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Performance Adaptation: A Theoretical Integration and Review

Samantha K. Baard
Tara A. Rench
Steve W. J. Kozlowski
Michigan State University

Stability and routine are two words that can rarely be used to describe the present-day workplace. Instead, individuals, teams, and organizations are required to respond to dynamic and changing situations. As a result, researchers have become increasingly interested in understanding performance adaptation, evident in the substantial growth in research over the past two decades. However, what researchers mean when they study adaptation is often broad, vague, and inconsistent—especially at the organizational level—such that drawing solid conclusions is challenging. To move toward integration, we focused the review on individual and team performance adaptation, where the mechanisms of adaptation can be observed. We developed a conceptual taxonomy to map extant research, provide insights for synthesis, and identify directions for future theory building and research. Specifically, we identify four theoretical approaches: (a) a performance construct, (b) an individual difference construct, (c) a change in performance, and (d) a process. Each perspective is reviewed, identifying definitions and key assumptions; discussing conceptual foundations and empirical findings; and highlighting discrepancies, similarities, and opportunities for synthesis. The discussion recommends useful lines of inquiry for future research. Moreover, to promote individual-, team-, and organizational-level integration,

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Corresponding author: Samantha K. Baard, Department of Psychology, Michigan State University, 316 Physics Road, East Lansing, MI 48824-1116, USA.

E-mail: baardsam@msu.edu

we propose a multilevel conceptual architecture specifying the what (nature), where (levels), and how (mechanisms) of adaptation to better define the nature of the phenomenon. In combination, the taxonomy, review content, and conceptual architecture are designed to enhance conceptual clarity and consistency, encourage integration, and advance theory and research on adaptation as a pervasive phenomenon in organizational science.

Keywords: *performance adaptation; performance change; adaptability; multilevel; individual and team*

Background and Conceptual Framework

In a world of increasing flux, organizations and the jobs within them can no longer be characterized as stable and predictable (Terreberry, 1968). Organizations and their employees increasingly face pressures from internal and external change (Bell & Kozlowski, 2008; Chan, 2000; Ilgen & Pulakos, 1999; Smith, Ford, & Kozlowski, 1997) that originate from many sources including economic and political instability, social and cultural shifts from globalization, the evolution of organizational structures and processes (e.g., team-based work), and technological advances (Burke, Stagl, Salas, Pierce, & Kendall, 2006; Ployhart & Bliese, 2006; Stokes, Schneider, & Lyons, 2010). As a result, employees often face conditions characterized by novelty, instability, unpredictability, and complexity (Kozlowski, Gully, Nason, & Smith, 1999).

To be effective under these conditions, individuals and work teams must be able to quickly adapt to new task and job demands (Burke et al., 2006; Kozlowski et al., 1999; Kozlowski, Watola, Nowakowski, Kim, & Botero, 2009). In response, there has been a surge of micro (i.e., individual-level) and meso (i.e., team-level) theory and research over the past two decades focused on identifying the drivers, processes, and performance characteristics of performance adaptation in the workplace (e.g., Bell & Kozlowski, 2008; Ployhart & Bliese, 2006; Pulakos, Arad, Donovan, & Plamondon, 2000; Pulakos, Schmitt, Dorsey, Arad, Borman, & Hedge, 2002). Although rich, this work has been diverse with different theoretical underpinnings, intended applications (i.e., selection, training and development, and performance management; Chan, 2000; Kozlowski & Rench, 2009; Stokes, Schneider, & Lyons, 2008), and conceptualizations of performance adaptation. The result is a vibrant literature that has potential for advancing knowledge, but which is also amorphous and diffuse, making it challenging to extract principles, integrate findings, and identify research gaps (Kozlowski & Rench, 2009; Stokes et al., 2008).

Our purpose is to present an integrated conceptual review of the individual- and team-level performance adaptation literature. Performance adaptation has been defined in a variety of ways, both explicitly and implicitly. For example, Pulakos et al. (2000: 615) discussed it as "altering behavior to meet the demands of the environment, an event or a new situation." Allworth and Hesketh (1999: 98) described it as "behaviors demonstrating the ability to cope with change and to transfer learning from one task to another as job demands vary." Bell and Kozlowski (2008) addressed it as performance during a task shift characterized by

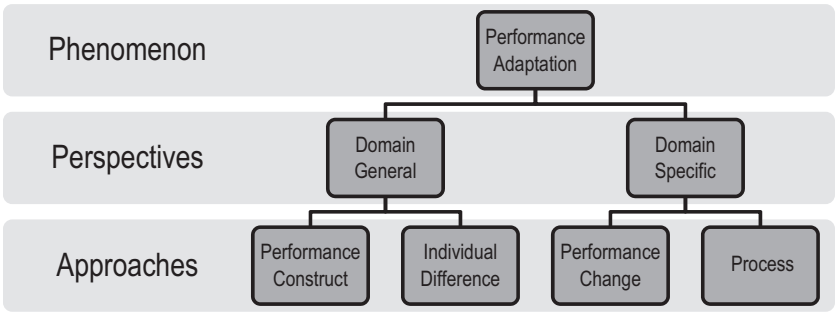
novelty, increased difficulty, and complexity. Shifting to the team level, Burke et al. (2006: 1192) defined it as "an emergent phenomenon that compiles over time from the unfolding of a recursive cycle whereby one or more team members use their resources to functionally change current cognitive or behavioral goal-directed action or structures to meet expected or unexpected demands." Based on this background, we define performance adaptation as *cognitive, affective, motivational, and behavioral modifications made in response to the demands of a new or changing environment, or situational demands.*

Adaptation is an exceptionally broad concept and has been applied to all levels of the organizational system. However, we have constrained our integrative review to the individual and team levels for several reasons. First, our goal is integration, and we are interested in the mechanisms of adaptation. Behavioral and psychological mechanisms that are relevant at the individual and team levels can be identified in extant individual and team research. Although these mechanisms are likely still relevant at higher levels or can be linked to other mechanisms at the organizational level, theory typically makes a qualitative shift to focus on organizational characteristics that glosses over linkages to psychological and group phenomena. Reviewers of this literature have noted its rich descriptive quality, but also its lack of attention to underlying process mechanisms (e.g., Faucheux, Amado, & Laurent, 1982; Ford & Foster-Fishman, 2012; Pettigrew, Woodman, & Cameron, 2001; Poole, Van de Ven, Dooley, & Holmes, 2000). Although a few recent efforts have begun to consider the process by which employees make sense of organizational changes (e.g., Sonenshein, 2010; Sonenshein & Dholakia, 2012), there is a substantial mechanism gap. Second, individual- and team-level research, although broad in focus (as we shall describe), is reasonably consensual with respect to the phenomenon of interest. There is a basis for classification and potential for integration. In contrast, the concept of organizational adaptation encompasses many distinct but overlapping literatures (e.g., organizational change, organizational learning, and organizational strategy; see Ford & Baucus, 1987; Hrebiniak & Joyce, 1985; Huber, 1991; Pettigrew, 2001). Organizational adaptation is diffuse and ill defined. Third, the research foundation for individual- and team-level research is based on large-sample observational (or nonexperimental) and experimental methods, whereas organizational adaptation is mostly conceptual, and the little empirical research is largely based on descriptive case studies of single organizations (Armenakis & Bedeian, 1999; Beer & Walton, 1987; Fugate & Kinicki, 2008; Weick & Quinn, 1999). Thus, these core issues of absent mechanisms, diffuse conceptualization, and limited research foundation combine to preclude incorporation of organizational adaptation in our taxonomy. However, organizational adaptation is a critical issue to which we return in the discussion to recommend steps to advance integration.

Conceptual Taxonomy

We surveyed the individual- and team-level performance adaptation literature, developed a conceptually based taxonomy to organize it, and mapped key theoretical approaches. The taxonomy drives the review structure, guides the focal issues we highlight, and sets up the research issues and recommendations we identify for future advances. Figure 1 illustrates the taxonomic structure. Different theoretical perspectives have guided distinct streams of

Figure 1
Performance Adaptation Taxonomy



research, resulting in a clear bifurcation. At the highest level, individual- and team-level performance adaptation research is *domain general* or *domain specific* (Kozlowski & Rench, 2009). In addition, adaptation research also differs in terms of the base *literature, assumptions, target applications and goals*, and *strengths and weaknesses*.

The *domain-general* approach takes a situation-spanning perspective that views adaptive capabilities as generic. This work is based in the individual differences *literature*, characterized by the key underlying *assumption* that adaptation can be captured as a relatively stable (set of) trait(s) and related performance constructs that can be generalized across domains (Ployhart & Bliese, 2006; Pulakos et al., 2000; Pulakos et al., 2002). Work in this area is primarily *targeted* toward selection and performance assessment applications. Research emanating from this area typically *conceptualizes* adaptation in one of two ways—a performance construct (i.e., a set of dimensions that characterize adaptive job performance; see Pulakos et al., 2000) or an individual difference construct (i.e., a set of broadband, relatively stable traits; see Ployhart & Bliese, 2006). Domain-general research has contributed to conceptualizing adaptation, although it is important to highlight its primary *strengths and weaknesses*. The main advantage of this approach is the potential generalizability and applicability across a wide range of jobs. However, that generality also contributes to its inability to capture more specific variance for prediction and to unpack the mechanisms underlying adaptive performance (Kozlowski & Rench, 2009; Pulakos et al., 2002).

Conversely, the *domain-specific* approach focuses on key skills and/or processes relevant to adaptation for domain-specific knowledge and skills. Research in this approach has a strong training and development (learning) focus, as it originates from the expertise (e.g., Holyoak, 1991) and skill acquisition *literatures* (e.g., Kanfer & Ackerman, 1989). A key *assumption* of this approach is that specific capabilities underlying performance adaptation can be learned and that their application is specific to a knowledge and skill domain rather than general across a range of work situations. The primary *target* for this work is to develop knowledge, skills, and capabilities via training or other developmental experiences that can increase performance in a task context that shifts in novelty, difficulty, and/or complexity. Within this approach, researchers have

typically adopted one of two general *conceptualizations* of performance adaptation—a domain-specific performance change (i.e., a change in performance from a routine to novel task; see Kozlowski, Toney, Mullins, Weissbein, Brown, & Bell, 2001; LePine, 2005) or a dynamic process (i.e., a cycle that unfolds over time, see Burke et al., 2006; Kozlowski et al., 1999; Marks, Mathieu, & Zaccaro, 2001).

We do not assert that there is necessarily a "right" or "wrong" way of defining and exploring the nature of performance adaptation. Rather, we emphasize that the inferences that can be drawn from the approaches will differ, which makes clear conceptualization and operationalization of the adaptation phenomenon critical. Theoretical clarity suffers when researchers fail to carefully define and situate their research. By structuring our review around the conceptual categories highlighted above and elaborating their distinctions, we identify targets for potential integration and synergy across different approaches. In the next section, we provide a comprehensive review of the extant literature, highlighting insights and recommendations for future research aimed at improving understanding of this important phenomenon.

Performance Adaptation Research

Review Focus

Our goal was to capture representative research focused on individual and team performance adaptation (*cognitive, affective, motivational and behavioral modifications made in response to the demands of a new or changing environment or situational demands*). Prior to beginning our search, we set boundary conditions: performance adaptation to a task, job, or work (as opposed to individuals adjusting to college or expatriates adapting to a new country) and performance adaptation at the individual and team levels. We focused primarily on theory and research published in human resource, organizational psychology, and organizational behavior journals. We started by identifying foundational theoretical and empirical treatments consistent with our definition and boundary conditions. These were primarily works published over a decade ago (1990s to early 2000s). Then we searched forward and backward with a focus on influential (well-cited) empirical and theoretical work.

The body of research that we identified in our search is organized within the conceptual taxonomy described above. Within each approach, we present the following sections to organize the review: (a) the overall definition and central assumptions that reveal the critical nuances between approaches, (b) the systematic conceptual development of adaptation that provides the foundation for each approach, and (c) a summary section that highlights the findings from empirical work conducted within the approach and identifies the common threads and key takeaways that emerge. Throughout the article, we highlight consistencies and inconsistencies in how adaptation has been studied, as well as the extent to which findings generalize across research efforts. For each study reviewed, tables provide specific detail regarding the conceptualization of adaptation, research design and operationalization, and level of analysis. Although every study could not be discussed in the narrative review, the tables provide documentation to allow examination of both the clear distinctions evident in the literature as well as the nuanced differences of the research within each approach.

Performance Construct Approach

Definition and Key Assumptions

Under the domain-general category, there are two construct-driven approaches that define adaptation as a *performance construct* and as an *individual difference construct*. Researchers adopting a performance construct conceptualization focus on mapping the adaptation criterion space, defining adaptation as a set of performance dimensions or individual characteristics that enable flexible responding on the part of the individual(s) or team(s).

Researchers in this approach have to make an assumption about whether or not adaptive performance is a unique performance dimension. While many have argued that adaptive performance is subsumed by the traditional task and contextual performance dimensions (e.g., Borman & Motowidlo, 1993; Campbell, McCloy, Oppler, & Sager, 1993), others have asserted that adaptive performance represents a distinct aspect of job performance (e.g., Campbell, 2012; Pulakos et al., 2000). In addition, researchers assume that there is a set of identifiable behaviors that uniquely tap the different dimensions of adaptive performance.

Conceptual Foundations

Allworth and Hesketh (1999: 98) were among the first to propose a unique adaptive performance construct, which captured "behaviors demonstrating the ability to cope with change and to transfer learning from one task to another as job demands vary." However, Pulakos et al. (2000) provided the first *rigorous* effort to conceptualize adaptive performance as a criterion construct. Through a review of the relevant literature and an expert review of hundreds of critical incidents of adaptive performance across multiple jobs, eight adaptive performance dimensions were identified: handling emergencies or crisis situations; handling work stress; solving problems creatively; dealing with uncertain and unpredictable work situations; learning work tasks, technologies, and procedures; demonstrating interpersonal adaptability; demonstrating cultural adaptability; and demonstrating physically oriented adaptability.

To evaluate the eight-dimensional model, Pulakos and colleagues (2000) developed the Job Adaptive Inventory (JAI), which comprises 68 behavioral items created from the critical incidents. The JAI was administered to thousands of individuals, across occupational specialties, and demonstrated high internal consistency, with alphas ranging from .92 to .97 and high rating agreement within jobs (ICCs = .73-.98). Exploratory and confirmatory factor analyses revealed that an eight-dimensional model fit the data better than a one- or two-dimensional model, providing initial evidence for an eight-dimension factor structure. However, in a follow-up study, Pulakos and colleagues (2002) reduced the JAI to a 24-item behaviorally based performance rating measure, which yielded only a one-factor solution. In a separate line of work, Griffin and Hesketh (2003) proposed a more parsimonious set of three adaptive performance dimensions (proactive behavior, reactive behavior, and tolerant behavior), which was intended to subsume Pulakos's eight dimensions but also found

support for a one-factor model of adaptive performance, as the two factors that emerged in their study were highly correlated (r = .72).

From a slightly different perspective, Griffin, Neal, and Parker (2007) sought to map work role behavior (performance), proposing that one dimension, *adaptivity*, represents behaviors that target how one copes with, responds to, and supports changes. This conceptualization of adaptive performance, or adaptivity, is narrower in scope than the work by Pulakos et al. (2000), drawing primarily from the "dealing with uncertain work situations" dimension. In addition, unlike prior work, Griffin and colleagues (2007) broke the adaptivity dimension across individual (e.g., change of equipment or processes), team (e.g., adding a new member), and organizational (e.g., changes in operations) levels of analysis. Results of a confirmatory factor analysis (CFA) supported the distinction of these three adaptivity factors and distinguished them from other work role dimensions (proficiency and proactivity). Adding the referent level distinction is an interesting nuance in the conceptualization of adaptive performance, but the confounding of dimension content *and* its referent level obscures the source of the distinction. That is, are the CFA findings reflecting content differences, level differences, or both? This inference is obscured, and thus this conceptualization requires more development and clear support.

Although the majority of researchers have focused on mapping the adaptive performance space at the individual level (see Table 1), Klein and Pierce (2001: 3) defined a set of team-level adaptive performance dimensions. Klein and Pierce defined adaptive teams as those "that are able to make the necessary modifications in order to meet new challenges," identifying three team adaptive performance dimensions: external versus internal adaptation (focus of resource allocation), adaptation versus coordination (degree of problem solving), and planning versus replanning (level of plan modification). However, this conceptualization of team adaptive performance has not been empirically evaluated.

Summary

The body of empirical research within this approach has been focused on establishing the criterion validity of the adaptive performance measures discussed above. As a result, several individual difference factors have been identified as predictors of adaptive performance. For example, cognitive ability consistently demonstrates a positive relationship with adaptive performance (Griffin & Hesketh, 2004; Pulakos et al., 2000; Pulakos et al., 2002). In addition, several personality variables have demonstrated consistent and positive correlations with adaptive performance including conscientiousness (Griffin & Hesketh, 2005; Shoss, Witt, & Vera, 2012), achievement orientation (Pulakos et al., 2000; Pulakos et al., 2002), and openness to experience (Griffin & Hesketh, 2004; Griffin et al., 2007). Other personality variables that have been explored less consistently include self-monitoring, tolerance for ambiguity, and service orientation (Gwinner, Bitner, Brown, & Kumar, 2005). Although multiple individual differences have been explored, future research should be more clearly theory driven to guide the choice of the individual differences used in these efforts. In addition, within the individual- and team-level research, there is a scarcity of research that has systematically investigated the impact of contextual factors on adaptive performance (for a

Table 1
Performance Construct Approach

Reference	Research Design	Definition/Conceptualization	Operationalization	Data Source
Allworth & Hesketh (1999)	Nonexperimental (I)	Adaptability consists of behaviors that demonstrate an individual's ability to cope with change and apply learning strategies between tasks as the environmental demands change.	High scores on adaptive performance (no description of items)	Self-report survey
Cronshaw & Jethmalani (2005)	Instrument development (I)	Adaptation is seen as a willingness of individuals to change their behavior and manage themselves to conform to the demands of a situation.	High scores on 12 adaptive skills based on a performance anchored rating scale (no description of items)	Performance-oriented interview
de Jong & de Ruyter (2004)	Nonexperimental (I)	Adaptive behaviors are responses to complicated, ill-defined, and/or idiosyncratic problems occurring during the job.	High scores on an adaptive selling scale (6 items)—based on Spiro and Weitz (1990)	Self-report survey
de Jong & de Ruyter (2004)	Nonexperimental (T)	Adaptive behaviors are responses to complicated, ill-defined, and/or idiosyncratic problems occurring during the job.	High scores on an aggregate of individual team members scores on an adaptive selling scale (6 items)—based on Spiro and Weitz (1990)	Self-report survey
Driskell, Goodwin, Salas, & O'Shea (2006)	Conceptual (T)	Adaptability refers to the adjustment of task strategies or team behaviors in response to changes in the team or task environment.	N/A	N/A
Griffin & Hesketh (2003)	Nonexperimental (I)	Adaptive performance consists of the aspects of performance related to changing job requirements.	High scores on supervisor ratings of adaptive performance (20 items)—based on 7 of 8 dimensions of Pulakos et al. (2000)	Other-report survey (supervisors)
Griffin & Hesketh (2004)	Nonexperimental (I)	Adaptive performance consists of the aspects of performance related to changing job requirements.	High scores on supervisor-ratings on adaptive performance (18-20 items depending on sample)—based on Pulakos et al. (2000)	Other-report survey (supervisors)
Griffin & Hesketh (2005)	Nonexperimental (I)	Adaptive performance consists of the aspects of performance related to changing job requirements.	High scores on supervisor-ratings on adaptive performance (18-20 items depending on sample) based on Pulakos et al. (2000)	Other-report survey (supervisors)
Griffin, Neal, & Parker (2007)	Instrument development (I)	Adaptivity is a multilevel construct referring to how individuals within teams and organizations respond to and support changes in the environment.	High scores on a measure of individual task, team member, and organization member adaptivity (3 items each)	Other-report survey (supervisors)

(continued)

Table 1 (continued)

Reference	Research Design	Definition/Conceptualization	Operationalization	Data Source
Gwinner, Bitner, Brown, & Kumar (2005)	Nonexperimental (I)	Employee adaptive behavior is a deliberate modification of the service offering and the interpersonal behavior of the employee to meet the needs of and respond to the customer.	High scores on the interpersonal adaptive behavior (4 items) and service-offering adaptive behavior measures (6 items)	Self-report survey
Johnson (2001)	Nonexperimental (I)	Adaptive performance is the effectiveness of the individual in meeting the demands of the environment or new situation.	High scores on the handling work stress measure (no description of items)—based on Pulakos et al. (2000)	Other-report survey (supervisors)
Klein & Pierce (2001)	Conceptual (T)	Adaptive performance is evident in the team making necessary modifications to meet new challenges (e.g., through replanning).	N/A	N/A
Macey & Schneider (2008)	Conceptual (I)	Behavior engagement is the adaptive behavior of individuals in anticipation of or response to changes in the environment.	N/A	N/A
Moss, Dowling, & Callanan (2009)	Conceptual (I)	Adaptive environments are dynamic and flexible and require employees to have the capacity to respond effectively in them.	N/A	N/A
Oswald, Schmitt, Kim, Ramsay, & Gillespie (2004)	Instrument development (I)	Adaptability is seen in an individual changing in response to a new environment and dealing with a gradual or sudden change.	High scores on the Adaptability subscale of the Situational Judgment Inventory (7 items)	Situational Judgment Inventory
Pulakos, Arad, Donovan, & Plamondon (2000)	Instrument development (I)	Adaptive performance describes situations in which individuals modify their behavior to meet the demands of a new situation or event or a changed environment.	High scores on the eight subscales of the performance measure (68 item)	Self-report survey
Pulakos, Schmitt, Dorsey, Arad, Borman, & Hedge (2002)	Nonexperimental (I)	Adaptive performance describes situations in which individuals modify their behavior to meet the demands of a new situation or event or a changed environment.	High scores on overall effectiveness of subordinate on each dimensions (8 items) and specific ratings of subordinate effectiveness on adaptive situations (28 items)—based on Pulakos et al. (2000)	Other-report survey (supervisors)
Sandelands, Brockner, & Glynn (1988)	Experimental (I)	Adaptive behavior is being persistent when goals are attainable, but letting go when goals are unattainable. Prolonged persistence in unattainable goal situations is maladaptive.	Lower mean time spent on the insoluble anagrams (as persistence would be futile)	Anagram task
Shoss, Witt, & Vera (2012)	Nonexperimental (I)	Adaptive performance is a facet of performance that targets effective responses to changes in the environment.	High scores on an adaptive performance measure (4 items)	Other-report survey (supervisors)

(continued)

Table 1 (continued)

Reference	Research Design	Definition/Conceptualization	Operationalization	Data Source
Spiro & Weitz (1990)	Instrument development (I)	Adaptability is the extent to which the employees apply adaptive selling strategies and is seen as altering sales behaviors during interactions with customers.	High scores on the adaptive selling scale (16 items)	Self-report survey
Stokes, Schneider, & Lyons (2008)	Experimental (I)	Adaptive performance is the assessment (via subjective measures of performance) of how an individual performed in an adaptive situation.	High scores on a subjective measure of adaptive performance (20 items)—based on Griffin & Hesketh (2003)	Other-report survey (experimenter)
Stokes, Schneider, & Lyons (2010)	Experimental (I)	Adaptive performance is an individual effectively responding to the adaptive elements in the environment, event, or situation.	High scores on a subjective measure of adaptive performance (20 items)—based on Griffin & Hesketh (2003)	Other-report survey (experimenter)
Tucker & Gunther (2009)	Nonexperimental (I)	Adaptive performance is evident in leaders who change their behavior in response to altered situations and achieve successful results.	High scores on a subjective measure of adaptive performance (no description of items)—based on 4 dimensions of Pulakos et al. (2000)	Other-report survey (trained observer)
Washburn, Smith, & Taglialatela (2005)	Experimental (I)	Adaptive decision making requires monitoring one's confidence level in an uncertain environment to respond appropriately.	Higher accuracy and lower latency on incongruous trials	Stroop color-word task
White et al. (2005)	Training instrument development (I)	Adaptability is an effective change in response to a shift in the environment.	High scores on a measure of mental, interpersonal, and physical adaptability (4-6 items each)	Officer Adaptive Thinking and Leadership Course
Wiedow & Konradt (2011)	Experimental (T)	Adaptation is the extent to which teams live up to agreements in light of changed team objectives, strategies, or processes.	High scores on a measure of team agreement (no description of items)	Other-report survey (supervisors)
Zaccaro, Banks, Kiechel-Koles, Kemp, & Bader (2009)	Nonexperimental (I)	Adaptation is a functional cognitive, behavioral, and/or affective change in behavior in response to or in anticipation of a change in the environment.	High scores on a behaviorally anchored supervisor rating of adaptive performance (no description of items)—based on Pulakos et al. (2000)	Other-report survey (supervisors)

Note: (I) indicates individual-level and (T) indicates team-level research designs.

few exceptions, see de Jong & de Ruyter, 2004; Shoss et al., 2012). A coherent theory identifying contextual factors that promote, support, or moderate the individual- and team-level relationships is needed in future research. This may be a potential area for synergy between the individual and team research and the organizational research, where more of these contextual factors have been examined.

Overall, adaptation research within the performance construct approach has yielded research that mapped the adaptive performance space and distinguished it from prior

performance models (Campbell, 2012). To advance the literature, future research should address three primary limitations—improving conceptual consistency, improving measurement consistency, and validating the underlying dimensional structure of adaptive job performance.

One primary concern is a lack of conceptual consistency regarding the nature of the adaptive performance construct (see Table 1 for a list of the definitions used across studies). Pulakos et al. (2000) conducted a rigorous definitional study of adaptive performance. Other researchers have proposed alternate frameworks (e.g., Griffin et al., 2007; Johnson, 2001). However, there is a noticeable lack of theory and systematic research guiding the formulation and validation of these alternatives, which calls their value into question. Given its rigorous development, we conclude that the Pulakos et al. (2000) conceptualization should serve as (a) a point of departure for more parsimonious alternative models and/or (b) an exemplar for rigorous theoretical development and empirical evaluation. Ad hoc conceptualizations that are not well developed contribute only confusion. More conceptual consistency and systematic research will constrain the proliferation of alternative models and mitigate the conceptual ambiguity that plagues work within this approach. Furthermore, most of these efforts have been focused on the individual level. Given the rise in team-based work structures, more work is needed at the team level. It is difficult to clearly conceptualize adaptive performance at the individual level without also considering adaptation in the team context (Burke et al., 2006; Kozlowski et al., 1999). Thus, there is potential value in mapping the current construct to the team level, considering the implications for new dimensions, and identifying relevant contextual factors that play a role (e.g., leaders, tasks, team processes; Kozlowski et al., 2009; Marks et al., 2001).

Another primary, and related, concern is the considerable inconsistency in how adaptive performance has been measured across studies. Table 1 provides the operationalizations adopted by each of the studies in this approach, which reveals many discrepancies. For example, researchers have, at times haphazardly, varied the number and content of the performance items used to capture a dimension, the number of dimensions tapped, and the way the items were aggregated (i.e., dimension level or overall) to compute an adaptive performance score. Inconsistency in measurement is a source of noise, making it difficult to establish empirical support for the structure of adaptive performance. We recommend that future research should be more consistent when operationalizing adaptive performance. Variations in measurement should be supported by a well-developed conceptual foundation, and researchers should report details about their operationalization so measurement differences are transparent.

Finally, more concerted effort is needed to establish the factor structure of adaptive performance. Conceptually, Pulakos et al. (2000) proposed eight adaptive performance dimensions; however, there has been relatively limited empirical work to evaluate this structure, and the empirical work that does exist is decidedly mixed. We recommend that research should focus on identifying potential explanations for the mixed results. For example, extant research has typically relied on supervisor-rated adaptive performance, which introduces the potential for well-established rating biases, such as halo error, to influence the dimensional structure. If rating biases are affecting ratings, it is more likely that a one-factor structure will emerge even if the conceptual space is multidimensional. Future research should examine

whether measurement methods are driving the factor structure. Perhaps 360-degree feedback, peer ratings, behavioral observation, or experience sampling methods would provide alternatives for evaluating the structure of adaptive performance. It may be that the underlying structure is better represented by a more parsimonious set of factors or even a single factor, but the primary use of supervisor ratings makes this determination ambiguous. This issue merits research attention, clarification, and progress.

Individual Difference Construct Approach

Definition and Key Assumptions

The second construct-oriented approach conceptualizes adaptability as a set of individual difference characteristics that allow employees to be effective under changing task conditions. Defined this way, adaptability is considered to be a relatively stable trait that is generalizable across situations (Chan & Schmitt, 2002). Along with the core assumptions of stability and generalizability underlying this approach, it is also assumed that identifying a compound trait or multidimensional construct of adaptability will contribute to the prediction of performance under changing conditions above and beyond what can be explained using existing individual differences constructs. If adaptability is nothing more than existing individual difference constructs, which at times it has been (see Table 2 for instances), then this assumption is violated and the contribution of this line of inquiry is questionable.

Conceptual Foundations

Researchers have taken one of two paths when defining adaptability as an individual difference. One approach conceptualizes adaptation as a *compound trait* comprising existing individual difference variables. Work by Pulakos et al. (2002) and Griffin and Hesketh (2003, 2004, 2005) represents two of the most systematic efforts emerging from this approach. Based on their adaptive performance dimensions, Pulakos and colleagues (2002) developed three multidimensional individual differences measures designed to capture individual adaptability: past adaptive experience (i.e., frequency with which an individual has engaged in adaptive behaviors relevant to each of the eight dimensions), interest in working in adaptive situations (i.e., how much an individual would like or dislike different adaptive tasks or situations), and adaptive self-efficacy (i.e., level of efficacy for performing adaptive behaviors). Results of a confirmatory factor analysis supported an eight-factor model for all three adaptability measures. However, only the past experience measure predicted adaptive performance above and beyond cognitive ability and personality (i.e., openness, emotional stability, and achievement motivation). The other adaptability measures failed to contribute beyond existing individual differences, raising questions regarding their utility.

Griffin and Hesketh (2003, 2004, 2005) similarly conceptualized adaptability as a multidimensional construct composed of personality (e.g., openness to experience, cognitive flexibility, proactivity), self-efficacy (e.g., self-efficacy for adaptive behavior), and

Table 2
Individual Difference Construct Approach

Reference	Research Design	Definition/Conceptualization	Operationalization	Data Source
Ahearne, Mathieu, & Rapp (2005)	Nonexperimental (I)	Adaptability is the willingness to adapt behaviors during customer interactions, as circumstances warrant.	High scores on the adaptive selling scale (7 items)—based on Spiro & Weitz (1990)	Self-report survey
Almahamid, McAdams, & Kalaldeh (2010)	Nonexperimental (I)	The adaptive capacity of individuals refers to whether the individual has the ability to change behaviors to respond to a new situation.	High scores on a measure of adaptability (55 items)—based on Ployhart & Bliese (2006) and Pulakos et al. (2000)	Self-report survey
Bergh (2001)	Experimental (I)	Adaptability is seen as the abilities of top executives to effectively change to meet the demands of their environment.	Whether or not the company that the executives were in successfully acquired the other company	Yearly activity reports
Burch, Pavelis, & Port (2008)	Nonexperimental (I)	Adaptability is seen in an individual's willingness to use different problem solving strategies beyond the tried and tested approaches.	High scores on a subscale of the innovation potential indicator (no description of items)	Self-report survey
Caldwell & O'Reilly (1982)	Nonexperimental (I)	Adaptability is seen in individuals who are high in self-monitoring and who are able to adapt their behavior in response to a variety of situations.	High scores on self-monitoring (no description of items)	Self-report survey
Chan & Schmitt (2002)	Instrument development (I)	Adaptability is similar to practical intelligence where it is an individual's ability to effectively respond to a variety of situational demands.	High scores on the Situational Judgment Test of 8 situations (40 items)	Situational Judgment Test
Dokko, Wilk, & Rothbard (2009)	Nonexperimental (I)	Adaptability is a trait that allows a person to identify what is needed for good performance and is able to engage in the necessary changes, which includes both reactive and proactive components.	High scores on a supervisor-rated measure of adaptability (no description of items)	Other-report survey (supervisors)
Fugate, Kinicki, & Ashforth (2004)	Conceptual (I)	A set of individual differences come together to represent how an individual changes behavior in response to a new environment (optimism, propensity to learn, openness, internal locus of control, and generalized self-efficacy).	N/A	N/A
Georgsdottir & Getz (2004)	Conceptual (I)	Adaptive flexibility is an individual's capacity to change behavior, adapt new strategies, identify innovative solutions, and adapt to a challenging environment.	N/A	N/A

(continued)

Table 2 (continued)

Reference	Research Design	Definition/Conceptualization	Operationalization	Data Source
Griffin & Hesketh (2003)	Nonexperimental (I)	Behavioral adaptability is defined as adaptable behaviors that are proactive, reactive, or tolerant (based on the Minnesota theory of work adjustment).	High scores on adaptive work requirements (14 items), self-efficacy for behaving adaptively (14 items), trait flexibility (5 items), and cognitive flexibility (10 math puzzles)	Self-report survey
Griffin & Hesketh (2004)	Nonexperimental (I)	Adaptability consists of four categories of variables: trait adaptability, cognitive flexibility, behavioral adaptability, and self-efficacy for behaving adaptively.	High scores on the measures of adaptability: trait adaptability (19 items); behavioral adaptability (12 items); self-efficacy for behaving adaptively (14 items)	Self-report survey
Griffin & Hesketh (2005)	Nonexperimental (I)	Adaptability consists of one's ability to change behaviors to meet the requirements of a situation.	High scores on personality adaptability (59 items), self-efficacy for behaving adaptively (9-14 items depending on sample), behavioral adaptability (9-12 items depending on sample)	Self-report survey
Meneely & Portillo (2005)	Nonexperimental (I)	Creative adaptation is the flexibility in thinking and effectiveness in responding to a changing environment.	Scores on some part of cognitive flexibility and creativity measures (no description of items)	Self-report survey
Ployhart & Bliese (2006)	Instrument development (I)	Individual adaptability is not only an ability to respond to a changing environment but also a set of abilities, skills, and motivations that an individual has to be proactive or reactive to changes in different situations.	High scores on the eight dimensions of adaptability (55 items)—based on Pulakos et al. (2000)	Self-report survey
Pulakos et al. (2002)	Instrument development (I)	Adaptability is seen in an individual's ability to alter behaviors to meet the demands of a new situation, event, or changed environment.	High scores on the three adaptability measures: past experience with adaptive performance (8 items); interest in working in situations that require adaptation (44 items); and self-efficacy in adapting (80 items)	Self-report survey
Stokes et al. (2008)	Experimental (I)	Adaptability is a predictor of adaptive performance, or the capacity (via ability, dispositions, or situations) to adapt to a changing environment.	High scores on the following individual difference measures that constitute adaptability: need for cognitive structure, personal need for structure, personal fear of invalidity, cultural adjustment, and emotion regulation (no information on items)—based on Svennson et al. (2008)	Self-report survey
Svennson, Lindoff, & Sutton (2008)	Nonexperimental (I)	Adaptability is a set of individual differences that allow an individual to have high performance in adaptive performance environments.	High scores on the adaptability facet, with these subscales: emotion regulation, intercultural adjustment potential, openness, desire for change, and extraversion (no description of items)	Self-report survey

(continued)

Table 2 (continued)

Reference	Research Design	Definition/Conceptualization	Operationalization	Data Source
Tucker, Pleban, & Gunther (2010)	Nonexperimental (I)	Adaptability is a combination of the skills of flexibility and tolerance of uncertainty that allow an individual to respond to new demands in dynamic and competitive environments.	High scores on a measure of adaptive skill (7 items)—based on Pulakos et al. (2000) and White et al. (2005)	Self-report survey
Wang, Zhan, McCune, & Truxillo (2011)	Nonexperimental (I)	Adaptability is the dispositional tendency of an individual to purposefully adjust behaviors to fit new tasks or new environments.	High scores on the eight dimension measure of adaptability (40 items)—based on Ployhart & Bliese (2006) and Pulakos et al. (2000)	Self-report survey
Wong, Bliese, & McGurk (2003)	Conceptual (I)	Adaptability or adaptive capacity is a metacompetency involving the ability to change due to variations in conditions.	N/A	N/A

Note: (I) indicates individual-level and (T) indicates team-level research designs.

behavioral-related (e.g., past experience with change) factors, although the specific operationalizations have varied across studies. In their 2003 and 2004 studies, Griffin and Hesketh found mixed results when examining how these adaptability dimensions predicted supervisor ratings of adaptive performance (see Table 2 for details). For example, in 2003, self-efficacy for adaptive behavior was found to be a significant predictor in one of two organizations, while in 2004, only openness was related to adaptive performance. Across studies using a compound trait approach, there are clear concerns with how the "adaptability" construct is distinct from, or overlaps with, other individual differences, which raises questions about the contribution of this conceptualization.

The second approach conceptualizes adaptability as a *metacompetency* (e.g., a set of knowledge, skills, and behaviors that allows an individual to respond to a changed situation; Almahamid, McAdams, & Kalaldeh, 2010; Ployhart & Bliese, 2006; Pulakos et al., 2002; Tucker, Pleban, & Gunther, 2010; Wang, Zhan, McCune, & Truxillo, 2011; Wong, Bliese, & McGurk, 2003). Work by Ployhart and Bliese (2006) represents one of the most rigorous conceptual efforts from this approach. While they drew on the work of Pulakos and colleagues (2000, 2002) for their conceptualization of an adaptability individual difference, their approach can be differentiated from the previous efforts in this area in two ways. First, Ployhart and Bliese (2006) take a more theoretical approach, mapping a model of how trait adaptability is positioned in an overall model of performance in a dynamic environment. In doing so, they conceptualize adaptability as a more proximal and malleable multidimensional construct. It is distinct from and influenced by knowledge, skills, abilities, and other characteristics (KSAOs; e.g., openness), but not composed of the KSAOs. Ployhart and Bliese developed a self-report measure (I-ADAPT) to assess their eight-dimensional individual adaptability construct based on Pulakos et al. (2000).

A second distinguishing characteristic of Ployhart and Bliese's (2006) theory is the proposed link between the individual difference of adaptability and performance adaptation. First, the proposed mediating mechanisms (e.g., situation appraisal, self-regulation, and coping), through which adaptability is likely to influence performance, make this conceptualization unique from other research that generally relies on input–output models and designs. Second, the performance criterion diverges from the conceptualization adopted by other researchers in that they view the performance environment on a continuum (from stable to dynamic), rather than suggesting a distinct set of adaptive performance dimensions. Therefore, not only is the individual difference construct conceptualized differently, but the criterion is also distinct.

Summary

An individual difference approach to adaptability is desirable for selection as its aim is to provide a generalizable tool for performance prediction across situational contexts. Researchers have explored how an individual difference of adaptability predicts outcomes across a variety of contexts, including business settings (Fugate, Kinicki, & Ashforth, 2004; Georgsdottir & Getz, 2004), Chinese culture (Wang et al., 2011), leadership positions (Wong et al., 2003), and military environments (Pulakos et al., 2002; Tucker et al., 2010). More specifically, researchers have operationalized adaptability using measures of flexibility (Georgsdottir & Getz, 2004; Griffin & Hesketh, 2004; Meneely & Portillo, 2005; Tucker et al., 2010), responsiveness to change (Ahearne, Mathieu, & Rapp, 2005; Dokko, Wilk, & Rothbard, 2009), and self-efficacy for adaptive behavior (Griffin & Hesketh, 2003, 2004, 2005; Pulakos et al., 2002). Using a metacompetency approach, researchers have found that adaptability explains unique variance in performance above and beyond cognitive ability, conscientiousness, openness to experience, extraversion, neuroticism, agreeableness, and job experience (e.g., Chan & Schmitt, 2002). In addition, subsets of the I-ADAPT measure have been found to predict organizational knowledge sharing, job satisfaction, fit perceptions, job performance, and turnover intentions (Almahamid et al., 2010; Wang et al., 2011). However, there is little consistency among research efforts on the conceptualization and measurement on the predictor (adaptability) or criterion (performance) side, making it very difficult to synthesize findings and draw meaningful conclusions about the utility of an individual difference construct of adaptability. Moreover, the methodology is nearly all cross-sectional and self-report, which is also problematic.

First, from a conceptual perspective, there has been considerable variability in how researchers have defined adaptability as an individual difference (see Table 2 to compare definitions). At a high level, the distinction between the two general perspectives for conceptualizing adaptability that are found in the literature (a *metacompetency*—e.g., Ployhart & Bliese, 2006; and a *compound trait*—e.g., Griffin & Hesketh, 2004) is not trivial. If adaptability is simply a combination of previously established individual differences, then it lacks unique conceptual value and researchers should halt the practice of labeling other constructs as adaptability ("old wine in a new bottle"). For an adaptability construct to be meaningful, it needs a consistent conceptualization, differentiation from existing constructs, and specification

of the psychological mechanisms by which it influences performance (e.g., Is it expected to influence different performance dimensions differentially? Does it serve as a mediator between other individual differences and performance? If not, what are the mechanisms that account for its effects?). Ployhart and Bliese (2006) provide a conceptual heuristic for how adaptability may fit into a larger performance model. We recommend that this should serve as an exemplar. Future research should focus on refining the theoretical underpinnings of this heuristic and using it as a basis from which to design more sophisticated evaluation studies. Alternatively, researchers may emulate the approach and develop competing models for evaluation.

Second, given the evident conceptual variability, there is also considerable inconsistency in the measurement of adaptability as an individual differences construct (see Table 2). However, Ployhart and Bliese's (2006) I-ADAPT measure provides researchers with a theoretically developed tool that could be used as a foundation for systematic research. Although sparse, empirical research examining the reliability and validity of the I-ADAPT measure (e.g., Almahamid et al., 2010; Wang et al., 2011) has typically used an abbreviated or modified version. Such practices make it difficult to evaluate the value of the measure as a whole. Although initial evidence is promising, more systematic work is required to establish criterion and construct validity. Until there is more consistency in conceptualization and measurement, research will continue to yield ambiguity and reduce the potential for practical utility.

Finally, the methodology underlying research within this approach is limited. Researchers have primarily relied on self-report assessments to measure adaptability, as well as the other key study predictors (e.g., personality) and control variables, which is understandable (see Table 2 for a few exceptions). More concerning is that the criteria have also been measured subjectively. Subjective (self- or other-) reports are plagued with measurement issues, including rater biases and restriction of variance (e.g., ceiling and floor effects). Compounding this problem, the majority of studies are cross-sectional, contributing to causal ambiguity. Such designs limit the inferences that can be drawn about adaptability and its relationships with other variables. It is critical that researchers are more rigorous in their methods.

Performance Change Approach

Overall Definition and Key Assumptions

With its primary origins in the expertise and skill acquisition literatures (e.g., Holyoak, 1991; Kanfer & Ackerman, 1989), research within the performance change approach is domain specific. Adaptation is treated as a response to changed task or environment conditions that necessitate the generalization and extension of specific knowledge and skills. This work focuses on understanding how knowledge and skill acquisition contribute to effective performance in a changed task or task environment (i.e., novel, ill-defined, more complex; Kozlowski, Toney, et al., 2001). Researchers using this approach typically assume that an adaptation process has occurred when the expected decline in performance is mitigated after the change occurs (i.e., performance adaptation); however, this process is not explicitly

examined. They also assume that the changed task or situation requires adaptation, but often fail to explicitly specify what changed and how the change requires psychological or behavioral mechanisms to be adapted.

Three distinct operationalizations of adaptation within this approach emerged from our review: input–output change (IO; e.g., Dormann & Frese, 1994; Frese, Brodbeck, Heinbokel, Mooser, Schleiffenbaum, & Thiemann, 1991); inputs, a learning process before a change, and adaptive performance (IPO; e.g., Bell & Kozlowski, 2002b, 2008; Chen, Thomas, & Wallace, 2005; Kozlowski, Gully, Brown, Salas, Smith, & Nason, 2001); and longitudinal performance after a change (LP; e.g., LePine, 2003, 2005; LePine, Colquitt, & Erez, 2000). At a high level of description, the IO approach focuses attention on how different inputs (e.g., personality or ability characteristics and training) explain performance adaptation after a task change. The IPO approach investigates processes that are present during the learning phase prior to a change. Finally, the LP approach focuses attention on how performance fluctuates over time after a change. Given that the operationalization of adaptive performance drives the inferences that can be drawn from any particular study, these conceptual, operational, and research design distinctions are critical.

Input–Output Performance Change (IO)

Definition and Key Assumptions

Within the IO approach, adaptation is operationalized as performance after a change with more adaptive individuals or teams being less negatively affected by the change. However, the assumption of domain specificity has resulted in unique operationalizations of adaptation across studies (see Table 3 for the nuanced distinctions). Another assumption of this stream of research is that changes in performance between training or routine performance and performance in a novel and complex, or adaptive, situation can be explained by inputs, such as training inductions and/or individual differences.

Conceptual Foundations

One of the most systematic research streams underlying the IO approach is Frese's work on error training, which emerged in the literature over two decades ago (Frese & Altmann, 1989; Frese et al., 1991) with the goal of understanding how error training can reduce the discrepancy in performance when individuals are presented with a transfer, or adaptive, task. Frese and colleagues primarily focused on how various error training conditions affected individuals' reactions, behaviors, and performance as compared to error avoidant conditions and, more specifically, on identifying error management strategies that can yield higher transfer performance (e.g., Dormann & Frese, 1994; Frese & Altmann, 1989; Frese et al., 1991; Heimbeck, Frese, Sonnentag, & Keith, 2003) through different computer software platforms (e.g., WordStar, Excel, SPSS) where adaptation was operationalized as performance in a transfer trial (e.g., a novel or more complex task). The benefit of this systematic stream of research is that several successful replications have been conducted. However, the

Table 3
Input–Output Performance Change Approach

Reference	Research Design	Definition/ Conceptualization	Operationalization	Data Source
Beersma, Hollenbeck, Conlon, Humphrey, Moon, & Ilgen (2009)	Experimental (T)	Structural adaptation theory suggests that teams are required to change their structure to respond effectively to the environment.	High performance after the team reward structure shifted (2 trials: 1 cooperative, 1 competitive—counterbalanced)	Computer-based scenario task: Distributed Dynamic Decision Making (DDD)
Dormann & Frese (1994)	Experimental (I)	Adaptation is an individual's ability to generalize training to new situations where a version of that knowledge is required.	High scores on 5-point Likert-type ratings of performance during the transfer tasks	Experimenter ratings
Frese, Brodbeck, Heinbokel, Mooser, Schleiffenbaum, & Thiemann (1991)	Experimental (I)	Adaptation is an individual's ability to generalize training to new situations where a version of that knowledge is required.	High scores on a 5-point Likert-type ratings of performance during the transfer task	Experimenter ratings
Heimbeck, Frese, Sonnentag, & Keith (2003)	Experimental (I)	Adaptive performance is seen in how well individuals address the gap between learning and transfer tasks that are more ill-structured and novel.	Correctly completing the task and sum scores of performance for the transfer trials	Experimenter ratings
Hollenbeck, Ellis, Humphrey, Garza, & Ilgen (2011)	Experimental (T)	Structural adaptation theory suggests that teams are required to change their structure to respond effectively to the environment.	High performance after the team reward structure shifted (1 training trial, 1 centralized trial, 1 decentralized trial—counterbalanced)	Computer-based scenario task: DDD
Ivancic & Hesketh (2000)	Experimental (I)	Adaptability is seen in the ability to recognize that a situation requires a new strategy and respond in a way that demonstrates adaptive expertise.	High performance on the final trial where a new strategy was required to perform well	Stisim model 100 driving simulator
Johnson, Humphrey, Ilgen, Jundt, & Meyer (2006)	Experimental (T)	Structural adaptation theory suggests that teams are required to change their structure to respond effectively to the environment.	High performance after the team reward structure shifted (2 trials: 1 cooperative, 1 competitive—counterbalanced)	Computer-based scenario task: DDD
Joung, Hesketh, & Neal (2006)	Experimental (I)	Adaptation is seen in individual's capacity to deal with changing work requirements and novel or unusual situations.	Higher number of errors identified in a new and more complex scenario	Situation judgment test for firefighters
Mumford, Baughman, Threlfall, Uhlman, & Costanza (1993)	Experimental (I)	Adaptation is performing well or maintaining performance when there are changing task demands, such as a novel or ill-defined task.	Higher problem-solving scores on an ill-defined analogy	Problem-solving analogy task

(continued)

Table 3 (continued)

Reference	Research Design	Definition/ Conceptualization	Operationalization	Data Source
Niessen, Swarowsky, & Leiz (2010)	Nonexperimental (I)	Adaptation is more than just learning new knowledge and skills but also unlearning of old work procedures, continuing performance of tasks and duties through change, and reassessing fit perceptions.	High scores on a survey measuring performance (after the organizational change occurred)	Self-report survey
Stokes et al. (2008)	Experimental (I)	Adaptive performance is seen in an individual altering behavior to meet the demands of the environment, event, or new situation.	High performance after a communication breakdown in the task	Computer-based scenario task: Aerial Port Simulation (CAPS)
Stokes et al. (2010)	Experimental (I)	Adaptive performance is seen in an individual altering behavior to meet the demands of the environment, event, or new situation.	High performance on two elements of the task: repurposing after a change and adjusting to a communication failure	Computer-based scenario task: CAPS
Zaccaro et al. (2009)	Nonexperimental (I)	Adaptation is a functional cognitive, behavioral, and/ or affective change in behavior in response to or in anticipation of a change in the environment.	High scores on measure of leader adaptability attributes	Situation judgment test for military leaders
Zaccaro et al. (2009)	Experimental (I)	Adaptation is a functional cognitive, behavioral, and/ or affective change in behavior in response to or in anticipation of a change in the environment.	High scores on a trainer-rated behaviorally anchored rating of leader adaptability after a change was introduced in the role play	Other-report surveys

Note: (I) indicates individual-level and (T) indicates team-level research designs.

extent to which Frese's work generalizes to other training programs (beyond error training) and to other tasks (beyond computer software tasks) is less clear. Additional research is needed to better calibrate the generalizability of error training effects on transfer (or adaptive) performance.

Summary

Empirical work in the IO approach primarily focuses on identifying inputs that affect performance in a novel situation. Specifically, three inputs are represented in the research: individual differences, individual training inductions, and team structure manipulations. Summarizing across studies (Niessen, Swarowsky, & Leiz, 2010; Stokes et al., 2010;

Zaccaro, Banks, Kiechel-Koles, Kemp, & Bader, 2009), the *individual differences* of job experience, cognitive ability, and personality predispose a person to obtain more flexible expertise that is needed to succeed in adaptive situations (see Dane, 2010; Holyoak, 1991). Zaccaro and colleagues specifically investigated traits critical for leader adaptation in military contexts, but it is unknown whether the traits identified would be replicable in other settings. An inherent aspect of the IO approach is the lack of investigation of why, or through what processes, individual differences influence performance adaptation.

Individual-based training inductions, such as the work by Frese and colleagues, have revealed that error-encouragement framing (encouraging individuals to explore and handle errors on their own and treat errors as learning opportunities) has a more positive impact on performance adaptation than error-avoidant framing (specifically informing individuals to prevent errors and exploration behaviors; Dormann & Frese, 1994; Frese et al., 1991; Heimbeck et al., 2003). However, as these studies did not report the specific changed task components that required adaptation (beyond the requirement of solving a new set of software problems), it is unclear what the individual is adapting to and how the inductions influence the underlying mechanisms of adaptation.

Team structure manipulations constituted the thrust of adaptation research at the team level, which targets a specific type of structural change, such as a shift from functional (where each member had unique resources and had to coordinate with others) to divisional (where members had all resources and could act autonomously). This is based on the need for teams to adapt to the structure of the task environment. Results of this series of research studies (Beersma, Hollenbeck, Conlon, Humphrey, Moon, & Ilgen, 2009; Hollenbeck, Ellis, Humphrey, Gerza, & Ilgen, 2011; Johnson, Humphrey, Ilgen, Jundt, & Meyer, 2006) suggest that differences in the order of structural change have asymmetrical effects on how well the team can adjust, or adapt, to the new structure. For example, teams were more adaptive when shifting from a functional to a divisional team structure (Hollenbeck et al., 2011). The researchers discussed how the relative ease of moving from constrained to autonomous structures, rather than vice versa, led to better adaptive performance through coordination. However, as coordination was not empirically examined, the mediating processes are not well mapped. In addition, as this research was solely focused on structural changes, it does not reveal how teams adapt to other types of changes.

Overall, although various individual differences, individually based training inductions, and team structure manipulations have been found to affect adaptive performance in the IO approach, the primary limitation is the lack of attention given to the process mechanisms underlying the relationship between the inputs and adaptive outcomes. This limits our ability to understand the psychological mechanisms that account for the findings.

Learning Process of Performance Change (IPO)

Definition and Key Assumptions

Research within the IPO approach generally consists of two phases—a multitrial learning phase followed by a single-trial adaptation phase. This research examines inputs (e.g., training

Table 4
Learning Process Performance Change Approach

Reference	Research Design	Definition/Conceptualization	Operationalization	Data Source
Bell & Kozlowski (2002a)	Experimental (I)	Adaptation is the use of self-regulatory processes to adjust behavior in the face of a new or novel situation.	High performance on the more difficult, longer adaptive training transfer trial (9 training trials, 1 adaptive trial)	Computer-based scenario task: Tactical Navy Decision Making (TANDEM)
Bell & Kozlowski (2002b)	Experimental (I)	An adaptive response pattern is evident when individuals persist when faced with failure, when they use more complex learning strategies, and when they pursue more difficult and challenging material and task, as seen in generalizing behaviors from a training situation to a more complex transfer environment.	High performance on the more difficult, longer adaptive training transfer trial (9 training trials, 1 adaptive trial)	Computer-based scenario task: TANDEM
Bell & Kozlowski (2008)	Experimental (I)	Adaptive transfer involves using one's existing knowledge base to change a learned procedure or to generate a solution to a completely new problem.	High performance on the more difficult, longer adaptive training transfer trial (9 training trials, 1 analogical trial, 1 adaptive trial)	Computer-based scenario task: TANDEM
Bell & Kozlowski (2010)	Conceptual (I)	Adaptive expertise is the ability to adjust one's learning to meet the demands of a more difficult, complex, and dynamic environment. This is developed through enhancing the cognitive, motivational, and affective self-regulatory processes during training, and is evident in adaptive, or far transfer, performance environments where there is increased complexity or novelty.	N/A	N/A
Brown (2005)	Nonexperimental (I)	Adaptation is seen as training transfer in the maintenance of training over time as well as the generalization of skills learned in a classroom environment to a workplace setting.	Higher scores on measures of training generalization	Self-report survey
Chen, Thomas, & Wallace (2005)	Experimental (I)	Adaptive performance is evident in transfer situations where knowledge and skills learned during training must be adapted to effectively perform in new or more complex situations.	High scores on a behaviorally anchored rating scale of skills that are required to have effective adaptive performance	Computer-based scenario task: Longbow2
Chen et al. (2005)	Experimental (T)	Adaptive performance is evident in transfer situations where knowledge and skills learned during training must be adapted to effectively perform in new or more complex situations.	High scores on the transfer trial	Computer-based scenario task: Longbow2
DeRue, Hollenbeck, Johnson, Ilgen, & Jundt (2008)	Experimental (T)	Adaptation is defined as behavioral change by an individual or team.	Higher performance after one of the team members were removed was evidence of effective adaptation	Computer-based scenario task: Distributed Dynamic Decision Making (DDD)
Entin & Serfaty (1999)	Experimental (T)	Adaptive performance is a team's ability to adapt their decision-making and coordination strategies and/or their structure to maintain performance in the presence of escalating workload and stress.	Higher implicit (vs. explicit) coordination in a time-pressured, stressful environment (2 training trials, 2 adaptive trials)	Observer-coded verbal behavior during a combat information center simulation
Ford, Smith, Weissbein, Gully, & Salas (1998)	Experimental (I)	Adaptive performance is evident in transfer situations where knowledge and skills learned during training must be adapted to effectively perform in new or more complex situations.	High performance on the more difficult, longer adaptive training transfer trial (12 training trials, 1 adaptive trial)	Computer-based scenario task: TANDEM
Keith & Frese (2005)	Experimental (I)	Adaptation is the transfer of knowledge and skills learned during training to a work-related problem that was unexpected.	Higher performance in creating PowerPoint slides that were more difficult than the training	Creating PowerPoint slides

(continued)

Table 4 (continued)

Reference	Research Design	Definition/Conceptualization	Operationalization	Data Source
Kozlowski (1998)	Conceptual (T)	Adaptive expertise is evident in transfer situations when an individual is able to invent new procedures that require a deep understanding of the principles behind the KSAs learned in addition to applying routine expertise to solve a familiar problem quickly and accurately.	N/A	N/A
Kozlowski & Bell (2006)	Experimental (I)	Adaptive performance is evident in transfer situations where knowledge and skills learned during training must be adapted to effectively perform in new or more complex situations.	High performance on the more difficult, longer adaptive training transfer trial (9 training trials, 1 adaptive trial)	Computer-based scenario task: TANDEM
Kozlowski, Gully, Brown, Salas, Smith, & Nason (2001)	Experimental (I)	Adaptive performance is evident in transfer situations where knowledge and skills learned during training must be adapted to effectively perform in new or more complex situations.	High performance on the more difficult, longer adaptive training transfer trial (4 training trials, 1 adaptive trial)	Computer-based scenario task: TANDEM
Kozlowski, Toney, Mullins, Weissbein, Brown, & Bell (2001)	Conceptual (I)	Adaptability is the generalization of knowledge and skills learned in training to more difficult, complex, or novel situations through the adaptive learning system, which is based on a self-regulatory model.	N/A	N/A
Marks, Zaccaro, & Mathieu (2000)	Experimental (T)	Adaptation is evident in teams that are able to construct and use new strategies and techniques for confronting novel elements in their environment through surveying those elements, interpreting their meanings with regard to the team goal, deciding on an effective strategy, and executing that strategy.	High performance on the two more complex adaptive performance scenarios (two different types of novel environment)	Computer-based scenario task: Team War Game Interaction Simulation Training (TWIST)
Moon et al. (2004)	Experimental (T)	Structural adaptation theory suggests that teams are required to change their structure to respond effectively to the environment.	High performance on the second trial (after the structure was changed) was evidence of adaptation (1 training trial, 1 adaptive trial)	Computer-based scenario task: DDD
Scaduto, Lindsay, & Chiaburu (2008)	Nonexperimental (I)	Adaptation is in the effectiveness of training transfer, maintenance, and generalizing in a more complex situation.	High scores on measures of training transfer, maintenance, and generalization	Self-report survey
Smith, Ford, & Kozlowski (1997)	Conceptual (I)	Adaptive expertise is evident in transfer situations when an individual is able to invent new procedures that require a deep understanding of the principles behind the KSAs learned in addition to applying routine expertise to solve a familiar problem quickly and accurately.	N/A	N/A
Zaccaro et al. (2009)	Experimental (T)	Adaptation is a functional cognitive, behavioral, and/or affective change in behavior in response to or in anticipation of a change in the environment.	Higher performance on a more difficult and complex scenario	Computer-based scenario task: Command and Conquer: Red Alert

Note: (I) indicates individual-level and (T) indicates team-level research designs.

inductions and/or individual differences), assesses processes that underlie learning, and identifies how the inputs and process mechanisms account for routine and adaptive performance. Similar to the IO approach, adaptive performance is evident in an individual's ability to minimize a performance decline after an increase in complexity (see Table 4 for detailed descriptions for each study). However, the IPO approach shifts the research focus from the

direct impact of inputs on adaptation to an investigation of the learning processes through which the inputs operate.

The IPO approach adopts the perspective that process mechanisms influence performance adaptation. However, the processes of interest are assessed during the learning phase but are not captured during the adaptation phase. Therefore, this approach assumes that the processes relevant during learning are similar to processes occurring after a change. Furthermore, the IPO approach generally assumes that domain-specific knowledge and skills are the primary drivers of adaptive performance.

Conceptual Foundations

Research in the IPO approach has emerged over the past 10 to 15 years, drawing from the expertise development (Holyoak, 1991) and skill acquisition literatures (Kanfer & Ackerman, 1989). The primary objective has been to understand how adaptive capabilities develop through self-regulation processes during learning, which then in turn influence performance adaptation when the task becomes more complex. Smith and colleagues (1997) described the nature of adaptive expertise and how it could be developed by several promising training interventions. Building on this foundation and the IO research described previously, Kozlowski and colleagues investigated self-regulatory mechanisms involved in the acquisition of adaptive capabilities, and active learning interventions and individual differences that shape these mechanisms.

Utilizing self-regulation as the theoretical driver, Kozlowski, Toney, et al. (2001) developed a theoretical framework to guide the design of active learning interventions. At its core, this research examined the joint effect of individual differences (e.g., mastery orientation and cognitive ability) and a variety of active learning inductions such as mastery learning (Kozlowski & Bell, 2006; Kozlowski, Gully, et al., 2001) and adaptive guidance/feedback (Bell & Kozlowski, 2002a) on the self-regulation process mechanisms underlying adaptive performance. Later research shifted to integrating across active learning techniques. Bell and Kozlowski (2008, 2010) advanced an integrated model of the differential impact of three core active learning techniques on self-regulatory mechanisms involved in adaptation. Specifically, guided exploration targeted the cognitive mechanisms (e.g., attention, metacognitive activity, knowledge structure or strategy) and behavioral mechanisms (e.g., self-evaluative activity and effort allocation), error framing targeted motivational mechanisms (e.g., self-efficacy and intrinsic motivation), and emotion-control training targeted affective mechanisms (e.g., anxiety).

Summary

Empirical research within the IPO approach has examined processes that are thought to drive adaptive performance at the individual and team levels in one of three ways: through individual difference research, individual-level training manipulations, or team structure manipulations. *Individual difference* research within the IPO approach has identified several characteristics (e.g., mastery/learning vs. performance orientation and cognitive ability) that

consistently affect self-regulatory mechanisms involved in learning, which in turn influence performance after a change (Bell & Kozlowski, 2002b, 2008; Ford, Smith, Weissbein, Gully, & Salas, 1998; Kozlowski & Bell, 2006; Kozlowski, Gully, et al., 2001). Stokes et al. (2008) have explored additional traits (e.g., need for structure, cultural adjustment, emotion regulation) that may also be impactful; however, it is unclear how robust these findings are as they have not been replicated. Although these studies have provided insight into which inherent capabilities of individuals influence learning processes, it is unclear whether these characteristics are robust to different operationalizations of performance adaptation.

Individual training inductions have focused on three core elements: exploration (manipulating the cognitive pathway), training frame (motivational pathway), and emotion (affective pathway; Bell & Kozlowski, 2008, 2010). Four training interventions have utilized these core elements in different ways to promote adaptive performance. *Goal orientation inductions* are focused on promoting mastery goals, which focus the individual on learning, understanding, and mastering the task, versus performance goals, which focus the individual on maximizing performance. Results suggest that mastery orientation is associated with higher self-efficacy, more coherent knowledge structures, and higher adaptive performance (Brown, 2005; Kozlowski & Bell, 2006; Kozlowski, Gully, et al., 2001). Similarly, *learning inductions* are targeted toward manipulating how individuals engage with the task. Guided exploration strategies require individuals to explore the environment with several learning topics in mind to build a deeper understanding of the underlying principles of the task. In contrast, procedural learning strategies provide specific instructions to walk an individual through the task step-by-step. Results suggest that guided exploration leads to greater metacognition, self-evaluation activity, and knowledge, which in turn yield higher adaptive performance (Bell & Kozlowski, 2002a, 2008). *Feedback manipulations*, such as the adaptive guidance feedback induction developed by Bell and Kozlowski (2002a), use performance information from the prior trial to direct attention (i.e., what to study and practice) toward the aspects of the task that have not been mastered. Compared with control feedback (i.e., raw performance feedback), adaptive guidance yields higher levels of basic and strategic knowledge and self-efficacy. *Error framing inductions* are based in Frese's work where errors are framed as either learning opportunities (encouragement) or learning detriments (avoidance). Results suggest that error encouragement increases state learning goal orientation, self-efficacy, intrinsic motivation, metacognition, and emotion control, which contribute to adaptive performance (Bell & Kozlowski, 2008; Keith & Frese, 2005). Together, these four types of training inductions—goal orientation, learning, feedback, and error framing—have received the most attention in the IPO approach, providing evidence of their effectiveness to influence learning processes and adaptive performance (see Table 4 for details on other studies). Other inductions (e.g., emotion control training; Bell & Kozlowski, 2008) have been investigated, but there is only limited empirical work and it is too early to draw conclusions about their efficacy.

Team structure manipulations represent another type of input researchers have investigated in relation to the processes preceding adaptive performance (DeRue, Hollenbeck, Johnson, Ilgen, & Jundt, 2008; Moon et al., 2004). Moon and colleagues (2004) used a simulation task to investigate the effect of a structural change within the team from functional (each team member managed one type of resource) to divisional responsibilities (each

member managed all types of resources), or vice versa. Like the IO research cited previously, results indicate asymmetrical effects of team structure manipulations, as teams were more adaptive when shifting from a functional to a divisional structure, as compared to divisional to functional. In this research, communication and assisting processes were found to mediate the effect of team structure on adaptive performance such that in teams with high communication and assisting behaviors the asymmetric effects were eliminated. The presumption is that the functional structure forced team members to develop patterns of cooperative interaction, whereas the autonomy inherent in the divisional structure did not. When forced to use the reciprocal structure, those team members who were previously autonomous had difficulty developing the underlying adaptive mechanisms (i.e., communication and mutual assistance). However, given that different structural manipulations have been explored (e.g., DeRue et al., 2008, investigated the effect of removing different team members), more research is needed to examine the robustness of these findings. Future team-level research may benefit from leveraging the findings from the individual-level research and investigating team characteristics and training inductions that are likely to affect team learning processes.

Overall, work within the IPO approach has primarily been focused on identifying ways to enhance learning processes that positively affect adaptive performance. Strong theoretical foundations (e.g., Bell & Kozlowski, 2010; Kozlowski, Toney, et al., 2001) have provided solid guidance for empirical examinations of the mechanisms involved in the learning process. Furthermore, researchers have investigated team-level adaptation with regard to team structure changes. Although the IPO approach is concerned with identifying the mechanisms involved in the learning process, researchers investigated performance adaptation at only one point in time, neglecting to examine longitudinal effects postchange.

Longitudinal Performance Change

Definition and Key Assumptions

Researchers within the LP approach operationalize adaptation as an increase in a series of performance measurements after a task change occurs (see Table 5). This approach assumes that once a task change is introduced, an adaptive process is initiated. However, the mechanisms underlying adaptive performance are not explicitly examined. Nonetheless, these unobserved mechanisms are assumed to influence fluctuations in performance over time after a change is introduced.

Conceptual Foundations

There is not a strong conceptual foundation guiding the LP approach. However, LePine (2003, 2005; LePine et al., 2000) conducted a series of empirical investigations that has shaped this research. His work exemplifies how this approach has matured over the past decade. In initial work, LePine et al. (2000) investigated how individuals adapted to different changes in a task over time. Although adaptive performance was

Table 5
Longitudinal Performance Change Approach

Reference	Research Design	Definition/Conceptualization	Operationalization	Data Source
Bröder & Schiffer (2006)	Experimental (I)	Adaptivity, and specifically strategy adaptivity, is defined as an appropriate or optimal change or shift in strategy use in response to a change in the task or environment. Maladaptive behavior occurs when a routine, previously effective, strategy is continued to be used after a change in the task or environment makes it less optimal.	Adaptation was seen in effective performance after the payoff structure changed (80 training trials; 80 adaptive trials)	Hypothetical stock market task
Drach-Zahavy & Somech (1999)	Experimental (I)	Change situations are those that require adaptation to a dynamic environment, which may increase the psychological states of anxiety, ambiguity, and resistance, which may hinder performance.	Lower mean absolute error in the trials following the change in equations used to predict stock value (90 training trials; 30 adaptive trials)	Stockbroker task
Holladay & Quiñones (2003)	Experimental (I)	Adaptation is seen in transferring principles learned during training to a more complex transfer trial.	Higher average scores on the 20 far transfer trials where more complexity and uncertainty was introduced in the targets (48 training trials, 10 near transfer trials, 20 far transfer trials)	Computer-based scenario task: Computer naval air defense simulation
Lang & Bliese (2009)	Experimental (I)	Transition adaptation constitutes how well individuals apply routines and expertise from the prechange environment to the postchanged environment. Reacquisition adaptation constitutes an individual's ability to relearn a changed task over time through reevaluating the prelearned routines and expertise.	Transition adaptation was high when the mean performance drop in trials after the change was small and reacquisition adaptation was high when the rate of performance increase was high after the change (300 training trials, 300 adaptive trials)	Computer-based scenario task: TankSoar Scenario
LePine, Colquitt, & Erez (2000)	Experimental (I)	Adaptability is evident in how effectively an individual performs after a change is introduced into the environment.	Fewer number of mean errors made after a shift in decision-making structure (25 training trials, 25 adaptive change 1 trials, 25 adaptive change 2 trials)	Multiple cue probability learning task TIDE2
LePine (2003)	Experimental (T)	Role structure adaptation is the responsiveness and behavioral adjustment of a team to a problem, error, or discrepancy in how team members are contributing to effective performance.	The number of trials that the team used a newly developed role structure/communication strategy, and an experimenter-rated score of newly structured communications	Multiple cue probability learning task TIDE2 (53 training trials, 30 adaptive trials)
LePine (2005)	Experimental (T)	Role structure adaptation is the responsiveness and behavioral adjustment of a team to a problem, error, or discrepancy in how team members are contributing to effective performance.	The number of trials that the team used a newly developed role structure/communication strategy, and an experimenter-rated score of newly structured communications	Multiple cue probability learning task TIDE2 (43 training trials, 20 trials with communication slowly breaking down, 20 adaptive trials)

(continued)

Table 5 (continued)

Reference	Research Design	Definition/Conceptualization	Operationalization	Data Source
Ployhart, Holtz, & Bliese (2002)	Conceptual (T)	Leader adaptability is how leaders can intervene and develop their team into a cohesive unit that can change their behaviors to meet the demands of a changing environment over time.	N/A	N/A
Porter, Webb, & Gogus (2010)	Experimental (T)	Adaptation is how well a team is able to adjust their behaviors and roles in response to new or changed task demands.	High scores in performance between the training trial to the first adaptive trial, and from the first to the second adaptive trial (1 training trial, 2 adaptive trials)	Computer-based scenario task: Distributed Dynamic Decision Making
Randall, Resick, & DeChurch (2011)	Experimental (T)	Adaptation is a combination of behavioral processes and cognitive emergent states that a team uses to adjust their actions and evaluate a changed environment.	Higher numbers of adaptive strategies used during the adaptive trials (6 training trials, 6 adaptive trials)	Computer-based scenario task: SimCity 4 Deluxe Edition
Stewart & Nandkeolyar (2006)	Nonexperimental (I)	Adaptation is evident when individuals, or employees, adjust their behaviors to meet environmental demands, or when others communicate their expectations and goals.	High number of sales weekly is considered adaptive performance (26 weeks)	Total dollar amount of sales each week and number of sales referrals
Woltz, Gardner, & Gyll (2000)	Nonexperimental (I)	Adaptation is evident when performance remains high when the demands of the environments change from the skill acquisition environment.	Low response latency and errors in transfer trials where the optimization rules were changed (22 training trials, 8 adaptive trials)	Logic Gates and Number Reduction Tasks

Note: (I) indicates individual-level and (T) indicates team-level research designs.

assessed longitudinally, it was averaged over time so that trajectories of adaptation were not examined. Next, LePine (2003) shifted to the team level and examined behavioral indicators that could provide insight into how quickly teams adapted to a change in communication structure. Again, longitudinal analyses were not employed and, therefore adaptive performance trajectories were not a central focus. However, LePine's (2005) subsequent work began to address this limitation by examining team adaptive performance trajectories in response to a task change. The key insight emerging from this line of work is that adaptive performance is not necessarily consistent over time. One measurement of adaptive performance is insufficient to capture trajectories in adaptation that occur after a task change is introduced.

Summary

Although a common thread in empirical research in this approach is the use of a longitudinal assessment of performance adaptation, studies can be distinguished by the analyses employed. Specifically, some research has aggregated performance scores across multiple adaptive trials (e.g., LePine, 2003; LePine et al., 2000), whereas other research has used longitudinal analyses to investigate fluctuations in adaptive performance over time (e.g., LePine, 2005). Within the work that has *aggregated performance scores*, research has investigated the positive effects of individual differences (cognitive ability, conscientiousness, and openness to experience), processes (self-efficacy, mental models, and role structure adaptation), and training inductions (goal manipulation) on higher adaptive performance at both the individual and team levels (Holladay & Quiñones, 2003; LePine, 2003; LePine et al., 2000). In these works, performance is aggregated over multiple trials (anywhere from 2 to 100) both before and after a task change, such as a communication breakdown or increased complexity.

Although most of the empirical research in the LP approach aggregates adaptive performance scores over time, more recent work has employed *longitudinal analyses.* For example, LePine (2005) investigated how a gradual task change (i.e., a degraded communications channel) influenced team performance adaptation. He found that teams composed of performance-oriented members were slower to adapt their role structure when given a more difficult performance goal than teams composed of learning-oriented members. Lang and Bliese (2009) found the individuals with different levels of cognitive ability (mean, 1 *SD* above, and 1 *SD* below) did not differ in their rate of performance adaptation after a sudden increase in complexity. However, those with higher cognitive ability were consistently better before and after the change. Had these researchers aggregated performance across adaptive trials, the discrepant findings may not have surfaced. Instead, the richness of the longitudinal data was exploited, presenting avenues for future investigation.

Overall, the LP approach is differentiated from the other approaches within the performance change category in that it expands the measurement of performance adaptation to provide a glimpse of its dynamics. Research designs including at least three repeated measurements are *minimally* longitudinal for investigating trajectories (Ployhart & Vandenberg, 2010); however, more sophisticated methods of dynamic modeling typically require 30 or more repeated measurements (DeShon, 2012). Even within studies that incorporate more than three trials, there was inconsistency in how the performance data were analyzed. In some studies, the longitudinal data were aggregated, obscuring any dynamics in performance adaptation (e.g., LePine et al., 2000); in other work, the analyses better exploit variations in performance adaptation (e.g., LePine, 2005). Furthermore, process mechanisms that might account for adaptive performance trajectories have not been incorporated in the research. Therefore, future research needs to incorporate a panel design where both processes and performance are measured (and analyzed) longitudinally.

Overall Summary for the Performance Change Approach

The performance change approach, as a whole, utilizes similar conceptualizations of adaptation: a change in performance once a task becomes more novel, becomes more

complex, or is otherwise changed. However, research is distinguished by operationalization, and each approach provides different insights into performance adaptation. Three key insights are highlighted below: (a) the value of integrating theory and methodology across the three approaches, (b) the need for a conceptually driven operationalization of adaptive performance change, and (c) the opportunity to extend empirical research to the field.

The conceptual foundations of the IPO approach differentiate it from the other perspectives. Prior to conducting empirical research, Kozlowski and colleagues developed a theoretical framework (Kozlowski, Toney, et al., 2001) that built on earlier skill acquisition (Kanfer & Ackerman, 1989), action learning (Frese & Altmann, 1989), and adaptive expertise (Smith et al., 1997) work. Subsequent empirical work supported the notion that self-regulation positively influences adaptive performance, shedding light on process mechanisms. Later research advanced theoretical integration across different active learning techniques and self-regulatory pathways (Bell & Kozlowski, 2008, 2010). Although the longitudinal approach does not have a strong theoretical foundation for adaptive processes, it expands the performance change approaches by raising awareness of the need to examine adaptive performance not as a one-shot event, but rather as a trajectory over time (Lang & Bliese, 2009; LePine, 2005). This highlights an opportunity for synthesis by integrating the theoretical and empirical work on learning process mechanisms with an examination of longitudinal performance trajectories. Such integration would advance insights into postchange adaptive processes.

Second, researchers within the performance change approach have, with a few notable exceptions, neglected to utilize theory to guide their operationalization of adaptation. Moreover, most research is vague in its description of what elements of the task changed and how that change creates a need for adaptation. What needs to be adapted, and how would it occur? Across this research, the lack of specification yields a weak understanding of the types of adaptive change that are being investigated and how they differ. Thus, a theoretical framework is required to specify what types of task changes (e.g., increase in complexity, ambiguity, or novelty) require an adaptive response, the nature of the required adaptation, and the factors driving differential effects on adaptive performance. For example, Kozlowski and colleagues (e.g., Bell & Kozlowski, 2002b, 2008; Kozlowski, Gully, et al., 2001) consistently used Wood's (1986) taxonomy of task complexity to precisely specify the nature of the task changes that required adaptation, which allowed them to identify theoretically relevant process mechanisms. Using or extending Wood's taxonomy, or synthesizing a broader conceptual framework, to clearly specify the nature of performance adaption is needed to better ground, integrate, and systematize this line of research. We will return to this critical issue in the discussion.

Finally, it would be useful to begin generalizing the findings of this line of research by extending it into the field. Although current paradigms have been useful for establishing the positive effects of several active learning inductions and individual differences on adaptive performance, and in some instances identifying their underlying process mechanisms, most is based on laboratory research using computer-based tasks or simulations. What remains unclear is whether laboratory simulations elicit the same set of process mechanisms on the part of the individuals engaging in tasks embedded in meaningful contexts. Although field research provides a set of unique challenges (e.g., controllability, precise measurement), the next phase for this research is to extend generalization and application.

Process

Definition and Key Assumptions

Almost two decades ago, researchers began to theorize about the phenomenon of adaptation as more than performance after a change, but rather as a process in and of itself, which unfolds over time (e.g., Burke et al., 2006; Kozlowski et al., 1999; Kozlowski, Gully, Salas, & Cannon-Bowers, 1996). This approach suggests that adaptation occurs from an individual or team, not only recognizing that a task or environmental change has occurred, but understanding that a series of responses have to be made to identify what implications the change has and what actions are required to effectively address the changed situation. As a result, the process approach views adaptation as iterative cycles of process mechanisms that are reciprocally linked to performance outcomes that individuals and teams exhibit following a task change, although different frameworks have been proposed (see Table 6). This approach assumes that the adaptation process can be captured through measurement. Although other works discussed in this review have alluded to an adaptation process, this approach is distinguished by the fact that researchers are attempting to explicitly identify measureable attributes of the process. It is also assumed that capturing the adaptation process directly will provide unique insight into how to maximize performance in dynamic situations (e.g., by leveraging specific process mechanisms that can be targeted during training, during development, or by team leaders).

Conceptual Foundations

With a few notable exceptions, this approach is mostly theoretical and is focused on the process underlying how individuals and teams respond to changes necessitating adaptation (see Table 6 for descriptions of the theoretical work conducted in this perspective). Work by Kozlowski and colleagues theorized how adaptive capabilities are developed over time in teams (e.g., Kozlowski & Bell, 2008; Kozlowski et al., 1999; Kozlowski, Gully, McHugh, Salas, & Cannon-Bowers, 1996). They assume this occurs during a developmental progression of the team through a series of phase transitions. Team formation is the first phase where individuals are socialized into the team through the creation of team norms, goals, and climate perceptions. Next, team members acquire task knowledge and self-regulation skills in the task compilation phase. Role compilation follows as members identify their roles and develop routines for task exchanges. Where the prior two phases were primarily individual level, this phase is dyadic in nature. In the team compilation phase, teams develop adaptive capabilities through the creation of flexible role networks. In this final team-level phase, teams are capable of self-regulating to continuously improve in response to incremental change (routine adaptation) and to innovate, adapt, and invent new responses to metamorphic, discontinuous, and unpredictable change.

Burke et al. (2006) shift away from the development of team adaptive capabilities, focusing instead on the mechanisms involved when teams adapt to a change. They con-

Table 6
Process Approach

Reference	Research Design	Definition/Conceptualization	Operationalization	Data Source
Burke, Stagl, Salas, Pierce, & Kendall (2006)	Conceptual (T)	Team adaptation is an emergent phenomenon created from cycles of performance where individuals utilize resources to meet changing demands.	N/A	N/A
Chan (2000)	Conceptual (I)	Adaptation is a processes through which individuals establish a fit between their behaviors and the novel or ill-defined situations they face.	N/A	N/A
Day, Gronn, & Salas (2004)	Conceptual (T)	Adaptability is a team's ability to appropriately respond and react to deviations in performance.	N/A	N/A
Kozlowski, Gully, Nason, & Smith (1999)	Conceptual (T)	Adaptation is the final stage in a team's cycle of development that requires a modification of a current network or an invention of a new way to meet changing internal or external contingencies.	N/A	N/A
Kozlowski, Gully, Salas, & Cannon-Bowers (1996)	Conceptual (T)	Adaptation is the final stage in a team's cycle of development that requires a modification of a current network or an invention of a new way to meet changing internal or external contingencies.	N/A	N/A
Kozlowski & Bell (2008)	Conceptual (T)	Team adaptation requires team members to learn the principles that underlie team performance through developing collaboration and coordination skills and adaptive capabilities that allow the team to meet unexpected and novel challenges.	N/A	N/A
Kozlowski, Watola, Nowakowski, Kim, & Botero (2009)	Conceptual (T)	Adaptation is seen as a team's ability to engage in a cycle of self-management and improvement in the face of changing circumstances.	N/A	N/A
Rosen, Bedwell, Wildman, Fritzsche, Salas, & Burke (2011)	Conceptual (T)	Team adaptation comprises multiple inputs, processes, and emergent states that allow for teams to effectively respond to event-driven changes in complex environments.	N/A	N/A
Tsui & Ashford (1994)	Conceptual (T)	Adaptive self-regulation refers to the way in which individuals set a standard, perform a behavior, detect a discrepancy, and reduce the discrepancy, which then informs a new standard and a new behavior.	N/A	N/A
Yukl & Mahsud (2010)	Conceptual (T)	Flexible and adaptive leadership involves changing behavior in appropriate ways as the situation changes.	N/A	N/A

Note: (I) indicates individual-level and (T) indicates team-level research designs.

ceptualize an adaptive cycle with four elements (situation assessment, plan formulation, plan execution, and team learning), which is subsumed within a larger model of team adaptive performance. Situation assessment is described as the first phase in adaptation as the change must first be recognized through a constant scanning of the environment to check for changes that may affect the team's goals. The second phase, plan formula-

tion, focuses on setting goals, assigning member responsibilities, prioritizing tasks, and sharing pertinent information to develop a shared understanding of the situation. Plan execution, phase three, is evident through the team engaging in the emergent states of mutual performance monitoring (where individuals keep each other accountable for the tasks they were assigned to complete to deal with the adaptive situation), communication about new information, back-up behavior, and functional leadership behaviors, which all result in team-level coordination. The final phase in the adaptive cycle, team learning, is intended to develop a deeper understanding about what change occurred, the response taken, and how this adaptive situation can be clearly recognized in the future if a similar adaptive need arises. More recently, Rosen, Bedwell, Wildman, Fritzsche, Salas, and Burke (2011) expanded the Burke et al. (2006) framework to incorporate more specific processes and emergent states that are present in the four phases of the adaptive cycle. They describe each phase as having a unique set of processes (e.g., the situation assessment phase incorporates cue recognition, meaning ascription, and team communication processes), which then yield the emergent states of mutual trust, motivation, shared mental models, team situation awareness, and psychological safety. These emergent states then affect the next phase of the adaptive cycle, which yield the same emergent states, and so on. Although this framework is too detailed to discuss in its entirety, it provides added insight into the mechanisms involved in the adaptation process, and how the relevant mechanisms change at the different phases.

Summary

Since work in the adaptation process approach is emergent, we recommend two paths for future research: (a) integration across the adaptation process conceptualizations and (b) empirical work examining the mechanisms of the process. There are different theories, components, and levels of specificity (among others), resulting in a lack of consensus about what mechanisms constitute the process of adaptation. However, it is clear that there have been two conceptual foci at the team level. Kozlowski and colleagues (1999) are primarily focused on developing adaptive capabilities so teams would be able to effectively adapt when presented with a novel situation. Burke et al. (2006) and Rosen et al. (2011) instead focus attention on identifying the elements of the adaptation process that occur after a change is presented. Future research will benefit from taking an integrative perspective that unites both of these foci. Moreover, the theoretical development of adaptation as a process has been largely focused on the team level. There is an opportunity to synthesize this work and to extrapolate it to develop an explicit individual-level model of the process of performance adaptation.

One key limitation in this area is the lack of empirical investigation of the process of adaptation. Understandably, empirical work has been slow to begin as study design is complex, longitudinal data are more difficult to obtain, and the analyses required to investigate a dynamic process are more challenging to conduct and interpret. However difficult this task may be, future research is needed to unpack the black box of the performance adaptation process.

Discussion

Taxonomy of Performance Adaptation Research

Over the past two decades there has been an increasing focus on understanding how individuals and teams respond to change. Performance adaptation has been described as a set of performance dimensions (e.g., Pulakos et al., 2000); a set of individual differences (e.g., Ployhart & Bliese, 2006); a change in task novelty or complexity that necessitates adaptation of cognition, motivation, affect, and behavior (e.g., Frese et al., 1991; Kozlowski, Gully, et al., 2001; LePine, 2003); and an iterative, emergent process (e.g., Burke et al., 2006; Kozlowski, Gully, Salas, & Cannon-Bowers, 1996; Kozlowski et al., 1999). Clearly, the conceptualization of adaptation is diverse. On one hand, this is a strength of the literature in that it addresses different aspects of the phenomenon. On the other hand, however, researchers have generally not been very explicit in their assumptions about the nature of adaptation or very precise in differentiating their conceptualization from others. The result is a vibrant, yet chaotic, line of inquiry; progress has been stymied.

The taxonomy we developed identifies meaningful clusters in the extant research and, importantly, areas of divergence and overlap where there is potential for integration, synthesis, and extension. As Table 7 indicates, these clusters have different theoretical foundations, degrees of development, and amounts of empirical work. Several insights emerge from our analysis of the literature. First, the construct perspectives have an abundance of observational (nonexperimental) research relative to designs that permit causal inference (experiments). Second, the performance change approach is the primary source of experimental research at the individual level and the sole source of experimental research at the team level. Finally, there is limited conceptual development of adaptation as a process at the individual, compared to the team, level, and there is a notable lack of empirical work focused on the underpinnings of adaptation as a dynamic process at either level of analysis. These are obvious gaps that call for progress.

Using the taxonomy, researchers can more precisely position their contribution to the study of performance adaptation and clarify advances. Understanding the conceptualization and definition of adaptation in use, identifying assumptions, and specifying the nature of change under investigation can provide more conceptual clarity. In addition, recognizing the strengths *and* limitations inherent in each of the approaches can help researchers to more precisely calibrate the potential contribution of their research. *We strongly recommend that researchers use the taxonomy to specify their conceptualization of adaptation and to ground their research in the extant literature as a step toward organizing this diffuse literature*. Table 8 describes the overarching definition and key assumptions, strengths, weaknesses, and conceptual and methodological recommendations for future research for each approach. Table 8 not only provides a common framework on which researchers can build, but also elucidates areas for integration, as we will discuss subsequently.

The remainder of the discussion has two objectives. We first offer insights for researchers who wish to incrementally enhance the study of adaptation within each extant approach by summarizing the current state of research and detailing conceptual and methodological recommendations for future research (see Table 8). We then turn attention to delineating

Table 7
Adaptation Approaches by Research Design and Level

Level	Performance Construct	Individual Difference Construct	Performance Change	Process
Individual	Macey & Schneider (2008)	Fugate et al. (2004)	Bell & Kozlowski (2010)	Chan (2000)
	Moss et al. (2009)	Georgsdottir & Getz (2004)	Kozlowski, Toney, et al. (2001)	
	Cronshaw & Jethmalani (2005)	Wong et al. (2003)	Smith et al. (1997)	
	Griffin et al. (2007)	Chan & Schmitt (2002)	Brown (2005)	
	Oswald et al. (2004)	Ployhart & Bliese (2006)	Niessen et al. (2010)	
	Pulakos et al. (2000)	Pulakos et al. (2002)	Scaduto et al. (2008)	
	Spiro & Weitz (1990)	Ahearne et al. (2005)	Stewart & Nandkeolyar (2006)	
	White et al. (2005)	Almahamid et al. (2010)	Woltz et al. (2000)	
	Allworth & Hesketh (1999)	Burch et al. (2008)	Zaccaro et al. (2009)	
	de Jong & de Ruyter (2004)	Caldwell & O'Reilly (1982)	Bell & Kozlowski (2002a)	
	Griffin & Hesketh (2003)	Dukko et al. (2009)	Bell & Kozlowski (2002b)	
	Griffin & Hesketh (2004)	Griffin & Hesketh (2003)	Bell & Kozlowski (2008)	
	Griffin & Hesketh (2005)	Griffin & Hesketh (2004)	Bröder & Schiffer (2006)	
	Gwinner et al. (2005)	Griffin & Hesketh (2005)	Chen et al. (2005)	
	Johnson (2001)	Meneely & Portillo (2005)	Dormann & Frese (1994)	
	Pulakos et al. (2002)	Svennson et al. (2008)	Drach-Zahavy & Somech (1999)	
	Shoss et al. (2012)	Tucker et al. (2010)	Frese et al. (1991)	
	Tucler & Gunther (2009)	Wang et al. (2011)	Ford et al. (1998)	
	Zaccaro et al. (2009)	Bergh (2001)	Heimbeck et al. (2003)	
	Sandelands et al. (1988)	Stokes et al. (2008)	Holladay & Quiñones (2003)	
	Stokes et al. (2008)		Ivancic & Hesketh (2000)	
	Stokes et al. (2010)		Joung et al. (2006)	
	Washburn et al. (2005)		Keith & Frese (2005)	
			Kozlowski & Bell (2006)	
			Kozlowski, Gully, et al. (2001)	
			Lang & Bliese (2009)	
			LePine et al. (2000)	
			Mumford et al. (1993)	
			Stokes et al. (2008)	
			Stokes et al. (2010)	
			Zaccaro et al. (2009)	
Team	Driskell et al. (2006)		Kozlowski (1998)	Burke et al. (2006)
	Klein & Pierce (2001)		Ployhart et al. (2002)	Day et al. (2004)
	de Jong & de Ruyter (2004)		Beersma et al. (2009)	Kozlowski et al. (1999)
	Wiedow & Konradt (2011)		Chen et al. (2005)	Kozlowski & Bell (2008)
			DeRue et al. (2008)	Kozlowski et al. (2009)
			Entin & Serfaty (1999)	Rosen et al. (2011)
			Hollenbeck et al. (2011)	Tsui & Ashford (1994)
			Johnson et al. (2006)	Yukl & Mahsud (2010)
			LePine (2003)	
			LePine (2005)	
			Marks et al. (2000)	
			Moon et al. (2004)	
			Porter et al. (2010)	
			Randall et al. (2011)	
			Zaccaro et al. (2009)	

Note: Very dark = conceptual; dark = instrument validation; light = nonexperimental; very light = experimental.

Table 8
Adaptive Performance Taxonomy: Definitions, Assumptions, Strengths, Weaknesses, and Recommendations for Future Research

	Domain General		Domain Specific	
	Performance Construct	Individual Difference Construct	Performance Change	Process
Definition	Adaptation is a set of performance dimensions or characteristics of an environment that require a change in behavioral responses.	Adaptability is a set of individual capabilities that drive behavioral responses to environmental changes.	Adaptation is an operationally defined criterion within the context of a new or more complex performance situation.	Adaptation is a process that unfolds over time in response to a change in the environment.
Assumptions	Adaptive performance captures a unique aspect of the performance space. Adaptive performance is multidimensional. The dimensions of adaptive performance are generalizable across jobs or domains.	Adaptability is a stable characteristic or skill that can be applied to a variety of situations. Adaptability provides unique prediction for performance after a change beyond other individual difference measures.	There is an underlying process occurring after a change is introduced that results in adaptive performance. Adaptive performance can be enhanced by training inductions and specific individual differences.	Adaptation is a process in response to a change that can be measured. There is additional knowledge gained from investigating the process that would affect selection or training systems.
Strengths	An adaptive performance taxonomy can have widespread application within the selection and performance assessment contexts. Reliance on field-based investigations increases the generalizability of the findings.	A well-defined and empirically validated measure of individual adaptability can have widespread application within the selection and performance assessment contexts. Reliance on field-based investigations increases the generalizability of the findings.	A strong conceptual basis for the training manipulations and variables investigated in this approach allows for theoretical precision. The lab-based task paradigms used allow researchers for increased control and predictive precision. The examination of the learning process and performance shows how adaptive performance is affected and changes over time.	The adaptation process approach presents a theoretical understanding of *how* teams respond to changes. This approach has potential for identifying an underlying adaptation process that may generalize over different domains, although domain-specific knowledge and skills will still be required.
Weaknesses	*Inconsistency*: lack of consensus about the dimensions of adaptive performance or its assessment; all individual level. *Methodology*: generally cross-sectional, supervisor ratings.	*Inconsistency*: lack of a unified theory guiding conceptualization of adaptability and no consistently used measure; all individual level. *Methodology*: generally cross-sectional, self-reports.	*Inconsistency*: operationalizations vary across studies, limiting the generalizability of findings. *Methodology*: almost solely lab-based research.	*Inconsistency*: there is a lack of agreement on the conceptual mechanisms composing the adaptation process. *Methodology*: there is a lack of empirical research.
Conceptual recommendations for future research	Use the taxonomy/measure developed by Pulakos et al. (2000), or make it more parsimonious through rigorous research. Use theory to drive measurement. Make the dimensions of adaptive performance more domain specific.	Use the I-ADAPT measure developed by Ployhart and Bliese (2006), or make it more parsimonious through rigorous research. Use theory to drive measurement. Contextualize individual adaptation by making it more domain specific.	Extend the study of self-regulatory mechanisms to the postchange phase of the adaptive process. Use a conceptual framework for determining change manipulations. Describe operationalizations specifically so others can replicate.	Continue to develop the theoretical model underlying adaptation to map the key components, understand the flow of the process, and theorize how the process manifests across levels.
Methodological recommendations	Use alternative methods (peer ratings; 360 degree). Use measures consistently.	Supplement self-reports (e.g., behaviors). Use measures consistently.	Expand research to the field. Employ longitudinal methods.	Begin testing empirically. Employ longitudinal methods.

broader requirements for clear conceptualization, specification of adaptive mechanisms, and multilevel integration to advance future research. To aid this advance, we provide a multilevel conceptual architecture to help bridge micro, meso, and macro research on adaptation in organizations.

State of the Extant Research and Future Directions Within the Four Extant Approaches

As described throughout this review, performance adaptation has been studied through multiple lenses. The disparate approaches have each contributed to our understanding, but the diversity yields ambiguity associated with how these research streams intersect. We therefore turn our attention to key insights from each approach, highlighting where research is needed to fill gaps in understanding through that lens, where research is no longer productive, and where there are opportunities for synthesis. We consider each approach in turn, summarizing current work and identifying conceptual and methodological opportunities to advance it.

The greatest strength of the *performance construct approach* is its potential generalizability. The domain-general nature of the adaptive performance dimensions lends itself to broad application for selection and performance assessment, and the field-based investigations composing most of the work also suggests generalizability. However, there are three primary weaknesses: (a) inconsistent and often ad hoc conceptualization, (b) measurement limitations in its reliance on individual and supervisor ratings, and (c) lack of team-level research. First, adaptive performance has been defined and measured somewhat haphazardly, with a lack of a clear theoretical framework guiding measurement. Pulakos and colleagues (2000, 2002) represent the most rigorous attempt to map the adaptive performance construct and to develop assessment tools. However, the research investigating the adaptive performance dimensions is limited due to measurement inconsistencies (e.g., Griffin et al., 2007; Griffin & Hesketh, 2003, 2004, 2005). Although the factor structure of the taxonomy proposed by Pulakos et al. (2000) has not been fully supported with data, its rigorous development remains unmatched by any extant alternative. To advance progress within this approach, we recommend that researchers take one of three courses of action: (a) use the full measurement framework proposed by Pulakos et al. (2000), (b) work to improve the framework and its measurement by a more rigorous examination of its underlying factor structure (likely making it more parsimonious), or (c) develop an alternative framework that is theory driven, rigorously developed, and empirically supported. These three actions will help overcome the problems plaguing this area of research.

First, it will be difficult to make conceptual and empirical advances if researchers continue to selectively choose and collapse dimensions to create a composite of adaptive performance, as this results in poor conceptual clarity. The second weakness of the performance construct approach is its heavy reliance on ratings of an individual's adaptive performance. It is likely that the mixed findings regarding the factor structure of adaptive performance are due to the well-established problems of rater errors such as halo error (Alliger & Williams, 1993; Murphy, Jako, & Anhalt, 1993). Halo error makes the distinctions in the adaptive

performance dimensions difficult to discern. Perhaps multiple peer observations or 360-degree reviews would assist in mitigating rater limitations and provide more clarity regarding the dimensionality of adaptive performance. Alternatively, one could contextualize the taxonomy (i.e., make it more domain specific) by incorporating specific behavioral exemplars into the rating scale (i.e., create a behavioral-anchored rating scale approach) relevant to the performance domain of interest. By doing so, raters may be better able to make more distinctive ratings. Finally, both conceptual and empirical work based on the Pulakos et al. framework has been at the individual level. There is potential to conceptually extend this conceptualization to the team level. It is currently unclear how adaptive performance manifests at the team level. That is, while some dimensions of team adaptive performance may be captured by Pulakos et al. (2000), it is likely that additional dimensions will be relevant at the team level that have not yet been explored. Given the shift to team-based work and the interest in team adaptation, future work needs to focus on understanding how adaptive performance manifests at the team level.

Researchers within the *individual difference construct approach* seek to conceptualize and measure adaptability as an individual difference or trait construct. If a well-defined and empirically validated theory and measure of individual adaptability is developed, it can have widespread application in selection and performance assessment. In addition, given that much of the work in this approach has been field-based, the potential for generalizability is good. However, research from the individual difference construct approach has a few key limitations. First, it has been lacking a solid theoretical basis. With the exception of Ployhart and Bliese (2006), the majority of the empirical work has been atheoretical, or at best only loosely linked to theory. Adaptive performance dimensions (Pulakos et al., 2000) have served as the basis for individual adaptability measures as well, with the same dimensionality underlying both the individual difference construct and the performance construct. The potential danger resulting from using adaptive performance dimensions to develop measures of adaptability, which are intended to predict adaptive performance, is conflating the constructs of adaptive performance and the individual difference of adaptability. More important, there is considerable inconsistency in how adaptability has been conceptualized as an individual difference, with some initial investigations describing adaptability as past experience with, or self-efficacy, for adaptation (e.g., Pulakos et al., 2002), while others describe adaptability as evident in manifestations of other individual differences (e.g., flexibility; Griffin & Hesketh, 2004). Thus, there is little conceptual consensus of what constitutes adaptability; rather, its utility lies in predicting the adaptive performance construct. For this perspective to yield useful advances, researchers should adopt a theory driven approach to guide future investigations. Future research should take one of three paths: (a) build on Ployhart and Bliese (2006; i.e., attempt to validate it, examine ways to make it more parsimonious), (b) develop an alternative approach that is conceptually grounded, or (c) attempt to contextualize the adaptability individual difference construct to increase its utility for predicting performance in specific contexts (i.e., similar to recent efforts focused on contextualizing personality; e.g., Bing, Whanger, Davison, & VanHook, 2004). Any of these three paths would advance the field. Continued use of atheoretical and inconsistent approaches to define adaptability will yield conceptual

confusion. This work cannot advance if the trait of adaptability cannot be theoretically distinguished from existing individual differences and from the performance construct. A solid underlying theory is necessary.

In addition to resolving these conceptual challenges, methodological advances are needed. Because this research is based on self-reports, the assumption is that individuals are able to identify whether or not they are adaptive; however, self-reports are plagued by a variety of response biases (Alliger & Williams, 1993; Donaldson & Grant-Vallone, 2002). To help reduce bias, self-report measures of adaptability should be replaced or supplemented with other measurement tools, such as behavioral measures. Objective indicators are not as susceptible to rating biases, such as self-presentation and halo effects that plague self-reports. However, work is needed to develop behavior-based measures. To do so effectively, it will likely be necessary to adopt a more domain-specific approach that will allow behavioral indicators to be situated within a specific context. In addition, alternative research designs, such as event sampling methods, may prove useful in understanding if an individual difference of adaptability can predict performance after changes over multiple points in time, and whether the variance predicted differs based on the specific change or situation. Beyond providing insight into the effectiveness of individual difference adaptability measures, employing a longitudinal data collection methodology would provide an opportunity for research to be synthesized across the individual difference and process approaches. If a reliable and valid individual difference measure is established, it can be used as a predictor of adaptive performance or an input in the adaptation process, providing integration opportunities with other areas of adaptation research. In addition, similar to the performance construct approach, future efforts need to explore the nature of team adaptability to determine if it manifests differently than simply the aggregate of individual adaptability across team members. It is possible that individual adaptability may not be elicited in the same way within a team. Without significant improvements in conceptualizing adaptability, and research designs to better capture it, research in this area will not advance.

With regard to the *performance change approach*, researchers have generally utilized a strong conceptual framework for examining the learning process before a change and for developing inductions to improve performance after a change. Results from this work have demonstrated that performance after a change can be enhanced by error framing (e.g., Frese et al., 1991) and active learning techniques (e.g., Kozlowski, Gully, et al., 2001) in laboratory settings. The laboratory-based paradigm typically employed in this approach allows for researchers to control the type and timing of the change occurring in the task environment, maximizing predictive precision. However, to advance this approach, researchers need to more clearly and explicitly specify the nature of the task change that necessitates adaptation and link the specific type of change to specific process mechanisms, training inductions, and individual differences. By doing so, researchers can examine how different types of changes implicate different self-regulatory pathways (e.g., cognitive, motivational, affective), which can in turn provide insight into how training manipulations can be leveraged in different situations. In addition, researchers should be increasing efforts to field evaluate these techniques for application. Finally, research within the learning process approach has found that self-regula-

tory mechanisms account for performance adaptation after a change (e.g., Bell & Kozlowski, 2008, 2010; Chen et al., 2005). This can be informative for the process approach. Work on the dynamic nature of performance after a change (e.g., Lang & Bliese, 2009; LePine, 2005) provides evidence that performance adaptation is not clearly understandable through a one-time assessment. Thus, research should integrate longitudinal designs that allow for the investigation of the impact of task changes over time. Indeed, there is an opportunity for synthesis between these approaches. Future research can extend the work conducted within the performance change approach to investigate adaptation as a process by synthesizing the theoretical mechanisms involved in the learning process with the methodological advance of longitudinal designs to capture the dynamics of adaptation and performance improvement.

Finally, research in the adaptation *process approach* provides conceptual understanding of how individuals and teams respond to changes through engaging in a series of activities that lead to more or less effective outcomes (e.g., Burke et al., 2006; Kozlowski, Gully, McHugh, et al., 1996). While it is likely that this process manifests itself differently in different domains with specific knowledge and skills, it is likely that the components composing the adaptation process (e.g., situation assessment, detection, diagnosis) will generalize across contexts. However, at this point in time, additional conceptual work is needed to flesh out what the mechanisms of the adaptation process are, how they relate to each other (e.g., sequential or co-occurring), and how they manifest in observable ways in different domains. In addition, most current theory specifies the team level. However, even though some researchers have addressed multilevel issues (e.g., Kozlowski et al., 1999), further attention needs to be focused on the interplay across levels to determine how they (e.g., individuals, teams, units) fit into the process model. Finally, empirical research is needed to begin evaluating the conceptual work. More specifically, longitudinal empirical research is necessary to determine whether or not the different components of the adaptation process can be teased apart empirically (i.e., There may be theoretically distinct parts of the adaptation process, but are they observable and measureable components?), and how they unfold over time (e.g., How does the adaptation process influence performance after a change occurs?). Synthesizing the performance change perspectives with the conceptual work on the cyclical nature of the adaptation process provides an opportunity for researchers to accrue empirical evidence to advance understanding of adaptation.

Advancing Theory and Research on Adaptation in Organizations: Toward Integration

Overview

Our taxonomy draws clear distinctions in conceptualization, operationalization, research design, inference, and purpose across the different extant approaches that characterize the individual- and team-level literature on adaptive performance. Those taxonomic distinctions allow new research to be situated so that investigators understand the strengths and limitations and desirable extensions inherent in the approach within which

they fit. The classifications identify, based on our recommendations, opportunities to advance clarity and consistency within each approach and, in some cases, targets for synthesis across different approaches as a step toward greater integration of this diverse research. Although these are laudable goals that will generally improve the quality of this research, they are nonetheless modest goals. It is a good start, but more is needed for significant conceptual progress.

Moving forward, our review provides ample and compelling evidence that a more substantial conceptual advance is necessary if *adaptation*, as a core organizational phenomenon, is to be meaningful scientifically. Two overarching concerns emanate from the fact that the concept of adaptation is broadly applicable to a wide range of phenomena in organizational behavior, but is poorly defined, inconsistently conceptualized, and ill specified. The idea of adaptation as changing to "fit" an environmentally driven task shift is so generic and widely applicable that it can literally be used to explain anything relevant to performance that changes, at any level of analysis. At that degree of vague specification, adaptation is useless as a scientific concept. As soon as adaptation is contextualized, assumptions, constraints, target levels, and relevant mechanisms are implicated if we are to understand what changed in the environment/task, what constituted adaptation, and what mechanisms were responsible for it. In general, researchers have not been explicit and transparent with these specifications.

Thus, we see two primary and related concerns that need to be resolved for meaningful advances and integration. First, research on macro-organizational adaptation has to be better integrated with the micro-meso literature. Second, the phenomenon of interest must be specified within a coherent conceptual framework that makes explicit its nature, focal levels, and underlying mechanisms and yet enables the evident diversity in conceptualization, approach, and purpose that we observed in the extant literature.

An Architecture for Conceptualizing Adaptation in Organizations: Integrating the Micro, Meso, and Macro Levels

First, it is noteworthy that in devising an integrative taxonomy to capture meaningful differences in the individual and team literature on performance adaptation, we could not incorporate organizational adaptation. Doing so would have forced a more general and less distinctive classification structure that would have precluded our goal of using the taxonomy to parse the literature to advance theory and research. Thus, we constrained our review to focus only on the micro and meso levels because there are substantial qualitative differences in how macro-organizational adaptation research is approached.

The meaning of organizational adaptation is ill defined; it is interwoven with many other concepts including organizational change (e.g., Argyris, 1976; Bartunek & Moch, 1987), organizational development (e.g., Beer & Walton, 1987; Weick & Quinn, 1999), and organizational learning (e.g., Fiol & Lyles, 1985; Huber, 1991; Tushman & Romanelli, 1985). It encompasses literatures addressing strategic management, where the focus is on aligning the organization with its environment or enacting a new environmental niche (e.g., Ford & Baucus, 1987; Miles, Snow, Meyer, & Coleman, 1978), and organizational development practice, where the focus is on readying individuals for change (e.g., Armenakis, Harris, &

Mossholder, 1993), change capability (e.g., Cohen & Levinthal, 1990), change implementation (Sonenshein, 2010), and managing organizational change or learning processes (e.g., Argyris & Schon, 1978; Fiol & Lyles, 1985).[1] Fiol and Lyles (1985: 805) summed up the state of the literature well when they concluded that organizational research on "change, learning and adaptation have all been used to refer to the process by which organizations adjust to their environment. The problem is that these terms have not been used consistently with the same meanings." This broad, multidisciplinary, and (often) practice-oriented literature has resulted in a lack of clarity regarding the meaning of the concept, and it stands in sharp relief to the individual and team research on adaptation, although more constrained and tractable for review, that evidences its own problems in this regard.

Moreover, although there is some limited quantitative research (e.g., Birdi et al., 2008), much of this literature is based on anecdotal case studies and qualitative approaches (for reviews, see Alderfer, 1977; Armenakis & Bedeian, 1999; Beer & Walton, 1987; Ford & Foster-Fishman, 2012; Oreg, Vakola, & Armenakis, 2011; Porras & Silvers, 1991; Weick & Quinn, 1999) despite multiple calls for quantitative research (e.g., Faucheux et al., 1982; Ford & Foster-Fishman, 2012; Pettigrew et al., 2001; Poole et al., 2000). Ford and Foster-Fishman (2012: 964) conclude, "Although most of the [organizational development and change] theories provide useful heuristic value, in that they promote insights into understanding the change process, few offer explanatory value." Given our focus of developing an integrative typology, these substantial differences would have precluded fine specifications in the taxonomy and would have made our effort to integrate futile.

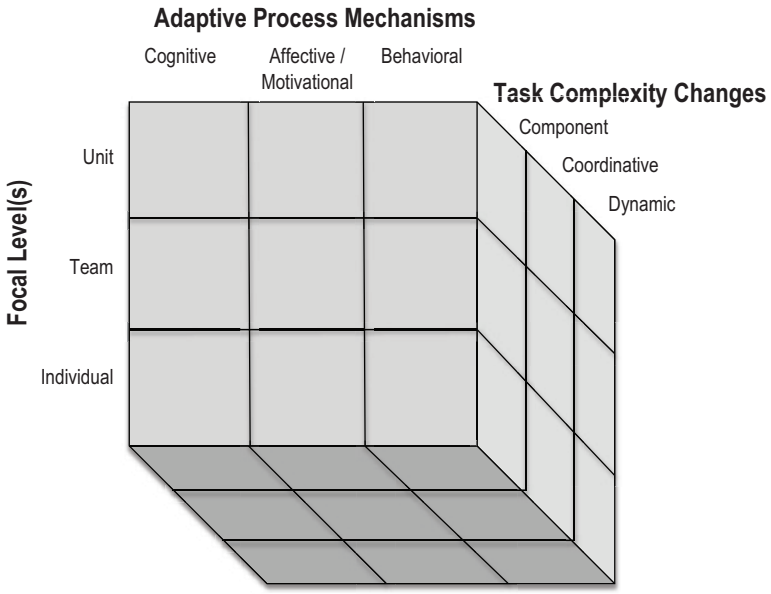
We assert that this is a good reason to eliminate organizational adaptation from our review, but it is also conceptually problematic. If the concept of adaptation is to be useful in organizational science, it has to span all levels of the system (Kozlowski & Klein, 2000). There is a clear and compelling need to unite these disparate literatures and bridge the underlying disciplinary and levels divide (Molloy, Ployhart, & Wright, 2011). However, this integration effort has to be accomplished in a way that is explicit about what changed, what levels were implicated, and what adaptive mechanisms were involved.

A Multilevel Conceptual Architecture for Adaptation

This brings us directly to the second point, which is also relevant to advance understanding for the micro-meso research that we incorporated in the taxonomy. There is a compelling need to explicitly situate the conceptualization of adaptation to specify (a) what it is to which an entity is adapting (i.e., key environment/task drivers), (b) what level(s) of the organizational system(s) are implicated (i.e., individual, team, unit, organization, transorganizational), and (c), importantly, what mechanisms underlie that particular form of adaptation at that level or at multiple levels.

Figure 2 presents a multilevel conceptual architecture that can be used to situate theoretical and research treatments of adaptation across the organizational space. Our architecture is not a "theory." Rather it is a means to add precision to the conceptualization of adaptation in research by integrating other models, frameworks, and theories to articulate the nature of adaptation, relevant levels, and mechanisms incorporated in the specific conceptu-

Figure 2
A Multilevel Conceptual Architecture for Adaptation



alization. Our architecture is based on three critical dimensions: (a) changes in task features (that may be driven by environmental shifts) that represent different dimensions of task complexity (Wood, 1986), (b) one or more focal levels of analysis that are relevant to the nature of the adaptation phenomenon (e.g., Kozlowski & Klein, 2000), and (c) adaptation process mechanisms that underlie adjustments to the change (e.g., Bell & Kozlowski, 2010).

The first dimension of *task complexity change* is intended to define what has changed that requires adaptation. A basic assumption is that environmental shifts drive task demands that then necessitate adaptive performance (e.g., Kozlowski et al., 1999; Kozlowski, Gully, et al., 2001; Marks et al., 2001; Terreberry, 1968). The nature of these changes can be captured using the typology of task complexity developed by Wood (1986). Component complexity represents the number of discrete cues and actions (triggered by cues) that compose the task. One can think of this dimension as indicative of task difficulty; more cues and actions make for a more difficult task. Coordinative complexity represents linkages among cues and actions, and their sequencing. One can think about this dimension as the network of conditional if–then linkages and the order or priority for their execution; more cues to trigger acts and/or more elaborate sequencing necessitate more coordination. Dynamic complexity represents the degree of flux inherent in component and coordinative complexity. One can think about this dimension as volatility in the rate of change, which is directly relevant to adaptation. Changes in the number of cues and actions, shifts in their if–then linkages and priority, and ongoing flux in these changes increment the degree of volatility. Thus, for example, one-time changes in component and/or coordinative complexity (e.g., Bell & Kozlowski,

2008; Hollenbeck et al., 2011; Kozlowski, Gully, et al., 2001; Marks, Zaccaro, & Mathieu, 2000) represent qualitatively different forms of adaptation compared to ongoing dynamic complexity (e.g., LePine, 2005). Specifying what has changed, how much it has changed, and the flux of these changes ground the nature of what it is to which an entity has to adapt. This adds theoretical precision to conceptualization.

The second dimension is the *focal level* of the adaptation phenomenon of interest. The need for individual-level performance adaptation may be driven by environmental or contextual shifts at higher levels, but the focus here resides at the origin of the focal unit of adaptation—the individual—that is the appropriate level for theory and explanation (Kozlowski & Klein, 2000). This is the case for the team level as well, but things get more complicated. Teams are at the juncture of the micro origin of adaptive performance, the macro context that drives the necessity for adaptation, and the level at which the phenomenon emerges (Kozlowski & Chao, 2012). Thus, for team adaptation as an emergent phenomenon, it is desirable to incorporate both the level of origin (individual) and the level at which adaptation emerges (team). Finally, unit and higher levels of adaptation often implicate lower levels (individual and team), but not always.

When the adaptation phenomenon of interest is directly linked to human capabilities and performance as the origin, then the levels are likely bridged from the bottom up (Snow & Snell, 2012), whereas if adaptation is based on the alignment of environment, strategy, and techno-structural characteristics (e.g., Miles et al., 1978), then the process would be driven from the top down. For example, if an organization's top management team (TMT) is seeking to exploit environmental opportunities or to respond to threats, it may institute a shift in its strategic alignment (Miles et al., 1978). This aspect of "organizational adaptation" is based on individual and team processes inherent in TMT deliberations. However, once a strategic realignment is implemented that changes the techno-structure of the system (e.g., a shift from an innovative firm to a more defensive strategy or vice versa), this top-down change in teamwork structures and individual tasks then necessitates individual and team adaptation at lower levels. In contrast, individuals and teams in volatile work settings (e.g., emergency medicine, innovative project teams) are likely to experience adaptive pressures directly at the task level (not cross-level from the top), so that adaptation is from the bottom up (Kozlowski et al., 1999). This dimension specifies how adaptation is conceptualized across the multilevel linkages.

The third dimension addresses the mechanisms underlying adaptive performance. In keeping with our treatment of adaptive performance emanating from human action, we characterize the primary mechanisms as cognitive, motivational-affective, and behavioral (Bell & Kozlowski, 2010; Kraiger, Ford, & Salas, 1993). At the individual level, cognitive mechanisms represent basic processes such as attention, learning, knowledge and its organization, decision making/problem solving, and creativity. Motivational-affective mechanisms represent factors such as goal orientation states (i.e., mastery, prove, avoid), self-efficacy, and anxiety. Behavioral mechanisms represent skilled action to accomplish specific acts driven by knowledge, skills, and abilities. Changes in coordinative complexity are most likely to implicate cognitive mechanisms as individuals attempt to comprehend the nature of task change. Changes in coordinative complexity primarily implicate motivational mechanisms. Flux in dynamic complexity will implicate both mechanisms, with pressure on behavioral skill to balance working smarter (cognition) and harder (motivation).

These mechanisms evolve at the team and organizational levels, but with careful attention researchers can map the conceptual correspondence. For example, a cognitive mechanism—knowledge organization—for adaptation at the individual level (e.g., Kozlowski, Toney, et al., 2001) corresponds to shared mental models and transactive memory systems for adaptation at the team level (Burke et al., 2006), which may then link to collective sense making at the organizational level (e.g., Sonenshein, 2010; Sonenshein & Dholakia, 2012). Similarly, motivational mechanisms—self-regulation models of goals and action—have been used to account for individual adaptation (e.g., Bell & Kozlowski, 2002b, 2008), multilevel dynamic goal regulation (DeShon, Kozlowski, Schmidt, Milner, & Weichmann, 2004), and organizational adaptation processes (Katz & Kahn, 1978). Action is instantiated by skilled human behavior at the individual level. At the team level, work processes can be conceptualized around a transition-action typology (Marks et al., 2001) that encompasses cognition and motivation (analysis, goals, strategy formulation) and behavioral action to coordinate team effort. Kozlowski and colleagues (1999) view team adaptation as a repertoire of team member networks that allow the team to select appropriate configurations from the repertoire or to invent new configurations linking member knowledge and skill to resolve novel task demands that require adaptation. Higher level linkages become more complex, but one might envision the adaptive connections linking multiple teams or units as dynamic networks (e.g., Contractor, Wasserman, & Faust, 2006).

We believe that this conceptual architecture can be used to characterize a wide range of adaptive phenomena with sufficient transparency and specificity as to advance conceptual development and aid integration. The architecture is focused on the what, where, and how of adaptation, which have been ill defined in the literature and yet are core to conceptualization. It can be augmented by linking it to antecedent factors, such as individual differences (e.g., cognitive ability, goal orientation traits), interventions (e.g., error training, active learning), and support systems (e.g., organizational information systems, leadership) that target adaptive mechanisms. It could serve as a useful framework for better specifying the theoretical mechanisms that underlie the Pulakos et al. (2000) adaptive performance dimensions or the mechanisms that are stimulated by I-ADAPT (Ployhart & Bliese, 2006). It is already in evidence in the IPO self-regulation mechanisms. It has potential to integrate micro-, meso-, and macro-level research.

Finally, we use the term *architecture*, rather than, say, *framework* or *model*, deliberately. We view the proposed architecture as a point of departure for conceptually situating theory and research going forward. It is sufficiently general as to encompass a wide variety of specific phenomena, yet the dimensions are core characteristics for defining the nature of adaptation so that it can be integrated. Moreover, we view the process mechanisms as basic and integrative, but having the potential to evolve as research knowledge accumulates. Thus, we do not view the architecture as static—especially with respect to mechanisms—but as flexible so that it can evolve with feedback from a more integrative and informative literature.

Conclusion

The purpose of this review was to assess the state of the growing research on performance adaptation, provide an integrative review with insights for synthesis, and suggest useful

avenues for future research. In doing so, we limited our review to individual and team research in the context of the workplace. We aimed to be comprehensive and parsimonious in our effort to identify meaningful distinctions to organize the literature, develop a common framework to situate research efforts, provide insights for synthesis, and guide future research on adaptation. In addition, we proposed a conceptual architecture to better define and ground the nature of adaptation and to advance integration between micro-meso research and organizational adaptation. It is our intention that the taxonomy and conceptual architecture provide a common language and conceptual structure for investigators to position their research and its contribution. Although we believe the potential impact of these conceptual structures for adaptation research is promising, their value is dependent on the willingness of future researchers to apply them in their work.

Note

1. The online supplemental material includes Table 9, which selectively lists several highly cited exemplars. We describe theoretical and methodological foci to support this characterization of organizational adaptation work. Table 9 is available at http://jom.sagepub.com/supplemental.

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