Eleni Georganta

Technical University of Munich

Katharina G. Kugler

Julia A. M. Reif

Felix C. Brodbeck

Ludwig-Maximilians-University Munich

Citation

Georganta, E., Kugler, K. G., Reif. J. A. M., & Brodbeck, F. C. (2021). The Four-Phase Team Adaptation Process: An Empirical Investigation. *Team Performance Management, 27*(1/2), 66-79. https://doi.org/10.1108/TPM-01-2020-0007

Abstract

Purpose: Several theoretical models have been developed to describe the process of successful team adaptation. Testing the models through empirical research is not yet mature and lacking. The present work empirically examines the way teams adapt to unexpected or novel circumstances and investigates the four-phase team adaptation process (i.e., situation assessment → plan formulation → plan execution → team learning), as proposed by Rosen, *et al.* (2011).

Design/methodology/approach: To test the positive relationship between the four team adaptation phases and their suggested sequence, a cross-sectional field study was conducted. Data were collected from 23 teams participating during an 8-week team project.

Findings: Results from random intercept models confirmed that the team adaptation process consisted of four phases that were positively related to each other. As expected, plan formulation mediated the positive relationship between situation assessment and plan execution. However, team learning was independently related to all three previous phases, not only to situation assessment as theory suggests.

Originality/value: The present study is one of the first attempts to test the theoretical model of the team adaptation process presented by Rosen *et al.* (2011). Findings illustrated that the team adaptation process is not a simple four-phase sequence, but it constitutes four dynamic phases that are strongly interrelated to each other.

Keywords: team adaptation process, situation assessment, plan formulation, plan execution, team learning

Article Classification: Research Paper

The Four-Phase Team Adaptation Process: An Empirical Investigation

Introduction

"Instead of constantly adapting to change, why not change to be adaptive?"

— Fred Emery, self-managing teams pioneer

A team's capability to adapt to changing conditions is an essential factor for successful team performance under challenging and unpredictable circumstances (Katzenbach and Smith, 2015). Hence, team research has increasingly focused on team adaptation suggesting various theoretical models that describe the way teams should adjust while maintaining or even improving their level of performance (Burke *et al.*, 2006; Kozlowski and Bell, 2008; Rosen *et al.*, 2011). Nevertheless, empirical work primarily focused on routine team performance (Christian *et al.*, 2017), offering limited evidence about the characteristics and processes that enable successful team adaptation.

Lacking in empirical underpinning (Baard *et al.*, 2014) is the team adaptation process, 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). The team adaptation process describes a dynamic team phenomenon that occurs when teams face a changing condition and recognize the need to adapt (Maynard *et al*., 2015). According to theory (Rosen *et al*., 2011), the team adaptation process reflects a sequence of four phases: (1) situation assessment, where the team gathers and interprets relevant information from the changing situation; (2) plan formulation, where the team determines a plan of action based on the information collected; (3) plan execution, where the plan is performed; (4) team learning, where the team reflects on its previous actions, weaknesses, and strengths in order to learn from its experience. Each phase incorporates different team processes (e.g., coordination) that are accompanied by various emergent states (e.g., shared mental models).

Literature suggests that teams need to execute the complete team adaptation process in order to adapt successfully and reach effective outcomes (Burke *et al.*, 2006). However, many empirical studies have used the four-phase team adaptation process only as their theoretical

framework, focusing either on parts of the team adaptation process or investigating it indirectly (Christian *et al*., 2017). For instance, Randall et al. (2011) showed that information sharing (i.e., situation assessment) contributed to effective team responses to changing conditions, while Santos and colleagues (2016) found that team learning behaviors (i.e., team learning) fostered successful team adaptation and performance. In other studies, the successful adaptation was simply reflected by a performance enhancement after a task was manipulated (Klein *et al*., 2006). Despite the importance of these findings, the relationship between the four team adaptation phases and the team adaptation process as a whole remains largely unexplored (e.g., Marques-Quinteiro *et al*., 2013).

The goal of the present study is to investigate the theoretically assumed relationships between all four phases and hence the complete team adaptation process (Rosen et al., 2011). To do so, we selected specific team processes – in line with the theoretical team adaptation process models (Burke *et al*., 2006; Rosen *et al*., 2011) and with prior team adaptation studies (e.g., Christian *et al*., 2017) – to assess each of the team adaptation phases[1]. The study provides initial insight into whether the assumed four-phase sequence is essential for successful adaptation. Showing how the phases are related to each other and thus the order in which they should be executed, enables the design of customized team trainings to support the adaptive capacity of both, teams and their organizations.

Theoretical Background and Hypotheses

The Four Phases of Team Adaptation

Situation assessment, the first phase of the team adaptation process (Rosen *et al.*, 2011), refers to the process of information gathering when facing a changing condition, in which teams scan the situation for cues that possibly affect their goals, mission, and execution

[1] For a first investigation of the relationships between the four team adaptation phases, we focused only on team processes and did not incorporate team emergent states.

of tasks (Burke *et al*., 2006; Gutwin and Greenberg, 2004). Specifically, team members search for potential problems, trying to make sense of their possible implications and, consequently, generate initial solutions. Empirical findings suggested that teams react quickly and effectively to unexpected events only after thoroughly assessing their situation and strategically scanning their environment (Ancona and Caldwell, 1992; Crant, 2000, Weick and Roberts, 1993).

Strategic scanning reflects an essential element of situation assessment. Therefore, we focused on the team process of strategic scanning to capture the first phase of the team adaptation process. Generally, strategic scanning refers to the identification of "ways to ensure a fit between the organization and its environment, such as ... actively searching the environment for future organizational threats and opportunities" (Parker and Collins, 2010, p. 637). We focused on strategic scanning at the team-level, specifically on the team's capacity to scan its current situation in order to identify relevant cues that require an adaptive response.

During plan formulation, the second phase of the team adaptation process (Rosen *et al*., 2011), teams decide on a course of action as a response to the changing condition, set goals, formulate expectations, and clarify responsibilities by reflecting on previous events and behaviors (Burke *et al*., 2006; Stout and Salas, 1993). Teams who reflect their assumptions and reexamine the meanings related to their situation learn from previous team processes, errors and mistakes (Schippers *et al*., 2013) and reach high team outcomes (Hoegl and Parboteeah, 2006). Hence, team reflexivity represents a key team process when formulating a plan as a response to changing conditions. We therefore captured plan formulation by the team process 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). This process takes place in-action (Schmutz *et al*., 2018) and involves reviewing the facing situation in order to become aware of the demands and the possible consequences (West, 1996).

During the third phase of team adaptation (Rosen *et al*., 2011), plan execution, team members actively engage in a number of activities aiming at successfully executing the plan previously formulated. Plan execution is defined as "an assortment of concomitant individual- and team-level processes that are enacted dynamically, simultaneously, and recursively" (Burke *et al*., 2006, p. 1195). One of the main requirements for successful plan execution, especially when facing a changing condition, is the coordination of actions between team members (Marks *et al*., 2001). Therefore, we focused on the team process of coordination to capture plan execution. Coordination in groups refers to the "way in which group members synchronize their actions in order to complete successfully the group task (…). [G]roup coordination involves who among the members does what, as well as when, where, and how they complete their designated tasks" (Wittenbaum *et al.*, 1998, p. 177). When responding to changing demands, successful coordination significantly contributes to high team performance (Braun *et al.*, 2020; Entin and Serfaty, 1999; Rosen *et al*., 2011).

After plan execution, teams ideally continue with the final phase of the team adaptation process, team learning (Rosen *et al*., 2011). During this phase, teams reflect on the actions they executed and identify the reactions that contributed (or that did not contribute) to a successful response to the changing condition. In our study, we captured team learning directly with the team process of team learning, defined as a change in team-level knowledge that guides future team behavior (Ellis *et al*., 2003). Through team learning, teams realize the consequences of completed actions, recognize where the team stands, and understand how unintended consequences could have been prevented (Edmonson, 1999). Team learning supports teams to gain to a more complete picture of their strengths and weaknesses and ideally to even more successful and innovative team responses in the future (Widman and Mulder, 2018).

Prior research has found positive relationships between the team processes selected to capture the four team adaptation phases. Specifically, studies have shown that assessing

information about ongoing conditions and processes enabled the emergence and update of team cognition (Ellwart *et al.*, 2015; Uitdewilligen *et al.*, 2013; Zajac *et al.*, 2014), while this increased awareness of the facing situation allows teams to reflect and plan accordingly (Widmer *et al.*, 2009). Further, team reflexivity enabled teams to revise or refine their understanding of what does and does not work and in turn, improved their subsequent coordinated actions (Gabelica *et al*., 2016; Lewis *et al.*, 2005). Specifically, teams that elaborated their shared understanding of their roles and responsibilities (e.g., Smith-Jentsch *et al.*, 2008) and "anticipate[d], rather than simply react[ed] to, each other's behavior" (Moreland and Myaskovksy, 2000, p. 118) showed effective coordination (see also Vashdi *et al.*, 2013; Salas *et al.*, 2007). As a result, suitable coordinated actions, real-time communication, and collective discussion gave rise to learning new practices and, future team processes improved based on shared experience and gained knowledge (Edmondson *et al.*, 2001).

Building on the theoretical and empirical rationale presented above and on the conceptualization of the team adaptation process as a sequence of four phases (Rosen *et al.*, 2011), we propose the following about the four team adaptation phases and hence, about the respective team processes selected to capture them:

Hypothesis 1: When adapting to changing conditions, there is a positive relationship between each of the following team adaptation phases: situation assessment (i.e., strategic scanning), plan formulation (i.e., team reflexivity), plan execution (i.e., coordination), and team learning.

Hypothesis 2: When adapting to changing conditions, the four team adaptation phases are related to each other in the form of a serial mediation model, which is situation assessment (i.e., strategic scanning) → plan formulation (i.e., team reflexivity) → plan execution (i.e., coordination) → team learning.

Methodology

Participants and Procedure

Fifty-four student teams worked on the development of a new recycling product for an eight-week engineering course held at a large university in Germany. We found these teams appropriate for exploring the team adaptation process due to: (1) the complexity of their task; (2) the interdependence among team members to reach high outcomes (e.g., team grades based on the jointly developed product); (3) the constant need to adapt to changing conditions in order to successfully perform (e.g., adjustment of the idea(s) to available resources or change of plan due to already existing product); and (4) the homogeneity among team members and teams (similar age, educational background, discipline, prior team experience, same task, instructors and semester).

Data was only relevant and used when at least three individuals of each team participated at three different points in time in the study (T1 = second week, T2 = fifth week, T3 = eighth week of the course). The final sample consisted of twenty-three student teams (mean [*M*] = 4.00 individuals per team, minimum = 3.00 individuals per team, maximum = 9.00 individuals per team, standard deviation [SD] = 1.80), with *N* = 103 individuals at T1, *N* = 101 individuals at T2, and *N* = 93 individuals at T3. Most of the engineering students were male (81%), with an average age of 19.55 years (SD = 2.24 years).

Data was collected using an online questionnaire at three points in time (T1, T2, and T3)[2]. Specifically, we assessed the selected team processes reflecting each team adaptation phase as well as whether teams faced conditions requiring them to adapt (e.g., adjusting ideas, strategies or actions) in order to ensure that teams executed the team adaptation process. In the last questionnaire, we also assessed participants' demographics (age, gender, and nationality).

[2] Prior to data collection, a unique code was generated for each individual and for each team in order to match the individuals' questionnaires over time as well as to their teams while ensuring anonymity.

Measures

Given that participants were studying in Germany, all scales were translated into German following the translation and back-translation strategy (Campbell *et al.,* 1970). If not mentioned otherwise, all scales were measured using a 5-point Likert scale ranging from 1 (totally disagree) to 5 (totally agree).

Situation assessment was measured using the three-item strategic scanning scale (e.g., "Actively scan the environment to see what is happening might affect your team in the future?") adapted from Parker and Collins (2010), showing good reliability (α = .78 at T1, α = .83 at T2, α = .85 at T3).

Plan formulation was assessed with the five-item scale of team reflexivity (e.g., "My team adjusted its task performance strategies in response to changes in the context and progress of the project.") by Hoegl and Paroteeah (2006). Reliability was moderate to good (α = .65 at T1; α = .78 at T2, and α = .79 at T3).

Plan execution was measured using the coordination four-item subscale (e.g., "Our team worked together in a well-coordinated fashion") adapted from Lewis's (2003) scale. The scale was reliable (α = .70 at T1, α = .78 at T2, α = .68 at T3).

Team learning was assessed with seven items developed by Edmondson (1999). As the reliability analysis did not reveal satisfying results, we removed four items from the original scale. The three remaining items ("Team members go out and get all the information they possibly can from others-such as customers, or other parts of the organization.", "This team frequently seeks new information that leads us to make important changes.", "People in this team often speak up to test assumptions about issues under discussion.") showed moderate to good reliability (α = .66 at T1, α = .72 at T2, and α = .64 at T3).

Whether teams experienced *conditions requiring them to adapt* was measured by asking the following question: "How many incidents that led to a change within your team took place during the last 2 weeks". Participants answered the question on a 5-point scale

ranging from 1 (none) to 5 (a lot).

Data Analyses

Prior to testing our hypotheses, we ensured that teams adapted to changing conditions at all three time points. Therefore, we first calculated the number of incidents that led them to adapt. Afterwards, we ran exploratory factor analyses (EFAs) to test whether the selected team processes represented four distinct factors (team adaptation phases) to ensure that the multiphasic-phase nature of the team adaptation process was reflected. Preliminary analyses were conducted with SPSS (IBM SPSS Statistics Version 23).

To test our hypotheses, we used a multilevel design with individuals nested in teams that were nested in points in time[3]. Hence, our level of analysis was at the individual level while taking into consideration the individual's allocation to its team and the team's allocation to each point in time. Specifically, we calculated random intercept models (lmer function from lme4 package; Bates and Maechler, 2009) applying the mixed-model formula (Bates *et al.*; 2014) and calculating R^2 (r.squaredGLMM function from MuMln package; Bartón, 2020). For the mediation analyses[4], we also calculated the bootstrap 95% confidence following the Monte Carlo method (Selig and Preacher, 2008). We *z*-standardized all variables before conducting the analyses. Hypotheses testing was conducted with R (version 3.3.2; 2014).

Means, SDs, and correlations between the study variables for each point in time are presented in Table 1.

Results

[3] We did not use the different points in time for longitudinal investigation because the team processes took place at unpredictable points in time, with teams adjusting to incidents at the time they occurred.

[4] In order to consider the nested nature of our data also in the mediation analysis, we did not test our mediation according to Hayes (2013).

Preliminary Analysis

Teams experienced changing conditions at all points in time requiring them to adapt (M = 1.90, SD = 0.51 at T1; M = 1.77, SD = 0.44 at T2; M = 1.53, SD = 0.43 at T3), hence, the requirement for investigating the team adaptation process was met[5]. Further, EFAs on the individual level with oblimin rotations favored, according to the elbow criterion, a four-factor solution for all points in time, results that reflected the four distinct team processes, and in turn, team adaptation phases. The eigenvalue criterion greater than 1 suggested a four-factor solution at T1 and T3 and a three-factor solution for T2 (see Supplemental Material).

Hypotheses Testing

Concerning the positive relationship between each of the four phases (Hypothesis 1), results supported our expectations. Specifically, results showed a positive relationship between the following team adaptation phases: situation assessment and plan formulation (β = .29, $p < 0.01$), plan formulation and plan execution (β = .46, $p < 0.01$), plan execution and team learning (β = .36, $p < 0.01$), situation assessment and plan execution (β = .20, $p < 0.01$), situation assessment and team learning (β = .46, $p < 0.01$), as well as plan formulation and team learning (β = .56, $p < 0.01$).

Concerning the relationship between the team adaptation phases in the form of a serial mediation model (Hypothesis 2), results partially supported our expectations (Table 2 and Table 3). In line with Hypothesis 2, plan formulation fully mediated the relationship between situation assessment and plan execution, with a positive indirect effect (β = .44, $p < 0.01$). The direct path from situation assessment on plan execution was no longer significant (β = .07, p = 0.18) and the bootstrap 95% confidence interval CI [0.02, 0.27] around the

[5] One team did not report any changing conditions. However, the team tutors informed us that all teams faced changing conditions that required them to adapt and that the complexity of the task was relatively high. Therefore, we decided to keep this team for the data analysis.

indirect effect did not contain zero. When exploring the relationship between all four team adaptation phases, plan formulation ($\beta = .41$, $p < 0.01$) and plan execution ($\beta = .11$, $p = 0.01$) did not mediate the relationship between situation assessment and team learning, with the bootstrap 95% confidence interval CI [-2.92, 3.87] around the indirect effect containing zero, in contrast to expectations. The direct path from situation assessment to team learning remained significant ($\beta = .31$, $p < 0.01$).

Exploratory multiple regression showed that team learning was independently predicted by situation assessment ($\beta = .32$, $p < 0.01$), plan formulation ($\beta = .41$, $p < 0.01$), and plan execution ($\beta = .38$, $p = 0.14$).

Discussion

Although effective teams "must be willing to adjust and consider alternative perspectives while developing a plan for future team action" (Salas *et al.*, 2005; p. 590), little is known about the way teams adapt to changing conditions (Baard *et al*., 2013). The goal of the present study was to provide insight into the process of team adaptation and start investigating the sequence of the four team adaptation phases as suggested in Rosen and colleagues' (2011) model. As expected, we found that the team adaptation phases positively related to each other. Further, our findings supported that teams (as perceived by team members) run through situation assessment followed by plan formulation and then by plan execution. However, the three-phase sequence did not continue onto team learning; each of the first three team adaptation phases contributed to team learning independently.

Our findings suggested that when teams adapt, team learning is not as a single outcome but an ongoing process. Reviewing past events, and reflecting on strengths and weaknesses are not necessarily aimed at final performance outcomes but at "learning how to play the game together" (Savelsbergh *et al.*, 2009, p. 581). Although Rosen et al. (2011) highlighted that during team learning a "a team retrospectively evaluates its past performance" (p. 111), it seems that teams continuously evaluate how they interact with each

other while adapting to changing conditions, not only their actions and outcomes. Similar to the concept of 'in-action team reflexivity' by Schmutz *et al.* (2018), teams, while adapting, might focus on the immediate implications of their lessons learned and on how to directly implement them. Similar to recent evidence by Georganta *et al.* (2020), the present findings did not confirm the fixed sequence of the four team adaptation phases. It seems that teams run though the first three team adaptation phases as proposed by theory, while team learning is recurring throughout the process of team adaptation.

With this study, we moved beyond prior studies investigating only single components of the team adaptation process (Christian *et al*., 2017) and explored the relationship between the four team adaptation phases, focusing on capturing the team adaptation process as a whole. Furthermore, we answered the call from Maynard *et al.* (2015) and did not view team adaptation "as occurring within a "black box" that goes unmeasured" (p.8) by assessing each team adaptation phase with a representative team process. Nevertheless, our study had limitations. First, we captured each team adaptation phase by selecting only one team process, neglecting that each phase incorporates various team processes accompanied by emergent states. Second, we did not measure the team adaptation phases as they unfolded, which is unfortunate given that team adaptation describes a dynamic process (Rosen *et al.*, 2011). Third, our sample size was quite small and included only student teams, questioning the generalizability of our findings to different organizational settings. Fourth, team members' perceptions were used to measure the four team adaptation phases, raising concerns about common method bias (Conway and Lance, 2010).

Overall, we suggest future research to aim for a larger sample to increase power, to use various assessment methods to capture the dynamic team adaptation process as a whole (e.g., Georganta and Brodbeck, 2018), and to assess it within an organizational setting that allows observations of the way its phases unfold over time. We hope that our study can serve as a starting point for exploring the multiphasic and dynamic nature of the team adaptation

process and for finding ways to train teams to adapt successfully to changing conditions.

Practical Implications

The fact that all four team adaptation phases were positively related to each other and that the first three team adaptation phases independently influenced team learning shows that all four phases are needed for successful team adaptation and that teams learn throughout their response to changing conditions. Hence, we suggest organizations to consider the implementation of training programs in which all four phases of team adaptation are explained and practiced. Previous research has already shown that training can promote team adaptation, for instance, by preparing teams to change their coordination strategies (Entin and Serfaty, 1999) or by improving the concentrated effort by team members during work (Marks *et al*., 2000).

Specifically, we propose that teams should face various changing conditions and learn to execute the team adaptation process by performing the first three team adaptation phases one after each other: first by assessing and understanding the changing condition, then by planning, and afterwards by moving into action. At the same time, team members should be encouraged to continuously review not only their completed actions but also their team behaviors and learn to implement their lessons learned directly. Further, when facing changing cognitions, teams should be trained to openly share their concerns in a transparent and constructive way in order to develop a positive team adaptation culture (Salas *et al.*,2005). Perceiving changing conditions as negative or harmful can lead to disengagement and negative team outcomes (Podsakoff *et al*., 2007).

Despite the importance of our findings and of the resulting implications, we believe that further research is needed to design customized team trainings in more detail and hence promote the teams' and their organizations' adaptive capacity.

Conclusion

The purpose of this study was to empirically investigate the relationship and sequence

of the four phases of the team adaptation process as suggested by Rosen et al. (2011). Our findings provide the empirical evidence of these theoretical assumptions supporting that the team adaptation process reflects four different phases that positively influence each other. At the same time, results imply that the actual execution of the team adaptation process may not completely reflect what theory suggests. Although the sequence of the first three phases was supported, findings showed that the last phase, team learning, was independently related to all three previous phases. This preliminary experimental research provided a first insight into the complete four-phase team adaptation process, presenting promising results warranting further investigation.

References

Ancona, D.G. and Caldwell, D.F. (1992), "Bridging the Boundary: External Activity and Performance in Organizational Teams", Administrative Science Quarterly, [online] Vol. 37 No. 4, p.634, available at: http://web.mit.edu/curhan/www/docs/Articles/15341_Readings/Group_Dynamics/Ancona_Caldwell_1992_Bridging_the_boundary.pdf.

Baard, S. K., Rench, T. A. and Kozlowski, S. W. (2013), "Performance adaptation: A theoretical integration and review", *Journal of Management,* Vol. 40 No. 1, pp. 48-99.

Baard, S. K., Rench, T. A. and Kozlowski, S. W. J. (2014), "Performance Adaptation: A Theoretical Integration and Review", *Journal of Management,* Vol. 40 No.1, pp. 48–99.

Barton (2020). "Package 'MuMIn'", available at: https://cran.r-project.org/web/packages/MuMIn/MuMIn.pdf

Bates, D. and Maechler, M. (2009), Package "lme4" (Version 0.999375-32): linear mixed-effects models using S4 classes [Computer software], available at: http://cran.r-project.org/web/packages/lme4/lme4.pdf

Bates, D., Maechler, M., Bolker, B. and Walker, S. (2014), "Fitting linear mixed-effects models using lme4", available at: http://arxiv.org/abs/1406.5823

Bowers, C. A., Jentsch, F., Salas, E. and Brown, C. C. (1998), "Analyzing communication sequences for team training needs assessment", *Human Factors,* Vol. 40 No. 4, pp. 672-679.

Braun, M. T., Kozlowski, S. W. J., Brown, T. A.,and DeShon, R. P. (2020), "Exploring the Dynamic Team Cohesion–Performance and Coordination–Performance Relationships of Newly Formed Teams", *Small Group Research,* Vol. 51 No. 5, pp. 551–580.

Burke, C. S., Stagl, K. C., Salas, E., Pierce, L. and Kendall, D. (2006), "Understanding team adaptation: A conceptual analysis and model", *Journal of Applied Psychology*, Vol. 91 No. 6, pp. 1189-1207.

Campbell, D., Brislin, R., Stewart, V. and Werner, O. (1970), "Back-translation and other translation techniques in cross-cultural research", *International Journal of Psychology*, Vol. 30, pp. 681-692.

Christian, J. S., Christian, M. S., Pearsall, M. J. and Long, E. C. (2017), "Team adaptation in context: An integrated conceptual model and meta-analytic review", *Organizational Behavior and Human Decision Processes*, Vol. 140, pp. 62-89.

Collins, C. G., Gibson, C. B., Quigley, N. R. and Parker, S. K. (2016), "Unpacking team dynamics with growth modeling: An approach to test, refine, and integrate theory", *Organizational Psychology Review*, Vol. 6 No. 1, pp. 63-91.

Conway, J. M. and Lance, C. E. (2010), "What reviewers should expect from authors regarding common method bias in organizational research", *Journal of Business and Psychology*, Vol. 25 No. 3, pp. 325-334.

Crant, J. M. (2000), "Proactive behavior in organizations", *Journal of Management*, Vol. 26 No. 3, pp. 435-462.

DeChurch, L. A. and Haas, C. D. (2008), "Examining team planning through an episodic lens: Effects of deliberate, contingency, and reactive planning on team effectiveness", *Small Group Research*, Vol. 39 No. 5, pp. 542-568.

DeShon, R. P., Kozlowski, S. W., Schmidt, A. M., Milner, K. R. and Wiechmann, D. (2004), "A multiple-goal, multilevel model of feedback effects on the regulation of individual and team performance", *Journal of Applied Psychology*, Vol. 89 No. 6, pp. 1035-1056.

Edmondson, A. (1999), "Psychological safety and learning behavior in work teams", *Administrative Science Quarterly*, Vol. 44 No. 2, pp. 350-383.

Edmondson, A. C., Bohmer, R. M. J. and Pisano, G. (2001), "Disrupted routines: team learning and new technology adaptation", *Administrative Science Quarterly*, Vol. 46 No. 4, pp. 685–716.

Ellis, A. P., Hollenbeck, J. R., Ilgen, D. R., Porter, C. O., West, B. J. and Moon, H. (2003), "Team learning: collectively connecting the dots", *Journal of Applied Psychology*, Vol. 88 No. 5, pp. 821-835.

Ellwart, T., Happ, C., Gurtner, A. and Rack, O. (2015), "Managing information overload in virtual teams: Effects of a structured online team adaptation on cognition and performance", *European Journal of Work and Organizational Psychology*, Vol. 24 No. 5, pp. 812-826.

Entin, E. E. and Serfaty, D. (1999), "Adaptive team coordination", *Human Factors: The Journal of the Human Factors and Ergonomics Society*, Vol. 41 No. 2, pp. 312-325.

Gabelica, C., Fiore, S., Van den Bossche, P. and Segers, M. and Gijselaers, W. (2016), "Establishing teamknowledge coordination from a learning perspective" *Human Performance,* Vol.29, pp. 33-53.

Georganta, E., and Brodbeck, F. C. (2018), "Capturing the four-phase team adaptation process with Behaviorally Anchored Rating Scales (BARS)", European Journal of Psychological Assessment, Vol. 36 No.2, pp. 336–347.

Georganta, E., Kugler, K. G., Reif, J. A. M., and Brodbeck, F. C. (in press), "Diving Deep into Team Adaptation: How Does it Really Unfold Over Time?" *Group Dynamics: Theory, Research, and Practice.*

Grote, G., Kolbe, M., Zala-Mezö, E., Bienefeld-Seall, N. and Künzle, B. (2010), "Adaptive coordination and heedfulness make better cockpit crews", *Ergonomics*, Vol. 53 No. 2, pp. 211–228.

Gutwin, C. and Greenberg, S. (2004), "The importance of awareness for team cognition in distributed collaboration", *Team Cognition,* Vol. 201, pp. 1-33.

Hoegl, M., & Parboteeah, K. P. (2006), "Team reflexivity in innovative projects", *R&D Management*, Vol. 36 No. 2, pp. 113-125.

Katzenbach, J. R., and Smith, D. K. (2015), *The wisdom of teams*, Harvard Business Review Press, Bosten, MA.

Klein, K. J., Ziegert, J. C., Knight, A. P., and Xiao, Y. (2006). "Dynamic delegation: Shared, hierarchical, and deindividualized leadership in extreme action teams". *Administrative Science Quarterly*, Vol. 51, pp. 590–621.

Kolbe, M., Grote, G., Waller, M. J., Wacker, J., Grande, B., Burtscher, M. J. and Spahn, D. R. (2014), "Monitoring and talking to the room: Autochthonous coordination patterns in team interaction and performance", *Journal of Applied Psychology*, Vol. 99 No. 6, pp. 1254-1267.

Kozlowski, S. W. and Bell, B. S. (2008), "Team learning, development, and adaptation", in Sessa, V. I. and London, M. (Eds.), *Group Learning*, Taylor & Francis Group, New York, NY, pp. 15-44.

Kozlowski, S. W., Watola, D. J., Jensen, J. M., Kim, B. H. and Botero, I. C. (2009), "Developing adaptive teams: a theory of dynamic team leadership", in Salas, E., Goodwin, G. F. and Burke, C. S. (Eds.), *Team Effectiveness in Complex Organizations: Cross-disciplinary Perspectives and Approaches*, Routledge Academic, New York, NY, pp. 113-155.

LePine, J. A., Piccolo, R. F., Jackson, C. L., Mathieu, J. E. and Saul, J. R. (2008), "A meta-analysis of teamwork processes: tests of a multidimensional model and relationships with team effectiveness criteria", *Personnel Psychology*, Vol. 61 No. 2, pp. 273-307.

Lewis, K. (2003), "Measuring transactive memory systems in the field: scale development and validation", *Journal of Applied Psychology*, Vol. 88 No. 4, pp. 587-604.

Lewis, K., Lange, D. and Gillis, L. (2005), "Transactive Memory Systems, Learning, and Learning Transfer", *Organization Science*, Vol. 16 No. 6, pp.581–598.

London, M., Polzer, J. T. and Omoregie, H. (2005), "Interpersonal congruence, transactive memory, and feedback processes: An integrative model of group learning", *Human Resource Development Review*, Vol. 4 No. 2, pp. 114-135.

Marks, M.A., Zaccaro, S.J. and Mathieu, J.E. (2000), "Performance implications of leader briefings and team-interaction training for team adaptation to novel environments", *Journal of Applied Psychology*, Vol. 85 No. 6, pp. 971–986.

Marks, M. A., Mathieu, J. E. and Zaccaro, S. J. (2001), "A temporally based framework and taxonomy of team processes", *Academy of Management Review*, Vol. 26 No. 3, pp. 356−376.

Mathieu, J. E. and Schulze, W. (2006), "The influence of team knowledge and formal plans on episodic team process-performance relationships", *Academy of Management Journal*, Vol. 49 No. 3, pp. 605-619.

Marques-Quinteiro, P., Curral, L., Passos, A.M. and Lewis, K. (2013), "And now what do we do? The role of transactive memory systems and task coordination in action teams", *Group Dynamics: Theory, Research, and Practice*, Vol. 17 No. 3, pp.194–206.

Maynard, T. M., Kennedy, D. M. and Sommer, A. S. (2015), "Team adaptation: A fifteen-year synthesis (1998-2013) and framework for how this literature needs to 'adapt' going forward", European Journal of Work and Organizational Psychology, Vol. 24 No. 5, pp. 1-26.

Moreland, Richard L. and Myaskovsky, Larissa (2000), "Exploring the Performance Benefits of Group Training: Transactive Memory or Improved Communication?," *Organizational Behavior and Human Decision Processes*, Elsevier, Vol. 82 No.1, pp. 117-133.

Parker, S. K. and Collins, C. G. (2010), "Taking stock: Integrating and differentiating multiple proactive behaviors", *Journal of Management*, Vol. 36 No. 3, pp. 633-662.

Podsakoff, N.P., LePine, J.A. and LePine, M.A. (2007), "Differential challenge stressor-hindrance stressor relationships with job attitudes, turnover intentions, turnover, and withdrawal behavior: A meta-analysis", *Journal of Applied Psychology,* Vol. 92 No.2, pp.438–454.

R Core Team (2014), "R: A language and environment for statistical computing" (Version 3.3.2) [Computer software], Vienna, Austria: R Foundation for Statistical Computing, available at: http://www.R-project.org/

Randall, K. R., Resick, C. J. and DeChurch, L. A. (2011), "Building team adaptive capacity: the roles of sensegiving and team composition", *Journal of Applied Psychology,* Vol. 96 No. 3, pp. 525-540.

Resick, C. J., Murase, T., Bedwell, W. L., Sanz, E., Jiménez, M. and DeChurch, L. A. (2010), "Mental model metrics and team adaptability: A multi-facet multi-method examination*", Group Dynamics: Theory, Research, and Practice,* Vol. 14 No. 4, pp. 332-349.

Rosen, M. A., Bedwell, W. L., Wildman, J. L., Fritzsche, B. A., Salas, E. and Burke, C. S. (2011), "Managing adaptive performance in teams: Guiding principles and behavioral markers for measurement", *Human Resource Management Review,* Vol. 21 No. 2, pp. 107-122.

Salas, E., Sims, D. E. and Burke, C. S. (2005), "Is there a 'Big Five' in teamwork?", *Small Group Research,* Vol. 36 No. 5, pp. 555-599.

Salas, E., Nichols, D., and Driskell, J. E. (2007), "Testing three team training strategies in intact teams: A meta-analysis", *Small Group Research,* Vol. 38, pp. 471–488.

Savelsbergh, C. M., van der Heijden, B. I., and Poell, R. F. (2009), "The development and empirical validation of a multidimensional measurement instrument for team learning behaviors", *Small Group Research,* Vol. 40, pp. 578-607.

Santos, C. M., Passos, A. M. and Uitdewilligen, S. (2016), "When shared cognition leads to closed minds: Temporal mental models, team learning, adaptation and performance", *European Management Journal,* Vol. 34 No. 3, pp. 258-268.

Schippers, M. C., Homan, A. C., and Van Knippenberg, D. (2013), "To reflect or not to reflect: Prior team performance as a boundary condition of the effects of reflexivity on learning and final team performance", *Journal of Organizational Behavior,* Vol. 34 No. 1, pp.6-23.

Schmutz, J. B., Lei, Z., Eppich, W. J., and Manser, T. (2018), "Reflection in the heat of the moment: The role of in-action team reflexivity in health care emergency teams", *Journal of Organizational Behavior,* Vol. 39 No. 6, 749-765.

Selig, J. P. and Preacher, K. J. (2008, June). Monte Carlo method for assessing mediation: An interactive tool for creating confidence intervals for indirect effects [Computer software], available at: http://quantpsy.org/.

Smith-Jentsch, K. A., Cannon-Bowers, J. A., Tannenbaum, S. I., and Salas, E. (2008), "Guided team self-correction: Impacts on team mental models, processes, and effectiveness", *Small Group Research,* Vol. 39, pp. 303–327.

Stout, R. E. and Salas, E. (1993), "The role of planning in coordinated team decision making: Implications for training", in *Proceedings of the Human Factors and Ergonomics Society 37th Annual Meeting*, Human Factors and Ergonomics Society, Santa Monica, CA, pp. 1238-1242.

Uitdewilligen, S., Waller, M. J. and Pitariu, A. H. (2013), „Mental model updating and team adaptation", *Small Group Research,* Vol. 44 No. 2, pp. 127-158.

Van den Bossche, P., Gijselaers, W. H., Segers, M. and Kirschner, P. A. (2006), "Social and cognitive factors driving teamwork in collaborative learning environments: Team learning beliefs and behaviors", *Small Group Research,* Vol. 37 No. 5, pp. 490-521.

Vashdi, D. R., Bamberger, P. A., and Erez, M. (2013), "Can surgical teams ever learn? The role of coordination, complexity, and transitivity in action team learning", *Academy of Management Journal*, Vol. 56 No. 4, pp. 945-971.

Waller, M. J. (1999), "The timing of adaptive group responses to nonroutine events", *Academy of Management Journal*, Vol. 42 No. 2, pp. 127-137.

Weick, K., & Roberts, K. (1993), "Collective mind in organizations: Heedful interrelating on flight decks", Administrative Science Quarterly, Vol. 38, pp. 357-381.

West, M.A. (1996), "Reflexivity and work group effectiveness: a conceptual integration", in West, M A. (Ed.). *Handbook of Work Group Psychology*, John Wiley & Sons, Chichester, UK. pp. 555–579.

Widmann, Andreas and Mulder, Regina H. (2018), "Team learning behaviours and innovative work behaviour in work teams" *European Journal of Innovation Management*, Vol. 21 No.3, pp. 501-520.

Widmer, P. S., Schippers, M. C., and West, M. A. (2009), "Recent developments in reflexivity research: A review", *Psychology of Everyday Activity*, Vol. 2 No. 2, pp. 2-11.

Wittenbaum, G. M., Vaughan, S. I., and Stasser, G. (1998), "Coordination in task-performing groups", In R. S. Tindale, L. Heath, J. Edwards, E. J. Posavac, F. B. Bryant, Y. Suarez-Balcazar, E. Henderson-King, & J. Myers (Ed.s), Social psychological applications to social issues, Vol. 4, p. 177–204.

Zajac, S., Gregory, M. E., Bedwell, W. L., Kramer, W. S. and Salas, E. (2014), "The cognitive underpinnings of adaptive team performance in ill-defined task situations A closer look at team cognition", *Organizational Psychology Review*, Vol. 4 No. 1, pp. 49-73.

Table 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. $p < .05$. ** $p < .001$.*

Table 2

Hierarchical Analysis Predicting Plan Execution

Steps and predictor variable	β	*SE β*	*t*	$R^2_{GLMM(m)}$	$R^2_{GLMM(c)}$
Step 1:					
Situation Assessment	0.20**	0.05	3.66	0.04	0.14
Step 2:					
Situation Assessment	0.07	0.05	1.33		
Plan Formulation	0.44**	0.05	7.93	0.22	0.29

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

Table 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	0.46**	0.05	9.08	0.22	0.27
Step 2:					
Situation Assessment	0.32**	0.04	6.88		
Plan Formulation	0.46**	0.04	9.80	0.43	0.44
Step 3:					
Situation Assessment	0.31**	0.04	6.70		
Plan Formulation	0.41**	0.05	7.99		
Plan Execution	0.11*	0.04	2.41	0.44	0.45

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