrohung

40

Wenn der „Jäger“ einen Zug überlebt hat, dann bewegt er sich auf der Terrorbahn mit einer Geschwindigkeit von drei Schritten vorwärts.

Bedrohungs-geschwindigkeit

41

Wenn der „Jäger“ einen Marker der Terrorbahn (X oder Y) erreicht oder überschreitet, führt er einen Angriff aus.

1. **Angriff:**
   keine Energie auf der jeweiligen oberen Station

2. **Angriff:**
   Schussstärke der Kanone(n) der jeweiligen Station(en) (ober- und unterhalb) um einen Punkt reduziert

3. **Angriff:**
   Kanone der jeweiligen oberen Station funktioniert nicht mehr

42

Ein Beispiel:
Wenn der „Jäger“ am Anfang der zweiten Phase auf der mittleren Terrorbahn erscheint, ...

43

... und während der zweiten Phase nicht bekämpft wird, bewegt sich der „Jäger“ drei Schritte in Richtung Raumschiff. In der dritten Phase hat er keinen Marker erreicht oder überschritten, deswegen gibt es hier keinen Angriff.

44

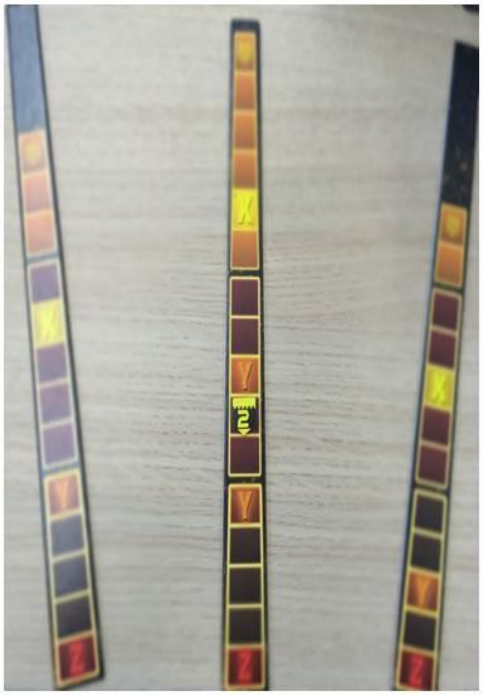
**Wenn der „Jäger“ in der dritten Phase wieder nicht bekämpft wird,
dann bewegt er sich weitere drei Schritte.
Jetzt hat der „Jäger“ einen Marker überschritten.**

45

**Der „Jäger“ führt seine erste Aktion aus,
er zerstört den Energiestein der oberen weißen Station.**

46

**Wenn der „Jäger“ in der vierten Phase immer noch nicht zerstört ist,
dann bewegt er sich weitere drei Schritte.
Der nächste Marker wird überschritten.**



47

Die Stärke der oberen weißen Kanone wird auf 4 reduziert.

48

Wenn der „Jäger“ in der vierten Phase immer noch nicht zerstört ist, dann bewegt er sich weitere drei Schritte. Der nächste Marker wird überschritten.

49

Die Kanone der oberen weißen Station funktioniert nicht mehr.

50

Wenn der „Jäger“ in der sechsten Phase immer noch nicht zerstört ist, und auf dem letzten Feld seiner Terrorbahn ankommt, wird das Raumschiff angegriffen und ...

... das Spiel ist verloren!

51

Hinweis

Wenn der 1. Angriff (Energiereduzierung) nicht ausgeführt werden kann, wird stattdessen der 2. Angriff (Schussstärken-reduzierung) ausgeführt.

Daraus folgend aktiviert der nächste Marker den 3. Angriff.

52

Ziele

So gut wie möglich miteinander kooperieren, um das Raumschiff zu schützen!

Schnelle und effektive Bekämpfung der Bedrohung wird belohnt!!

53

Viel Spaß!

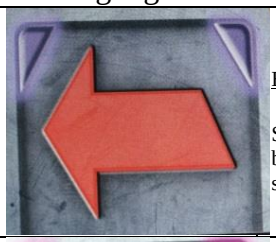
54

B.4 Overview of game's rules

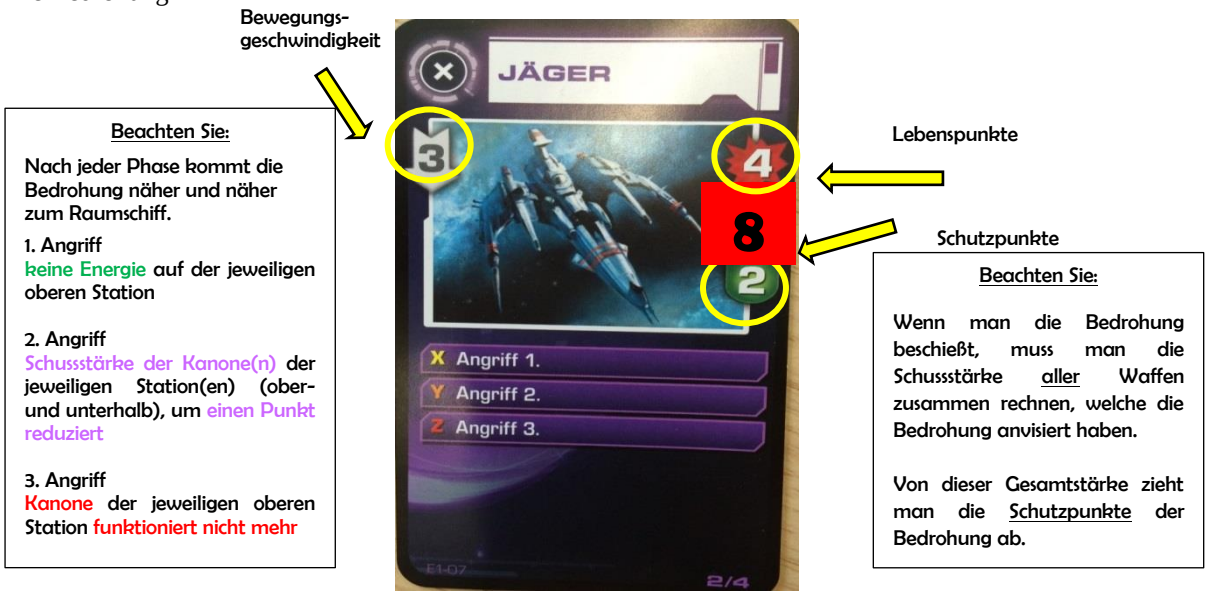
Crewmitglied: Rot/Blau/Gelb/Grün

Pro Runde – 7 Phasen

Pro Phase – 1 Aktion (Schießen, Bewegen, Navigieren oder Energienachladen)

Aktionskarten		Bewegungskarten	
	A – Schießen Beachten Sie: Für jeden Schuss 1 Energiestein Bedrohung kann von allen Stationen geschossen werden		Nach links bewegen Beachten Sie: Sie müssen sich zu der Kanone bewegen, um mit dieser Kanone schießen zu können.
	B – Energie nachladen Beachten Sie: Nur wenn es in einer Station gar keinen Energiestein mehr gibt, kann man über B einen Energiestein aus einer anderen Station dorthin transportieren.		Nach rechts bewegen Beachten Sie: Sie müssen sich zu einer Station bewegen, um von da aus, ein Energiestein zu transportieren.
	C- Navigieren Beachten Sie: Das Navigationssystem C muss von mindestens 1 Crewmitglied… • Einmal bis Aktion 3 • und einmal bis Aktion 7 … aktiviert werden.		Nach oben oder nach unten bewegen Beachten Sie: Sie können sich nur mit den Lifts und durch die Türen bewegen (nicht diagonal).

Die Bedrohung



B.5 Instructions for examiner

Zeitplan

- Begrüßung, Kennenlernen (Namenschilder) und Einleitung
- Standardisierte Einleitung zur Studie (Power-Point Präsentation mit Ton)

Mögliche Fragen der Teilnehmer beantworten

- Probe-Runde (7 Minuten Mission, 2 Minuten Auswertung, 1. Fragebogen ausfüllen)

Mögliche Fragen der Teilnehmer beantworten

- 1. Runde (7 Minuten Mission, 2 Minuten Auswertung, 2. Fragebogen ausfüllen)
- 2. Runde (7 Minuten Mission, 2 Minuten Auswertung, 3. Fragebogen ausfüllen)
- 3. Runde (7 Minuten Mission, 2 Minuten Auswertung, 4. Fragebogen ausfüllen)
- 4. Runde (7 Minuten Mission, 2 Minuten Auswertung, 5. Fragebogen ausfüllen)
- NASA Aufgabe
- Abschluss

Nicht vergessen: Vor Beginn Checkliste!!

Einleitung

Herzlich Willkommen zu unserem Experiment und vielen Dank für Ihre Teilnahme.

Ich würde vorschlagen, dass jeder von Ihnen sein Name auf das farbige Blatt vor Ihnen schreibt, und sich kurz vorstellt.

Vielen Dank.

Jetzt möchte ich kurz erklären, wie die nächsten eineinhalb Stunden aussehen werden.

Sie werden insgesamt 5 Mal ein Teamspiel spielen. Die erste Runde ist eine Übungsrunde, die anderen 4 werden normale Spielrunden sein. zu Beginn jeder Runde kann es sein, Ereignisse auftreten können, die ihre Handlungsmöglichkeiten beeinflussen. Zwischen den Runden werden Sie kurze Fragebögen zu Ihrer Teamarbeit ausfüllen. Am Ende dieser fünf Runden werden Sie eine andere kurze Gruppenaufgabe lösen. Insgesamt wird das Experiment 1,5 Stunden dauern.

Zu dem Spiel:

Sie befinden sich in dem Raumschiff „Space Bombe“. Ihr Raumschiff ist von einer Bedrohung angegriffen, und ihr Ziel ist es, mit einander zu kooperieren, um diese Bedrohung effektiv zu bekämpfen und das Raumschiff zu beschützen. Nach jedem Spielzug kommt die Bedrohung näher und näher. Je besser Sie sich als Team verteidigen und je schneller Sie die Bedrohung bekämpfen, desto mehr werden Sie belohnt. Jeder von Ihnen kann bis zu 20 Euro verdienen.

Jeder von Ihnen hat eine farbige Spielfigur und die farblich dazu passende Aktionstafel mit den Ziffern 1-7 vor sich. Vor Ihnen haben Sie auch ein Handout mit der gleichen Farbe wie Ihre Spielfigur. In diesem Handout werden alle Aktionen, die Sie durchführen können, und die wichtigsten Regeln des Spieles zusammengefasst. Vor Ihnen sehen Sie auch eine andere farbige Mappe. Diese Mappe enthält alle Fragebögen, die Sie während dieser Sitzung ausfüllen müssen. Der Versuchsleiter wird Ihnen informieren, wann die umblättern müssen, um den jeweiligen Fragebogen auszufüllen.

Jetzt möchte ich Ihnen das Spiel ausführlicher erläutern. Bitte passen Sie gut auf!

Spieleinführung – Power Point Präsentation

Runde

Folie 3: Wie davor gesagt, wird es insgesamt 5 Spielrunden geben. Eine Probe-Runde und vier Runden, in denen Sie das Raumschiff richtig verteidigen müssen.

Jede Runde besteht aus 7 Phasen; jede Phase wird ungefähr 1 Minute dauern.

Jeder von Ihnen hat neben seiner farbigen Aktionstafel 10 Karten.

Die ersten 5 Karten sind dafür da, dass Sie Ihre Aktionen von der 1. bis zur 3. Phasen ausführen können, und die nächsten 5 Karten sind für die Phasen 4 bis 7.

Der Versuchsleiter wird Sie während jeder Runde informieren, wann die nächste Phase begonnen hat.

Folie 4: Mit Hilfe dieser Karten können Sie pro Phase eine Aktion durchführen. Mögliche Aktionen in diesem Spiel sind: sich bewegen, schießen, Energie nachlasen und navigieren

Das Raumschiff und die Crew

Folie 6: In der Mitte des Tisches sehen Sie den Raumschiffplan.

Folie 7: Das Raumschiff hat zwei Decks: das Oberdeck und das Unterdeck

Folie 8: und 6 Stationen: die obere rote Station, die obere weiße, die obere blaue, die untere rote, die untere weiße und die untere blaue Station.

Folie 9: Am Anfang jeder Runde stehen Sie, die Crewmitglieder, auf der ***Brücke*** des Raumschiffes.

Folie 9: Mit den Lifts können Sie sich zwischen den oberen und unteren Stationen fortbewegen. Zum Beispiel von der oberen roten Station zu der unteren roten Station

Folie 10: Durch die Türen werden die Stationen jedes Decks miteinander verbunden. Zum Beispiel, können Sie sich von der oberen weißen rechts zu der oberen blauen Station bewegen.

Im Raumschiff dürfen Sie sich nicht diagonal bewegen.

Die Systeme des Raumschiffes

Folie 12: Jede Station des Raumschiffs besitzt drei Systeme.

Das erste System ist das Waffensystem A. Mit Hilfe des Waffensystems kann man die Bedrohung abschießen um das Raumschiff zu verteidigen.

Folie 13: Das Waffensystem A besteht aus 5 Kanonen,
die eine Schussstärke von 5, 4 oder 2 haben. Oberhalb jeder Kanone können Sie sehen, mit welcher Stärke die jeweilige Kanone schießen kann.

Folie 14: Sie müssen sich zu jeder Kanone erst hin bewegen, damit Sie mit dieser Kanone schießen können. Zum Beispiel, müssen Sie sich erstmal nach links bewegen, um mit der Kanone der oberen roten Station mit einer Stärke von 4 zu schießen.

Folie 15: Das zweite System der Stationen, ist das Energiesystem B, mit dem Sie Energiesteine zwischen Stationen transportieren können.

Folie 16: Zu Beginn des Spiels hat jede obere Station **einen** und jede untere Station **zwei** Energiesteine.

Folie 17: Sie müssen sich zu einer Station erstmal hin bewegen, damit Sie von da aus ein Energiestein transportieren können. Zum Beispiel, wenn es in der unteren roten Station keine Energiesteine mehr gibt, müssen Sie sich entweder in die obere rote Station oder in die unteren weißen Station bewegen, um von dort aus, ein Energiestein zu der unteren roten Station zu transportieren.

Folie 18: Hinweis! Für jeden Schuss wird ein Energiestein verbraucht, unabhängig von der Stärke der Kanone.

Folie 19: Hinweis! Nur wenn es in einer Station gar keinen Energiestein mehr gibt, kann man über B einen Energiestein aus einer anderen Station dorthin transportieren.

Folie 20: Das dritte System, das Raumschiff, ist das Navigationssystem C und wird benutzt um den aktuellen Standort des Raumschiffes zu berechnen.

Folie 21: Hinweis: Das Navigationssystem C muss von mindestens 1 Crewmitglied einmal bis Aktion 3 und einmal bis Aktion 7 aktiviert werden. Wenn nicht, wird sich das Raumschiff in höchster Gefahr befinden.

Aktionen jedes Crewmitglieds im Raumschiff

Folie 23: Ich möchte Sie wieder daran erinnern, dass Sie eine Aktion bzw. eine Karte pro Phase auswählen können. Die möglichen Aktionen, die Sie haben sind, sich im Raumschiff zu bewegen, gegen die Bedrohung zu schießen oder einen Energiestein pro Aktion nachzuladen und zu navigieren.

Folie 24: So können Sie mit Ihrer Karten eine Aktion ausführen: Jede Karte ist zweigeteilt: in eine Bewegungs- und eine Aktivierungshälfte.

Folie 25: Es gibt insgesamt 3 Bewegungskarten: Bewegung nach rechts, Bewegen nach links, und Bewegung nach oben oder unten.

Folie 26: Es gibt noch 3 Aktionskarten: Die Karte A, mit der Sie das Waffensystem aktivieren können, um mit einer Kanone zu schießen, die Karte B, mit der Sie ein Energiestein pro Karte von einer Station zu einer anderen transportieren können, und die Karte C, mit der Sie sich navigieren können.

Folie 27: Will man sich nach links bewegen, legt man die Karte mit der Bewegungshälfte oben hin.

Will man in einer Phase nichts tun, legt man einfach keine Karte auf das jeweilige Zahlenfeld.

Will man jedoch die Aktivierungshälfte nutzen, z.B. das Navigationssystem aktivieren, dreht man die Karte so, dass die Hälfte nach oben zeigt.

Folie 28: Für jede Phase/Aktion ist ungefähr eine Minute verfügbar!

Sobald die Minute vorbei ist, darf man die Karte, die man gelegt hat, nicht mehr verändern und nicht mehr verwenden.

Der Versuchsleiter wird Sie informieren, wann die Phase vorbei ist.

Die Bedrohung

Folie 30: Wie ganz am Anfang besprochen, wird Ihr Raumschiff von einer Bedrohung angegriffen. Diese Bedrohung kann am Anfang der linken, der mittleren oder der rechten Terrorbahn, oberhalb des Raumschiffes auftreten.

Folie 31: Der Jäger, die Bedrohung, erscheint immer am Anfang der zweiten Phase. Bitte auf die Informationen vom Versuchsleiter aufpassen, auf welcher Terrorbahn der „Jäger“ auftreten wird.

Der Jäger hat 8 Lebenspunkte, 2 Schutzpunkte, und eine Bewegungsgeschwindigkeit von 3.

Folie 32: Hinweis! Die Bedrohung bewegt sich entweder auf der linken, mittleren oder rechten Terrorbahn und kommt nach jeder Phase näher und näher zum Raumschiff.

Sie müssen die Bedrohung abschießen, um das Raumschiff zu verteidigen.

Raumschiff vor Bedrohung beschützen

Folie 34: Hinweis! Wenn man die Bedrohung beschießt, muss man die Schussstärke aller Waffen zusammen rechnen, welche die Bedrohung anvisiert haben.

Von dieser Gesamtstärke zieht man die Schutzpunkte der Bedrohung ab.

Folie 35: Zum Beispiel: Wenn zwei Spieler während der Aktion 2 gleichzeitig schießen (beide nehmen die Aktionskarte, und legen die Karte so, dass die Aktivierungshälfte A auf Feld 2 nach oben zeigt)

Folie 36: …ein Crewmitglied von der oberen roten Station (Stärke 4) und ein Crewmitglied von der unteren blauen Station (Stärke 2) also mit einer Gesamtschussstärke von 6…

Folie 37: …dann werden von der gesamten Schussstärke 2 Schutzpunkte abgezogen…
(Restschussstärke 4)

Folie 38: …da die Bedrohung 8 Lebenspunkte hat,
wird sich die Bedrohung in der dritten Phase
mit 4 Lebenspunkte statt 8 vorwärts bewegen.

Folie 39: Hinweis! Es kann von jeder Station gegen die Bedrohung geschossen werden, unabhängig auf welcher Terrorbahn (linke, mittlere, rechte), die Bedrohung erscheint und sich bewegt.

Angriff der Bedrohung

Folie 41: Wenn der „Jäger“ einen Zug überlebt hat, dann bewegt er sich vorwärts auf der Terrorbahn mit einer **Geschwindigkeit** von drei Schritten.

Folie 42: Wenn der „Jäger“ einen Marker der Terrorbahn (X oder Y) erreicht oder überschreitet, führt er einen Angriff aus.

(1. Angriff) Wenn der Jäger den ersten Marker der jeweiligen Terrorbahn erreicht oder überschreitet, dann führt er seinen ersten Angriff aus, er zerstört die Energie der jeweiligen oberen Station. Wenn sich zum Beispiel der Jäger auf der linken Terrorbahn bewegt, und den ersten Marker überschreitet, dann wird der Energiestein der oberen roten Station zerstört.

(2. Angriff) Wenn der Jäger den zweiten Marker der jeweiligen Terrorbahn erreicht oder überschreitet, führt er seine zweiten Angriff aus, er reduziert nämlich die Schussstärke der Kanone oder der Kanonen der jeweiligen Station um einen Punkt. Zum Beispiel, wenn sich der Jäger auf der rechten Terrorbahn bewegt, und den zweiter Marker erreicht oder überschreitet, dann wird die Schussstärke der Kanone der oberen blauen Station und die Schussstärke der Kanone der unteren blauen Station um einen Punkt reduziert.

(3. Angriff) Wenn der Jäger den dritten Marker der jeweiligen Terrorbahn erreicht oder überschreitet, führt er seinen dritten Angriff aus, die Kanone der jeweiligen oberen Station wird zerstört. Wenn sich zum Beispiel der Jäger auf der mittleren Terrorbahn befindet, und den dritten Marker erreicht oder überschreitet, wird die Kanone der oberen weißen Station zerstört.

Folie 43: Ein Beispiel: Wenn der „Jäger“ am Anfang der zweiten Phase auf der mittleren Terrorbahn erscheint,…

Folie 44: …und während der zweiten Phase nicht bekämpft wird, bewegt sich der Jäger drei Schritte in Richtung Raumschiff. In der dritten Phase hat er kein Marker erreicht oder überschritten, deswegen gibt es hier keinen Angriff.

Folie 45: Wenn der „Jäger“ in der dritten Phase wieder nicht bekämpft wird, dann bewegt er sich weitere drei Schritte. Jetzt hat der „Jäger“ ein Marker überschritten.

Folie 46: Der „Jäger“ führt seine erste Aktion aus, er zerstört den Energiestein der oberen weißen Station.

Folie 47: Wenn der „Jäger“ in der vierten Phase immer noch nicht zerstört ist, dann bewegt er sich weitere drei Schritte. Der nächste Marker wird überschritten.

Folie 48: Die Stärke der oberen weißen Kanone wird auf 4 reduziert.

Folie 49: Wenn der „Jäger“ in der vierten Phase immer noch nicht zerstört ist, dann bewegt er sich weitere drei Schritte. Der nächste Marker wird überschritten.

Folie 50: Die Kanone der oberen weißen Station funktioniert nicht mehr.

Folie 51: Wenn der „Jäger“ in der sechsten Phase immer noch nicht zerstört ist, und auf dem letzten Feld seiner Terrorbahn ankommt, wird das Raumschiff angegriffen und…

… das Spiel ist verloren!

Folie 52: Hinweis! Wenn der 1. Angriff (Energiereduzierung) nicht ausgeführt werden kann, wird stattdessen der 2. Angriff (Schussstärken-reduzierung) ausgeführt. Zum Beispiel wenn von der oberen roten Station in der vorigen Phase geschossen wurde, und es deshalb keinen Energiestein in der oberen roten Station mehr gibt, wird beim ersten Angriff der Bedrohung die Kanone der oberen roten und unteren roten Station um einen Punkt reduziert.

Daraus folgt, dass der nächste Marker den 3. Angriff statt den 2. aktiviert.

Folie 53: Das wichtigste Ziel des Spieles ist es, so gut wie möglich miteinander kooperieren, um das Raumschiff zu schützen!

Schnelle und effektive Bekämpfung der Bedrohung wird belohnt!!

Folie 54: Viel Spaß!

Haben Sie Fragen?

.

Spiel

(Vor Beginn des Spiels anschauen, welche Subgruppe heute teilnimmt)

- Probe Runde

Tondatei auswählen.
Crewmitglieder spielen, Versuchsleiter muss Bedrohung bewegen, und Steine entfernen.
Nach Ende des Spiels Fragebogen 1 verteilen.
Teilnehmer haben 2 Minuten um den Fragebogen auszufüllen.
Während die Teilnehmer den Fragebogen ausfüllen, Versuchsleiter soll anhand der Tabelle die Team-Leistung und Belohnung berechnen.

- 1. Runde

Tondatei auswählen und Folie (wenn Experimentalgruppe)
Crewmitglieder spielen, Versuchsleiter muss Bedrohung bewegen, und Steine entfernen.
Nach Ende des Spiels Fragebogen 2 verteilen.
Teilnehmer haben 2 Minuten um den Fragebogen auszufüllen.
Während die Teilnehmer den Fragebogen ausfüllen, Versuchsleiter soll anhand der Tabelle die Team-Leistung und Belohnung berechnen.

- 2. Runde

Tondatei auswählen und Folie (wenn Experimentalgruppe)
Crewmitglieder spielen, Versuchsleiter muss Bedrohung bewegen, und Steine entfernen.
Nach Ende des Spiels Fragebogen 3 verteilen.
Teilnehmer haben 2 Minuten um den Fragebogen auszufüllen.
Während die Teilnehmer den Fragebogen ausfüllen, Versuchsleiter soll anhand der Tabelle die Team-Leistung und Belohnung berechnen.

- 3. Runde

Tondatei auswählen und Folie (wenn Experimentalgruppe)
Crewmitglieder spielen, Versuchsleiter muss Bedrohung bewegen, und Steine entfernen.
Nach Ende des Spiels Fragebogen 4 verteilen.
Teilnehmer haben 2 Minuten um den Fragebogen auszufüllen.
Während die Teilnehmer den Fragebogen ausfüllen, Versuchsleiter soll anhand der Tabelle die Team-Leistung und Belohnung berechnen.

- 4. Runde

Tondatei auswählen und Folie (wenn Experimentalgruppe)
Crewmitglieder spielen, Versuchsleiter muss Bedrohung bewegen, und Steine entfernen.
Nach Ende des Spiels Fragebogen 5 verteilen.
Teilnehmer haben 2 Minuten um den Fragebogen auszufüllen.
Während die Teilnehmer den Fragebogen ausfüllen, Versuchsleiter soll anhand der Tabelle die Team-Leistung und Belohnung berechnen.

Gruppen

Kontrollgruppe

Kontrollgruppe – Subgruppe A (12 Gruppen)

- Probe Runde

Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 1 ausfüllen

- 1. Runde

Tondatei „**Durchlauf rot**“ spielen lassen. (Bedrohung kommt in Phase 2 auf linker Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 2 ausfüllen

- 2. Runde

Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 3 ausfüllen

- 3. Runde

Tondatei „**Durchlauf blau**“ spielen lassen. (Bedrohung kommt in Phase 2 auf rechter Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 4 ausfüllen

- 4. Runde

Tondatei „Durchlauf weiß ernsthaft“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)
Folie „KanoneBlockieren“ zeigen

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 5 ausfüllen

- NASA Aufgabe

Kontrollgruppe

Kontrollgruppe – Subgruppe B (12 Gruppen)

- Probe Runde

Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 1 ausfüllen

- 1. Runde

Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 1 ausfüllen

- 2. Runde

Tondatei „**Durchlauf blau“** spielen lassen. (Bedrohung kommt in Phase 2 auf rechter Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 3 ausfüllen

- 3. Runde

Tondatei „**Durchlauf rot**“ spielen lassen. (Bedrohung kommt in Phase 2 auf linker Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 4 ausfüllen

- 4. Runde

Tondatei „Durchlauf weiß ernsthaft“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)
Folie „KanoneBlockieren“ zeigen

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 5 ausfüllen

- NASA Aufgabe

Kontrollgruppe

Kontrollgruppe – Subgruppe C (9 Gruppen)

- Probe Runde

Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 1 ausfüllen

- 1. Runde

Tondatei „**Durchlauf blau**“ spielen lassen. (Bedrohung kommt in Phase 2 auf rechter Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 2 ausfüllen

- 2. Runde

Tondatei „**Durchlauf rot**“ spielen lassen. (Bedrohung kommt in Phase 2 auf linker Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 3 ausfüllen

- 3. Runde

Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 3 ausfüllen

- 4. Runde

Tondatei „Durchlauf weiß ernsthaft“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)
Folie „KanoneBlockieren“ zeigen

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 5 ausfüllen

- NASA Aufgabe

Experimentalgruppe

Experimentalgruppe – Subgruppe A1 (4 Gruppen)

- Probe Runde

Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 1 ausfüllen

- 1. Runde

Crewmitglieder informieren, dass blaue und rote Spieler in Phase 4 einsteigen dürfen.
Tondatei „**Durchlauf rot**“ spielen lassen. (Bedrohung kommt in Phase 2 auf linker Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 2 ausfüllen

- 2. Runde

Crewmitglieder informieren, dass im oberen roten und blauen Raum keine Energie vorhanden.
Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 3 ausfüllen

- 3. Runde

Crewmitglieder informieren, dass nur doppelt Schießen erlaubt ist.
Tondatei „**Durchlauf blau**“ spielen lassen. (Bedrohung kommt in Phase 2 auf rechter Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 4 ausfüllen

- 4. Runde

Tondatei „Durchlauf weiß ernsthaft“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)
Folie „KanoneBlockieren“ zeigen

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 5 ausfüllen

- NASA Aufgabe

Experimentalgruppe

Experimentalgruppe – Subgruppe A2 (4 Gruppen)

- Probe Runde

Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 1 ausfüllen

- 1. Runde

Crewmitglieder informieren, dass nur doppelt Schießen erlaubt ist.
Tondatei „**Durchlauf rot**“ spielen lassen. (Bedrohung kommt in Phase 2 auf linker Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 2 ausfüllen

- 2. Runde

Crewmitglieder informieren, dass blaue und rote Spieler in Phase 4 einsteigen dürfen.
Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 3 ausfüllen

- 3. Runde

Crewmitglieder informieren, dass im oberen roten und blauen Raum keine Energie vorhanden.
Tondatei „**Durchlauf blau**“ spielen lassen. (Bedrohung kommt in Phase 2 auf rechter Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 4 ausfüllen

- 4. Runde

Tondatei „Durchlauf weiß ernsthaft“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)
Folie „KanoneBlockieren“ zeigen

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 5 ausfüllen

- NASA Aufgabe

Experimentalgruppe

Experimentalgruppe – Subgruppe A3 (4 Gruppen)

- Probe Runde

Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 1 ausfüllen

- 1. Runde

Crewmitglieder informieren, dass im oberen roten und blauen Raum keine Energie vorhanden.
Tondatei „**Durchlauf rot**“ spielen lassen. (Bedrohung kommt in Phase 2 auf linker Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 2 ausfüllen

- 2. Runde

Crewmitglieder informieren, dass nur doppelt Schießen erlaubt ist.
Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 3 ausfüllen

- 3. Runde

Crewmitglieder informieren, dass blaue und rote Spieler in Phase 4 einsteigen dürfen.
Tondatei „**Durchlauf blau**“ spielen lassen. (Bedrohung kommt in Phase 2 auf rechter Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 4 ausfüllen

- 4. Runde

Tondatei „Durchlauf weiß ernsthaft“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)
Folie „KanoneBlockieren“ zeigen

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 5 ausfüllen

- NASA Aufgabe

Experimentalgruppe

Experimentalgruppe – Subgruppe B1 (4 Gruppen)

- Probe Runde

Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 1 ausfüllen

- 1. Runde

Crewmitglieder informieren, dass blaue und rote Spieler in Phase 4 einsteigen dürfen.
Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 1 ausfüllen

- 2. Runde

Crewmitglieder informieren, dass im oberen roten und blauen Raum keine Energie vorhanden.
Tondatei „**Durchlauf blau**“ spielen lassen. (Bedrohung kommt in Phase 2 auf rechter Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 3 ausfüllen

- 3. Runde

Crewmitglieder informieren, dass nur doppelt Schießen erlaubt ist.
Tondatei „**Durchlauf rot**“ spielen lassen. (Bedrohung kommt in Phase 2 auf linker Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 4 ausfüllen

- 4. Runde

Tondatei „Durchlauf weiß ernsthaft“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)
Folie „KanoneBlockieren“ zeigen

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 5 ausfüllen

- NASA Aufgabe

Experimentalgruppe

Experimentalgruppe – Subgruppe B2 (4 Gruppen)

- Probe Runde

Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 1 ausfüllen

- 1. Runde

Crewmitglieder informieren, dass nur doppelt Schießen erlaubt ist.
Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 1 ausfüllen

- 2. Runde

Crewmitglieder informieren, dass blaue und rote Spieler in Phase 4 einsteigen dürfen.
Tondatei „**Durchlauf blau**“ spielen lassen. (Bedrohung kommt in Phase 2 auf rechter Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 3 ausfüllen

- 3. Runde

Crewmitglieder informieren, dass im oberen roten und blauen Raum keine Energie vorhanden.
Tondatei „**Durchlauf rot**“ spielen lassen. (Bedrohung kommt in Phase 2 auf linker Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 4 ausfüllen

- 4. Runde

Tondatei „Durchlauf weiß ernsthaft“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)
Folie „KanoneBlockieren“ zeigen

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 5 ausfüllen

- NASA Aufgabe

Experimentalgruppe

Experimentalgruppe – Subgruppe B3 (4 Gruppen)

- Probe Runde

Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 1 ausfüllen

- 1. Runde

Crewmitglieder informieren, dass im oberen roten und blauen Raum keine Energie vorhanden.
Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 1 ausfüllen

- 2. Runde

Crewmitglieder informieren, dass nur doppelt Schießen erlaubt ist.
Tondatei „**Durchlauf blau**“ spielen lassen. (Bedrohung kommt in Phase 2 auf rechter Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 3 ausfüllen

- 3. Runde

Crewmitglieder informieren, dass blaue und rote Spieler in Phase 4 einsteigen dürfen.
Tondatei „**Durchlauf rot**“ spielen lassen. (Bedrohung kommt in Phase 2 auf linker Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 4 ausfüllen

- 4. Runde

Tondatei „Durchlauf weiß ernsthaft“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)
Folie „KanoneBlockieren“ zeigen

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 5 ausfüllen

- NASA Aufgabe

Experimentalgruppe

Experimentalgruppe – Subgruppe C1 (4 Gruppen)

- Probe Runde

Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 1 ausfüllen

- 1. Runde

Crewmitglieder informieren, dass blaue und rote Spieler in Phase 4 einsteigen dürfen.
Tondatei „**Durchlauf blau**“ spielen lassen. (Bedrohung kommt in Phase 2 auf rechter Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 2 ausfüllen

- 2. Runde

Crewmitglieder informieren, dass im oberen roten und blauen Raum keine Energie vorhanden.
Tondatei „**Durchlauf rot**“ spielen lassen. (Bedrohung kommt in Phase 2 auf linker Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 3 ausfüllen

- 3. Runde

Crewmitglieder informieren, dass nur doppelt Schießen erlaubt ist.
Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 3 ausfüllen

- 4. Runde

Tondatei „Durchlauf weiß ernsthaft“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)
Folie „KanoneBlockieren“ zeigen

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 5 ausfüllen

- NASA Aufgabe

Experimentalgruppe – Subgruppe C2 (4 Gruppen)

- Probe Runde

Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 1 ausfüllen

- 1. Runde

Crewmitglieder informieren, dass nur doppelt Schießen erlaubt ist.
Tondatei „**Durchlauf blau**“ spielen lassen. (Bedrohung kommt in Phase 2 auf rechter Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 2 ausfüllen

- 2. Runde

Crewmitglieder informieren, dass blaue und rote Spieler in Phase 4 einsteigen dürfen.
Tondatei „**Durchlauf rot**“ spielen lassen. (Bedrohung kommt in Phase 2 auf linker Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 3 ausfüllen

- 3. Runde

Crewmitglieder informieren, dass im oberen roten und blauen Raum keine Energie vorhanden.
Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 3 ausfüllen

- 4. Runde

Tondatei „Durchlauf weiß ernsthaft“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)
Folie „KanoneBlockieren“ zeigen

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 5 ausfüllen

- NASA Aufgabe

Experimentalgruppe – Subgruppe C3 (4 Gruppen)

- Probe Runde

Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 1 ausfüllen

- 1. Runde

Crewmitglieder informieren, dass im oberen roten und blauen Raum keine Energie vorhanden.
Tondatei „**Durchlauf blau**“ spielen lassen. (Bedrohung kommt in Phase 2 auf rechter Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 2 ausfüllen

- 2. Runde

Crewmitglieder informieren, dass nur doppelt Schießen erlaubt ist.
Tondatei „**Durchlauf rot**“ spielen lassen. (Bedrohung kommt in Phase 2 auf linker Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 3 ausfüllen

- 3. Runde

Crewmitglieder informieren, dass blaue und rote Spieler in Phase 4 einsteigen dürfen.
Tondatei „**Durchlauf weiß**“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 3 ausfüllen

- 4. Runde

Tondatei „Durchlauf weiß ernsthaft“ spielen lassen. (Bedrohung kommt in Phase 2 auf mittlerer Terrorbahn)
Folie „KanoneBlockieren“ zeigen

Leistung, Belohnung & Learning anhand Tabelle berechnen
Fragebogen 5 ausfüllen

- NASA Aufgabe

Proberunde

Jetzt möchte ich Sie bitten, die Zusammenfassung der Regeln des Spieles von Ihrem Handout durchzulesen.
(nach 1-2 Minuten)
Haben Sie vielleicht noch Fragen?
Ich möchte noch kurz erwähnen, dass Sie nur während der Runden miteinander über das Spiel reden dürfen, nicht zwischen den Runden.
Ich möchte Sie auch darauf aufmerksam machen, dass die Schildpunkte der Bedrohung von jedem Schuss abgezogen werden müssen. Nicht nur beim ersten Schießen.

(Die richtige Tondatei vorbereiten.)
(Teilnehmer spielen lassen; Energiesteine entfernen und Bedrohung auf Terrorbahn bewegen)

Runden

(Für die Experimentalgruppe muss vor der 1., 2., und 3. Runde die Folie gezeigt werden, die die unerwartende Veränderung beschreibt.)
(Für beide Gruppen muss vor der 4. Runde die entsprechende Folie gezeigt werden)

„In dieser Runde…“

NASA-Aufgabe

Zum Schluss müssen Sie eine letzte Aufgabe machen.
Jeder von Ihnen wird ein Arbeitsblatt bekommen.
Auf der ersten Seite wird genau beschrieben, was Sie für diese Aufgabe machen müssen.

(Zeit geben, damit die Teilnehmer die Aufgabe durchlesen)

Je schneller Sie die Gegenstände auswählen, desto höher sind Ihre Lebenschancen!
Viel Erfolg!

(wenn Sie fertig sind, das Lösungsblatt kurz geben und Arbeitsblätter sammeln)

Abschluss

(Über Belohnung informieren.)

Anhand Ihrer Teamleistung wird jeder von Ihnen mit X Euro belohnt! Herzlichen Glückwünsch und vielen Dank für Ihre Teilnahme.

Haben Sie noch Fragen?

B.6 Questionnaire between task missions

LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

DEPARTMENT PSYCHOLOGIE

LEHRSTUHL

WIRTSCHAFTS- UND ORGANISATIONSPSYCHOLOGIE

Bitte geben Sie an, inwiefern Sie den folgenden Aussagen zustimmen.
Es gibt keine richtigen/falschen Antworten.

Inwieweit stimmen Sie den folgenden Aussagen in Hinblick auf die Arbeit in Ihrem Team zu?	überhaupt nicht	sehr wenig	zum Teil	in hohem Maß	in sehr hohem Maß
Die Teammitglieder zeigen ihren Einsatz für das Team, indem sie sich Mühe geben, um zum Erfolg des Teams beizutragen.	1	2	3	4	5
Jeder im Team ist motiviert, sich für den Erfolg des Teams einzusetzen.	1	2	3	4	5
Einige Teammitglieder tragen nicht ihren gerechten Anteil zur gesamten Arbeitsbelastung bei.	1	2	3	4	5
Verschiedene Teammitglieder haben sich auf einen bestimmten Aspekt unseres Projektes spezialisiert.	1	2	3	4	5
Verschiedene Teammitglieder tragen die Verantwortung für unterschiedliche Aspekte unserer Mission.	1	2	3	4	5
Um die Aufgaben der Mission zu erfüllen, sind spezielle Kompetenzen der einzelnen Teammitglieder notwendig	1	2	3	4	5
Ich weiß, welches Teammitglied welche spezifischen Kompetenzen hat.	1	2	3	4	5
Vorschläge von anderen Teammitgliedern kann ich mit gutem Gefühl akzeptieren.	1	2	3	4	5
Ich vertraue auf die Richtigkeit des Mission-Wissens der anderen Teammitglieder.	1	2	3	4	5
Ich kann mich auf die eingebrachten Informationen der anderen Teammitglieder absolut verlassen.	1	2	3	4	5
Ich habe großes Vertrauen in das Wissen der anderen Teammitglieder.	1	2	3	4	5
In meinem Team haben wir eine offene Beziehung zueinander. Wir können unsere Ideen, Gefühle und Hoffnungen offen miteinander teilen.	1	2	3	4	5
Ich kann mit meinen Teammitgliedern offen über Schwierigkeiten, die während der Mission auftreten, sprechen und weiß, dass sie mir gerne zuhören.	1	2	3	4	5
Wenn jemand von uns das Team verlassen würde und wir nicht mehr zusammenarbeiten könnten, dann würden wir diese Person vermissen.	1	2	3	4	5
Wenn ich den anderen Teammitglieder eigene Probleme mitteilen würde, dann würden sie konstruktiv und mitfühlend reagieren.	1	2	3	4	5
Ich würde sagen, dass wir alle sehr viel in die Beziehungen in unserem Team investiert haben.	1	2	3	4	5

LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN
DEPARTMENT PSYCHOLOGIE
LEHRSTUHL
WIRTSCHAFTS- UND ORGANISATIONSPSYCHOLOGIE

Bitte geben Sie an, inwiefern Sie den folgenden Aussagen zustimmen.

	überhaupt nicht	sehr wenig	zum Teil	in hohem Maß	in sehr hohem Maß
Wenn man in diesem Team einen Fehler macht, wird einem das oft vorgehalten.	1	2	3	4	5
Den Mitgliedern meines Teams ist es möglich Probleme und schwierige Situationen anzusprechen.	1	2	3	4	5
Einige in diesem Team lehnen andere manchmal ab, weil diese anders sind.	1	2	3	4	5
Es ist ungefährlich in diesem Team ein Risiko einzugehen.	1	2	3	4	5
Es ist schwierig andere Teammitglieder um Hilfe zu bitten.	1	2	3	4	5
Keiner im Team würde absichtlich etwas tun, das meine Bemühungen untergräbt.	1	2	3	4	5
Bei der Arbeit mit Mitgliedern dieses Teams werden meine einzigartigen Fähigkeiten und Talente anerkannt und in Anspruch genommen.	1	2	3	4	5

Bitte geben Sie zuletzt an, inwiefern Sie der folgenden Aussage zustimmen.

	überhaupt nicht — sehr stark
Wie sehr identifizieren Sie sich mit Ihrem Team?	
Wie sehr identifizieren Sie sich mit Ihrem Projekt?	

LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN
DEPARTMENT PSYCHOLOGIE
LEHRSTUHL
WIRTSCHAFTS- UND ORGANISATIONSPSYCHOLOGIE

Bitte geben Sie an, inwiefern Sie den folgenden Aussagen zustimmen.

	überhaupt nicht	sehr wenig	zum Teil	in hohem Maß	in sehr hohem Maß
Hat Ihnen das Spiel Spaß gemacht?	1	2	3	4	5
Wie zufrieden sind Sie mit der Teamarbeit Ihrer Gruppe?	1	2	3	4	5
Haben Sie gut in Ihrer Gruppe koordiniert?	1	2	3	4	5
Würden Sie mit diesem Team wieder zusammenarbeiten?	1	2	3	4	5
Wie zufrieden sind Sie mit dem Ergebnis?	1	2	3	4	5

Zum Schluss bitten wir Sie einige Angaben zu Ihrer Person zu machen.

Wie alt sind Sie?

Sie sind… ○ weiblich ○ männlich

Was studieren Sie?/ Was ist Ihr Beruf?

Was ist Ihre Nationalität?

Vielen Dank für Ihre Teilnahme!

B.7 Compensation based on team performance

Belohnung jedes Gruppenmitglieds anhand der Gruppenleistung

Jede Person kann bis zu 4 Euro in jeder Runde verdienen. Wenn eine Gruppe in allen Runden die beste Lösung durchgeführt hat, dann werden die Gruppenmitglieder dieser Gruppe, mit 4 Euro belohnt (insgesamt 20 Euro pro Person). Jeder Teilnehmer wird auch zusätzlich 4 Euro fürs Erscheinen bekommen.

1. Runde/ Doppel Schießen	Action 2	Action 3	Action 4	Action 5	Action 6	Action 7	Wenn bis Action 7 eine Person auf Computer gewartet hat:	Wenn bis Action 7 eine Person auf Computer gewartet hat:	**Beste Lösung**	
Leistungspunkte	20	16	12	8	4	0 Punkte	(+ 1) Punkt	(+ 1) Punkt	Beste Lösung: In Action 1 ein Crewmitglied nach rechts, eins nach links, und eins nach rechts, in Action 2 von oberen weißen und roten oder blauen Station schießen, in Action 2 Energie in oberen weißen Station nachladen, in Action 3, von oberen weißen und blauen oder roten Station schießen, bis Action 3 ein Crewmitglied Navigationssystem C aktivieren.	Zweimal Schießen in Action 2, und zweimal Schießen in Action 3
Belohnung	4 Euro	3 Euro	2 Euro	1 Euro	0 Euro	0 Euro	falls vergessen 0,20 Cent weniger	falls vergessen 0,20 Cent weniger		
Leistung	4 Punkte	3 Punkte	2 Punkte	1 Punkte	0 Punkte	0 Punkte				

										Beste Lösung	
2. Runde / keine Energiesteine										In Action 1 ein Crewmitglied bewegt sich nach links oder rechts, bis Action 2 ein zweites Mitglied bewegt sich in die gleiche Richtung. In Action 2 ein Crewmitglied schießt vom oberen weißen Raum, in Action 2 ein Crewmitlgied bewegt sich nach unten (nach untere rote oder blaue Station), in Action 3 ein Crewmitglied lädt mit einem Energiestein von der unteren roten oder blauen Station die obere rote oder blaue Station, in Action 3 ein anderes Crewmitglied schießr von der nachgeladenen Station (obere rote oder blaue), bis Action 3 ein Crewmitglied aktiviert das Navigatinossystem C. In Action 1 ein Crewmitglied bewegt sich nach der unteren weißen Station, in Action 2 lädt mit Energie die oberen weiße Station, Crewmitglied, der in Action 2 von der oberen weißen Station schießt, wird wieder schießen.	
	Action 2	Action 3	Action 4	Action 5	Action 6	Wenn bis Action 7 eine Person auf Computer gewartet hat:	Wenn bis Action 7 eine Person auf Computer gewartet hat:				Einmal Schießen in Action 2 (oberen weißen Raum) und zweimal in Action 3 (oberen weißen raum & obere blauer oder roten Raum)
Leistungspunkte		20	16	12	8	(+ 1) Punkt	(+ 1) Punkt				
Belohnung		4 Euro	3 Euro	2 Euro	1 Euro	falls vergessen 0,20 Cent weniger	falls vergessen 0,20 Cent weniger				
Leistung		4 Punkte	3 Punkte	2 Punkte	1 Punkte	0 Punkte					

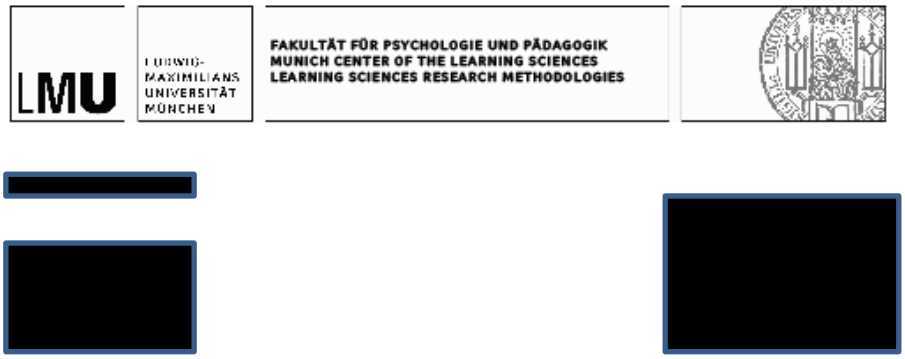
3. Runde / Zwei Crewmitglieder									**Beste Lösung**	
	Action 2	Action 3	Action 4	Action 5	Action 6	Wenn bis Action 7 eine Person auf Computer gewartet hat:	Wenn bis Action 7 eine Person auf Computer gewartet hat:		(*Während dieser Runde dürfen Sie bis die anderen Crewmitglieder wieder da sind, sich auch diagonal bewegen) Beste Lösung: In Action 1 ein Crewmitglid bewegt sich diagonal nach untere blaue oder rote Station, das andere aktiviert das Navigationssystem C. In Action 2 gleichzeit Schießen von oberen weißen und unteren roten oder blauen Station, in Action 3 Energie von unteren Station auf weiße obere Station nachladen, in Action 3 von oberen weißen Station schießen.	Zweimal Schießen in Action 2, und zweimal Schießen in Action 3.
Leistungspunkte		20	16	12	8	(+ 1) Punkt	(+ 1) Punkt			
Belohnung		4 Euro	3 Euro	2 Euro	1 Euro	falls vergessen 0,20 Cent weniger	falls vergessen 0,20 Cent weniger			
Leistung		4 Punkte	3 Punkte	2 Punkte	1 Punkte	0 Punkte				

4. Runde / Ernsthafte Bedrohung									**Beste Lösung**	
	Action 2	Action 3	Action 4	Action 5	Action 6	Action 7	Wenn bis Action 7 eine Person auf Computer gewartet hat:	Wenn bis Action 7 eine Person auf Computer gewartet hat:	In Action 1 ein Crewmitglied bewegt sich nach links, und ein Crewmitglied bewegt sich nach rechts. In Action 2 gleichzeit schießen von oberen roten und blauen Station. In Actino 3 von oberen weißen Station schießen.	
Leistungspunkte		20	16	12	8	4	(+ 1) Punkt	(+ 1) Punkt		Zwiemal Schießen in Action 2, und einmal in Action 3
Belohnung		4 Euro	3 Euro	2 Euro	1 Euro	0 Euro	falls vergessen 0,20 Cent weniger	falls vergessen 0,20 Cent weniger		
Leistung		4 Punkte	3 Punkte	2 Punkte	1 Punkte	0 Punkte				

Appendix C: Chapter 4

C.1 Study 1

C.1.1 Ethical Approval



[redacted]

[redacted]

[redacted]

München, 15.02.2015

Ihr Antrag an die Ethikkommission

Lieber Frau Georganta, liebe Frau Kugler,

die Ethikkommission hat sich in ihrer Sitzung am 09.02.2015 eingehend mit Ihrem Antrag bezüglich des Forschungsprojektes

„Team Adaptation - Ein dynamischer Prozess"

beschäftigt.
Gemäß §7, Absatz 4 teile ich Ihnen das Votum der Ethikkommission hiermit mit:

Es bestehen keine Bedenken gegen die Durchführung des Forschungsvorhabens.

Mit freundlichen Grüßen

[redacted]

Dienstgebäude
Leopoldstr. 13, Zi. 3520
80802 München

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StadtBus 154, Haltestelle Giselastraße
U-Bahn U3/U6, Haltestelle Giselastraße

Bayerische Landesbank München
Kto. 24 868 BLZ 700 500 00
USt-IdNr. DE 811 205 325

C.1.2 Questionnaire

Liebe Studierende,

Herzlichen Dank, dass Sie sich die Zeit nehmen, diesen Fragebogen auszufüllen. Diese Studie wird im Rahmen eines größeren Forschungsprojektes der LMU und der TUM (Sonderforschungsbereich 768) durchgeführt. Ziel dieser Studie ist es, Arbeitsprozesse in Gruppen zu untersuchen.

Die Beantwortung des Fragebogens dauert ca. 15 Minuten. In 10-15 Tagen wird Ihnen ein weiterer Fragebogen zugeschickt. Die Bearbeitung des Fragebogens erfolgt freiwillig, sie können die Bearbeitung also jederzeit und ohne Angabe von Gründen abbrechen. Es kann jedoch nur bei einer hohen Beteiligungsquote eine sinnvolle und aussagekräftige Auswertung vorgenommen werden.

Hinweise zum Ausfüllen des Fragebogens:

Bitte beantworten Sie jede Frage sorgfältig aber gleichzeitig auch zügig. Der erste Gedanke ist meist auch der zutreffendste. Da es um Ihre persönliche Einschätzung und Meinung geht, gibt es keine richtigen oder falschen Antworten.

Da jeder Themenbereich mit mehreren Fragen abgedeckt wird, kann es sein, dass Ihnen manche Fragen ähnlich erscheinen. Bitte versuchen Sie bei ähnlichen Fragen jeweils den spezifischen Aspekt der jeweiligen Frage zu berücksichtigen. Diese Art der Befragung ist nicht etwa als „Kontrolle“ gedacht, sondern hat messtechnische bzw. statistische Gründe.

Bitte beziehen Sie die Fragen zu Ihrem Team auf Ihre **Projektgruppe** und die Fragen zu Ihren Aufgaben und Ihrer Arbeit auf die **Aufgaben und die Arbeit in Ihrer Projektgruppe**.

Bitte beantworten Sie die Fragen, indem Sie den Kreis ankreuzen, der für Sie am ehesten zutrifft:

z.B.

1	2	3	4	5
überhaupt nicht	**sehr wenig**	**zum Teil**	**in hohem Maß**	**in sehr hohem Maß**

Anonymität und Vertraulichkeit der Daten:

Das Format des Fragebogens, die Administration der Befragung, wie auch die Regelungen zum Schutz der Anonymität und die Datensicherheit entsprechen den Kriterien wissenschaftlichen Arbeitens. Ihre Angaben werden anonymisiert, sodass kein Rückschluss auf Ihre persönlichen Antworten möglich ist.

Vergütung:

Die Teilnahme an der Studie wird mit **10 €** pro Person vergütet. Voraussetzung für eine Auszahlung ist, dass mindestens drei Personen aus Ihrem Team an der Befragung teilnehmen und dass alle drei Fragebögen von Ihnen und Ihren Teamkolleginnen und Teamkollegen ausgefüllt werden.

Die folgenden Fragen beziehen sich auf **Ihr Team und Ihre Projektarbeit**.
Bitte machen Sie zunächst einige allgemeine Angaben zu Ihrem Team.

Aus wie vielen Personen besteht Ihr Team?

☐

Haben Sie Führungsverantwortung?

Ja	Nein
○	○

Wie lange besteht Ihr Team bereits?

- ○ Kürzer als 1 Monat
- ○ 1-2 Monate
- ○ 3-4 Monate
- ○ 5-6 Monate
- ○ Länger als 6 Monate

Wie oft trifft sich Ihr Team durchschnittlich?

- ○ täglich
- ○ mehrmals in der Woche
- ○ mehrmals im Monat
- ○ monatlich
- ○ seltener als ein Mal im Monat

Wie viele der Teammitglieder haben sich vor diesem Projekt bereits gekannt?

keiner		einige		alle
○	○	○	○	○

Bitte beschreiben Sie nun in 2-5 Stichpunkten die Aufgabe, die Sie mit Ihrem Team derzeit bearbeiten.

Die folgenden Fragen beziehen sich auf **Ihr Team und Ihre Projektarbeit**.

In welchem Umfang arbeitet Ihr Team aktiv an den folgenden Aufgaben?	überhaupt nicht	sehr wenig	zum Teil	in hohem Maß	in sehr hohem Maß
Identifizieren unserer wesentlichen Aufgaben.	1	2	3	4	5
Identifizieren der zentralen Herausforderungen, von denen wir erwarten, dass wir uns ihnen stellen müssen.	1	2	3	4	5
Festlegen der Ressourcen, die wir brauchen, um erfolgreich zu sein.	1	2	3	4	5
Setzen von Zielen für das Team.	1	2	3	4	5
Sicherstellen, dass jeder im Team unsere Ziele eindeutig versteht.	1	2	3	4	5
Verknüpfen unserer Ziele mit der strategischen Ausrichtung des Projektes.	1	2	3	4	5
Entwickeln einer übergeordneten Strategie, die unser Handeln leitet.	1	2	3	4	5
Ausarbeiten von Alternativplänen ("wenn X - dann Y"), um mit ungewissen Situationen umzugehen.	1	2	3	4	5
Erkennen, wann an einem gegebenen Arbeitsplan festgehalten und wann ein anderer herangezogen werden sollte.	1	2	3	4	5
Regelmäßiges Überprüfen, wie gut wir unsere Teamziele erreichen.	1	2	3	4	5
Einsetzen klar definierter Kennwerte, um unseren Fortschritt zu bewerten.	1	2	3	4	5
Rechtzeitiges Einholen von Rückmeldung darüber, wie gut wir unsere Ziele erreichen.	1	2	3	4	5
Überwachen und Verwalten unserer Ressourcen.	1	2	3	4	5
Überwachen wichtiger Aspekte unserer Arbeitsumgebung (z.B. Inventar, Ausstattung, Prozessablauf, Informationsfluss).	1	2	3	4	5
Beobachten des Geschehens und der Gegebenheiten außerhalb des Teams, die Einfluss auf unsere Tätigkeiten haben.	1	2	3	4	5
Entwickeln von Standards für eine annehmbare Leistung der Teammitglieder.	1	2	3	4	5
Ausgewogenes Verteilen des Arbeitspensums unter den Teammitgliedern.	1	2	3	4	5
Gegenseitiges Unterstützen, wenn Hilfe gebraucht wird.	1	2	3	4	5
Gut miteinander kommunizieren.	1	2	3	4	5
Reibungsloses aufeinander Abstimmen unserer Arbeitsbemühungen.	1	2	3	4	5
Abstimmen unserer Tätigkeiten.	1	2	3	4	5
Faires und gerechtes Umgehen mit persönlichen Konflikten.	1	2	3	4	5
Einander Respekt zeigen.	1	2	3	4	5
Aufrechterhalten der Harmonie in der Gruppe.	1	2	3	4	5
Stolz auf unsere Leistungen sein.	1	2	3	4	5
Entwickeln von Vertrauen in die Fähigkeit unseres Teams, gute Leistungen zu erbringen.	1	2	3	4	5
Gegenseitiges Ermutigen unser Allerbestes zu geben.	1	2	3	4	5
Teilen eines Gefühls der Zusammengehörigkeit und des Zusammenhalts.	1	2	3	4	5
Mit Stress umgehen.	1	2	3	4	5
Bewahren eines guten emotionalen Gleichgewichts im Team.	1	2	3	4	5

Die folgenden Fragen beziehen sich auf **Ihr Team und Ihre Projektarbeit**.

Inwieweit stimmen Sie den folgenden Aussagen in Hinblick auf die Arbeit in Ihrem Team zu?	überhaupt nicht	eher nicht	teils teils	eher	voll und ganz
Den Teammitgliedern ist es möglich Probleme und schwierige Themen anzusprechen.	1	2	3	4	5
Die Teammitglieder zeigen Motivation, indem sie zusätzliche Zeit und Mühe investieren, um zum Erfolg des Teams beizutragen.	1	2	3	4	5
Jeder im Team ist motiviert, sich für den Erfolg des Teams einzusetzen	1	2	3	4	5
Einige Teammitglieder tragen nicht ihren gerechten Anteil zur gesamten Arbeitsbelastung bei.	1	2	3	4	5
Verschiedene Teammitglieder haben sich auf einen bestimmten Aspekt unseres Projektes spezialisiert.	1	2	3	4	5
Verschiedene Teammitglieder tragen die fachliche Verantwortung für unterschiedliche Gebiete unseres Projektes.	1	2	3	4	5
Um die Aufgaben des Projektes zu erfüllen, sind spezielle fachliche Kompetenzen der einzelnen Teammitglieder notwendig.	1	2	3	4	5
Ich weiß, welches Teammitglied welche spezifischen fachlichen Kompetenzen hat.	1	2	3	4	5
Vorschläge von anderen Teammitgliedern kann ich mit gutem Gefühl akzeptieren.	1	2	3	4	5
Ich vertraue auf die Richtigkeit des Projektwissens der anderen Teammitglieder.	1	2	3	4	5
Ich kann mich auf die eingebrachten Informationen der anderen Teammitglieder absolut verlassen.	1	2	3	4	5
Ich habe großes Vertrauen in das Wissen der anderen Teammitglieder.	1	2	3	4	5
Unser Team arbeitet in einer gut abgestimmten Weise zusammen.	1	2	3	4	5
Es gibt in unserem Team nur sehr wenige Missverständnisse darüber was zu tun ist.	1	2	3	4	5
Wir erledigen unsere Aufgaben reibungslos und effektiv.	1	2	3	4	5
Im Team gibt es selten Unklarheiten darüber, auf welchem Weg die Aufgabe erfüllt wird.	1	2	3	4	5
Wir nehmen uns regelmäßig die Zeit, um Wege zu finden, die Arbeitsprozesse des Teams zu verbessern.	1	2	3	4	5
Dieses Team neigt dazu, mit Meinungsverschiedenheiten im Stillen umzugehen, anstatt sie direkt in der Gruppe anzugehen.	1	2	3	4	5
Die Teammitglieder bemühen sich alle Informationen, die sie von anderen erhalten können, zu bekommen.	1	2	3	4	5
Dieses Team sucht häufig neue Informationen, die uns dazu bringen wichtige Änderungen einzuführen.	1	2	3	4	5
In diesem Team gibt es immer jemanden, der sicherstellt, dass wir innehalten, um die Arbeitsprozesse des Teams zu überdenken.	1	2	3	4	5
Die Leute in diesem Team setzen sich dafür ein, dass Annahmen zu Themen, über die gerade diskutiert werden, überprüft wird.	1	2	3	4	5
Wir laden Leute von außerhalb des Teams ein, die uns Informationen präsentieren oder mit uns diskutieren.	1	2	3	4	5

Die folgenden Fragen beziehen sich auf **Ihr Team und Ihre Projektarbeit**.

Inwieweit stimmen Sie den folgenden Aussagen in Hinblick auf die Arbeit in Ihrem Team zu?	über-haupt nicht	eher nicht	teils teils	eher	voll und ganz
Mein Team beobachtet und prüft den Arbeitskontext und den Fortschritt unserer Projekte (z.B. Aufgabenerbringung, Strategien, Ziele, Projektanforderungen, etc.)	1	2	3	4	5
Mein Team passt seine Strategien bei Veränderungen im Arbeitskontext an.	1	2	3	4	5
Mein Team verbringt einen angemessenen Anteil der Arbeitszeit damit, sich über Konsequenzen der Arbeitsaufgaben Gedanken zu machen (z.B. Verwendbarkeit der Arbeitsergebnisse, Kompatibilität, Kosten, etc.)	1	2	3	4	5
Strategien und Herangehensweisen werden später hinsichtlich ihrer Angemessenheit überprüft.	1	2	3	4	5
Mein Team lernt von seinen Erfahrungen.	1	2	3	4	5
In meinem Team gibt es häufig Konflikte wegen unterschiedlicher Ideen.	1	2	3	4	5
In meinem Team gibt es häufig Unstimmigkeiten hinsichtlich der Aufgabe, an der das Team arbeitet.	1	2	3	4	5
Die Teammitglieder haben häufig sich widersprechende Meinungen hinsichtlich der Aufgabe, an der das Team arbeitet.	1	2	3	4	5
In meinem Team gibt es viele zwischenmenschliche Spannungen.	1	2	3	4	5
Die Teammitglieder werden bei der Arbeit häufig ärgerlich.	1	2	3	4	5
In meinem Team gibt es viele emotionale Konflikte.	1	2	3	4	5
Die Teammitglieder halten im Umfeld des Teams aktiv Ausschau nach Ereignissen, die das Team in Zukunft betreffen könnten.	1	2	3	4	5
Die Teammitglieder versuchen langfristige Möglichkeiten und Gefahren für das Team zu identifizieren.	1	2	3	4	5
Die Teammitglieder versuchen Veränderungen vorherzusehen, die aufgrund von Entwicklungen im Umfeld des Teams notwendig werden könnten.	1	2	3	4	5

Inwieweit stimmen Sie den folgenden Aussagen in Hinblick auf die Arbeit in Ihrem Team zu?	über-haupt nicht	eher nicht	teils teils	eher	voll und ganz
In meinem Team haben wir eine offene Beziehung zueinander. Wir können unsere Ideen, Gefühle und Hoffnungen offen miteinander teilen.	1	2	3	4	5
Ich kann mit meinen Teammitgliedern offen über Schwierigkeiten, die während der Arbeit am Projekt auftreten, sprechen und weiß, dass sie mir gerne zuhören.	1	2	3	4	5
Wenn jemand von uns das Team verlassen würde und wir nicht mehr zusammenarbeiten könnten, dann würden wir diese Person vermissen.	1	2	3	4	5
Wenn ich den anderen Teammitgliedern eigene Probleme	1	2	3	4	5

mitteilen würde, dann würden sie konstruktiv und mitfühlend reagieren.					
Ich würde sagen, dass wir alle sehr viel in die Beziehungen in unserem Team investiert haben.	1	2	3	4	5
Wir müssen die Tätigkeiten sehr häufig miteinander abstimmen.	1	2	3	4	5
Die Aufgaben im Team hängen voneinander ab.	1	2	3	4	5
Damit das Team gute Arbeit leistet muss viel kommuniziert werden.	1	2	3	4	5
Um hohe Leistung zu erzielen ist es wichtig, dass wir uns aufeinander verlassen können.	1	2	3	4	5
Die Arbeit unseres Teams ist sehr anspruchsvoll.	1	2	3	4	5
In unserem Team bearbeiten wir immer mehrere Aufgaben zur gleichen Zeit.	1	2	3	4	5
Die Aufgaben in unserem Team sind schwierig und kompliziert.	1	2	3	4	5
Mein Team hat Vertrauen in sich.	1	2	3	4	5
Mein Team kann viel erreichen, wenn wir hart arbeiten.	1	2	3	4	5
Mein Team glaubt daran, dass wir sehr produktiv sein können.	1	2	3	4	5
Mein Team kann unterschiedliche Wege für die Teamarbeit aussuchen.	1	2	3	4	5
Mein Team entscheidet als Team, wie die Arbeit im Team erledigt wird.	1	2	3	4	5
Mein Team trifft seine eigenen Entscheidungen ohne Vorgabe vom Management.	1	2	3	4	5
Mein Team arbeitet sehr effektiv	1	2	3	4	5
Mein Team macht sehr gute Fortschritte bei der Erreichung seiner Ziele	1	2	3	4	5
Mein Team leistet sehr gute Arbeit	1	2	3	4	5

Inwieweit stimmen Sie den folgenden Aussagen in Hinblick auf die Arbeit in Ihrem Team zu?					
Die Teammitglieder...	über-haupt nicht	eher nicht	teils teils	eher	voll und ganz
…. führen die zentralen Aufgaben ihrer Arbeit gut aus.	1	2	3	4	5
…. erledigen ihre zentralen Aufgaben gut unter Verwendung von Standardabläufen.	1	2	3	4	5
…. stellen sicher, dass ihre Aufgaben ordentlich erfüllt werden.	1	2	3	4	5
…. führen bessere Verfahren zur Erledigung ihrer zentralen Aufgaben ein.	1	2	3	4	5
…. lassen sich etwas einfallen, wie sie ihre zentralen Aufgaben besser erledigen können.	1	2	3	4	5
…. ändern die Art und Weise, wie ihre zentralen Aufgaben erledigt werden.	1	2	3	4	5
… passen sich gut an Änderungen in ihren zentralen Aufgaben an.	1	2	3	4	5
…. kommen mit Änderungen in der Art und Weise, wie sie ihre zentralen Aufgaben zu erledigen haben, zurecht.	1	2	3	4	5
…. lernen neue Fähigkeiten, die ihnen dabei helfen sich an Änderungen in ihren zentralen Aufgaben anzupassen	1	2	3	4	5

Die folgenden Fragen beziehen sich auf **Ihr Team und Ihre Projektarbeit.**

Sind in letzter Zeit Ereignisse aufgetreten, die die Ziele, Prozesse oder Arbeitsweise in Ihrem Team verändert haben?

Keine	einige	eine gewisse Anzahl	viele	sehr viele
○	○	○	○	○

Bitte nennen Sie diese Ereignisse:

_____

_____

_____

_____

Inwieweit stimmen Sie den folgenden Aussagen in Hinblick auf die oben genannten Ereignisse zu?					
Haben Sie aufgrund dieser Ereignisse...	über-haupt nicht	eher nicht	teils teils	eher	voll und ganz
.... die Ziele des Teams angepasst?	1	2	3	4	5
..... die Prozesse im Team angepasst?	1	2	3	4	5
…. Ihre Arbeitsweise angepasst?	1	2	3	4	5

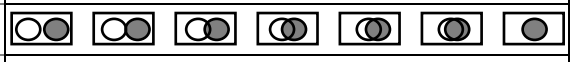
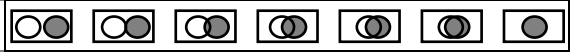
Inwieweit stimmen Sie den folgenden Aussagen in Hinblick auf die oben genannten Anpassungenzu?					
	über-haupt nicht	eher nicht	teils teils	eher	voll und ganz
Die Anpassungen wurden schnell im Team integriert.	1	2	3	4	5
Die Anpassungen waren sehr umfangreich.	1	2	3	4	5
Die Anpassungen waren sehr wichtig für unsere Teamarbeit.	1	2	3	4	5

Wie viel Zeit hat die Anpassung in Anspruch genommen?

Minuten ○ Stunden ○ Tagen ○ Wochen ○

Die folgenden Fragen beziehen sich auf **Ihr Team und Ihre Projektarbeit.**

Im Folgenden geht es um **Identifikation**.
Mit der zunehmenden Überlappung der beiden Kreise in den Rechtecken von links nach rechts soll eine zunehmende Identifikation ausgedrückt werden.

	überhaupt nicht — sehr stark
Wie sehr identifizieren Sie sich mit Ihrem Team?	
Wie sehr identifizieren Sie sich mit Ihrer Aufgabe?	

Die folgenden Fragen beziehen sich auf **Ihre Person.**

Inwieweit stimmen Sie den folgenden Aussagen in Hinblick auf ihre eigene Person zu?	über-haupt nicht	eher nicht	teils teils	eher	voll und ganz
Ich gehe Probleme aktiv an.	1	2	3	4	5
Wenn etwas schief geht, suche ich sofort nach Abhilfe.	1	2	3	4	5
Wenn sich Möglichkeiten anbieten, etwas zu gestalten, dann nutze ich sie.	1	2	3	4	5
Ich ergreife sofort die Initiative, wenn andere dies nicht tun.	1	2	3	4	5
Ich nehme Gelegenheiten schnell wahr, um meine Ziele zu erreichen.	1	2	3	4	5
Ich tue meist mehr, als von mir gefordert wird.	1	2	3	4	5
Ich bin besonders gut darin, Ideen umzusetzen.	1	2	3	4	5

Wie alt sind Sie:_____
Ihre Nationalität: _____
Geschlecht männlich ◯ weiblich ◯

Vielen Dank für Ihre Teilnahme!

C.1.3 R-Code for Multi-level analysis with nested data

```
# path of the folder
setwd("C:/Users/ri28faq/Desktop/Work LMU/Team Adaptation/1. Studie - TUM Projektteams/IOOB2017")

# install packages

install.packages(c("foreigt","psych", "Hmisc", "lme4", "lmerTest"))

library(foreign)

Teamadaptation1 <- read.spss(file = "IOOB_TA_MLM_17-01-15.sav", to.data.frame= TRUE, reencode = TRUE)

# building the scales
# stategic scanning for situation assessment (SA), team reflexivity for plan formulation (PF)
# coordination for plan execution (PE) and team learning (TL)

Teamadaptation1$SA <- rowMeans(Teamadaptation1[, c('SS1', 'SS2', 'SS3')])

Teamadaptation1$PF<- rowMeans(Teamadaptation1[, c('RP1', 'RP2', 'RP3', 'RP3', 'RP4', 'RP5')])

Teamadaptation1$PE<- rowMeans(Teamadaptation1[, c('TMS_CO1', 'TMS_CO2', 'TMS_CO3', 'TMS_CO4')])

Teamadaptation1$TL<- rowMeans(Teamadaptation1[, c('TL3', 'TL4', 'TL6')])

# z-standardize for all team adaptation phase-variable
# standardized situation assessment (SAZ)
# standardized plan formulation (PFZ)
# standardized plan execution (PEZ)
# standardized team learning (TLZ)

Teamadaptation1$SAZ <- as.numeric (scale (Teamadaptation1$SA, scale = FALSE))

Teamadaptation1$PFZ <- as.numeric (scale (Teamadaptation1$PF, scale = FALSE))

Teamadaptation1$PEZ <- as.numeric (scale (Teamadaptation1$PE, scale = FALSE))

Teamadaptation1$TLZ <- as.numeric (scale (Teamadaptation1$TL, scale = FALSE))

str(Teamadaptation1)

psych::describe(Teamadaptation1)
```

```
Hmisc::describe(Teamadaptation1)


psych::alpha (Teamadaptation1 [, c('SS1', 'SS2', 'SS3')])
psych::alpha (Teamadaptation1 [, c('RP1', 'RP2', 'RP3', 'RP3', 'RP4', 'RP5')])
psych::alpha (Teamadaptation1 [, c('TMS_CO1', 'TMS_CO2', 'TMS_CO3', 'TMS_CO4')])
psych::alpha (Teamadaptation1 [, c('TL3', 'TL4', 'TL6')])

Teamadaptation1$TeamID <- as.factor(Teamadaptation1$Gruppe)

# Calculate ICC(1) and ICC(2) for team adaptation process phases and subgroups

library(multilevel)

iccmodelSA <- aov(SA ~ TeamID, data = Teamadaptation1)
summary(iccmodelSA)
ICC1(iccmodelSA)
ICC2(iccmodelSA)

iccmodelPF <- aov(PF ~ TeamID, data = Teamadaptation1)
summary(iccmodelPF)
ICC1(iccmodelPF)
ICC2(iccmodelPF)

iccmodelPE <- aov(PE ~ TeamID, data = Teamadaptation1)
summary(iccmodelPE)
ICC1(iccmodelPE)
ICC2(iccmodelPE)

iccmodelTL <- aov(TL ~ TeamID, data = Teamadaptation1)
summary(iccmodelTL)
ICC1(iccmodelTL)
ICC2(iccmodelTL)

library(lme4)
library(lmerTest)

# situation assessment on plan formulation
SA_PF <- lmer (PF ~ SA + (1 | TeamID) + (1 | Time), data = Teamadaptation1)
summary(SA_PF)

# plan formulation and plan execution sequence
PF_PE <- lmer (PE ~ PF + (1 | TeamID) + (1 | Time), data = Teamadaptation1)
summary(PF_PE)
```

```
# situation assessment on plan execution
SA_PE <- lmer (PE ~ SA + (1 | TeamID) + (1 | Time), data = Teamadaptation1)
summary(SA_PE)

# situation assessment and plan formulation on plan execution
SA_PF_PE <- lmer (PE ~ SA + PF + (1 | TeamID) + (1 | Time), data = Teamadaptation1)
summary(SA_PF_PE)


# situation assessment on plan formulation
SA_PF <- lmer (PF ~ SA + (1 | TeamID) + (1 | Time), data = Teamadaptation1)
summary(SA_PF)

# plan formulation and plan execution sequence
PF_PE <- lmer (PE ~ PF + (1 | TeamID) + (1 | Time), data = Teamadaptation1)
summary(PF_PE)

#plan execution on team learning
PE_TL <- lmer (TL ~ PE + (1 | TeamID) + (1 | Time), data = Teamadaptation1)
summary(PE_TL)

# situation assessment on team learning
SA_TL <- lmer (TL ~ SA + (1 | TeamID) + (1 | Time), data = Teamadaptation1)
summary(SA_TL)

#situation assessment, plan formulation and plan exeuction on team learning

SA_PF_PE_TL <- lmer (TL ~ SA + PF + PE + (1 | TeamID) + (1 | Time), data =
Teamadaptation1)
summary(SA_PF_PE_TL)

#situation assessment, plan formulation and plan exeuction on team learning
alle_TL <- lmer(TL ~ SA + PF + PE + (1 | TeamID) + (1 | Time), data = Teamadaptation1)
summary (alle_TL)

##############################################################################


# Analysis with standardized variables

SAZ_PEZ <- lmer (PEZ ~ SAZ + (1 | TeamID) + (1 | Time), data = Teamadaptation1)
summary(SAZ_PEZ)

SAZ_PFZ_PEZ <- lmer (PEZ ~ SAZ + PFZ + (1 | TeamID) + (1 | Time), data =
Teamadaptation1)
summary(SAZ_PFZ_PEZ)
```

```
PEZ_TLZ <- lmer (TLZ ~ PEZ + (1 | TeamID) + (1 | Time), data = Teamadaptation1)
summary(PEZ_TLZ)

SAZ_TLZ <- lmer (TLZ ~ SAZ + (1 | TeamID) + (1 | Time), data = Teamadaptation1)
summary(SAZ_TLZ)

SAZ_PFZ_PEZ_TLZ <- lmer (TLZ ~ SAZ + PFZ + PEZ + (1 | TeamID) + (1 | Time), data =
Teamadaptation1)
summary(SAZ_PFZ_PEZ_TLZ)

alle_TLZ <- lmer(TLZ ~ SAZ + PFZ + PEZ + (1 | TeamID) + (1 | Time), data =
Teamadaptation1)
summary (alle_TLZ)

# Assymptotic covariance matrix for Monte Carlo analysis
vcov(SA_PF_PE)

#Monte Carlo

a=0.07131
b=0.38507
covajbj=0.00000377
vara=0.0017167209
varb=0.0031421768
covab=0.0006915156
varcovajbj=0.322994
rep=20000
conf=95
dvec=rnorm(rep)
avec=dvec*sqrt(vara)+a
bvec=dvec*covab/sqrt(vara)+sqrt(varb)*rnorm(rep,sd=sqrt(1-(covab^2)/(vara*varb)))+b
cvec=rnorm(rep)*sqrt(varcovajbj)+covajbj
ab=avec*bvec+cvec
low=(1-conf/100)/2
upp=((1-conf/100)/2)+(conf/100)
LL=quantile(ab,low)
UL=quantile(ab,upp)
LL4=format(LL,digits=4)
UL4=format(UL,digits=4)
hist(ab,breaks='FD',col='skyblue',xlab=paste(conf,'% Confidence Interval ','LL',LL4,'  UL',UL4),
    main='Distribution of Indirect Effect')
print(ab)

# CIs based on likelihood ratio tests:
confint(SA_PF)
confint(PF_PE)
```

```
confint(SA_PE)
confint(SA_PF_PE)
confint(PE_TL)
confint(SA_TL)
confint(SA_PF_PE_TL)
confint(alle_TL)

#bootstrapped (i.e., non-parametric) CIs:
confint(SA_PF, method = "boot")
confint(PF_PE, method = "boot")
confint(SA_PE, method = "boot")
confint(SA_PF_PE, method = "boot")
confint(PE_TL, method = "boot")
confint(SA_TL, method = "boot")
confint(SA_PF_PE_TL, method = "boot")
confint(alle_TL, method = "boot")

#bootstrapped (i.e., non-parametric) CIs with standardized variables:
confint(SAZ_PFZ, method = "boot")
confint(PFZ_PEZ, method = "boot")
confint(SAZ_PEZ, method = "boot")
confint(SAZ_PFZ_PEZ, method = "boot")
confint(PEZ_TLZ, method = "boot")
confint(SAZ_TLZ, method = "boot")
confint(SAZ_PFZ_PEZ_TLZ, method = "boot")
confint(alle_TLZ, method = "boot")
```

C.1.4 Exploratory Factor Analysis for team adaptation phase parameters

	Time 1				Time 2			Time 3			
Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 1	Factor 2	Factor 3	Factor 1	Factor 2	Factor 3	Factor 4
Strategic Scanning Item 1	.83				.86			.86			
Strategic Scanning Item 2	.84				.91			.86			
Strategic Scanning Item 3	.80				.80			.83			
Team Reflexivity Item 1						.78			.82		
Team Reflexivity Item 2						.74			.78		
Team Reflexivity Item 3		.65				.57			.83		
Team Reflexivity Item 4		.71				.61			.70		
Team Reflexivity Item 5		.72				.75			.42		
Coordination Item 1			.43				.77			.61	
Coordination Item 2			.79				.75			.79	
Coordination Item 3			.72				.82			.82	
Coordination Item 4			.79				.74			.56	
Team Learning Item 1				.76		.63					.71
Team Learning Item 2				.76		.63					.65
Team Learning Item 3				.53		.76					.65

C.2 Study 2

C.2.1 Example of transcribed team missions

Team	Transkribierung	Notizen
2EGA1		
	Gut, dann machen wir immer einer hier, einer hier, und einer da.	PF und SA
	Und auch wenn einer ausfällt, haben wir locker genug	
	Ja	
	Ich bleib stehen und lege den Stein da	PE
	Ja, und die eins da.	
	Die zwei die halt können, müssen dann schießen, wenn es wirklich wäre. Kommt halt drauf an	PF
	Ja	
	Also theoretisch kann ja einer ausfallen	SA
	Ja, genau. Dafür können noch zwei schießen.	PF
	Achso, stehen wir alle, ach ja ok.	PE
	Computerstimme: Ernsthafte Bedrohung erreicht.	
	Die da drüben schießen?	PF
	Ja	
	Die blauen schießen. Ne, schon wirklich A... Ja ist egal, so oder sorum hinlegen.	PE
	Ok, 4 minus 2, 2.	
	Wir können jetzt noch da oder da. Dann können wir mit denen was schießen.	PF
	Du schießt auch?	
	Ja.	PE
	Oder wir können auch (???) Oder du gehst da.	PF
	4 minus 2, 2.	
	Ja, ich geh besser hier hin... (???)	
	Dann können nächste Runde du und ich schießen.	
	Ja.	
	Computerstimme.	
	Die Bedrohung bewegt sich drei Schritte.	10:44
	Ich schieße	PE
	Wie viel Schuss haben wir jetzt dann?	SA
	7 minus 5.	
	Super.	
14EGA1		
	Die blockieren sie aber, von Anfang an. Die eine, also eine blockiert.	SA
	Dann geh ich hierlang.	PF
	Und du bist da, ich bleibe hier.	PE

Ja Dann bleibe ich, ah ok. Ja.	
Computerstimme: Ernsthafte Bedrohungen erreicht.	
Aber jetzt geht auf jeden Fall	SA
Gehen die beiden	PF
Ja genau.	
Kann man auch die seitlich dazu laden? Ja	SA
Also, dann kannst du die hier rübertun.	PF
Aber wann gehen die denn...	
Ab der dritten Runde funktionieren sie wieder. So, 8 minus 2 ist 6, dann habt ihr immer noch 4 Lebenspunkte.	PE
Dann kannst du da zum Beispiel da einen hintun und aufladen. Ja genau, da tu ich den Stein jetzt hin.	PF
Aber kann da theoretisch von hier auch einer... Geht das? Glaube nicht. Können wir auch diagonal aufladen?	SA
Nein.	
Diagnoal nicht. Aber man kann aufladen über B oder? Ah ja, ich kann nur so rüber machen. Wenn das passt, oder? Ja.	SA
Aber schieß einfach hier rein. Aber ne, ja.	PF
So rüber. Aber ich kann hier auch rüber, geht nicht, oder? Nein.	SA
Computerstimme.	
Ja, dann ich schieße.	PF
Ja. Du schießt und ich schieße auch.	PE
Dann ist das hier. *6 minus 2 ist 4, dann ist die Bedrohung tot. Perfekt.*	

C.2.2 Example of rater coding and consensus process

Team	Gruppe (EG=1, KG=0)	Phase	Person	Transkribieren	Eleni	Clara	Überein-stimmung (JA/NEIN)	Final
2EGA1	1	4	D	Gut, dann machen wir immer einer hier, einer hier, und einer da. Und auch wenn einer ausfällt, haben wir locker genug	PF	PF	JA	PF
2EGA1	1	4	D	Gut, dann machen wir immer einer hier, einer hier, und einer da. Und auch wenn einer ausfällt, haben wir locker genug	SA	SA	JA	SA
2EGA1	1	4	D	Ich bleib stehen und lege den Stein da	PE	PE	JA	PE
2EGA1	1	4	D	Die zwei die halt können, müssen dann schießen, wenn es wirklich wäre. Kommt halt drauf an	PF	PF	JA	PF
2EGA1	1	4	C	Also theoretisch kann ja einer ausfallen	SA	SA	JA	SA
2EGA1	1	4	D	Ja, genau. Dafür können noch zwei schießen.	PF	0	NEIN	PF
2EGA1	1	4	C	Ach so, stehen wir alle, ach ja ok.	PE	PE	JA	PE
2EGA1	1	4	D	Die da drüben schießen?	PF	PF	JA	PF
2EGA1	1	4	D	Die blauen schießen. Ne, schon wirklich A... Ja ist egal, so oder so rum hinlegen.	PE	PE	JA	PE
2EGA1	1	4	D	Wir können jetzt noch da oder da. Dann können wir mit denen was schießen.	PF	PF	JA	PF
2EGA1	1	4	B	Ja.	PE	PE	JA	PE
2EGA1	1	4	D	Oder wir können auch (???) Oder du gehst da.	PF	PF	JA	PF
2EGA1	1	4	VL	*4 minus 2, 2.*	PF	PF	JA	PF
2EGA1	1	4	C	Ja, ich geh besser hier hin... (???)	PF	PF	JA	PF
2EGA1	1	4	D	Dann können nächste Runde du und ich schießen.	PF	PF	JA	PF
2EGA1	1	4	C	Ja.	PF	PF	JA	PF
2EGA1	1	4	A	Ich schieße	PE	PE	JA	PE
2EGA1	1	4	C	Wie viel Schuss haben wir jetzt dann?	SA	SA	JA	SA
2EGA1	1	4	D	7 minus 5.	SA	SA	JA	SA
14EGA1	1	4	D	Die blockieren sie aber, von Anfang an. Die eine, also eine blockiert.	SA	0	NEIN	SA
14EGA1	1	4	A	Dann geh ich hier lang.	PF	0	NEIN	PE
14EGA1	1	4	B	Und du bist da, ich bleibe hier.	PE	PE	JA	PE
14EGA1	1	4	C	Ja	PE	PE	JA	PE
14EGA1	1	4	D	Dann bleibe ich, ah ok.	PE	PE	JA	PE

14EGA1	1	4	A	Ja.	PE	PE	JA	PE
14EGA1	1	4	C	Aber jetzt geht auf jeden Fall	SA	SA	JA	SA
14EGA1	1	4	A	Gehen die beiden	PF	0	NEIN	PF
14EGA1	1	4	B	Kann man auch die seitlich dazu laden?	SA	SA	JA	SA
14EGA1	1	4	C	Ja	SA	SA	JA	SA
14EGA1	1	4	B	Also, dann kannst du die hier rüber tun.	PF	0	NEIN	PE
14EGA1	1	4	VL	*Ab der dritten Runde funktionieren sie wieder. So, 8 minus 2 ist 6, dann habt ihr immer noch 4 Lebenspunkte.*	PE	PE	JA	PE
14EGA1	1	4	B	Dann kannst du da zum Beispiel da einen hintun und aufladen.	PF	PF	JA	PF
14EGA1	1	4	C	Ja genau, da tu ich den Stein jetzt hin.	PF	0	NEIN	PE
14EGA1	1	4	A	Aber kann da theoretisch von hier auch einer...	SA	SA	JA	SA
14EGA1	1	4	B	Geht das?	SA	SA	JA	SA
14EGA1	1	4	D	Glaube nicht.	SA	SA	JA	SA
14EGA1	1	4	A	Können wir auch diagonal aufladen?	SA	SA	JA	SA
14EGA1	1	4	A	Diagonal nicht.	SA	0	NEIN	TL
14EGA1	1	4	B	Aber man kann aufladen über B oder?	SA	SA	JA	SA
14EGA1	1	4	C	Ah ja, ich kann nur so rüber machen. Wenn das passt, oder?	SA	SA	JA	SA
14EGA1	1	4	B	Ja.	SA	SA	JA	SA
14EGA1	1	4	A	Aber schieß einfach hier rein. Aber ne, ja.	PF	PF	JA	PF
14EGA1	1	4	C	So rüber. Aber ich kann hier auch rüber, geht nicht, oder?	SA	SA	JA	SA
14EGA1	1	4	D	Nein.	SA	SA	JA	SA

C.2.3 Example of preparation for sequence analysis

Team	Group	Phase	Person	Transkribierung	Phase	Cons1	Cons2	Cons 3
2EGA1	**1**	4	D	Gut, dann machen wir immer einer hier, einer hier, und einer da. Und auch wenn einer ausfällt, haben wir locker genug	PF	SA	PE	PF
2EGA1	**1**	4	D	Gut, dann machen wir immer einer hier, einer hier, und einer da. Und auch wenn einer ausfällt, haben wir locker genug	SA	PE	PF	SA
2EGA1	**1**	4	D	Ich bleib stehen und lege den Stein da	PE	PF	SA	PF
2EGA1	**1**	4	D	Die zwei die halt können, müssen dann schießen, wenn es wirklich wäre. Kommt halt drauf an	PF	SA	PF	PE
2EGA1	**1**	4	C	Also theoretisch kann ja einer ausfallen	SA	PF	PE	PF
2EGA1	**1**	4	D	Ja, genau. Dafür können noch zwei schießen.	PF	PE	PF	PE
2EGA1	**1**	4	C	Achso, stehen wir alle, ach ja ok.	PE	PF	PE	PF
2EGA1	**1**	4	D	Die da drüben schießen?	PF	PE	PF	PE
2EGA1	**1**	4	D	Die blauen schießen. Ne, schon wirklich A... Ja ist egal, so oder sorum hinlegen.	PE	PF	PE	PF
2EGA1	**1**	4	D	Wir können jetzt noch da oder da. Dann können wir mit denen was schießen.	PF	PE	PF	PE
2EGA1	**1**	4	B	Ja.	PE	PF	PE	SA
2EGA1	**1**	4	D	Oder wir können auch (???) Oder du gehst da.	PF	PE	SA	
2EGA1	**1**	4	A	Ich schieße	PE	SA		
2EGA1	**1**	4	C	Wie viel Schuss haben wir jetzt dann?	SA			
14EGA1	**1**	4	D	Die blockieren sie aber, von Anfang an. Die eine, also eine blockiert.	SA	PE	SA	PF
14EGA1	**1**	4	A	Dann geh ich hierlang.	PE	SA	PF	SA
14EGA1	**1**	4	C	Aber jetzt geht auf jeden Fall	SA	PF	SA	PE
14EGA1	**1**	4	A	Gehen die beiden	PF	SA	PE	PF
14EGA1	**1**	4	B	Kann man auch die seitlich dazu laden?	SA	PE	PF	PE
14EGA1	**1**	4	B	Also, dann kannst du die hier rübertun.	PE	PF	PE	SA
14EGA1	**1**	4	B	Dann kannst du da zum Beispiel da einen hintun und aufladen.	PF	PE	SA	TL
14EGA1	**1**	4	C	Ja genau, da tu ich den Stein jetzt hin.	PE	SA	TL	SA
14EGA1	**1**	4	A	Aber kann da theoretisch von hier auch einer...	SA	TL	SA	PF
14EGA1	**1**	4	A	Diagnoal nicht.	TL	SA	PF	SA
14EGA1	**1**	4	B	Aber man kann aufladen über B oder?	SA	PF	SA	PF
14EGA1	**1**	4	A	Aber schieß einfach hier rein. Aber ne, ja.	PF	SA	PF	PE
14EGA1	**1**	4	C	So rüber. Aber ich kann hier auch rüber, geht nicht, oder?	SA	PF	PE	
14EGA1	**1**	4	D	Ja, dann ich schieße.	PF			

15EGA1	**1**	2	B	Ich würde sagen, dass ich jetzt nicht mehr auffülle. Weil ich habe ja nur noch einmal B. Dann füllen die anderen lieber auf.	PF	SA	PF	SA
15EGA1	**1**	2	B	Ich würde sagen, dass ich jetzt nicht mehr auffülle. Weil ich habe ja nur noch einmal B. Dann füllen die anderen lieber auf.	SA	PF	SA	PF
15EGA1	**1**	2	B	Ich würde sagen, dass ich jetzt nicht mehr auffülle. Weil ich habe ja nur noch einmal B. Dann füllen die anderen lieber auf.	PF	SA	PF	PE
15EGA1	**1**	2	D	Wir haben alle nur einmal B.	SA	PF	PE	PF
15EGA1	**1**	2	D	Stimmt ja. Dann könntest du ja oben bleiben und in der ersten Runde B machen.	PF	PE	PF	TL
15EGA1	**1**	2	C	Ich geh nach da.	PE	PF	TL	SA
15EGA1	**1**	2	D	Dann müssen wir noch schauen, dass eine von denen... Genau, ich geh mal... Und du gehst...	PF	TL	SA	PF
15EGA1	**1**	2	A	Ja, shit. Wenn ich runter geh, sind alle B weg.	TL	SA	PF	PE
15EGA1	**1**	2	A	Und bei dir	SA	PF	PE	PF
15EGA1	**1**	2	B	Dann geh ich halt runter und du rauf.	PF	PE	PF	PE
15EGA1	**1**	2	D	Genau.	PE	PF	PE	PE
15EGA1	**1**	3	D	Dann kann ich jetzt schießen... Und du gehst erstmal rüber.	PF	PE	PE	PF
15EGA1	**1**	3	A	Genau. Und dann müssen wir halt schauen, dass wir da dicht (?!) sind... Also ich geh jetzt mal nach rechts.	PE	PE	PF	SA
15EGA1	**1**	3	VL	Wenn ihr beide schießt, ist 8 minus 2, 6. Immer noch 4 Lebenspunkte.	PE	PF	SA	PF
15EGA1	**1**	3	C	Du kannst die auffüllen.	PF	SA	PF	SA
15EGA1	**1**	3	D	Genau und ich hab hier... Ne, man kann nur einmal schießen, oder?	SA	PF	SA	PF
15EGA1	**1**	3	A	Du kannst hier auch runter gehen, oder?	PF	SA	PF	PE
15EGA1	**1**	3	B	Ich kann nicht mehr schießen dann.	SA	PF	PE	PF
15EGA1	**1**	3	C	Dann kann ich nicht schießen. Dann schießt ihr.	PF	PE	PF	SA
15EGA1	**1**	3	D	Ich geh auf jeden Fall mal runter.	PE	PF	SA	TL
15EGA1	**1**	3	A	Ich hätt jetzt erstmal aufgefüllt.	PF	SA	TL	SA
15EGA1	**1**	3	C	Nein, du kannst...	SA	TL	SA	PF
15EGA1	**1**	3	A	Ach, jetzt geht das nicht.	TL	SA	PF	PE
15EGA1	**1**	3	D	Aber jetzt können wir die Karte (?!) doch ändern.	SA	PF	PE	SA
15EGA1	**1**	3	C	Dann schießt du. Und ich bin (??!)	PF	PE	SA	PF
15EGA1	**1**	3	VL	Ok, also wenn du schießt, ist es 2 minus 2, 0.	PE	SA	PF	SA
15EGA1	**1**	4	D	Jetzt dürfen wir die hier nehmen.	SA	PF	SA	PE
15EGA1	**1**	4	A	Dann geht am besten einer hoch, und gelb schießt, oder?	PF	SA	PE	
15EGA1	**1**	4	A	Und wer ist gelb?	SA	PE		
15EGA1	**1**	4	A	Du schießt und ich bring dir B runter.	PE			