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It's about the process, not the product: A meta-analytic investigation of team demographic diversity and processes

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Abstract

To better understand the effects of demographic diversity on teams, we conducted a meta-analytic investigation of the relationship between team demographic diversity and team processes.

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Drawing from the categorization-elaboration model, we hypothesized that team demographic diversity elicits opposing effects on team performance via information elaboration and social categorization processes. We also explored several team-level and contextual moderators on these relationships. In our meta-analysis of 406 effects from 38,304 teams, we found that team demographic diversity is related to increased social categorization processes, but we did not find support for a relationship between team demographic diversity and information elaboration. In addition, we identified team education level and occupational and industry context as moderators of these relationships, finding stronger support for moderators of the relationship between diversity and social categorization than the relationship between diversity and information elaboration. We discuss implications of our findings for research and practice.

Plain Language Summary: We summarize previous work on how demographic diversity (i.e., age, gender, race/ethnicity, and nationality diversity) affect how teams work together. We analyzed data from multiple studies and explored the relationship between team demographic diversity and team processes. We also examined various factors that may influence these relationships, including team characteristics and features of a team's context. We found evidence supporting a positive relationship between team demographic diversity and social categorization processes. However, we did not find any support for a relationship between team demographic diversity and information elaboration. We also discovered that team education level, as well as occupational and industry context, impacted the strength of these relationships. Notably, the relationship between diversity and social categorization was more strongly influenced than the relationship between diversity and information elaboration. Our findings have important implications for future research and practical applications in team settings.

Keywords
Team diversity, team processes, categorization-elaboration model

In the past half-century, organizations and researchers alike have shifted their focus from the individual employee to the role of teamwork in innovation and productivity (Mathieu et al., 2017). In tandem, the global workforce is undergoing extensive demographic shifts, and organizations are increasing expenditures on diversity management (Colby & Ortman, 2015; Sethi & Cambrelen, 2022). As a result, interest in understanding the performance of demographically diverse teams in the workplace has skyrocketed, as evidenced by both academic works and popular press articles (e.g., Rock & Grant, 2016). However, prior meta-analyses of the team diversity-performance relationship suggest that the effects of diversity on performance are complex and dependent on a number of moderators including features of teams, their tasks, and their environments (Bell et al., 2011; Horwitz & Horwitz, 2007; Joshi & Roh, 2009; van Dijk et al., 2012). The categorization-elaboration model of team diversity provides one theoretical explanation for the complex relationship between team diversity and performance, providing that the primary mechanism by which team diversity influences performance is via information elaboration processes, or the exchange of information and perspectives within a team. However, these positive effects of diversity may be hindered by social categorization, or the "us" versus "them" processes that can arise when differences are made salient (Van Knippenberg et al., 2004). The categorization-elaboration model includes multiple characteristics of

teams that may moderate the relationship between diversity, information elaboration, and social categorization. In addition, since the publication of the categorization-elaboration model, additional theories have emerged, suggesting that teams' contexts shape the impact of diversity on the information available to teams and how team members interact (Joshi, 2006; Joshi & Neely, 2018).

This paper focuses on testing several central propositions of the categorization-elaboration model, as well as newer perspectives that focus on diverse teams' contexts. First, the categorization-elaboration model suggests that all types of team diversity, including demographic diversity, will impact both information elaboration and social categorization (van Knippenberg et al., 2004, p. 1018). Next, the categorization-elaboration model focuses on several features of teams and teamwork that may give rise to information elaboration or social categorization (including task requirements, task motivation, and task ability). Finally, the categorization-elaboration model suggests that workplace and societal context such as teams' occupational and industry contexts, as well as time, effect information elaboration and social categorization processes. Indeed, the power structures present in society (i.e., intergroup bias) are mirrored in small group settings (i.e., social categorization; Berger et al., 1998, DiTomaso et al., 2007; Hirsh & Kornrich, 2008; Johns, 2006). A more demographically diverse team context may also bolster disadvantaged demographic group members' ability to garner information and resources from their network, further promoting information elaboration (Joshi, 2006).

This work contributes to the current literature on team demographic diversity in three important ways. First, we look beyond team performance to understand the effects of team demographic diversity on team processes. Meta-analyses of the team diversity-performance relationship indicate that this relationship is complex and dependent on a variety of factors including task type, performance measure, and context (Bell et al., 2011; Joshi & Roh, 2009; van Dijk et al., 2012). However, previous meta-analyses considered team performance, rather than processes, and as a result were unable to test several central propositions of the categorization-elaboration model (van Knippenberg et al., 2004). Following from the categorization-elaboration model and earlier work on social categorization and information elaboration, we suggest that understanding team processes can help disentangle the complex effects of diversity on performance. Namely, we suggest that demographically diverse teams are more likely to engage in both information elaboration, which would benefit performance, as well as social categorization, which would be detrimental to performance. These opposing forces may lead to better or worse performance depending on a team's processing demands, or they may create a "wash-out" effect, wherein the mixed positive and negative effects of diversity on processes generate no effect on performance overall, potentially explaining mixed findings regarding the team diversity-performance relationship.

Second, we focus on demographic characteristics rather than deep-level or work-related characteristics. Previous meta-analyses have found that the impact of demographic characteristics on team functioning differs from the impact of work-related diversity on team functioning (Bell et al., 2011; Roh et al., 2019). Given changes in demographic trends and pressure from stakeholders, organizations are increasingly focused on diversity, equity, and inclusion management (Sethi & Cambrelen, 2022). In addition, stereotyping and prejudice are more likely to arise on the basis of demographic attributes (Bodenhousen & Richeson, 2010). Accordingly, we focus on demographic characteristics often studied in work contexts: age, gender, racioethnicity, and nationality. Furthermore, to increase the practical relevance of this meta-analysis and to address our hypotheses related to team and contextual characteristics, we focus on field studies of work groups rather than laboratory studies or studies using student teams.

Third, as the most recent holistic meta-analyses on team demographic diversity were published almost a decade ago and included only performance as an outcome, we provide a more updated state of the science of team demographic diversity, investigating 94 studies and over 400 effects in work groups. The increased empirical work in this area over the past decade also allows us to examine the relative effects of specific types of demographic diversity and focus on work groups (rather than laboratory or classroom teams), providing both more nuance than has previously been available and a narrower scope that improves generalizability to work teams.

The categorization-elaboration model in diverse teams

The categorization-elaboration model was introduced to provide a theoretical framework explaining the inconsistent results in studies of team diversity and team performance, combining the conflicting social categorization and information elaboration perspectives on team diversity (van Knippenberg et al., 2004). The categorization-elaboration model argues that the effects of demographic diversity in teams are not clear-cut, and that demographically diverse teams are likely to elicit both information elaboration and social categorization perspectives (van Knippenberg et al., 2004; p. 1018).

Information-processing theories describe how teams might benefit from task-related information. These approaches suggest that diverse team members may bring more varied perspectives to the table, eliciting novel viewpoints and increased debate that ultimately improve team decision-making and performance (Jehn et al., 1999; van Knippenberg et al., 2004). Moreover, diverse teams may have access to broader networks, increasing the amount of unique information available to the team (Joshi, 2006). The current meta-analysis focuses on four demographic characteristics commonly considered in studies of team diversity: age, gender, racioethnicity, and nationality. Indeed, each of these types of diversity has the potential to increase information elaboration.

For example, the differing perspectives afforded by team age diversity have the potential to increase cognitive conflict, promoting creativity and innovation as teams are more likely to find and implement unique solutions to problems (Wegge et al., 2012). Gender diversity may similarly benefit information elaboration. Women exhibit a higher level of social perceptiveness in their teams, and gender diverse teams tend to achieve greater equality in participation than male dominated teams (Woolley et al., 2010). Women also tend to be better than men at recognizing the expertise of fellow team members, making gender diverse teams more likely to engage in information elaboration (Joshi, 2014). Racioethnically diverse teams may broaden teams' creativity and innovation by matching the demographic characteristics of consumer markets, and racially diverse teams generate more diverse criteria for evaluating alternatives (Horwitz, 2005). Finally, nationality diversity can lead to improved information elaboration because of the diverse perspectives and approaches afforded by representation from multiple cultural backgrounds (Stahl & Maznevski, 2021).

> **Hypothesis 1:** Team diversity on the basis of age (H1a), gender (H1b), race/ethnicity (H1c), and nationality (H1d) will be related to increased information elaboration.

While we expect that the average overall effects of demographic diversity on information elaboration processes will be positive, we acknowledge that there are likely to be differences between various aspects of information elaboration. For example, Martins and Sohn (2022) suggest that team cognitive processes such as team information sharing and elaboration, creativity, task conflict, communication, cognition, and learning should be considered separately to better understand the nuance associated with main effects of team diversity on

processes. Accordingly, we explore the effects of diversity on specific processes related to information elaboration to better understand this relationship.

In contrast to information elaboration perspectives, which describe the positive effects of diversity on team performance, social categorization perspectives describe the risks of diversity for team performance. Social categorization perspectives on team diversity describe how in-groups and out-groups form both within and between teams based on demographic characteristics (Tajfel et al., 1971; Tajfel & Forgas, 2000) and suggest that in diverse teams, demographic status cues (e.g., gender or race) will lead to asymmetry in team processes across demographic lines (Joshi & Neely, 2018). For example, in gender diverse teams, social categorization perspectives would suggest that female members may be more likely to share information with other female members, and males with other male members. Conversely, in gender homogenous teams, information is more likely to be distributed throughout the team. Moreover, social categorization breeds detrimental teamwork processes, such as relational conflict, and harms positive socially-oriented team processes such as cohesion and team identification (van Knippenberg et al., 2004).

Indeed, the four demographic characteristics considered in the current work are also likely to breed social categorization processes. For example, age-related stereotypes regarding older employees' cognitive decline and stereotypes about younger workers' motivation are likely to give rise to social categorization (Jungmann et al., 2020; Paoletti et al., 2020). Gender biases can also give rise to conflict, particularly when an organization's climate is not supportive (Nielsen et al., 2018; Nishii, 2013). There is similar evidence for racioethnic discrimination, which impacts minority group members' perceptions of group climate, ultimately serving as a detriment to performance (Ely et al., 2012). Finally, in nationally diverse teams, surface-level diversity, but not deep-level cultural diversity, tends to lead to increased conflict and issues with interpersonal interactions, providing further evidence for the effects of stereotypes on social categorization processes (Stahl et al., 2010).

> **Hypothesis 2:** Team diversity on the basis of age (H2a), gender (H2b), race/ethnicity (H2c), and nationality (H2d) will be positively related to social categorization.

As is the case with information elaboration, studies of team diversity and social categorization capture a broad range of processes. While we expect that demographic diversity will yield social categorization overall, there may be differences in the relationship between demographic diversity and specific processes (e.g., relational conflict versus team identification). Accordingly, we also explore the relationships between team demographic diversity and various processes commonly addressed in the studies included in this meta-analysis.

The moderating role of team characteristics

In addition to the potential for main effects of demographic diversity on information elaboration and social categorization, the categorization-elaboration model suggests a number of moderating factors that influence these relationships (van Knippenberg et al., 2004). Much of the research on team diversity over the past two decades has focused on team-level moderating mechanisms to help explain differing findings across topics. Using the information available in the articles used for this meta-analysis, we explore the effects of several characteristics of teams and teamwork that may influence the relationship between diversity and processes. Our theoretical model, including main effect and moderator hypotheses, is depicted in Figure 1.

Task requirements. Team diversity may be especially useful for work in which new and unique

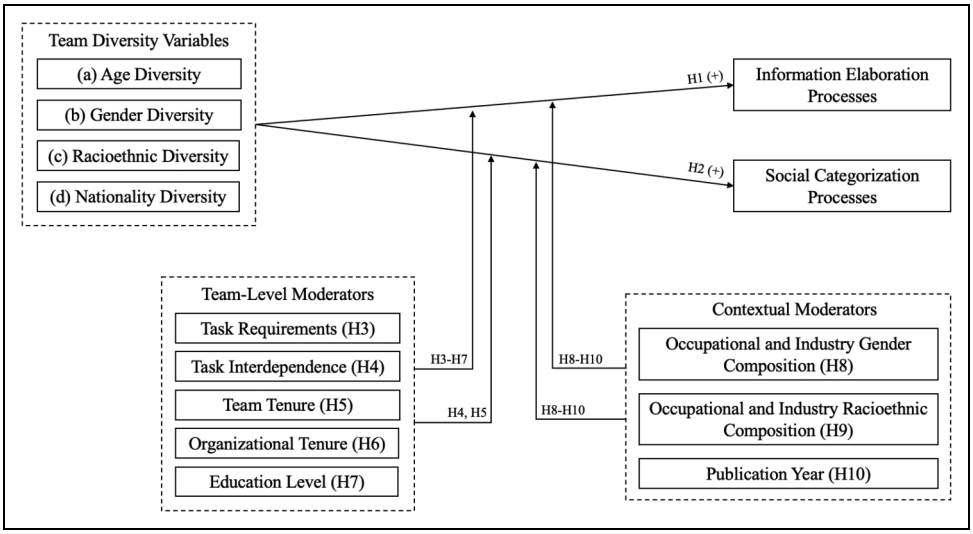


Figure 1. Theoretical Model.

perspectives are required, valued, and/or influential (van Knippenberg et al., 2004, p. 1012). Teams with diverse team members often possess a broader range of experiences and competencies. These distinct vantage points allow diverse teams to capture and process task-relevant information during the information elaboration process (Williams & O'Reilly, 1998; Van Knippenberg et al., 2004). A recent meta-analysis found that deep-level diversity was positively related to team creativity and innovation (Wang et al., 2019). Moreover, Kim and Song (2021) found that although team diversity predicted creativity, conflict did not mediate this relationship, which suggests the responsible mechanism for this relationship may be through information elaboration and not social categorization processes. Overall, team diversity may be especially impactful in tasks that require creativity, innovation, or problem solving.

Hypothesis 3: Task requirements will moderate the relationship between team diversity and information elaboration processes, such that the relationship between team diversity and information elaboration will be stronger in teams working on tasks that require creativity, innovation, or problem solving.

Task interdependence. Team diversity may be an asset when teams are required to work closely together and coordinate their efforts. Katz-Navon and Erez (2005) found that highly interdependent tasks (in contrast to less interdependent tasks) gave teams the opportunity to develop meaningful collective-efficacy and increased team performance. That is, as tasks become more interdependent, team members tend to think of their collective, rather than individual, efficacy and performance. Van der Vegt and colleagues (2003) also examined task interdependence and performance alongside diversity-related factors. They found that, in heterogeneous teams, task interdependence was strongly and positively related to innovative behavior for individuals who perceived high levels of goal interdependence. Accordingly, researchers have called for diverse teams to develop a sense of emerging interdependence as a means of improving collaboration (Carruso & Woolley, 2008). On the other hand, interdependent tasks inherently increase the exposure and interaction between team members, which

may also introduce more opportunities for social categorization by making differences more salient and accessible (Van Knippenberg et al., 2004). Taken all together, this research suggests that highly interdependent tasks may drive team members to engage more strongly in group processes, such as information elaboration and social categorization.

> **Hypothesis 4:** Task interdependence will moderate the relationship between team diversity and processes, such that team diversity will be related to stronger increases in information elaboration (H4a) and social categorization (H4b) when teams are more highly interdependent.

Team tenure. Research suggests that there are positive relationships between team tenure and group processes and performance. A recent meta-analysis found that team tenure is positively related to team performance (Gonzalez-Mulé et al., 2020), while another meta-analysis found that task-oriented diversity (e.g., tenure, functional background) in top management teams was strongly associated with both information elaboration and social categorization-based processes (Roh et al., 2019). With regard to the categorization-elaboration model, tenure is thought to lead to improved information elaboration. In particular, teams with longer tenure are more likely to build stronger team cognition, wherein team members possess knowledge that improves functioning because members understand how to carry out task work (DeChurch & Mesmer-Magnus, 2010). Over time, team members can better recognize each other's areas of expertise (Bunderson, 2003), communicate and coordinate more effectively (e.g., Gersick & Hackman, 1990; Katz, 1982), and more efficiently locate stores of information within the team. Moreover, these skills are especially important in gender-diverse teams, wherein perceptions of member expertise may be colored by gender (Joshi, 2014). To this point, Keleman and colleagues (2020) found that gender diversity improves team performance when leader vision communication and team tenure are high. Given this research, we believe that diverse teams' ability to engage in information elaboration will be enhanced by longer tenure.

Conversely, diverse groups may be prone to engaging in social categorization processes, especially when they have not yet become familiar. In newly-formed teams, members may still need to build shared experience in order to become acquainted, gain trust, and contribute to team functioning (Pearson, Carr & Shaw, 2008; Tsai & Ghoshal, 1998; Tuckman, 1965). Because of the effort spent on these basic team-building functions, lower-tenure teams could have less cohesion and efficacy (Gonzalez-Mulé et al., 2020). This effect may be especially apparent in diverse teams, wherein members must devote more energy to bridge their lack of similarity and/or shared experiences. However, as time increases, members also spend more time thinking of themselves in collective terms (Katz-Navon & Erez, 2005) and may be less likely to engage in social categorization processes. Indeed, as teams grow their tenure, social categorizations that are initially engendered from diversity may decrease (Van Knippenberg et al., 2004). To this point, Harrison et al. (1998) founda negative relationship between demographic diversity and team integration (a construct similar to cohesion) that diminished over time; conversely, a negative relationship of attitude diversity with integration emerged over time.

> **Hypothesis 5:** Team tenure will moderate the relationship between team diversity and processes, such that team diversity will be related to a stronger increase in information elaboration (H6a) in teams with longer tenure, and that team diversity will be related to a weaker increase in social categorization (H6b) in teams with longer tenure.

In addition to team tenure, we also anticipate that organizational tenure will moderate the

relationship between team diversity and information elaboration. Organizational tenure is a form of functional diversity based on the maximum amount of time an individual has spent in an organization. There are two primary ways in which we anticipate organizational tenure will influence team processes and performance. Firstly, with higher organizational tenure, we predict higher levels of task-specific knowledge, skills, and abilities gained through employee organizational experience (Ng & Feldman, 2010). According to the categorization-elaboration model, the effect of diversity on performance and team processes is greater when task ability is higher (van Knippenberg et al., 2004). Secondly, teams with higher organizational tenure benefit from more developed socialization in the organization (e.g., understanding organizational policies and procedures, norms of communication) as well as potential social familiarity with team members. Through these processes, organization socialization bolsters employees' abilities to perform their tasks proficiently, navigate organizational policies and procedures and politics, and know people and communication patterns, all of which can benefit employee effectiveness (Chao et al., 1994). Furthermore, in a meta-analysis, organizational tenure is related to both increased task and citizenship behaviors (Ng & Feldman, 2010). In socialization processes, familiarity with team members professionally, including through reputational knowledge, predicts information elaboration in teams (Maynard et al., 2019). Thus, as team members become familiar with norms and individuals within organizations, we anticipate improved performance over time. Furthermore, team members high in organizational tenure are more likely to perceive potentially stress-inducing scenarios (e.g., multiteam membership) as challenges rather than hindrances, leading to improved performance (van de Brake et al., 2020). The benefits of high levels of task ability as well as organizational socialization will particularly benefit diverse teams who may have initial social categorization challenges to overcome. Organizational socialization can help overcome these challenges by providing a shared task and social framework for team members to leverage. In summary, we anticipate high organizational tenure particularly will enable diverse teams to better share information due to higher task ability and higher levels of organizational socialization.

> **Hypothesis 6:** Organizational tenure will moderate the relationship between team diversity and processes, such that team diversity will be related to a stronger increase in information elaboration in teams with higher average member organizational tenure.

In addition to organizational tenure, we also expect that education level will positively relate to team member task ability. Education level refers to the highest level of education an individual has completed and is a functional background characteristic of team members. We expect education level to positively relate to both domain-specific knowledge, skills, and abilities as well as general cognitive ability (Ritchie & Tucker-Drob, 2018; van Knippenberg et al., 2004). Our assumption is that educational programs (e.g., vocational, high school, and college degrees) serve as career preparation and contain some domain-specific training for a topic, major, or career. Education levels are not only positively correlated with higher levels cognitive ability, but there is also evidence that education increases one's cognitive ability (Ritchie & Tucker-Drob, 2018), so we expect those with higher educational attainment to benefit from higher levels of cognitive ability. Higher cognitive ability can support team members' problem-solving and adapting to various team tasks. Specifically in workplaces, higher levels of education level predict greater task performance, increased citizenship behaviors, and decreased counterproductive work behaviors (Ng & Feldman, 2009). This holds true across not only individual performance but also team performance. Importantly, in a meta-analysis, Devine and Philips (2001) report that mean levels of team cognitive ability predict team

performance, whereas measures of dispersion do not. Based on this research, we do not expect a diversity of education level to benefit teams, but rather anticipate that an overall higher mean level of education will positively impact team processes and performance due to deepened collective knowledge, skills, and abilities. These knowledge, skills, and abilities will be especially important for diverse teams who may be working to synthesize and collaborate across differences. Consequently, we predict that teams with higher mean levels of education will be able to better process complex and diverse information from team members, in comparison to teams with lower levels of education.

> **Hypothesis 7:** Education level will moderate the relationship between team diversity and information elaboration, such that team diversity will be related to a stronger increase in information elaboration in teams with higher levels of education.

The moderating role of team context

Although the categorization-elaboration model focuses primarily on team and task characteristics that may affect information elaboration and social categorization, the impact of team diversity may also be impacted by a team's context (Joshi & Neely, 2018). Indeed, the categorization-elaboration model suggests that social categorization arises when the cognitive accessibility of a social category is high (van Knippenberg et al., 2004). For example, if aspects of a team's context are gendered, the team's gender diversity may become more salient, leading to a greater risk of social categorization. Here, we focus on three aspects of a team's context that may affect the cognitive accessibility of social categories: occupational context, industry context, and publication year.

Occupational and industry context. Numerous theoretical accounts of team demographic diversity have described the role that context may play in shaping the influence of diversity on team outcomes. In their initial work on the categorization-elaboration model, van Knippenberg et al. (2004) describe how context may shape individuals' perceptions of team diversity. Other authors have echoed these sentiments, more recently calling for researchers to examine team diversity via a multilevel "structural emergence" approach that draws from multilevel theory to describe how the team diversity-performance relationship is impacted both by bottom-up emergent processes and top-down contextual influences (Joshi & Neely, 2018; Kozlowski & Klein, 2000).

Structural-emergence perspectives on team diversity expand past team boundaries to include individual and organization-level variables (Joshi & Neely, 2018; Tasheva & Hillman, 2018). Joshi and Neely's (2018) structural-emergence perspective describes the interaction of phenomena at the dyad, team, and contextual levels. The authors describe the top-down effects of structural context at the firm, occupation, and industry levels, demonstrating how the context in which a team is embedded can shape the interpersonal interactions surrounding various demographic groups. To these ends, an abundance of research has suggested that the power structures that exist in society are mirrored in small group settings (Berger et al., 1998, DiTomaso et al., 2007; Hirsh & Kornrich, 2008; Johns, 2006). For example, in industries where demographic groups are underrepresented or marginalized, information sharing between team members may decrease because status cues are more salient in these contexts (Joshi & Roh, 2009).

We argue that more demographically diverse contexts will emphasize the positive effects of demographic diversity (i.e., on information elaboration processes), whereas demographically homogenous contexts will exacerbate the negative effects of demographic diversity (i.e., on social categorization processes). To test our hypotheses related to context, we drew from the U.S. Bureau of Labor Statistics' (BLS) occupational and industry demographic

information. BLS also provides data on occupational and industry age and national diversity. However, there was little variability in average age across occupations and industries, and the effects for national diversity included in our meta-analysis were from studies conducted outside of the U.S., so we focus on gender and racioethnic diversity.

Hypothesis 8: Occupational and industry gender composition will moderate the relationship between team diversity and teamwork processes, such that in samples from predominately female (versus male) occupations (H8a) and industries (H8b), gender diversity will yield a stronger increase in information elaboration processes, and in samples from predominately female (versus male) occupations (H8c) and industries (H8d), gender diversity will a yield weaker increase in social categorization processes.

Hypothesis 9: Occupational and industry racioethnic composition will moderate the relationship between team diversity and teamwork processes, such that in samples from predominately non-white (versus white) occupations (H9a) and industries (H9b), team racial diversity will yield a stronger increase in information elaboration processes, and in samples from predominately non-white (versus white) occupations (H9c) and industries (H9d), team racial diversity will yield a weaker increase in social categorization processes.

Publication year. Diversity in organizations has undoubtedly changed over the years due to social, moral, and legal efforts. Many organizations have made strides to be more inclusive and less discriminatory. As organizations started to focus on diversity, research showed more challenges than benefits (Dass & Parker, 1999; Joplin & Daus, 1997). Initially, research pointed to the negative outcomes of diversity, such as discrimination, bias, and tokenism (Shore et al., 2009). Some individuals may have been unwilling to adjust to differences among team members and resisted changes in organizational diversity. Misunderstandings and disagreements may have caused relational conflict and tension related to social categorization. This may have also impacted team members' ability or willingness to communicate or involve each other in task-related team processes. However, as increased diversity has become more commonplace, resistance to diversity has decreased and a focus on inclusion has emerged (Shore et al., 2011). Therefore, we expect that over time, team diversity will lead to fewer social categorization concerns and more information elaboration among team members. By examining studies' publication date as a continuous moderator, we test whether the impact of demographic diversity on team processes has attenuated over time as norms of acceptance of diversity and inclusivity have increased.

Hypothesis 10: Publication year will moderate the relationship between team diversity and processes, such that team diversity will yield a stronger increase in information elaboration (H10a) in more recent studies, and team diversity will yield a weaker increase in social categorization (H10b) in more recent studies.

Methods

Literature search

We employed three approaches to identify relevant studies for our meta-analysis. First, we searched three relevant databases for published and unpublished studies: PsycINFO, Business Source Complete, and ProQuest Dissertations and Theses. Second, we manually searched 15 relevant journals in management and applied psychology (e.g., *Academy of Management Journal, Journal of Applied Psychology, Journal of International Business Studies*). Database and journal searches included keyword combinations of *group* or *team* paired with *age, gender, sex, rac*, ethn*,*

nation,* and *cultur*,* and *diversity, heterogeneity,* or *homogeneity*, and searches spanned from 1980 through 2023. Third, we manually searched programs from the annual meetings of the Academy of Management, Society for Industrial and Organizational Psychology, and INGRoup from 2015–2023, contacting first authors of potentially relevant presentations.

Inclusion and exclusion criteria

Our first approach yielded 28,329 unique records for potential inclusion. We examined titles and abstracts and excluded articles that were not available in English, were not broadly related to group or team diversity, did not include primary data, and/or were qualitative. After this initial review, we examined articles in-depth to assess the remaining criteria. First, we removed articles that did not assess team diversity based on age, gender, race/ethnicity, or nationality. Second, we selected only studies of work teams (i.e., studies of top management teams and student teams were removed). Third, we selected only studies conducted in a field setting. Fourth, we eliminated articles that did not report the necessary statistical information to compute a correlation coefficient between team demographic diversity and team processes. Fifth, we eliminated studies examining only relationships between team diversity and emergent states (e.g., cohesion or psychological safety), leader behaviors, or performance measures. These criteria yielded 89 relevant papers with 94 independent samples and 406 correlation coefficients measuring the relationship between team diversity and processes. A PRISMA eligibility chart is included in Supplemental Material A. A list of included articles with relevant statistical and coding information is provided in Supplemental Material B.

Coding procedure

We coded included articles in two phases. In the first phase, we collected primary information from each article including statistical information for all team diversity and process variables and primary information provided for moderator variables. In the second phase, we coded team processes and moderators based on the coding criteria outlined below. The first author and one other author double-coded each article in each phase. Agreement between coders was 82.9% across phases. Discrepancies typically arose because papers inconsistently reported information or because there was conceptual overlap categorizing team process measures. Authors clarified coding discrepancies in meetings and electronic correspondence.

Diversity. We coded the type of diversity variable in each study as age, gender, racioethnic, or nationality diversity. Racioethnic diversity included any studies focused on race or ethnicity, which varied based on national context. Nationality diversity included studies of "culture" that used national origin as a measure of culture.

Teamwork processes. To develop coding guidelines (Supplemental Material C) for the categorization of team processes, we reviewed the categorization-elaboration model (van Knippenberg et al., 2004) to generate working definitions of information elaboration and social categorization processes. To code for specific sub-processes, we reviewed the categorization-elaboration model, which emphasizes two information elaboration processes (i.e., task-related debate; information sharing) and four social categorization processes (i.e., relational conflict, lack of cohesion, lack of identification, and lack of commitment) characteristic of the categorization-elaboration model. Next, we reviewed the remaining processes and generated categories for commonly studied processes. For example, many studies of team diversity explored diversity climate or discrimination, which we coded as "intergroup bias" and conceptualized as a social categorization process. After inductively reviewing the

remaining processes, we generated four additional subcategories for information elaboration (i.e., cognition, coordination, decision making, and learning) and two additional subcategories for social categorization (i.e., intergroup bias, poor relationship quality). Additional subcategories were created for processes with a sufficient number of effects for meta-analysis ($k \geq 5$). Processes that did not fall into these subcategories were coded as "Other."

Task requirements. The categorization-elaboration model focuses on team task requirements related to innovation and creativity (van Knippenberg et al., 2004). Accordingly, we operationalized task requirements based on the extent to which teams were expected to generate innovative or creative outcomes. Studies were coded as "requiring creativity" if creativity or innovation were measured as outcome variables and were coded as "not requiring creativity" if creativity or innovation were not measured as outcome variables.

Task interdependence. Task interdependence was coded as "high" when team members' actions were based on the other members' actions and team members must interact to complete the task, and as "low" when team members did not need to interact to complete their task. This coding scheme is in line with definitions from the literature on teamwork (e.g., Shea & Guzzo, 1987) and with previous meta-analyses on teamwork (e.g., Marlow et al., 2018).

Team and organizational tenure. We operationalized team and organizational tenure as the number of years, on average, that the sample used in a study had worked with their team and in their organization, respectively. Team and organizational tenure were converted from months where applicable, and were only recorded when explicitly measured in a given study. Team and organizational tenure were coded as continuous variables.

Education level. We operationalized education level into three categories, based on the average education level of members in a given sample. Samples were coded as "less than high school" if the majority of participants held less than a high school diploma; as "undergraduate degree" if the majority of participants had at least a college degree; and as "graduate degree or more" if the majority of participants had at least one advanced degree (e.g., M.A. or Ph.D.).

Occupational and industry composition. We derived occupational and organizational composition from the U.S. Bureau of Labor Statistics' (BLS) Current Population Survey from 2018. We used BLS major group codes to categorize sample occupational group, and sector codes to categorize sample industry group. Samples were matched with an occupation or industry code only if the entire sample fell under the same category. Next, we matched major group codes with occupation and industry composition data, including percent female and percent non-white (aggregate of Asian, Black or African American, and Hispanic or Latino groups). To create a categorical moderator from this data, we categorized occupations and industries with greater than 70% women as majority female, 30–70% women as average female, and under 30% female as minority female. We categorized occupations and industries with greater than or fewer than 30% non-white employees (high racioethnic minority and low racioethnic minority, respectively). MostNotably, studies from outside of the U.S. were included in the meta-this analysis were conducted in the U.S.; however, studies from outside of the U.S. were also included in these composition analyses. Occupational and industry coding information is included in Supplemental Material D.

Publication year. Publication year was recorded as the year in which a journal article or dissertation was published. This variable was analyzed as a continuous moderator.

Meta-Analytic procedure

We tested our hypotheses using the random effects meta-analytic methods outlined by Schmidt and Hunter (2015) via the *psychmeta* package in R (Dahlke & Wiernik, 2019). In our meta-analysis, we calculated a sample weighted mean correlation and corrected for measurement unreliability in the dependent (i.e., process) variable using an artifact distribution method. This method corrects for small sample bias, uses a normal distribution to build confidence and credibility intervals, estimates variance using a maximum likelihood method, and uses observed variances to estimate the standard deviation of ρ. To provide readers with information on heterogeneity of effects in our meta-analysis, we report the 80% credibility interval around the calculated mean true-score correlation (Wiernik et al., 2017). We tested hypotheses for categorical moderators using subgroup analyses and used meta-regression to test continuous moderators. Effect size and reliability information by study is included in Supplemental Material B.

Results

Results of the main effects meta-analyses examining the relationship between team diversity and teamwork processes are summarized in Tables 1 and 2. Results of moderator analyses are summarized in Tables 3, 4, and 5. Effect sizes were interpreted by assessing the 95% confidence interval (CI; Whitener, 1990). Credibility intervals were interpreted as estimates of the variability within the individual correlations. Prior to testing our hypotheses, we generated contour-enhanced funnel plots, conducted a leave one out analysis, and tested for publication bias (analyses presented in Supplemental Material E).

Next, we conducted tests of hypothesized relationships. Hypothesis 1 (H1) predicted that team demographic diversity would be related to increased information elaboration processes. The omnibus test of team diversity on information elaboration processes was not statistically significant (ρ = −.01, 95% CI [-.03, .01]). Thus, H1 was not supported. Effects of age (ρ = .01, 95% CI [−.04, .05]), gender (ρ = −.02, 95% CI [−.06, .01]), racioethnic (ρ = −.04, 95% CI [−.10, .01]), and nationality (ρ = .06, 95% CI [−.01, .13]) diversity on information elaboration processes were also not statistically significant. Thus, H1a, H1b, H1c, and H1d were not supported.

Exploratory analyses considered the effects of age, gender, racioethnic, and nationality diversity on cognition, coordination, decision making, information sharing, learning, task conflict, and other information elaboration processes. These results are also summarized in Table 1. These results indicated a statistically significant, negative relationship between team gender diversity and team cognition (ρ = −.08, 95% CI [−.16, −.01]); a statistically significant, positive relationship between team nationality diversity and team coordination (ρ = .04, 95% CI [.02, .06]); a statistically significant, positive relationship between team racioethnic diversity and team learning (ρ = .04, 95% CI [.01, .07]); and a statistically significant, positive relationship between team nationality diversity and team task conflict (ρ = .19, 95% CI [.01, .37]).

Hypothesis 2 (H2) predicted that team demographic diversity would be related to increased social categorization processes. The omnibus test of team diversity on social categorization processes demonstrated a statistically significant effect, indicating that team demographic diversity was related to increased social categorization processes (ρ = .02, 95% CI [.00, .05]), providing support for H2. There was also a statistically significant effect of team nationality diversity on social categorization (ρ = .08, 95% CI [.02, .13]), providing support for H2d. However, relationships between team age (ρ = .03, 95% CI [−.01, .07]), gender (ρ = .01, 95% CI [−.02, .04]), and racioethnic (ρ = .01, 95% CI [−.03, .06]) diversity were not statistically significant. Thus, H2a, H2b, and H2c were not supported.

Table 1. Results for meta-analysis of team diversity on information elaboration.

	k	*N*	$\bar{r}$	SD_r	SD_{res}	$\bar{\rho}$	SD_{r_c}	SD_ρ	95% CI	80% CR	Inference
Information elaboration (H1)	195	15 933	−.01	.15	.10	−.01	.17	.12	[−.03, 01]	[−.16, .14]	NS
Age (H1a)	64	5 051	.01	.16	.11	.01	.18	.13	[−.04, .05]	[−.15, .17]	NS
Gender (H1b)	80	6 267	−.02	.15	.10	−.02	.17	.11	[−.06, .01]	[−.17, .12]	NS
Racioethnic (H1c)	32	3 087	−.04	.14	.09	−.05	.15	.10	[−.10, .01]	[−.17, .08]	NS
Nationality (H1d)	15	1 259	.06	.12	.05	.06	.13	.05	[−.01, .13]	[−.01, .13]	NS
Cognition	19	1 390	−.05	.13	.05	−.06	.14	.05	[−.12, .01]	[−.12, .01]	NS
Age	9	660	−.04	.15	.10	−.05	.17	.11	[−.16, .06]	[−.19, .09]	NS
Gender	8	587	−.08	.10	.00	−.08	.11	.00	[−.16, −.01]	[−.08, −.08]	Sig
Coordination	31	2 984	−.02	.10	.00	−.02	.11	.00	[−.06, .02]	[−.02, −.02]	NS
Age	11	910	.03	.10	.00	.03	.11	.00	[−.03, .09]	[.03, .03]	NS
Gender	13	1 205	−.03	.10	.00	−.04	.11	.00	[−.10, .02]	[−.04, −.04]	NS
Racioethnic	4	589	−.05	.07	.00	−.06	.08	.00	[−.13, .02]	[−.06, −.06]	NS
Nationality	2	205	.03	.01	.00	.04	.01	.00	[.02, .06]	[.04, .04]	Sig
Decision making	8	642	.03	.15	.10	.03	.16	.11	[−.09, .14]	[−.11, .16]	NS
Age	4	378	.05	.16	.13	.06	.18	.14	[−.12, .24]	[−.12, .24]	NS
Gender	3	231	.00	.10	.00	.00	.11	.00	[−.13, .13]	[.00, .00]	NS
Information sharing	35	2 657	−.00	.14	.09	−.00	.16	.10	[−.06, .05]	[−.13, .12]	NS
Age	12	1 027	.00	.13	.07	.00	.15	.08	[−.08, .08]	[−.10, .11]	NS
Gender	13	1 055	−.05	.13	.06	−.06	.14	.07	[−.13, .02]	[−.14, .03]	NS
Racioethnic	5	235	.08	.18	.10	.08	.20	.11	[−.09, .26]	[−.06, .23]	NS
Nationality	5	340	.08	.14	.07	.09	.15	.08	[−.04, .23]	[−.01, .19]	NS
Learning	14	1 984	.06	.16	.13	.07	.18	.15	[−.02, .16]	[−.12, .26]	NS
Age	5	520	.13	.28	.27	.15	.32	.30	[−.13, .42]	[−.23, .53]	NS
Gender	4	307	.05	.06	.00	.05	.07	.00	[−.02, .12]	[.05, .05]	NS
Racioethnic	3	1 025	.04	.03	.00	.04	.03	.00	[.01, .07]	[.04, .04]	Sig
Task conflict	34	2 419	−.04	.16	.10	−.04	.17	.11	[−.10, .01]	[−.19, .10]	NS
Age	5	413	−.01	.13	.07	−.01	.14	.07	[−.14, .11]	[−.11, .08]	NS
Gender	13	995	−.04	.11	.00	−.04	.12	.00	[−.11, .03]	[−.04, −.04]	NS

(continued)

Table 1. (continued)

	k	N	$\bar{r}$	SD_r	SD_{res}	$\bar{\rho}$	SD_{r_c}	SD_ρ	95% CI	80% CR	Inference
Racioethnic	12	736	−.14	.14	.06	−.15	.16	.07	[−.24, −.07]	[−.24, −.07]	NS
Nationality	3	200	.17	.14	.08	.19	.16	.08	[.01, .37]	[.08, .30]	Sig
Other	54	3 857	−.02	.18	.14	−.02	.20	.15	[−.07, .03]	[−.22, .18]	NS
Age	18	1 143	−.04	.12	.00	−.04	.14	.00	[−.11, .02]	[−.04, −.04]	NS
Gender	26	1 887	.01	.21	.18	.01	.24	.20	[−.08, .10]	[−.24, .27]	NS
Racioethnic	6	432	−.11	.17	.12	−.12	.19	.14	[−.27, .03]	[−.30, .06]	NS
Nationality	3	351	−.04	.03	.00	−.04	.03	.00	[−.08, −.00]	[−.04, −.04]	NS

Note: Results with fewer than 2 studies are not reported. k = number of studies contributing to meta-analysis; N = total sample size; $\bar{r}$ = mean observed correlation; SD_r = observed standard deviation of r; SD_{res} = residual standard deviation of r; $\bar{\rho}$ = mean true-score correlation; SD_{r_c} = observed standard deviation of corrected correlations (r_c); SD_ρ = residual standard deviation of ρ; CI = confidence interval around $\bar{\rho}$; CR = credibility interval around $\bar{\rho}$. Correlations corrected using artifact distributions.

Table 2. Results for meta-analysis of team diversity on social categorization.

	k	N	$\bar{r}$	SD_r	SD_{res}	$\bar{\rho}$	SD_{r_c}	SD_ρ	95% CI	80% CR	Inference
Social categorization (H2)	211	22 279	.02	.14	.10	.02	.15	.11	[.00, .05]	[−.12, .17]	**Sig**
Age (H2a)	52	5 658	.03	.14	.10	.03	.15	.11	[−.01, .07]	[−.11, .18]	NS
Gender (H2b)	78	8 524	.01	.14	.10	.01	.15	.11	[−.02, .04]	[−.13, .15]	NS
Racioethnic (H2c)	53	5 287	.01	.15	.11	.01	.16	.12	[−.03, .06]	[−.14, .16]	NS
Nationality (H2d)	25	2 615	.07	.12	.07	.08	.13	.08	[.02, .13]	[−.02, .17]	**Sig**
Intergroup bias	25	2 728	.01	.18	.15	.01	.20	.17	[−.07, .09]	[−.21, .23]	NS
Age	6	591	.00	.18	.15	.00	.20	.17	[−.16, .16]	[−.21, .22]	NS
Gender	8	803	−.06	.19	.16	−.06	.20	.17	[−.20, .08]	[−.28, .16]	NS
Racioethnic	8	1 157	.04	.18	.16	.05	.20	.17	[−.09, .18]	[−.17, .27]	NS
Nationality	3	177	.07	.07	.00	.07	.08	.00	[−.01, .16]	[.07, .07]	NS
Lack of cohesion	23	2 237	.05	.12	.07	.06	.14	.08	[.00, .11]	[−.04, .15]	**Sig**
Age	6	868	.07	.11	.07	.08	.12	.08	[−.02, .17]	[−.02, .18]	NS
Gender	8	802	.07	.13	.08	.08	.14	.09	[−.02, .17]	[−.03, .19]	NS
Racioethnic	7	454	.02	.09	.00	.02	.10	.00	[−.06, .09]	[.02, .02]	NS
Lack of commitment	16	1 086	.02	.14	.07	.03	.15	.07	[−.05, .10]	[−.07, .12]	NS
Age	4	218	.07	.19	.13	.08	.21	.14	[−.12, .28]	[−.10, .26]	NS
Gender	6	367	.07	.12	.00	.08	.13	.00	[−.02, .19]	[.08, .08]	NS
Racioethnic	4	250	−.05	.14	.06	−.05	.15	.06	[−.20, .10]	[−.13, .03]	NS
Nationality	2	251	−.02	.01	.00	−.02	.01	.00	[−.04, −.00]	[−.02, −.02]	**Sig**
Lack of identification	24	1 768	−.01	.13	.07	−.01	.15	.07	[−.07, .05]	[−.10, .09]	NS
Age	7	417	−.01	.16	.09	−.01	.18	.10	[−.14, .12]	[−.14, .12]	NS
Gender	7	516	−.05	.16	.10	−.05	.17	.11	[−.18, .08]	[−.19, .09]	NS
Racioethnic	2	114	−.10	.10	.00	−.11	.11	.00	[−.26, .04]	[−.11, −.11]	NS
Nationality	7	645	.03	.08	.00	.03	.09	.00	[−.04, .10]	[.03, .03]	NS
Relational conflict	49	8 028	.03	.11	.07	.03	.12	.08	[.00, .07]	[−.07, .13]	**Sig**
Age	12	2 390	.03	.10	.08	.03	.11	.08	[−.03, .10]	[−.08, .14]	NS
Gender	19	2 892	.02	.10	.06	.02	.11	.07	[−.03, .07]	[−.07, .11]	NS
Racioethnic	12	2 125	.03	.10	.06	.03	.11	.07	[−.03, .09]	[−.06, .12]	NS
Nationality	5	546	.09	.09	.00	.10	.10	.00	[.01, .19]	[.10, .10]	**Sig**

(continued)

Table 2. (continued)

	k	N	$\bar{r}$	SD_r	SD_{res}	$\bar{\rho}$	SD_{r_c}	SD_ρ	95% CI	80% CR	Inference
Poor relationship quality	24	2 136	.09	.11	.03	.10	.12	.03	[.05, .15]	[.06, .14]	**Sig**
Age	6	621	.11	.12	.07	.12	.13	.07	[.01, .22]	[.02, .21]	**Sig**
Gender	10	807	.10	.11	.00	.11	.12	.00	[.03, .18]	[.11, .11]	**Sig**
Racioethnic	7	591	.06	.10	.00	.07	.11	.00	[−.02, .15]	[.07, .07]	NS
Other	50	4 296	−.02	.17	.13	−.02	.19	.15	[−.08, .03]	[−.21, .16]	NS
Age	11	553	−.09	.17	.08	−.10	.18	.09	[−.21, .01]	[−.22, .02]	NS
Gender	20	2 337	−.03	.14	.10	−.03	.15	.11	[−.09, .04]	[−.17, .11]	NS
Racioethnic	13	596	−.12	.20	.13	−.13	.22	.14	[−.25, −.02]	[−.32, .05]	NS
Nationality	6	810	.11	.17	.14	.12	.18	.16	[−.02, .27]	[−.08, .32]	NS

Note: Results with fewer than 2 studies are not reported. k = number of studies contributing to meta-analysis; N = total sample size; $\bar{r}$ = mean observed correlation; SD_r = observed standard deviation of r; SD_{res} = residual standard deviation of r; $\bar{\rho}$ = mean true-score correlation; SD_{r_c} = observed standard deviation of corrected correlations (r_c); SD_ρ = residual standard deviation of ρ; CI = confidence interval around $\bar{\rho}$; CR = credibility interval around $\bar{\rho}$. Correlations corrected using artifact distributions.

Table 3. Results from categorical moderator analyses.

	k	N	$\bar{r}$	SD_r	SD_{res}	$\bar{\rho}$	SD_{r_c}	SD_ρ	95% CI	80% CR	Inference
Task Demands on Diversity × Information Elaboration (H3)											
Creative demands	38	1 854	.00	.14	.00	.00	.15	.00	[−.05, .05]	[.00, .00]	NS
No creative demands	106	10 094	−.03	.17	.13	−.03	.18	.14	[−.06, .00]	[−.21, .15]	NS
Task Interdependence on Diversity × Information Elaboration (H4a)											
Low interdependence	8	574	.09	.15	.09	.10	.16	.09	[−.01, .21]	[−.02, .22]	NS
High interdependence	58	4 237	.02	.13	.05	.02	.14	.06	[−.01, .06]	[−.05, .10]	NS
Task Interdependence on Diversity × Social Categorization (H4b)											
Low interdependence	9	1 584	.03	.09	.05	.04	.10	.06	[−.04, .12]	[−.04, .12]	NS
High interdependence	52	8 911	.02	.08	.02	.02	.09	.02	[−.01, .04]	[−.01, .05]	NS
Education Level on Diversity × Information Elaboration (H7)											
Less than high school	10	871	.04	.11	.03	.05	.12	.03	[−.03, .12]	[.01, .08]	NS
Undergraduate degree	69	4 755	−.01	.14	.07	−.02	.15	.07	[−.05, .02]	[−.11, .08]	NS
Graduate degree or more	21	1 079	.07	.13	.00	.07	.14	.00	[.01, .13]	[.07, .07]	**Sig**
Gender Occupation on Information Elaboration (H8a)											
Minority female	16	1 062	.04	.15	.09	.04	.17	.10	[−.04, .12]	[−.09, .17]	NS
Average female	18	1 394	−.03	.12	.04	−.03	.13	.04	[−.10, .03]	[−.09, .02]	NS
Majority female	9	606	.07	.16	.10	.07	.17	.11	[−.04, .18]	[−.06, .21]	NS
Gender Industry on Information Elaboration (H8b)											
Minority female	16	1 113	−.01	.20	.16	−.01	.22	.17	[−.12, .10]	[−.23, .21]	NS
Average female	35	2 960	−.01	.12	.06	−.01	.13	.06	[−.05, .04]	[−.09, .07]	NS
Majority female	6	462	.02	.15	.10	.03	.16	.11	[−.11, .16]	[−.11, .16]	NS
Gender Occupation on Social Categorization (H8c)											
Minority female	11	874	.14	.15	.10	.15	.16	.11	[.05, .25]	[.01, .29]	**Sig**
Average female	20	3 734	−.01	.11	.08	−.01	.12	.09	[−.06, .05]	[−.12, .11]	NS
Majority female	10	748	−.01	.14	.08	−.01	.16	.09	[−.11, .09]	[−.12, .10]	NS
Gender Industry on Social Categorization (H8d)											
Minority female	17	2 818	.06	.11	.07	.07	.12	.08	[.01, .12]	[−.04, .17]	**Sig**
Average female	26	3 062	.02	.12	.07	.02	.13	.08	[−.03, .07]	[−.08, .13]	NS
Majority female	4	274	−.08	.13	.05	−.09	.15	.06	[−.23, .05]	[−.17, −.01]	NS

(continued)

Table 3. (continued)

	k	N	$\bar{r}$	SD_r	SD_{res}	$\bar{\rho}$	SD_{r_c}	SD_ρ	95% CI	80% CR	Inference
Racioethnic Occupation on Information Elaboration (H9a)											
High racioethnic minority	4	1 137	.04	.06	.01	.04	.07	.02	[−.03, .10]	[.02, .06]	NS
Low racioethnic minority	9	773	−.05	.14	.10	−.06	.16	.10	[−.16, .05]	[−.19, .08]	NS
Racioethnic Industry on Information Elaboration (H9b)											
High racioethnic minority	8	565	−.10	.17	.12	−.10	.18	.13	[−.23, .02]	[−.27, .06]	NS
Low racioethnic minority	10	1 722	.00	.10	.07	.00	.11	.07	[−.07, .07]	[−.09, .10]	NS
Racioethnic Occupation on Social Categorization (H9c)											
High racioethnic minority	10	2 679	.01	.06	.01	.01	.07	.01	[−.03, .06]	[.00, .03]	NS
Low racioethnic minority	8	308	−.02	.17	.04	−.02	.18	.04	[−.15, .10]	[−.08, .03]	NS
Racioethnic Industry on Social Categorization (H9d)											
High racioethnic minority	17	2 834	.08	.11	.07	.08	.11	.08	[.03, .14]	[−.02, .18]	**Sig**
Low racioethnic minority	10	1 059	−.03	.08	.00	−.04	.09	.00	[−.09, .02]	[−.04, −.04]	NS

Note: k = number of studies contributing to meta-analysis; N = total sample size; $\bar{r}$ = mean observed correlation; SD_r = observed standard deviation of r; SD_{res} = residual standard deviation of r; $\bar{\rho}$ = mean true-score correlation; SD_{r_c} = observed standard deviation of corrected correlations (r_c); SD_ρ = residual standard deviation of ρ; CI = confidence interval around $\bar{\rho}$; CR = credibility interval around $\bar{\rho}$. Correlations corrected using artifact distributions.

Table 4. Regression results for moderating effects on diversity–information elaboration relationship.

	Model 1	Model 2	Model 3
Constant	−0.00 (0.04)	0.04 (0.05)	−12.46 (5.26)
Team tenure (H5a)	−0.00 (0.01)		
Org tenure (H6)		−0.01 (0.01)	
Pub year (H10a)			0.01 (0.00)*
k	97	93	195
R^2	.00	.00	.07

Note. Unstandardized regression coefficients are presented; numbers in parentheses are standard errors; *k* = number of studies contributing to analysis. *p < .05.

Table 5. Regression results for moderating effects on diversity–social categorization relationship.

	Model 1	Model 2
Constant	0.03 (0.05)	−2.71 (3.38)
Team tenure (H5b)	−0.00 (0.01)	
Pub year (H10b)		0.00 (0.00)
K	102	211
R2	.00	.00

Note. Unstandardized regression coefficients are presented; numbers in parentheses are standard errors; *k* = number of studies contributing to analysis. *p < .05.

Exploratory analyses considered the effects of age, gender, racioethnic, and nationality diversity on specific social categorization processes including intergroup bias, lack of cohesion, lack of commitment, lack of identification, relational conflict, poor relationship quality, and other social categorization processes. Results are summarized in Table 2. These analyses yielded a statistically significant, positive effect of team diversity on teams' lack of cohesion (ρ = .06, 95% CI [.00, .11]), relational conflict (ρ = .03, 95% CI [.00, .07]), and poor relationship quality (ρ = .10, 95% CI [.05, .15]). In addition, there were statistically significant, positive relationships between team nationality diversity and team lack of commitment (ρ = −.02, 95% CI [−.04, −.00]); team nationality diversity and team relational conflict (ρ = .10, 95% CI [.01, .19]); team age diversity and poor relationship quality (ρ = .12, 95% CI [.01, .22]); and team gender diversity and poor relationship quality (ρ = .11, 95% CI [.03, .18]).

Hypothesis 3 (H3) predicted that task requirements would moderate the relationship between team diversity and information elaboration processes, such that teams with higher creativity and innovation demands would demonstrate stronger relationships between team diversity and information elaboration. The effect of team diversity on information elaboration processes was not statistically significant in teams with creative demands (ρ = .00, 95% CI [−.05, .05]), nor in teams without creative demands (ρ = −.03, 95% CI [.−.06, .00]). Accordingly, H3 was not supported.

Hypothesis 4 (H4) predicted that task interdependence would moderate the relationship between team diversity and information elaboration (H4a) and social categorization (H4b). There was not a statistically significant relationship between team diversity and information elaboration in teams with low interdependence (ρ = .10, 95% CI [−.01, .21]), nor in teams with high interdependence (ρ = .02, 95% CI [−.01, .06]). There was also not a statistically significant relationship between team diversity and social categorization in teams with low interdependence (ρ = .04, 95% CI [−.04, .12]),

nor in teams with high interdependence (ρ = .02, 95% CI [−.01, .04]). Thus, Hypothesis 4 was not supported.

Hypothesis 5 (H5) predicted that team tenure would moderate the relationship between team diversity and information elaboration (H5a) and social categorization (H5b). There was not a statistically significant relationship effect of team tenure on the relationship between team diversity and information elaboration ($\beta = -.00$, $p = .84$), nor a statistically significant effect of team tenure on the relationship between team diversity and social categorization ($\beta = -.00$, $p = .61$). Thus, H5 was not supported.

Hypothesis 6 (H6) predicted that organizational tenure would moderate the relationship between team diversity and information elaboration. There was not a statistically significant relationship effect of organizational tenure on the relationship between team diversity and information elaboration ($\beta = -.01$, $p = .06$). Thus, H6 was not supported.

Hypothesis 7 (H7) predicted that education level would moderate the effect between team diversity and information elaboration. There was a statistically significant, positive relationship between team diversity and information elaboration in teams with an average education of a graduate degree or more (ρ = .07, 95% CI [.01, .13]). There was not a statistically significant relationship between team diversity and information elaboration in teams with less than high school education (ρ = .05, 95% CI [−.03, .12]), nor in teams with undergraduate degrees (ρ = −.02, 95% CI [−.05, .02]). Thus, H7 was partially supported.

Hypothesis 8a (H8a) and Hypothesis 8b (H8b) were focused on the moderating effects of occupational and industry gender composition on the relationship between team gender diversity and information elaboration processes. There was not a statistically significant effect of gender diversity on information elaboration processes in minority female (ρ = .04, 95% CI [−.04, .12]), average female (ρ = −.03, 95% CI [−.10, .03]), or majority female (ρ = .07, 95% CI [−.04, .18]) occupational groups. Thus, H8a was not supported. There was also not a statistically significant effect of gender diversity on information elaboration processes in minority female (ρ = −.01, 95% CI [−.12, .10]), average female (ρ = −.01, 95% CI [−.05, .04]), or majority female (ρ = .03, 95% CI [−.11, .16]) industries. Thus, H8b was not supported.

Hypothesis 8c (H8c) and Hypothesis 8d (H8d) were focused on the moderating effects of occupational and industry gender composition on the relationship between team gender diversity and social categorization processes. There was a statistically significant, positive effect of team gender diversity on social categorization in minority female occupations (ρ = .15, 95% CI [.05, .25]). However, there was not a statistically significant effect of team gender diversity on social categorization in average female (ρ = −.01, 95% CI [−.06, .05]) nor majority female (ρ = −.01, 95% CI [−.11, .09]) occupations. The difference between minority female and average female occupations was statistically significant (95% CI = [-.25, -.04]), as was the difference between minority female and majority female organizations (95% CI = [-.28, -.01]). Thus, H8c was supported. There was a statistically significant, positive effect of team gender diversity on social categorization in minority female industries (ρ = .07, 95% CI [.01, .12]). However, there was not a statistically significant effect of team gender diversity on social categorization in average female (ρ = .02, 95% CI [−.03, .07]) nor majority female (ρ = −.09, 95% CI [−.23, .05]) industries. However, the difference between minority female and average female occupations was not statistically significant (95% CI = [-.11, .03]), nor was the difference between minority female and majority female organizations 95% CI = [-.29, .01]. Thus, H8d was not supported.

Hypothesis 9a (H9a) and Hypothesis 9b (H9b) were focused on the moderating effects of occupational and industry racioethnic composition on the relationship between team

racioethnic diversity and information elaboration processes. There was not a statistically significant relationship between team diversity and information elaboration in high racioethnic minority occupations (ρ = .04, 95% CI [−.03, .10]), nor in low racioethnic minority occupations (ρ = −.06, 95% CI [−.16, .05]). Thus, H9a was not supported. There was not a statistically significant relationship between team diversity and information elaboration in high racioethnic minority industries (ρ = −.10, 95% CI [−.23, .02]), nor in low racioethnic minority industries (ρ = .00, 95% CI [−.07, .07]). Thus, H9b was not supported.

Hypothesis 9c (H9c) and Hypothesis 9d (H9d) were focused on the moderating effects of occupational and industry racioethnic composition on the relationship between team racioethnic diversity and social categorization processes. There was not a statistically significant relationship between team diversity and social categorization in high racioethnic minority occupations (ρ = .01, 95% CI [−.03, .06]), nor in low racioethnic minority occupations (ρ = −.02, 95% CI [−.15, .10]). Thus, H9c was not supported. There was a statistically significant, positive relationship between team diversity and social categorization in high racioethnic minority industries (ρ = .08, 95% CI [.03, .14]). However, there was not a statistically significant relationship between team diversity and social categorization in low racioethnic minority industries (ρ = −.04, 95% CI [−.09, .02]). In addition, the difference between high and low racioethnic minority industries was statistically significant (95% CI = [.04, .19]). However, this relationship was in the opposite direction as expected. Thus, H9d was not supported.

Hypothesis 10 (H10) predicted that publication year would moderate the relationship between team diversity and information elaboration (H10a) and social categorization (H10b). There was a statistically significant relationship effect of publication year on the relationship between team diversity and information elaboration ($\beta = .01, p = .009$), such that the relationship between team diversity and information elaboration was more positive in more recent years. Thus, H10a was supported. However, there was not a statistically significant effect of publication year on the relationship between team diversity and social categorization ($\beta = .00, \ p = .42$). Thus, H10b was not supported.

Discussion

Research and practice surrounding team composition has long focused on the potential impact of demographic diversity on teamwork. Previous meta-analyses have explored the effects of team diversity, but aggregate team demographic variables and focus almost exclusively on performance as the outcome. Our meta-analysis provides a more nuanced look at the impact of team demographic diversity, exploring its effects on information elaboration, which should benefit team performance, and social categorization, which may limit information elaboration and harm team performance (van Knippenberg et al., 2004). Moreover, we separate demographic diversity variables as well as specific information elaboration and social categorization processes to explore whether the effects are consistent. In addition, our meta-analysis tests several additional moderators of the team diversity-process relationship, driven by various theoretical perspectives on team diversity (e.g., van Knippenberg et al., 2004; Joshi & Neely, 2018).

Our meta-analyses yielded several findings regarding the relationship between team demographic diversity and team processes. First, we found that team demographic diversity is related to increased social categorization processes. Indeed, more diverse teams yielded lower levels of cohesion, more relational conflict, and poorer quality relationships. The largest and most consistent effects of team diversity were on teams' reported relationship quality, typically measured by indices of team member exchange (e.g., Baugh & Graen, 2007; Ford & Seers, 2006; Kämmerer, 2015). Notably, team demographic diversity did not

yield effects on some commonly studied processes (e.g., intergroup bias) and processes identified in the categorization-elaboration model (e.g., team identification). Moderating team characteristics did not demonstrate expected effects on information elaboration processes; however, team context significantly shaped social categorization. In minority female occupations and industries, effects of social categorization on team diversity were substantially larger ($r = .14$ and .06 for occupation and industry, respectively) than the overall effect of team demographic diversity on social categorization ($r = .02$). However, we found evidence for the opposite effect in racioethnically diverse industries, where team diversity was related to increased social categorization.

In contrast, we did not find an overall effect of team demographic diversity on information elaboration processes, nor consistent effects on specific information elaboration processes. We did find statistically significant relationships between certain demographic traits and subprocesses; however, many of these effects had a small number of studies and should be interpreted with caution. Of note, we found evidence for a statistically significant, negative effect of gender on team cognition. The categorization-elaboration model suggests that social categorization and many other moderating variables have an impact on the extent to which team diversity elicits information elaboration (van Knippenberg et al., 2004); however, the only tested moderator with a significant effect on information elaboration processes was education level, wherein teams with primarily graduate degrees outperformed teams with less than high school or only college degrees. In addition to increased member task ability or motivation, education level may improve information elaboration processes due to its relationship with other related variables. For example, it is possible that teams with graduate education levels may be more likely to be involved in complex tasks requiring creativity and problem-solving. In such teams, diversity can enhance these critical information elaboration processes.

These findings align with recent meta-analytic work examining top management teams (TMTs), wherein authors found that TMT demographic diversity was related to increased social categorization, but not information elaboration (Roh et al., 2019). Some authors suggest that the lack of findings related to demographic diversity and team outcomes stem from measurement. That is, studies of team demographic diversity tend to measure diversity objectively, whereas perceived or subjective diversity would have a stronger link with performance (Jungmann et al., 2020). Existing research almost exclusively considers demographic diversity objectively; however, we urge researchers to consider subjective diversity (e.g., team members' perceptions of the diversity in their teams) in future studies of team demographic diversity, particularly as it relates to information elaboration processes.

Of the specific demographic groups considered in this study, nationality diversity received the most consistent support across process types. These findings are in line with prior work on team composition, which suggests that deep-level traits have a greater impact on team processes than surface-level traits (Bell et al., 2018). Indeed, nationality diversity can serve as a proxy for culture, a deep-level trait with substantial impact on team functioning (Stahl et al., 2010). Although gender, race, and age can correlate with other deep-level traits, these links may not be as apparent as the link between nationality and culture, leading to weaker overall effects. However, the number of studies considering nationality diversity was low and some of the statistically significant effects of nationality diversity should be interpreted with caution, as they include fewer than $k = 5$ effects.

Theoretical implications

The primary theoretical contribution of this work was to provide an initial test of the categorization-elaboration model in demographically diverse teams. While we were not able to

test the precise model laid out by its authors (van Knippenberg et al., 2004), we tested the premise that demographic diversity would lead to diverging forces in teams by increasing both information elaboration and social categorization. Our findings provided some support for this model. Indeed, demographic diversity tends to elicit social categorization. However, we did not find evidence of consistent effects on information elaboration, even when considering many of the moderating variables laid out by the categorization-elaboration model. This may suggest that diversity type serves as a partial boundary condition of the categorization-elaboration model, and/or that additional moderators may play a role in understanding these relationships. Our analyses yielded stronger support for the model in studies of nationality diversity—perhaps the model is not as strong for surface-level demographic characteristics as for deeper-level characteristics, such as national culture. AlternativelyAlternately, some of our unsupported findings may be due to the presence of curvilinear relationships. For example, research suggests there may be a curvilinear relationship between team tenure and creativity and innovation (e.g., Chi et al., 2009; Koopmann et al., 2016; Gonzalez-Roma et al., 2003) and team tenure and psychological safety (Koopmann et al., 2016). It is possible that the impact of diversity on some of these outcomes could also be curvilinear, which would therefore be washed out in a meta-analytic investigation of linear relationships.

Further, our findings suggest that many of the moderating variables suggested in the categorization-elaboration model impacted neither the relationships between team diversity and information elaboration, nor between team diversity and social categorization (van Knippenberg et al., 2004). Our analyses yielded more consistent findings regarding the role that context plays in shaping the relationship between team demographic diversity and processes, which may suggest that, for demographically diverse teams, the theoretical perspectives focused on context and diverse teams have greater empirical support (e.g., Joshi & Neely, 2018). In general, our findings suggest that recent calls to explore factors outside of the categorization-elaboration model, such as time (Srikanth et al., 2016), specific processes (Martins & Sohn, 2022), and context (Joshi & Neely, 2018) may be important paths forward in this area.

In addition, these findings suggest that recent calls for dynamic perspectives on teamwork and team diversity will be an essential path forward for research on team demographic diversity (Humphrey & Aime, 2014; Joshi & Neely, 2018; Srikanth et al., 2016; van Dijk et al., 2017). Such calls emphasize the importance of digging deeper into team dynamics to understand the interactions amongst team members at a dyadic level (Humphrey & Aime, 2014). The findings from this meta-analysis emphasize that teamwork emerges based not only on *who* is working together, but on *what* processes the team is engaging in. That is, we suggest that team performance is likely based on the interplay between members' characteristics and the extent to which tasks require task- versus relationship-oriented processes. Moreover, the studies used in this meta-analysis provided little opportunity to understand how demographically diverse teamwork unfolds over time. Most studies were cross-sectional and provided average team tenure, but data collection across multiple time points, both short-term and long-term, may yield important insights.

Practical implications

This work also provides important implications for practitioners. First, our findings underscore the complexity of diversity in teams, countering overly simplified and reductionist perspectives. Indeed, there are many misperceptions and inappropriate blanket statements surrounding diversity in groups and organizations. However, the diversity and team processes literatures are deep and describe complicated mechanisms, in an of themselves. The interplay of these two areas thus requires consideration of

many factors and yield nuanced findings, as we have shown. As we discuss further in our limitations and future directions section, the categorization-elaboration model alone may be insufficient for understanding the complex interplay between demographic diversity and teamwork processes, and practitioners should be careful to tailor interventions to their specific organization.

Second, our findings regarding the effects of demographic diversity on social categorization processes demonstrates that organizations still need to do more to create inclusive environments where all team members can equally participate and contribute. As diversity continues to increase, organizations should allocate more resources and effort toward promoting inclusivity. More attention should be given to designing diversity-related interventions at both the leadership and team level. Leadership development programs should address managing diversity and fostering inclusion. These programs can help leaders reduce their own biases and facilitate conflict resolution and social issues on their teams. Team development interventions typically focus on helping teams improve behavioral processes (Shuffler et al., 2018) and have been found to be effective (e.g., Salas et al., 2008).

Given the findings from this meta-analysis, practitioners may consider tailoring interventions to provide demographically diverse teams with additional support building and managing relationships amongst teammates. For example, in addition to providing support surrounding information elaboration processes such as communication, demographically diverse teams may benefit from conflict management training or team coaching to help team members improve interpersonal relationships. In addition, implementing interventions focused on the specific, rather than general, processes identified in our meta-analysis may yield more effective diverse teams. For example, team development interventions may focus on improving cognition in gender diverse teams or reducing relational conflict and building relationships in demographically diverse teams generally. Our findings also suggest that these types of interventions may be particularly important in male-dominated work contexts, where demographically diverse teams tend to have much more difficulty avoiding social categorization.

Further, our findings suggest that, in addition to interventions aimed at improving relations in demographically diverse teams, managing deep-level diversity (such as national culture) may be of equal or greater importance as its effects on social categorization seem to be more pronounced. Moreover, some work suggests that subjective perceptions of diversity, which may be more likely to arise from deep-level differences, could have a more substantial effect on teamwork (Jungmann et al., 2020). Organizations with high nationality diversity should implement cross-cultural training and awareness programs to increase cross-cultural competence, which should benefit team processes. Meta-analyses suggest that cross-cultural and diversity trainings (e.g., Bezrukova et al., 2009; Morris & Robie, 2001), when developed and implemented appropriately, can significantly improve performance. For example, team pre-briefing initiatives, which build familiarity and encourage bonding prior to performance episodes, may be able to dampen social categorization tendencies that arise as a result of deep-level diversity.

Limitations and future research directions

Though this study benefits from the strengths of meta-analysis, it is not without limitations. As is the case with all meta-analyses, the current effort is limited by the number and nature of studies available. Though we had a sufficient number of studies to test the effects in our analyses, our tests of moderating effects were capped by the number of studies reporting occupational or industry information. Relatedly, our data on occupational and industry context were U.S.-specific and focused on gender and race (data for age and nationality diversity were

insufficient), potentially limiting the generalizability of our context-related findings. Future research should further explore the role of context in shaping team processes, particularly outside of the U.S. and for teams with age or nationality diversity. Moreover, some of the demographic variables and specific processes considered in our study had received much more research attention than others. For example, there were fewer studies of nationality diversity than the other demographic traits under consideration, limiting the potential conclusions that could be drawn from our findings. In addition, some information elaboration processes, such as decision making, which are emphasized in the categorization-elaboration model have received little empirical attention (van Knippenberg et al., 2004). Researchers might consider using these meta-analytic findings as a road map for future work in this area.

We were also limited in terms of the precision with which we could test core tenets of the categorization-elaboration model. Notably, in addition to its propositions regarding main effects of diversity on information elaboration and social categorization, the categorization-elaboration model argues that both information elaboration and social categorization processes can interact to shape the effects of team diversity on team creativity, innovation, and performance (van Knippenberg et al., 2004). The authors suggest that, while information elaboration is the central process driven by team diversity, social categorization weakens the relationship between team diversity and information elaboration. This model may be useful in understanding null or negligible overall effects of team age, gender, racial, and nationality diversity on team performance (Bell et al., 2011; Horwitz & Horwitz, 2007; Joshi & Roh, 2009; Stahl et al., 2010). In a recent meta-analysis, Roh et al. (2019) found that demographic and task-related diversity elicited differing effects on social categorization and information elaboration processes in TMTs, supporting the notion that a focus on teamwork processes, rather than performance, may yield important insights on diverse team functioning. However, due to methodological limitations, we are not able to directly test the moderating effects of social categorization on information elaboration in the current study.

Further, the categorization-elaboration model suggests that the effects of social categorization are contingent on comparative and normative fit, as well as the cognitive accessibility of a social category (van Knippenberg et al., 2004). Although our moderator analyses were based on this premise, and to some degree tested these contingencies, the lack of available data in primary studies directly measuring fit and cognitive accessibility of social categories limited our ability to test these aspects of the categorization-elaboration model directly. The categorization-elaboration model also suggests that intergroup bias, rather than social categorization, drives processes described by social categorization, such as relational conflict and low identification (van Knippenberg et al., 2004, p. 1015). However, this distinction was overwhelmingly unacknowledged in the studies included in our meta-analyses and, as a result, we were unable to directly test whether intergroup bias or social categorization drove these outcomes. Similarly, some of our information elaboration processes (e.g., task conflict, learning) are proxies for information elaboration and could be argued to be distinct from information elaboration (van Knippenberg et al., 2004). We opted to include these processes in our meta-analysis as they were so commonly studied in research on work team diversity driven by the categorization-elaboration model, but acknowledge that our inductive approach to identifying social categorization and information elaboration processes yields imperfect parallels to the original categorization-elaboration model. Further, our conceptualization of some moderator variables, such as task demands, was imperfect and limited by the nature and information reported in studies.

Some scholars have also brought attention to limitations associated with the categorization-elaboration model itself. For example, Martins and Sohn (2022) emphasize the importance of

considering the main effects of diversity on specific aspects of team cognition, which the categorization-elaboration model tends to consider in aggregate as "information elaboration" processes. Our exploration of specific information elaboration and social categorization processes shed some light on this issue, indicating that the effects of demographic diversity tend to be clearer when exploring specific sub-facets rather than information elaboration and social categorization in aggregate. Srikanth et al. (2016) suggest that time may be another important moderator not captured by the categorization-elaboration model, arguing that in the short term, demographic diversity may yield better information sharing, but over time issues related to social categorization may arise in response to team stressors (e.g., coordination difficulties). Although our approach was not able to capture the dynamics of time, future work should consider the variation in effects of diversity on social categorization and information elaboration longitudinally.

In order to explore occupational and industry context and to provide more clear implications for work teams, we excluded a number of additional studies of student teams, TMTs, and executive boards. Although scholars have investigated the role of team diversity on processes for top management teams (Roh et al., 2019), future research might explore the effects of demographic diversity on team processes in student teams or on corporate boards, where incentive structures and taskwork differ from work teams. Relatedly, our exploration of occupational and industry context was based on U.S. data from a single year. We acknowledge that although occupational and industry demographics tend to be correlated across countries and time, this is an imprecise proxy.

This study was also limited by the scope of demographic variables included in analyses. Although demographic variables beyond age, gender, race/ethnicity, and nationality may impact team processes, we identified few studies of other demographic variables. Future research might explore additional diversity variables—for example, sexual orientation, socioeconomic status, or marital status diversity. Furthermore, due to the limited conceptualization of team diversity across the included studies, it was not possible to explore findings related to intersectionality. Considering the role that intersectional identities play in team contexts may highlight additional nuance, shedding further light on team dynamics (Cole, 2009).

Finally, we were limited in the moderators that could be explored meta-analytically. For example, exploring various conceptualizations or measures of team demographic diversity may have yielded interesting insights. For example, Leslie (2017) found that considering the status of racioethnic groups in conceptualizing unit diversity yielded much stronger effects on diversity than approaches that do not consider status differences. There was very little variability in how studies in this meta-analysis conceptualized demographic diversity (e.g., most studies of gender diversity used Blau's index of heterogeneity); however, future research in this area may further explore different conceptualizations to further expand upon the impacts. Similarly, studies were inconsistent in reporting several of the moderator variables included in our analysis (e.g., occupation and industry context) as well as moderators that would have contributed to our analysis (e.g., task requirements). Future research may more closely examine these and other moderator variables or, at a minimum, report this information so that future meta-analyses may provide greater nuance.

Conclusion

Building on the categorization-elaboration model, this study takes a process-centric approach to better understand demographically diverse team dynamics. The current meta-analysis unpacks the relationships between demographic diversity and processes and provides a roadmap for researchers interested in

further exploring the effects of team demographic diversity via multilevel or relational approaches. Moreover, we provide some evidence that context (including occupational and industry demographics as well as time) shape the effects of team demographic diversity on team processes, though the lack of consistency across these effects warrants further consideration.

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Supplemental material

Supplemental material for this article is available online.

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