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Determinants of innovation at work : The moderating role of team diversity

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Déterminants de l'innovation au travail :

Le rôle modérateur de la diversité dans les équipes.

Determinants of innovation at work: The moderating role of team diversity.

Sous la direction du Professeur Adalgisa BATTISTELLI

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Déterminants de l'innovation au travail :
Le rôle modérateur de la diversité dans les équipes.

Résumé :

L'objectif de cette thèse est d'étudier, au niveau d'équipe, les antécédents de l'innovation au travail, ainsi que le rôle de la diversité sur ces relations. La diversité des attributs des membres des équipes est généralement étudiée comme un déterminant des résultats d'équipe. Cependant, nous proposons qu'elle puisse également avoir un rôle contextuel complexe. Avec le but d'évaluer ces idées, plusieurs études ont été menées dans : une organisation du service postal Italien (1) et une organisation militaire Italienne (2). Nous avons montré une relation positive entre la diversité d'âge et la créativité d'équipe (Chapitre 2, Article 1). Cette relation était plus forte pour des niveaux plus élevés de perception du climat d'inclusion au travail que pour les niveaux les plus faibles. De plus, la diversité peut également avoir un effet modérateur entre les facteurs d'équipe et l'innovation. Plus précisément, une relation positive a été mise en évidence entre le système de mémoire transactif et l'innovation d'équipes militaires et cette relation était modérée par la diversité de grade (Chapitre 3, Article 2). A des niveaux plus élevés de diversité de grade dans l'équipe, l'effet de la mémoire transactive sur l'innovation devenait non significatif. Enfin, nous avons montré que la diversité modère également d'autres déterminants de l'innovation d'équipe. Pour des niveaux de diversité d'âge faibles l'élaboration d'information relevant à la tâche a médié la relation entre la valeur organisationnelle perçue d'innovation et l'innovation d'équipe (Chapitre 4, Article 3). En complément, des analyses et études supplémentaires ont été réalisées afin d'étudier de manière plus approfondie les déterminants de l'innovation ainsi que le rôle, le type, et les effets de la diversité dans les équipes. Pour conclure, ces résultats montrent l'importance d'étudier les interactions entre la diversité et les facteurs déterminants de l'innovation dans les équipes de travail.

Mots clés : Innovation d'équipe, diversité dans les équipes, état émergent, processus d'équipe

**Determinants of innovation at work:
The moderating role of team diversity.**

Abstract:

The objective of this dissertation is to study the team-level antecedents of innovation at work, as well as the role of team diversity's in these relationships. The diversity of team member attributes is generally studied as an input of team outcomes; however, we argue that it can also adopt a more complex contextual role. With the purpose of evaluating the determinants of team innovation, several studies were carried out on: an Italian postal service organization (1) and on an Italian military organization (2). We found a positive relationship between age diversity and team creativity (Chapter 2, Article 1). This relationship was stronger at higher levels of perceived age inclusion climate than at lower levels. Additionally, diversity may also have a moderating effect between team-level factors and innovation. More precisely, a positive relationship was identified between transactive memory system and military unit innovation, and this relationship was moderated by grade diversity (Chapter 3, Article 2). At higher levels of military grade diversity, the effect of transactive memory on innovation became non-significant. Finally, we showed that diversity also moderated the effect of other team-level determinants of innovation. For low levels of team age diversity the elaboration of task-relevant information mediated the relationship between the perceived organizational value of innovation and team innovation (Chapter 4, Article 3). In addition, several analyses and additional studies were carried out with the purpose of studying more precisely the determinants of innovation as well as the role, type, and effects of team diversity. In conclusion, these results show the importance of studying the interactions between diversity and the antecedents of innovation in teams.

Keywords: Team innovation, team diversity, emergent state, team process

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Texte Long Français

Introduction

Les équipes de travail construisent et font avancer les organisations. Cependant, c'est leur capacité à innover qui permet aux organisations de rester compétitives et d'améliorer leur environnement. Simultanément, le monde de travail est de plus en plus divers grâce aux ouvertures politiques, économiques, managériales et technologiques permettant aux personnes de différentes âges, cultures, expériences, et professions de travailler ensemble. A partir de la recherche sur les équipes, l'innovation, et la diversité, nous proposons dans ce présent travail plusieurs études sur les déterminants de l'innovation au travail et le rôle de la diversité dans les équipes. Nous analysons l'effet de la diversité sur l'innovation mais aussi nous proposons que la diversité puisse être un facteur contextuel qui influence les relations entre plusieurs facteurs d'équipe et l'innovation.

Ce travail de thèse est structuré par cinq chapitres. Dans le Chapitre 1, une révision de la littérature a été réalisée sur les équipes, la diversité, et l'innovation. Dans le Chapitre 2, nous examinons la relation directe entre la diversité d'âge et la créativité (impliquée dans le processus d'innovation) ainsi que le rôle du climat d'inclusion sur ce lien. Dans le Chapitre 3, nous explorons l'effet du système de mémoire transactive sur l'innovation et identifions le rôle modérateur de la diversité de grade militaire sur cette relation. Dans le Chapitre 4, nous testons un modèle de médiation modéré sur la relation entre la perception de la valeur d'innovation, l'élaboration d'information et l'innovation d'équipe, ainsi que le rôle modérateur de la diversité d'âge sur le lien entre ces deux dernières variables. Finalement, dans le Chapitre 5 nous discutons les résultats obtenus, leurs implications théoriques et appliquées, ainsi que leurs limites et nous présentons des ouvertures de recherche.

Chapitre 1. Etat de l'art

La recherche sur la diversité explore la manière par laquelle les différences entre les membres d'une même équipe sont liées avec plusieurs facteurs comme le conflit intra-groupes, le partage d'information, et la performance. Ces différences peuvent être démographiques comme la variété d'âge, de sexe, d'origine ethnique, ou plus centrées sur le travail comme les professions dans l'équipe ou les niveaux d'expertise. La diversité peut être bénéfique pour les équipes due aux ressources plus diverses qui peuvent être utilisées lors de la réalisation d'une tâche ou défavorable due aux processus de catégorisation, stéréotypes, discrimination, et conflits liés aux différences. La majorité des études ont proposé une influence directe de la diversité sur les résultats d'équipe (pour une revue, Guillaume, Dawson, Otaya-Ebede, Woods, & West, 2017), cependant, le modèle de catégorisation-élaboration (van Knippenberg, de Dreu, & Homan, 2004) argumente que les effets de la diversité sont indirects et conditionnels, donc basés sur d'autres facteurs comme par exemple l'élaboration d'information dans l'équipe. Aujourd'hui, la diversité est considérée comme un facteur important à prendre en compte dans les études sur les équipes mais qui doit être étudiée de manière plus approfondie. Récemment, plusieurs chercheurs ont analysé les rôles que la diversité peut avoir dans le travail en équipe et ses résultats, ainsi que ses différentes facettes, niveaux, dynamique, et interactions complexes (c.f., Bunderson & Van der Vegt, 2018; Guillaume, Dawson, Otaya-Ebede, Woods, & West, 2017; van Knippenberg & Mell, 2016).

D'autre part, l'innovation est étudiée généralement comme un processus – ou un comportement (Kanter, 1988a ; Scott & Bruce, 1994) – consistant à générer et à introduire des idées créatives dans l'environnement de travail (Anderson, Potočnik, & Zhou, 2014). Ces idées doivent être évidemment originales, utiles, et bénéfiques pour la société (West & Farr, 1990). La recherche a identifié plusieurs antécédents de l'innovation au niveau d'équipe, par

exemple : la taille de l'équipe, le climat d'équipe pour l'innovation, la communication interne, l'orientation à la tâche, l'identification avec l'équipe, le leadership transformationnel, la réflexivité d'équipe, ou la dissidence minoritaire (Anderson & West, 1998 ; De Dreu & West, 2001 ; Eisenbeiß & Boerner, 2010 ; Hülshager, Anderson, & Salgado, 2009 ; Mitchell, Parker, Giles, Joyce, & Chiang, 2012 ; Schippers, West, & Dawson, 2015).

De plus, le potentiel de la diversité permettant à l'équipe d'avoir des ressources informationnelles diverses, ainsi qu'à promouvoir des discussions de perspectives et méthodes entre membres, est théoriquement lié avec l'innovation (van Knippenberg & Schippers, 2007). Cependant, comme vu précédemment, les effets de la diversité sur l'innovation sont aussi indirects et conditionnels, ils dépendraient donc d'autres facteurs (van Knippenberg, 2017). Par exemple, la diversité peut être bénéfique à l'innovation dépendamment du niveau d'apprentissage individuel, du partage d'information dans l'équipe, ou de la capacité de collaboration groupale (Batarseh, Usher, & Daspit, 2017a ; Cheung, Gong, Wang, Zhou, & Shi, 2016 ; Sun & Teh, 2017). C'est à partir de cette perspective conditionnelle que nous avons choisi d'étudier les déterminants de l'innovation et du rôle de la diversité dans les équipes sur l'innovation. Dans un premier temps, nous testons l'effet direct – dit classique – de la diversité sur la créativité ainsi que l'effet d'un récent facteur du climat susceptible d'avoir une influence sur cette relation. Ensuite, nous analysons un modèle concernant l'effet du système de mémoire transactive sur l'innovation, ainsi qu'un modèle de médiation entre la valeur organisationnelle perçue d'innovation et l'innovation d'équipe. Dans ces deux dernières études, nous testons le rôle modérateur de la diversité ; une manière relativement récente d'analyser la diversité comme un facteur contextuel influençant les relations au niveau d'équipe (e.g., Lee & Chae, 2017; Mitchell, Boyle, Nicolas, Maitland, & Zhao, 2016). Finalement, nous réalisons une discussion des résultats ainsi qu'une analyse des limites, implications, et perspectives futures liées à nos travaux.

Chapitre 2. Article 1

La diversité d'âge et la créativité d'équipe : Analyse du rôle de la perception d'inclusion au travail dans une organisation postale Italienne

La recherche sur la diversité est centrée actuellement sur l'identification des modérateurs qui peuvent influencer la relation entre la diversité et les résultats d'équipe (c.f., van Knippenberg & Mell, 2016). Ainsi, notre première étude teste la relation entre la diversité d'âge et la créativité d'équipe, en prenant en compte le rôle modérateur du climat d'inclusion générationnel. Cette dernière variable provient de l'échelle du climat intergénérationnel au travail (WICS, King & Bryant, 2016) et mesure le niveau de perception partagée d'un climat respectueux et positif pour les personnes de tous les âges dans l'organisation. La présente étude est réalisée avec les réponses de 168 leaders d'équipe d'une organisation postale en Italie. Nos principaux résultats montrent que la diversité d'âge est positivement liée avec la créativité et qu'à niveaux plus élevés du climat d'inclusion cette relation est plus forte qu'à niveaux plus bas. Ensuite, dans une analyse supplémentaire, nous avons testé l'invariance de mesure du WICS. Dans cette étude nous avons trouvé que deux sous-échelles du WICS sont comprises différemment entre les employés du service postal d'Italie et de Bulgarie.

Chapitre 3. Article 2

Mémoire transactive et innovation d'équipe : Le rôle modérateur de la diversité dans les équipes militaires

Cette étude analyse la diversité comme un facteur contextuel. Nous testons la relation entre le système de mémoire transactive et l'innovation d'équipe dans 48 équipes de l'armée de l'air Italienne. Ce système est un état émergent qui concerne une mémoire collective qui réunit les connaissances particulières et partagées entre les membres d'une équipe ainsi que la conscience collective sur qui sait quoi (DeChurch & Mesmer-Magnus, 2010 ; Lewis & Herndon, 2011). La diversité de grade militaire et d'ancienneté dans les équipes ont été

proposés comme de possibles modérateurs de la relation mémoire transactive - innovation. Nos résultats montrent que le système de mémoire transactive a un effet positif sur l'innovation et que cet effet n'est pas significatif à des niveaux élevés de la diversité de grade militaire. Il semble donc que le bénéfice lié à une mémoire transactive sur l'innovation diminue quand les membres de l'équipe présentent une forte diversité de grade. Cela confirme que la diversité peut interagir avec les déterminants de l'innovation d'équipe et être analysée comme un facteur contextuel. Nos résultats aident à supporter cette perspective qui ouvre les champs d'analyse sur la diversité comme un modérateur.

Chapitre 4. Article 3

Un modèle de médiation modérée sur les valeurs organisationnelles perçues et l'innovation d'équipe : le rôle de l'élaboration d'information relevant aux tâches et de la diversité d'âge

Dans cette étude nous testons la relation entre la perception partagée que l'organisation valorise l'innovation et l'innovation d'équipe médiée par l'élaboration d'information relevant aux tâches. De plus, nous analysons la modulation de la diversité d'âge sur la relation entre l'élaboration d'information et l'innovation d'équipe. L'élaboration d'information est un processus d'équipe qui concerne la création, le partage, et la discussion active des informations importantes à la tâche entre les membres d'une équipe (van Knippenberg, de Dreu, & Homan, 2004). Pour tester ce modèle de médiation modérée nous avons utilisé les données des 48 équipes de l'armée de l'air Italienne évaluées précédemment. Les résultats de cette étude montrent que, seulement à niveaux bas de la diversité d'âge, l'élaboration d'information peut médier la relation entre la valeur organisationnelle d'innovation perçue et l'innovation d'équipe. De plus, comme étude supplémentaire, nous avons comparé ce modèle avec un modèle qu'identifie la mémoire transactive comme médiateur à la place de l'élaboration d'information. Les résultats identifient la mémoire

transactive comme médiateur à niveaux bas et moyens de la diversité d'âge. Enfin, l'effet de la mémoire transactive sur l'innovation est plus important que celui de l'élaboration d'information. Ces résultats confirment une nouvelle fois le rôle modérateur de la diversité cette fois sur un processus d'équipe. De plus, au vu de ces résultats, la recherche sur les équipes doit développer des méthodologies adaptées capables d'étudier l'interaction entre les processus d'équipe et les états émergents.

Chapitre 5. Discussion générale

Plusieurs études ont été menées afin de tester les déterminants de l'innovation d'équipe ainsi que le rôle de la diversité. Les résultats de nos travaux montrent que dans certains cas, la diversité peut avoir un rôle modérateur dans les équipes. Cela élargit nos connaissances sur la diversité qui est actuellement vue comme un facteur avec des facettes multiples, à différents niveaux, et dynamique (e.g., Bunderson & Van der Vegt, 2018). De plus, nous avons confirmé l'effet de plusieurs facteurs d'équipe (perceptions sur le climat, processus d'équipe, états émergents) sur l'innovation ainsi que l'influence de la diversité sur ces relations. Nous avons testé nos modèles dans une organisation postale et une organisation militaire permettant ainsi l'approfondissement des connaissances sur les équipes dans ces milieux.

De plus, nos résultats supportent le fait que d'avoir un climat sain et inclusif dans les organisations est bénéfique pour la mise en place de comportements d'innovation au sein d'une équipe de travail. Valoriser et intégrer les différences, ainsi qu'identifier et adresser des attitudes implicites, sont des conclusions que nous trouvons dans la littérature sur la diversité (e.g., Joshi & Roh, 2009 ; Nembhard & Edmondson, 2006) mais aussi dans nos résultats avec le climat d'inclusion. Nous proposons également que c'est important de traiter les discussions entre membres, favoriser l'intégration des informations différentes et de les valoriser,

encourager les améliorations constantes dans le travail, avoir un focus sur les activités capables de diminuer les stéréotypes et de promouvoir l'idée que l'organisation valorise les comportements liés à l'innovation (Anderson & West, 1998 ; Allen, Reiter-Palmon, Crowe, & Scott, 2018 ; Nembhard & Edmondson, 2006 ; Rico, Sánchez-Manzanares, Antino, & Lau, 2012).

Dans de futures recherches, il serait intéressant de réaliser des études longitudinales et expérimentales pour étudier plus adéquatement l'émergence et la dynamique des déterminants de l'innovation et de la diversité. De plus, l'importance du leader ne peut pas être négligée dans les interactions proposées ainsi que les possibles niveaux de la diversité, les changements dans la composition des équipes, l'inégalité de pouvoir entre membres, ou les effets *top-down* et *bottom-up* (e.g., Bunderson & Van der Vegt, 2018; Li, Meyer, Shemla, & Wegge, 2018; Tasheva & Hillman, In press). Finalement, des approfondissements sont nécessaires sur le rôle de l'inclusion au travail et la diversité (Shore, Cleveland, & Sanchez, 2018). Les pratiques inclusives à différents niveaux de l'organisation pourraient promouvoir un environnement qui facilite le développement personnel, la sécurité psychologique et l'innovation au travail.

Conclusion

A partir des études menées dans ce travail de thèse, nous avons pu observer l'effet de plusieurs variables d'équipe sur l'innovation. De plus, nous avons confirmé que la diversité peut avoir différentes facettes dans les équipes et influencer l'effet des déterminants de l'innovation. La recherche sur les aspects liés à l'innovation est généralement complexe, nous pensons que l'enjeu restant concerne(ra) l'étude de nos facteurs de manière plus adaptée aux changements, aux émergences, et aux dynamiques du monde de travail.

Abbreviations

The following is a non-exhaustive list of the most common abbreviations present on the current dissertation. This list mainly concerns abbreviations not found in the American Psychological Association publication manual (2010) like those related to statistical concepts or procedures (e.g., SD = Standard Deviation).

CEM: Categorization-Elaboration Model.

TMS: Transactive Memory System.

EMP: Empowering Leadership.

VIN: Perceived Organizational Value of Innovation.

ETRI: Elaboration of Task-Relevant Information.

WGI: Workplace Generational Inclusiveness.

IMOI: Input-Mediator-Outcome-Input.

WICS: Workplace Intergenerational Climate Scale.

IPO: Input-Processes-Output.

Concerning the titles for the tables and figures:

A1: Article 1 (A1), Article 2 (A2), Article 3 (A3).

AA1: Additional Analyses 1 (AA1), ...2 (AA2), ...3 (AA3). Found only in the Annex.

AS1: Additional Study 1 (AS1), Additional Study 2 (AS2).

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Introduction

Team diversity research explores the way that differences between team members relate to factors like intragroup conflict, information sharing, and performance. Recently, the way that team diversity is analyzed and understood has changed; research has come a long way on the study of how diversity affects teamwork and its multiple facets (c.f., Bunderson & Van der Vegt, 2018; Guillaume, Dawson, O'taya-Ebede, Woods, & West, 2017; van Knippenberg & Mell, 2016). Due to a large amount of inconsistent studies on the direct effects of diversity on team results like performance, research is now centered on the analysis of the mediating and moderating factors capable of determining how team member characteristics influence team outcomes (van Knippenberg, De Dreu, & Homan, 2004; van Knippenberg & Schippers, 2007). Nevertheless, recent studies have also found the importance of analyzing diversity as a contextual factor and to observe how these differences interact with team-level variables.

Furthermore, the study of collective innovation coupled with diversity is centered on knowledge integration principles (e.g., Ancona & Caldwell, 1992; Richter, Hirst, van Knippenberg, & Baer, 2012). These propositions, which support the idea that diverse resources enable innovativeness, have established a large amount of studies also concluding the imperative of contingency-based models (c.f., van Knippenberg, 2017). It is in our interest, as researchers on work and organizational psychology, to advance research on the interrelationship between these two factors characterized by an arduous journey in team research. To make this possible, we propose and test three team-level models consisting of the relationship between diversity and team innovation, as well as the effect of valuable team-level factors for these interactions.

On the current doctoral dissertation we assess the following content:

- As a starting point, in Chapter 1, we explore and review the literature on teams, diversity, and innovation.
- Following this, as our first article in Chapter 2, we test a model of diversity and team creativity contingent on an age inclusive climate.
- Next, as our second article in Chapter 3, we test a model on the relationship between transactive memory system, an emergent state, and team innovation, centering on the moderating role of team diversity.
- Moreover, as our third article in Chapter 4, we test a moderated-mediation model on the relationship between perceived organizational values and innovation, as well as the mediating role of information elaboration and the moderating role of team diversity.
- Finally, in Chapter 5, we discuss the main contributions and limitations of this dissertation as well as provide some ideas for future research.

These sections are consistent with our research studies and provide, to our knowledge, important insights about our propositions and their respective findings. To conclude, we consider worth noting that Chapters 2, 3, and 4 correspond to research articles that will be or are submitted to scientific journals related to our field.

Chapter 1 – Literature Review

Within this chapter, we carry out a literature review on team diversity and team innovation with the purpose of exploring these and other relevant concepts. We start the current section by addressing teams and by defining the most important team processes concepts. Next, we conceptualize and explore research on team diversity with a focus on one of the most recent perspectives: the categorization-elaboration model (van Knippenberg, De Dreu, & Homan, 2004). Following this, we define our outcome of interest – team innovation – and analyze its relationship with team diversity to finally introduce our research objectives as a culmination for this chapter.

1.1. Teams, collective processes, and shared cognitions

By reading current studies on teams¹ it's not unusual to see them being addressed as the basic building blocks of organizations (e.g., Jian, Gu, & Wang, 2015; Kozlowski & Bell, 2003; Pearce, Yoo, & Alavi, 2004). Indeed, teams are considered an important foundation of organizational functioning: they link formal work with cooperative effort and provide a more capable solution for accomplishing challenging tasks (Marquardt, Seng, & Goodson, 2010; Sundstrom, De Meuse, & Futrell, 1990). Teams are considered groups of employees that “share one or more common goals, interact socially, exhibit task interdependencies, maintain and manage boundaries, and are embedded in an organizational context” (Kozlowski & Bell, 2003, p.334). We should add that teams are now operating in more complex dynamic environments than before; new technologies promote new ways of working and interacting, and managerial practices may leave teams self-driven making them share leader responsibilities (c.f., Carson, Tesluk, & Marrone, 2007; Cascio & Montealegre, 2016; Tannenbaum, Mathieu, Salas, & Cohen,

¹ *Teams* and *work groups* are considered analogous terms within this dissertation.

2012). Moreover, team members must integrate, synthesize, and share information, coordinate, cooperate, and engage in both taskwork and teamwork processes to accomplish their tasks (Salas, Cooke, & Rosen, 2008). For facilitating the comprehension of these terms we've developed a synthesis table with their respective definitions (see Table 1).

Table 1

Synthesis of common team-related terms

Term	Definition
Team process	“Members' interdependent acts that convert inputs to outcomes through cognitive, verbal, and behavioral activities directed toward organizing taskwork to achieve collective goals” (Marks, Mathieu, & Zaccaro, 2001, p. 357).
Emergent state	“Describe conditions that dynamically enable and underlie effective teamwork” (DeChurch & Mesmer-Magnus, 2010, p.33), they refer to the “cognitive, motivational and affective states of teams” (Marks, Mathieu, & Zaccaro, 2001, p. 357).
Knowledge sharing	“Team members sharing task-relevant ideas, information, and suggestions with each other” (Srivastava, Bartol, & Locke, 2006, p.1239).
Cooperation	Refers to the contribution of personal efforts towards an interdependent goal which provides value-creation opportunities for the team and is considered a key antecedent of their performance (Lin, He, Baruch, & Ashforth, 2017).
Coordination	“Orchestrating the sequence and timing of interdependent actions” (Marks, Mathieu, & Zaccaro, 2001, p. 363). Teams can coordinate explicitly, by communicating, or implicitly by anticipating task demands and member needs and by dynamically adjusting their own behavior (c.f., Rico, Sanchez-Manzanares, Gil, & Gibson, 2008).
Taskwork	What the team is doing or "a team's interactions with tasks, tools, machines, and systems” (Bowers, Braun, & Morgan, 1997, p. 90).

Teamwork How the team does what it's doing or "the interdependent components of performance required to effectively coordinate the performance of multiple individuals" (Salas, Cooke, & Rosen, 2008, p.541).

It's important to point out that some of these terms have been used interchangeably (e.g., cooperation and coordination), some have been even used without any particular precision of its definition (e.g., team processes; c.f., Marks, Mathieu, & Zaccaro, 2001), and some, like emergent states, have been adopted more recently than others. Additionally, the literature refer to these affective states, behavioral processes, and cognitive states as the ABCs of teamwork (Salas, Cooke, & Rosen, 2008; see also Bell, Brown, Colaneri, & Outland, 2018). Also, we point out that teamwork has been categorized to group certain dimensions and activities in a hierarchical structure; Marks, Mathieu, and Zaccaro (2001) proposed three types of processes: transition, action, and interpersonal (see Table 2). These occur mostly during a particular temporal phase (e.g., transition processes between action processes) and their use in teams is positively related to team performance and team member satisfaction (c.f., Driskell, Salas, & Driskell, 2018).

Table 2.

Types of teamwork processes

Type	Transition processes	Action processes	Interpersonal processes
Description	Occurs between action processes and have the purpose of evaluating and adjusting team strategies.	Goal-directed actions that team members engage in.	Occurs during both transition and action processes and refer to how team members manage their interpersonal relationships.
Dimensions	Mission analysis, formulation and planning, goal specification, and strategy formulation	Monitoring progress towards goals, systems monitoring, and behavior, and coordination	Conflict management, motivation and confidence building, and affect management.

Activity example	The team analyses their resources and capabilities leading them to set a more realistic goal (goal specification).	After communicating a major error one of the team members decides to change its role during the procedure (coordination).	The employee decided to intervene and provide a fair settlement on the heated discussion (conflict management).
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Notes: Based on Marks, Mathieu, and Zaccaro (2001) and from Table 1 *representative activities* section from Driskell, Salas, and Driskell (2018).

Moreover, teams have a long history within organizational research which has focused particularly on their effectiveness. We adopt the model based on McGrath's (1964) heuristic which delineates the input-process-output (IPO) model of team effectiveness. The IPO has been frequently used for demonstrating how processes – and contexts – can shape resources and capabilities into team task accomplishments (Kozlowski, 2015). The focus of this type of model is on categorizing psychosocial *factors* into three theoretical modules: a first module concerning resources and enabling factors (input), a second module concerning mechanisms, behaviors, and actions (processes), and a third module concerning consequences (output). For example, team diversity corresponds to the input module as it can be seen as a capacity and as a resource, team processes and shared cognitions like communication, information sharing, TMS, and intragroup conflict correspond to the process module as they use or interact with these resources, and finally, team innovation refers to the output module as it's a consequence of collective effort and contextual influences (an outcome). We consider more recent integrative models, like the Input-Mediator-Outcome-Input model (IMOI, Ilgen, Hollenbeck, Johnson, & Jundt, 2005) which is more complex but the idea is the same as, for example, processes has been changed to mediators to address more interceding factors, and a retroactive module (the second input) has been added to describe cyclical influences where the outcome affects the input. This particular framework has been constantly used for explaining how particular factors are mediated and moderated by

certain processes predicting the effectiveness and innovative outcomes of teams (Goodwin, Blacksmith, & Coats, 2018).

Furthermore, by analyzing the literature on teams, we find the need to inscribe our attention into the literature on *team cognition*, also known as *shared cognition* or *collective cognition* (e.g., DeChurch & Mesmer-Magnus, 2010). This relatively recent concept is a cognitive emergent state that refers to the shared understandings of tasks, goals, expertise, and resources among team members. Team cognition studies as well the way that the team processes and uses these understandings within their work environment (DeChurch & Mesmer-Magnus, 2010; Kozlowski & Ilgen, 2006; MacMillan, Estin, & Serfaty, 2004). Additionally, within the literature of team cognition the most common studied constructs are shared mental models (SMMs) and transactive memory systems (TMS). The two can be seen as fairly similar; however, SMMs refer to the common knowledge held by the team and TMS to the distributed knowledge (DeChurch & Mesmer-Magnus, 2010). More precisely, SMMs refer to *shared knowledge structures* – mental representations held by the members of a team (c.f., Wildman, et al., 2012) – which “enable them to form accurate explanations and expectations for the task, and in turn, to coordinate their actions and adapt their behavior to demands of the task and other team members” (Cannon-Bowers, Salas, & Converse, 1993, p. 228).

On the other hand, a TMS is “a form of cognitive architecture that encompasses both the knowledge uniquely held by particular group members with a collective awareness of who knows what” (DeChurch & Mesmer-Magnus, 2010, p. 33). Additionally, Lewis and Herndon (2011) cleared that, when defining TMS, it’s crucial to address three qualities incorporated in TMS theory: team members held specialized knowledge due to their own expertise and responsibilities within their team, but teams can also have a common knowledge about this expertise which is useful to quickly respond and coordinate their efforts; this means that TMS encompasses shared

but also *differentiated knowledge*. Next, there're two TMS *components*: a structural component, where knowledge is stored and organized, and a process or transactive component, which refers to encoding, storing, and retrieving knowledge. This latter component enables team members to effectively use the knowledge stored within the structural component to accomplish taskwork. Finally, TMS is *dynamic* in the sense that both of its components influence each other. For example, when communicating and cooperating to accomplish a task, team members will perform TMS processes which will overtime develop a better and more refined TMS structure.

Research on TMS has also connected the appearance of three behaviors to the existence of a TMS in a team (c.f., Lewis, 2003). The first one, *specialization*, refers to what we explained before as differentiated knowledge (non-shared knowledge or knowledge appertaining only to one team member). For example, higher levels of specialization are identified when team members perceive that their colleagues are somewhat experts in their field based on previous work experiences. The second behavior, *credibility*, describes a reliance on this differentiated knowledge. Team members that rely on each other's expertise also perceive that this knowledge is relevant to task accomplishment and are also open to their colleagues' suggestions. The third behavior, *coordination*, reflects an orchestrated use of this knowledge between members. A well-developed TMS structure will enable the team to be effective and to accomplish tasks in a fluid manner. It's important to note that the manifestation of these behaviors together, and not independently (c.f., Lewis & Herndon, 2011), has been used to measure the level of TMS within a team (Lewis, 2003).

On its antecedents, TMS has been found to be affected by team member demographics, technical competencies, assertiveness, task interdependence, goal interdependence, group training, team familiarity, shared experiences, communication, technology or the level of virtuality, imposed knowledge structure, acute contextual stress, and the organization's

geographic distribution (Ren & Argote, 2011). Among these factors, we highlight the role of shared experiences and communication; both team-level variables. This is because shared experiences offer team members the opportunity to exchange information between them (through communication), which can be *explicitly* discussed, where team members talk about their particular expertise, or *implicitly* shared, where colleagues demonstrate their knowledge through work experiences. Both shared experiences and communication enable the TMS structure to be developed and enriched, as well as provide an opportunity to carry out TMS processes during work activities (c.f., Hollingshead, 1998).

Finally, both SMMs and TMS have been linked to higher team performance (e.g., DeChurch & Mesmer-Magnus, 2010; Ren & Argote, 2011; respectively) and have been the most representative team cognition constructs (Mohammed, Hamilton, Sánchez-Manzanares, & Rico, 2017). Particularly concerning team innovation, TMS has been related to it (Fan et al., 2016; Peltokorpi & Hasu, 2014, 2016), as well as SMMs (e.g., Lee-Kelley & Blackman, 2005; Reuveni & Vashdi, 2015). TMS is said to offer team members a way to follow-up new ideas as they'll know who will have the knowledge about particularities and challenges. Additionally, TMS can help the team have the time to test new ideas as effectiveness is higher and work is more coordinated. Concerning SMMs, team members will be more capable of understanding others' ideas and the way to use them on the task at hand. Teams with strong SMMs will be more capable of developing and benefitting from multiple and divergent ideas, ultimately leading to innovation.

After providing a synthesis on teams, processes, and team cognition definitions, we now explore team diversity research, its focal perspectives, and its main research findings.

1.2. Team diversity

Team diversity refers to the differences among team member characteristics. These characteristics, or attributes, may be any thinkable aspect like age, profession, gender, or even distance from work, personality, height, number of kids, or political opinion. However, the most studied attributes are more conventional, which are gender, ethnic background, age, tenure, functional background, and educational background (van Dijk, van Engen, & van Knippenberg, 2012). It is not uncommon to see these characteristics being classified into socio-demographic (e.g., age, gender, or ethnicity) and job-related characteristics (e.g., functional and educational background) (van Knippenberg & Schippers, 2007; Webber & Donahue, 2001); interestingly enough, other classifications have been proposed for these characteristics (see Table 3). Moreover, team diversity has commonly a ‘last name’ accompanying it depending on the attribute of interest. For example, when studying age differences a team may be viewed as an *age diverse team* and the focal point will be then to study *age diversity* (e.g., Williams, 2016). Some authors have even used a configuration of diversity attribute classifications (e.g., socio-demographic) to study the effects of compositional attributes (e.g., sex and age) on team functioning (e.g., Bezrukova, Spell, Caldwell, & Burger, 2016).

Table 3.

Team diversity attributes main classifications

<u>Definition & attribute examples</u>		<u>Study examples</u>
<u>Job-related / task-related</u>	<u>(Socio-)demographic</u>	Bankewitz & Kandli (2016); Kanadli, Bankewitz, & Zhang (2018); Luring & Selmer (2013); Rink & Ellemers (2007); van Dijk, van Engen, & van Knippenberg, (2012); Webber & Donahue (2001)
Characteristics related to the job or that could influence task-accomplishment. Examples: tenure, profession,	Characteristics not related to the job, social or demographic in nature. Examples: age, gender, and ethnicity.	

functional, and educational background.

<u>Deep-level</u>	<u>Surface-level</u>	
Underlying characteristics, often psychological in nature. Example: personality factors, values, and attitudes.	Discernable demographic characteristics easily estimated after a short amount of exposure. Examples: age, race, educational level, and organizational tenure.	Harrison, Price, & Bell (1998); Harrison, Price, Gavin, & Florey (2002); Mohammed & Angell (2004); Organ & O’Flaherty, 2016; Phillips & Loyd (2006); Phillips, Northcraft, & Neale (2006); Tekleab & Quigley (2014)
<u>Trait</u>	<u>State</u>	<u>Emergent</u>
Stable characteristics (they do not change over time). Example: gender and personality.	Malleable characteristics independent from the team and/or team processes. Example: distributed information and individual preferences.	Team processes and psychological states in reference to the team. Example: dyadic interactions and the level of sharedness of team cognition.
		van Knippenberg & Mell (2016)

It’s important to note that these different classifications do not necessarily intersect each other on each case. For example, trait diversity concerns stable characteristics like gender (socio-demographic) and personality (deep-level) which are in different categories if we match job-related with deep-level attributes and socio-demographic with surface-level attributes.

Furthermore, we follow the idea that the study of diversity is highly relevant to work and organizations. Team member composition stands as a factor more and more pertinent due to different reasons: teams are becoming more diverse, the work environment is changing, and the retirement age is rising. First, teams are increasingly diverse due to market globalization. In terms of ethnic background diversity, employees from different parts of the world now have the chance to travel more easily; international barriers and mobility are helping factors for this, as well as the development of multinationals (c.f., Caligiuri & Bonache, 2016). Moreover, multi-disciplinary,

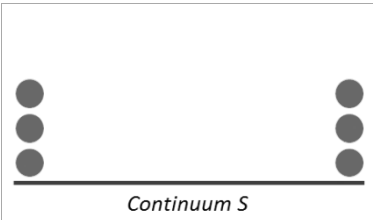
multi-generational, and multi-functional teams are also being used more often in organizations with the purpose of benefitting from diversity. Second, the work context has partially shifted from face-to-face communication to virtual internet-based grounds (e.g., Gilson, Maynard, Young, Vartiainen, & Hakonen, 2015), as well as the use of new technologies like virtual and augmented reality (e.g., Lee, Chung, & Jung, 2015). These factors provide an answer to distanced team members but also change the way that employees interact, cooperate, and share experiences together. Team diversity research must also address these factors in virtual non-traditional teams, as well as to study the psychosocial and work-related consequences of, for example, new technology implementation and collaborative robot-human interaction in diverse teams. Furthermore, in terms of age diverse teams, collaboration between employees of different – and more distanced – ages is more common than before due to a rise of the age retirement and life expectancy in Europe (European Commission, 2017). Age diverse teams are composed by people with more and less work experiences, with newer and more traditional methods, and with different work perspectives, values, attitudes, preferences, and behaviors; all differences that need to be addressed and managed effectively. Diversity research is important as teams are more diverse than ever and the work environment is dealing with all of these changes.

Next, an important part of this section concerns the typology of team diversity. Harrison and Klein (2007) proposed that studies interested in diversity must analyze it based on its particular definition, which could adopt three different forms: *separation* which refers to differences in position or opinion, *variety* which describes categorical differences of relevant knowledge or experiences, and *disparity* which reflects proportional differences of valuables or resources. The best way to detail this diversity meanings or types is to describe the maximum and the minimum values that diversity could take in hypothetical cases for each one of these. For example, the maximum value for disparity will be a team where only one person is paid

considerably more than the other team members. For attribute shapes at maximum diversity and some examples taken from Harrison and Klein (2007) see Table 4. Our interest resides in diversity studied in terms of *variety* as source and categorical differences translate into unique and distinctive information; which is argued to be related to creativity and innovation (e.g., Amabile, 1983; Jackson, 1996). Finally, it's important to note that each type of diversity is measured in a different way (e.g., Blau's index of heterogeneity for variety), and that the type of diversity chosen is not necessarily defined by the attribute. For example, if a researcher decides to analyze gender diversity the chosen type is defined by how gender is hypothesized: gender could convey conflict due to a division of two groups composed by men and women respectively (separation), produce creativity in dyads when the two members dissent due to their previous experiences as men or women (variety), or suggest isolation if the study aims to capture teams where only one member is a man or a woman (disparity).

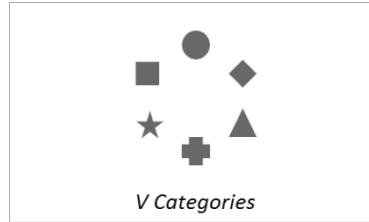
Table 4.

Properties of team diversity types

Diversity type	Attribute shape at maximum diversity	Pictorial representation at maximum diversity	Attribute examples
Separation	Bimodal distribution, with half of unit members at highest and lowest endpoints of S continuum.		Opinions, beliefs, values, and attitudes, especially regarding team goals and processes

Variety

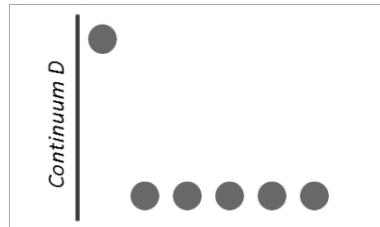
Uniform distribution, with even spread of members across all possible categories of V (no continuum)



Content expertise, functional background, nonredundant network ties, industry experience

Disparity

Positively skewed distribution, with one member at highest endpoint of D continuum and others at lowest



Pay, income, prestige, status, decision-making authority, social power

Notes: Modified version of Table 1 by Harrison & Klein (2007, p.1203), pictorial representations are recreated based on Figure 1 (p.1202).

However, the study of team diversity doesn't stop at classifying attributes and defining differences. There's a central paradox with diversity that has been the interest of team researchers for decades, we synthesize it with the following phrase: *although diverse people are different, but interesting, similar people are alike, yet boring*. This affirmation implies what the classic issue with team diversity is: diverse member characteristics may introduce incompatibilities and conflict into a team due to their differences (different). However, diversity may also bring distant ideas, perspectives, and methods to the team to use (interesting). On the other hand, homogenous teams with little to no diversity may interact more easily and may not waste time coordinating their work (alike). However, similar people think the same, and therefore, not much differing ideas, perspectives, and methods could be expected for these teams (boring). Moreover, although different ideas, perspectives, and methods could improve performance through the optimization of procedures and other changes (maybe innovations), it's not surprising to have a focus on innovation while reviewing the literature on team diversity. It may seem that differences may

have a positive effect on team innovation and a negative one on performance according to these assumptions. However, as we'll find in future analyses, team diversity can be both beneficial and harmful for both performance and innovation. The key for the central issue of diversity is that differences may be both hampering as well as beneficial for team functioning. Studies on team diversity have tried to find a simple conclusion to the effects of diversity so two perspectives are identified in the literature (mainly pre-2000): the social-categorization and the information/decision-making perspective (Williams & O'Reilly, 1998).

1.2.1. The social-categorization perspective

The social-categorization perspective is commonly based on three theories: the similarity/attraction, the social identity, and the social categorization theory. Applied to a team diversity approach, the similarity/attraction theory dictates that individuals have a tendency to select similar team members to interact with (Byrne et al., 1966; Lincoln & Miller, 1979). This means that, in diverse teams, similar members (e.g., young people) will be less likely to interact with other people (e.g., old people). Moreover, these engaged interactions are not only more frequent between similar people but also more positive, leading to better results. For example, employees that perceived being dissimilar to their team are less satisfied and committed at work (c.f., Joshi, Liao, & Roh, 2011). Additionally, the social identity and the social categorization theory affirm that people categorize themselves and others into categories with the purpose of building their identity and organize social stimuli (c.f., Abrams & Hogg, 1990; Ashforth & Mael, 1989; Tajfel, Billig, Bundy, & Flament, 1971; Tajfel, & Turner, 1986). Therefore, in a team, an employee will perceive himself within a category, like its profession (e.g., technician), and identify other members within their respective categories (e.g., engineer, doctor, psychologist, etc.). This classification allows for a simple binomial shortcut: inside my category and outside

my category (technician vs. non-technician). However, due to this social process, erroneous conclusions may be drawn based on generalizations and other psychological mechanisms. The intergroup bias, also known as in-group favoritism and out-group derogation, refers to a mechanism used to theorize why diversity may be harmful to the team. As individuals perform social categorization, they'll tend to perceive higher differences with those outside of their artificial group and perceive higher similarities with those of their own (c.f., Brewer, 1979, 1999; Gaertner & Dovidio, 2000; Randel & Jaussi, 2003). Intergroup bias has been theorized to be caused by the desire of people to be positively socially identified, that is, of having socially desirable characteristics (e.g., Tajfel, 1982; Turner, 1981). Moreover, research shows that the intergroup bias may be related to subgrouping², which conveys the active establishment of one or more groups within a team (e.g., one group composed by older employees and another composed by younger employees), as well as with intragroup conflict, and root negative effects like lower team performance (c.f., Williams & O'Reilly, 1998; Thatcher, Jehn, & Zanutto, 2003). Finally, stereotypes are sometimes seen as the enabling factors of this misadventure, as attitudes towards a particular social category can be erroneous and can be a passage towards discrimination, ultimately hampering interaction and affecting teamwork (c.f., Fiske, 1998; Joshi & Roh, 2009).

1.2.2. The information/decision-making perspective

On the other side, the information/decision-making perspective claims for the 'interesting' side of member differences. Diversity can be translated into a variety of ideas, skills, methods, perspectives, attitudes, experiences, and knowledge that members bring to the team (Jehn, Northcraft, & Neale, 1999; Pelled et al., 1999; van Knippenberg, De Dreu, & Homan, 2004). These varied elements are seen as informational resources that are processed by the team (Hinsz,

² For more information on subgroups and diversity research see the works on faultlines by, for example, Lau and Murnighan (1998, 2005).

Tindale, & Vollrath, 1997) and could provide new ways of working, promote discussions on how to improve teamwork, or optimize problem-solving in a higher array of subjects compared to homogenous teams. For example, if an organization starts a project that includes the conception, design, market prediction, production, distribution, marketing, and feedback of a new product, a team that has a diversity of functional backgrounds may be more prepared to face this project compared to a team that's composed by members that've worked only in the same department (e.g., marketing). This richness of information is often theorized as a 'wider pool of resources' for heterogeneous teams and has been associated to the effects of divergent thinking and paradigms on creativity and innovation research (e.g., De Dreu, 2002; De Dreu & West, 2001; Farh, Lee, & Farh, 2010).

As expected, the social categorization perspective views team diversity as a hinderer for team functioning, and the information/decision-making perspective views it as a beneficial factor. Nevertheless, empirical findings for both perspectives have found inconsistent results to say the least (c.f., Williams & O'Reilly, 1998; van Knippenberg, De Dreu, & Homan, 2004; Joshi & Roh, 2009). In a way, team diversity has sometimes been positively related, negatively related, and non-related to team performance independently of the diverse attribute (e.g., profession) or classification studied (e.g., job-related attribute). Although some authors have a tendency to orient or confirm a negative effect of socio-demographic diversity on team performance, the overall consensus is that diversity can't be studied independently of other mediating and moderating factors (van Knippenberg & Mell, 2016). Evidently, subgrouping and relational conflict, which concerns discussions and incompatibilities about topics unrelated to work like politics, sports or religion (personal and emotional issues, see Jehn, 1995), have been confirmed as disruptors of team functioning (e.g., Martins, Schilpzand, Kirkman, Ivanaj, & Ivanaj, 2013),

however, a direct path between team diversity *per se* and these factors has not been found consistently.

1.2.3. The categorization-elaboration model

As a way of dealing with these results and providing a more integrative perspective on team diversity, van Knippenberg, De Dreu, and Homan (2004) proposed the categorization-elaboration model (CEM). The CEM acknowledges both the social categorization and the information/decision-making perspectives and claims that diversity may have an effect on a team's functioning depending on other factors; the authors based their ideas on the IPO model of team effectiveness. In synthesis, factors like the elaboration of task-relevant information (ETRI) are seen as the primary processes that explains the effects of diversity. ETRI is defined as the active “exchange, processing, and integration of diverse information and perspectives” among the members of a team (van Knippenberg & Schippers, 2007, p. 527). Several studies have concluded that ETRI mediates the relationship between team diversity and team outcomes like team performance (Homan, et al., 2008) and creativity (Hoever, van Knippenberg, van Ginkel, & Barkema, 2012). The central idea of the CEM is to search for the mediators and moderators that can interact with team diversity to affect team outcomes³; this has influenced several studies delineating both the positive and the negative effects of team diversity (c.f., van Knippenberg & Mell, 2016).

Other factors that have been the focus of research on team diversity through the CEM lens have been, for example, need for cognition. This variable refers to the individual intrinsic motivation to enjoy cognitive efforts and thus, people high in need for cognition seek information in diverse domains and they're often tolerant towards ambiguity and open to new experiences

³ The search for mediating factors was mainly proposed by van Knippenberg & Schippers (2007).

(Cacioppo, Petty, Feinstein, & Jarvis, 1996; Kearney, Gebert, & Voelpel, 2009; Petty, Brinol, Loersch, & McCaslin, 2009). Kearney, Gebert, and Voelpel (2009) found that age and educational diversity were positively related to team performance through ETRI, and that need for cognition moderated the diversity-ETRI relationship in such a way that, at high levels of need for cognition, the relationship was positive and significant. Moreover, Nederveen Pieterse, van Knippenberg, and van Ginkel (2011) found a relationship between goal orientation diversity, which refers to the diversity of preferred goals in achievement situations, and team performance moderated by team reflexivity. Team reflexivity refers to the “extent to which group members overtly reflect upon the group's objectives, strategies and processes, and adapt them to current or anticipated endogenous or environmental circumstances” (West, 1996, p. 559). This team process has often been related to team performance, innovation, and satisfaction, among others (e.g., Carter & West, 1998; De Dreu, 2002; Schippers, West, & Dawson, 2015; van Ginkel, Tindale, & van Knippenberg, 2009). Moreover, Nederveen Pieterse and colleagues (2011) concluded that goal orientation diversity has a negative effect on team performance through information elaboration and that team reflexivity counteracted this effect.

Other studies influenced by the CEM have confirmed that ETRI, rather than information exchange, is the key process for the positive effects of team diversity, and that the link between diversity, social categorization processes, and intergroup bias is determined by any factor that affects categorization salience (c.f., van Knippenberg, De Dreu, & Homan, 2004; van Knippenberg & Mell, 2016). This is because the mere exchange of information is not sufficient to boost performance and innovation; team members also must integrate and use this information to benefit from team diversity (c.f., Hoever, van Knippenberg, van Ginkel, & Barkema, 2012; van Ginkel & van Knippenberg, 2008). Additionally, categorization salience derives from cognitive accessibility (facility to perceive differences), normative fit (the categorization makes sense), and

comparative fit (the categorization makes similarities and differences more pronounced) which gives researchers a sort of map to trace the probability that diversity negatively affects a team (van Knippenberg, de Dreu, & Homan, 2004). Among the factors that may affect categorization salience, research has a particular interest on ETRI. However, contextual factors like shared perceptions among team members have the potential to moderate the relationship between diversity and team outcomes. For example, Van Der Vegt and Bunderson (2005) found that collective team identification moderated the relationship between expertise diversity and team performance in such a way that, at low levels of collective team identification, expertise diversity had a negative effect on team performance, and at high levels the effect was positive. Additionally, other variables that have been identified as shared perceptions that moderate the team diversity – outcomes relationship have been: team-oriented HR practices, transformational leadership behaviors, team openmindedness norms, openness to experience, demographic social context, shared objectives, team behavioral integration, innovation climate, and threat, among others (Bezrukova, Jehn, Zanutto, & Thatcher, 2009; Chi, Huang, & Lin, 2009; Homan, et al., 2008; Hüttermann & Boerner, 2011; Jackson & Joshi, 2004; Kearney & Gebert, 2009; Mitchell & Boyle, 2015; Spoelma & Ellis, 2017; Tekleab, Karaca, Quigley, & Tsang, 2016; Valls, González-Romá, & Tomás, 2016).

Although research has covered multiple contextual variables having a role on the effect of diversity on team outcomes (c.f., Joshi & Roh, 2009; van Knippenberg & Mell, 2016), there are still many other factors to identify. For example, King and Bryant (2016) have recently proposed an integrative instrument concerning age discrimination in organizations: the Workplace Intergenerational Climate Scale (WICS)⁴. By reviewing the literature on age discrimination, the

⁴ We consider generations as age groups and we interpret their possible effects through a team diversity perspective in terms of, for example, age differences, stereotypes, and social categorization processes.

authors integrated five sub-scales. First, lack of generational stereotypes indicating less age discrimination in the workplace concerns the cognitive component of attitudes towards different age groups. Second, positive intergenerational affect relates to the feeling of interacting with people of different age groups. Third, intergenerational contact assesses behaviors, mostly cooperative, between employees of different age groups. Fourth, a workplace generational inclusiveness refers to a perception of respect and a healthy climate for employees of all ages reflecting a common shared identity for all employees. Finally, the fifth subscale, workplace intergenerational retention, refers to perceived feelings of pressure to resign due to one's age from employees of other age groups. Certainly, a team where employees perceive age discrimination via cognitive, affective, and behavioral indicators, as well as a lack of inclusion of employees regardless of their age, will not benefit from their diversity and will probably have to deal with intragroup conflict and subgrouping; however, to our knowledge, no studies addressing the WICS and team diversity have been developed before. Following this review, we continue our exploration of team research by addressing the literature on team innovation, its definition, particularities, and antecedents.

1.3. Team innovation

Every day we are surrounded by products and services that are or were considered innovations. These human advancements shape how we live, interact with others, and how we work, so it's not strange to find people trying to innovate or be committed to motivate others to do so. However, there can be some misconceptions; for example, innovation is not only the act of having new ideas, these ideas need to be relevant, communicated, and implemented to be really considered innovative. In the current section, by exploring organizational research, we'll define,

discuss, and address creativity and innovation in teams to more accurately study our outcome of interest.

Innovation is defined as an intentional process composed by the generation and the implementation of creative ideas into the workplace (Anderson, Potočnik, & Zhou, 2014). Any innovation should benefit society in some way, and thus, these ideas must be useful and new, and translate into real products, processes, and procedures embedded into a role, team, or organization (West & Farr, 1990). Although less studied, idea promotion is the second phase of the innovation process which refers to the diffusion or communication of the new idea (Kanter, 1988a). Moreover, the idea generation phase corresponds to what is often called creativity; this means that creativity only consists on generating new ideas, whereas innovation adds the active implementation of these ideas into the workplace (Anderson, Potočnik, & Zhou, 2014). Nevertheless, some studies show that there's still some confusion on their differences – creativity can even be assessed as a personality trait or as the act of being creative –, therefore, it's crucial to define and clarify the object of study related to innovation (c.f., Battistelli, 2014). Within these lines, research on innovation in organizations has gone a long way and is now dealing with new technologies, the influence of HR systems, and virtual team environments (e.g., Andersson, Dasí, Mudambi, & Pedersen, 2016; Batarseh, Usher, & Daspit, 2017b; Fay, Shipton, West, & Patterson, 2014).

Additionally, we can also study innovation as a work behavior. Innovative work behavior refers to three behaviors parallel to the three phases of the innovation process: idea generation, promotion, and implementation (Scott & Bruce, 1994). Researchers have often studied these factors within team environments and, according to van Knippenberg (2017), team innovation has taken a particularly crucial role in organizational research as a team-level outcome. This is because teams integrate a high amount of resources which could make them be more effective

and because organizations are relying more and more on them (Ancona & Caldwell, 1992; Hackman, 1990; Ilgen, Hollenbeck, Johnson, & Jundt, 2005). Additionally, team innovation can be both the purpose of the team (e.g., product development teams) and a secondary desired outcome (e.g., management teams); however, innovations can arise at any environment and for any purpose like, for example, to optimize a marketing procedure, create a new work position, or address ecological issues through new technologies. Sometimes, these innovations can even come from teams motivated by HR initiatives intending to drive change and produce a competitive advantage for the organization (e.g., Donate & Guadamillas, 2011; Jimenez-Jimenez & Sanz-Valle, 2008).

In their meta-analysis of 104 independent studies, Hülshager, Anderson, and Salgado (2009) identified a list of team-level antecedents of team innovation; these variables were team size (small and positive), job-related diversity (small and positive), goal-interdependence (small and positive), vision (strong and positive), external communication (strong and positive), support for innovation (strong and positive), task orientation (strong and positive), internal communication (medium and positive), and cohesion (medium and positive). Moreover, other antecedents have been identified, among them: team climate for innovation (which includes a shared vision, Anderson & West, 1998), leadership clarity (West, et al., 2003), transformational leadership (Eisenbeiß & Boerner, 2010), servant leadership through leader identification (Yoshida, Sendjaya, Hirst, & Cooper, 2014), transactive memory system (Peltokorpi & Hasu, 2011), perceived value congruence through team identification (Mitchell, Parker, Giles, Joyce, & Chiang, 2012), team learning goal orientation (Hirst, van Knippenberg, & Zhou, 2009), team reflexivity (Schippers, West, & Dawson, 2015), promotive team voice (Li, Liao, Tangirala, & Firth, 2017), connective thinking through cooperative learning (Post, 2012), team members' positive mood through team-directed learning behavior (Walter & van der Vegt, 2013), minority

dissent at high levels of participation in decision-making (De Dreu & West, 2001), team promotion focus through team perspective taking (Li, Li, & Lin, 2018), and team emotional energy (Leicht-Deobald & Lam, 2016).

Among these antecedents, team climate for innovation has been one of the most studied factors capable of promoting innovative behavior. Team climate refers to the shared perceptions within a team of common elements based on member interaction and group proximity (Anderson & West, 1998). Anderson and West (1994, 1996, 1998) proposed a multidimensional inventory of team climate factors that promote innovation (based on West, 1990). Their inventory is composed by five subscales: vision, or sharing and focusing on clear and attainable objectives; participative safety, or the existence of a psychologically safety climate with high amounts of participation; task orientation, or a focus on excellence through high standards of performance; support for innovation, as the assistance to attempt the development and application of ideas; and interaction frequency, which was originally part of participative safety as an element of participation. Finally, interaction frequency was left apart by the use of a shortened version consisting of the original four-factor theory variables: vision, participative safety, task orientation, and support for innovation (Kivimäki & Elovainio, 1999).

On the other hand, antecedents at the organizational-level have been, however, understudied compared to team-level factors. We could identify perceived organizational support through shared objectives (Lyubovnikova, West, Dawson, & West, 2018), organizational support for innovation and empowering climate (Nsenduluku & Shee, 2009), low power distance orientation and collectivism through explorative and exploitative behaviors (Rodriguez & Hechanova, 2014), organizational support and reward system as a moderator between knowledge integration and team innovative performance (Jin & Zhong, 2014), performance pressure as a moderator between inclusive leadership and team innovation (Ye, Wang, & Guo, 2016), and

collaborative culture – but only as a predictor of team creativity (Barczak, Lassk, & Mulki, 2010); these factors are often analyzed via shared team perceptions and the way they affect how members interact, participate, process, and collectively work towards innovating; however, more studies are needed on the role of the organizational context on team innovation (van Knippenberg, 2017).

Next, as expected, team diversity has often been related to innovation due to its potential to provide informational resources and facilitate discussions on perspectives and methods (van Knippenberg & Schippers, 2007). Nevertheless, as with the case for team effectiveness, research concludes similar findings: moderating factors should be the focus of research for identifying and exploring the relationship between team diversity and innovation (van Knippenberg, 2017). Some studies acknowledging this idea have found that, for example, that information exchange, learning, motivation, and negotiation are team processes that mediate the relationship between functional background diversity and team innovation (Drach-Zahavy & Somech, 2001). This is not surprising when following an IPO model of team effectiveness where processes translate resources, or diversity in terms of available information, into outcomes. Within these lines, Miron-Spektor, Erez, and Naveh (2011) found that heterogeneous teams composed by creative and conformist members, which defined member trait diversity, were more innovative than more homogeneous teams. Through the lens of the CEM model (van Knippenberg, De Dreu, & Homan, 2004), we identify various mediators and moderators in recent years (after 2014) concerning the relationship between diversity and team innovation; among them: perceived diversity effects partially mediated by individual learning (Sun & Teh, 2017), functional diversity effects mediated by knowledge sharing and moderated by team affect-based trust (Cheung, Gong, Wang, Zhou, & Shi, 2016), professional diversity effects moderated by openmindedness norms

(Mitchell & Boyle, 2015), educational-background diversity effects mediated by team learning and moderated by knowledge integration capability (Luan & Xie, 2014), and functional-diversity effects moderated by collaboration capability in virtual teams (Batarseh, Usher, & Daspit, 2017a).

Furthermore, although little research addresses it, team innovation can also be the cause of other factors. Through our review, we could only identify a positive relationship with team productivity (Li, Liao, Tangirala, & Firth, 2017), a reciprocal relationship with shared vision (Pearce & Ensley, 2004), and a lack of a relationship with team conflict (O'Neill & McLarnon, 2017). The justification for this last study is that team innovations have been argued to be related to conflict as it may add additional tasks to deal with, as well as more ambiguity and uncertainty, leading to dissent (Anderson 2004; González-Romá, 2008; Janssen, van de Vliert, & West, 2004). Still, as other authors have pointed out, more research is needed concerning the consequences of innovation (González-Romá, 2008; Shalley, Zhou & Oldham, 2004; Totterdell, Leach, Birdi, Clegg, & Wall, 2002).

With these elements at our disposal, we conclude this section by defining the objectives of the current dissertation in order to advance research on teams, diversity, and innovation.

1.4. Objectives of the dissertation

We adopt a quantitative analysis through a correlational approach to propose and test different models addressing factors that relate to team diversity and innovation. First, as we are concerned with the effect of team diversity we decide to test its direct relationship with team creativity. Our analysis of diversity as a predictor variable through the CEM lens leads us to study this relationship along with the moderation of workplace generational inclusiveness from the WICS (King & Bryant, 2016). This study advances research on the CEM by identifying a

new factor that influences the effects of team diversity on team outcomes. Along these lines, and with the purpose of identifying the elements that affect innovation in teams, we follow the idea that diversity could adopt a moderating role. To test this, we analyzed the relationship between transactive memory system and team innovation in military teams, with military grade diversity as a contextual factor. This particularly understudied way of analyzing diversity as a moderator has its upsides, as often, diversity may not directly affect certain mechanisms but be an assistant or detractor of how particular processes and states relate to team outcomes.

For our last study, we propose a moderated-mediation model which concerns the relationship between shared perceptions of organizational values and team innovation. As research has mainly centered on the team-level antecedents of team innovation, we test the idea that team shared perceptions of what is valued by their organization may be related to idea generation and implementation behaviors. This model proposes ETRI as a mediator due to its particular link with team diversity mechanisms seen in the literature. Additionally, we test the moderating role of age diversity for the relationship between ETRI and team innovation arguing its possible effects in consonance with an information processing and knowledge integration perspectives. Particular hypotheses, insights, and research results of these studies are discussed in the following chapters. To finalize this dissertation we offer an analysis of future research openings and other interesting factors related to our work within this domain.

Chapter 2 – Article 1

Age diversity and team creativity: Analyzing the role of perceived workplace inclusiveness in an Italian postal organization

Abstract

In the present study we identify the effect of member age diversity on the generation of new and useful ideas in teams. Following research on team composition and age discrimination climate we propose a moderation model where age diversity is positively related to team creativity and that this relationship is stronger at high levels of workplace generational inclusiveness (WGI). We tested these hypotheses by evaluating 168 team leaders from an Italian postal organization controlling for information elaboration and empowering leader behavior. As a result, we identified a positive effect of age diversity on team creativity and confirmed that at higher levels of WGI this relationship is stronger. In light of past studies on team composition, we discuss these findings, their implications, and propose new directions for future research.

Keywords: Team diversity, team creativity, workplace inclusiveness, team composition

2.1. Introduction

Due to the day to day advancements in technology, and the ever changing environment of global markets, the postal industry is in need for creative solutions. Not only people and institutions are shifting from traditional mail to emails but also the internet is being more and more used for commercial purposes (c.f., Crew & Kleindorfer, 2011). Additionally, these changes arrive with an older and more age diverse workforce (Eurostat, 2013; Toossi, 2012) leaving postal organizations with a challenging duty of dealing with team diversity, age

differences, and work discrimination. Moreover, there's a lack of studies on the relationship between age and creativity at work (c.f., Rietzschel & Zacher, 2015). Our study centers on the diversity of team members in regard to their age and the effect that this may have on team creativity. Additionally, we go in line with recent studies on team diversity and we also analyze the role of WGI (King & Bryant, 2016); as the literature now centers on the moderating factors of the relationship between diversity and team outcomes we expect that WGI will interact within these relationships (Guillaume, Dawson, Otaya-Ebede, Woods, & West, 2017; van Knippenberg & Mell, 2016). Furthermore, we consider age diversity as a valuable resource due to the experience differentiation of team members belonging to different age groups. We posit the idea that these age differences will provide a variety of intellectual and technical resources, arguing that diversity will have a positive relationship with team creativity, especially in a climate of inclusion.

Following these statements, we propose and test a moderation model where we predict that age diversity will be positively related to team creativity, and that the effect will be stronger at higher levels of perceived WGI. We argue that the inclusion of employees of all ages into the workplace is traduced into fewer problems related to member differences within teams and a higher chance that age diversity will improve team creativity. By testing these ideas, we extend the literature on team diversity by further identifying its possible contingent effects on creativity, as well as supporting research on the categorization-elaboration model of diversity (van Knippenberg, De Dreu, & Homan, 2004). Moreover, the present study also uses and identifies WGI as a moderating factor recently proposed by King and Bryant (2016) in their Workplace Intergenerational Climate Scale (WICS). To our knowledge, the use of the sub-scales of the WICS has not been tested before as moderators for diversity and, therefore, we effectively

integrate elements of intergenerational studies and age-inclusive climate effects into the team diversity literature.

2.2. Theoretical background and hypotheses

Team diversity refers to the “variation among team members on any attribute on which individuals may differ, such as demographic background, functional or educational background, and personality” (van Knippenberg & Mell, 2016, p. 136); from these, the most studied characteristics are gender, race, age, tenure, and profession (c.f., van Dijk, van Engen, & van Knippenberg, 2012). Since its beginning, the literature on team diversity has tried to establish a relationship between diversity and team outcomes. We follow today a line of thinking that states how the effects of diversity are contingent, and thus, research is now centered on the moderating factors that may explain the diversity-performance relationship (c.f., Guillaume, Dawson, Olaya-Ebede, Woods, & West, 2017; van Knippenberg & Mell, 2016).

Member age differences have been studied thoroughly on the team diversity literature. However, as well as with the effects of other diversity attributes like gender and ethnicity, age differences have shown inconsistent effects on performance. For example, Kearney and Gebert (2009) found no relationship with team performance at high levels of transformation leadership, Leonard, Levine, and Joshi (2004) found a negative relationship in store-sales, and Wegge, Roth, Neubach, Schmidt, and Kanfer (2008) found a positive relationship at high levels of task complexity. This indicates that, as other researchers on team diversity have predicted (e.g., van Knippenberg, De Dreu, & Homan, 2004), effects of age diversity are dependent on other factors. In line with this, Ries and colleagues’ (2013) longitudinal studies on the German workforce found that establishing a positive team climate and reducing age diversity salience, or the extent to which team members focus on age differences, are one of the key aspects that could boost

team effectiveness in age diverse teams. Likewise, concerning creativity and innovation, empirical findings have found no direct relationship (e.g., Bell, Villado, Lukasik, Belau, & Briggs, 2011) or no effect on variables like ETRI (Kearney, Gebert, & Voelpel, 2009) which have been related to creativity. It's necessary to point out that we assimilate studies on team creativity with those of innovation and vice versa, as we consider team creativity to be the first phase of the innovation process, where teams generate new and useful ideas without necessarily implementing them into the workplace, which refers to the second phase (c.f., Anderson, Potočnik, & Zhou, 2014); it's important to note that team creativity requires less collective effort to be produced compared to idea implementation as it's easier to generate and communicate a new idea than to introduce one within a work environment. This last assumption goes in line with an information processing perspective centered on innovation, as implementing a novel idea requires overcoming barriers like resource allocation processes, organizational politics, and even resistance to change (c.f., De Dreu, Nijstad, Bechtold, & Baas, 2011).

We consider that age diversity will promote more idea generation in teams as different age groups will provide technical and knowledge-based resources to use for creating new ideas. Moreover, additional and diverse information may also translate into team task discussions and dissent, making more likely the development of novel segments or procedures within the work environment. We argue that these circumstances may be due to the connection between age and in-the-job experience, and by how members of different age groups may possess different working methods, knowledge, and competence levels, which may provide a wide range of perspectives within the team. Additionally, age diverse team members may even be more satisfied, feel committed, and experience less emotional conflict than homogeneous teams; factors related to creativity and innovation (e.g., Mohd, 2010; Spanjol, Tam, & Tam, 2015; Yong, Sauer, & Mannix, 2014). For example, Jehn, Northcraft, and Neal (1999) have found that age

diversity may increase satisfaction and group commitment. This may be due to a ‘greater morale’ felt by the team members after being able to work successfully by overcoming dissimilarity challenges. On the same line, Pelled, Eisenhardt, and Xin (1999) found that age diversity reduces conflict; the authors argue that, as age is a career-related attribute, team members of similar ages will perform social comparison, which produces jealous rivalry and then emotional conflict, especially in cases when members try to become the next team leader. We propose that these different mindsets, better member attitudes, and less emotional conflict caused by age diversity, will promote and enable the exchange and discussion of task elements ultimately leading to team creativity. Authors have often argued and confirmed this notion that dissent, as well as information sharing, increases team idea generation (e.g., De Dreu & West, 2001; Madrid, Totterdell, Niven, & Barros, 2016). Based on these factors, we expect members of age diverse teams to provide more new ideas than more homogeneous teams.

Hypothesis 1. Age diversity will be positively related to team creativity.

Furthermore, our interest also resides on how perceived workplace generational inclusiveness (WGI) interacts with age diversity to enhance idea generation in teams. WGI refers to a shared within-group identity that describes a positive intergenerational climate (King & Bryant, 2016). As a way of identifying age discrimination perceptions, King and Bryant (2016) developed a scale that takes into account several intergenerational climate factors, the WICS. Being one of those factors, WGI asks if employees of all ages are respected, if there’s a healthy climate among them, and if communication is possible despite the age differences. The WGI represents the level of shared identity of the sample by referring to an age inclusive climate. In these lines, we expect that a higher level of WGI will be a contextual facilitator of discussions

and information sharing between members ultimately increasing the relationship between age diversity and team creativity; this, as we argue, is due to several reasons.

First, an inclusive climate means more communication between individuals of different age groups. This group process is vital for information to be exchanged and discussed as well as its use for developing creative solutions (c.f., Hülshager, Anderson, & Salgado, 2009). Second, an inclusive climate will promote less tension and help to avoid potential conflicts. This is a consequence of sharing the same identity within a team, which has been found to reduce the probability of out-group bias as fewer differences are perceived by the members of diverse teams (Gaertner & Dovidio, 2000). In addition to this, as differences become less salient team members will look at colleagues as collaborators and not rivals which counters subgroup formation (Brown & Turner, 1981) and, therefore, reduces potential conflicts that could hinder information sharing and team creativity. Third, a sense of respect for employees of all ages may be a good indicator of employee participation within age diverse teams. In a similar fashion as with team psychological safety, when employees are and feel respected they will be less concerned about speaking up (Edmondson, 1999); due to a psychological safety climate, team members could bring up errors without being concerned about showing incompetence and, thus, they will not rest silent. Moreover, a sense of respect in an inclusive climate may open employees to hear different contributions and even promote unthreatening discussions about this new information. Along these lines, research on a climate of respect has found, for example, a positive relationship with employee participation in decision-making (Fuller, et al., 2006); however, studies on respect as a construct are still scarce (c.f., Rogers & Ashforth, 2017). Finally, we expect that employees of different age groups will feel safe to share their perspective, opinions, and ideas, even if they differ from those of other younger or older colleagues, increasing the positive relationship between age diversity and team creativity.

Hypothesis 2. Perceived WGI will moderate the relationship between age diversity and team creativity in such a way that at higher levels of WGI the effect will be stronger.

2.3. Method

2.3.1. Data and sample

We evaluated Italy's postal organization for carrying out this correlational research study. Our sample comprised 207 team leaders known as middle managers. After conforming the sample for teams of 2 to 40 employees we analyzed 168 team leader responses, where 64.9% were male, the mean team leader age was 47.55 (SD = 7.01, min = 33, max = 62), and the mean team size was 14.47 (SD = 8.77).

2.3.2. Procedure

This study takes place within a PostEurope and Erasmus + European project⁵ that aims to develop a training prototype for multigenerational teams in the postal office sector. One of the main topics of this project is to enhance teamwork and boost innovative behavior in teams composed by members of different age groups. A questionnaire was developed and evaluated by representatives of Italy's postal organization and later translated into Italian through a back-translation procedure. Each team leader responded to the questionnaire via a link where the measures were presented from February to July of 2017. By using all the team leader responses available (Nmax = 207) scales were validated through a confirmatory factor analysis (CFA) and by calculating their Cronbach's alpha.

⁵ INNOV'AGE Erasmus + project, 2016-2019, EU Code 2016-1-FR01-KA202-023924 – Beneficiaries: La Poste, Université de Bordeaux, Association des Opérateurs Postaux Publics Europeens (PostEurop), Bulgarski Poshtibp, Compania Nationala Posta Romana, Poste Italiane, Hellenic Post S.A. – ELTA, KEK-ELTA, The Vocational Training Center of Hellenic Post, Department of Postal Services – Cypryus, and INOSALUS.

2.3.3. Measures

2.3.3.1. Age diversity

Diversity can be studied through different ways; we decided to analyze age diversity as an objective variable that indicates variety (Harrison & Klein, 2007). As we know, how we operationalize diversity captures different things which may have their own way of interacting with teamwork and team outcomes (Bell, Brown, Colaneri, & Outland, 2018). This type of diversity encompasses categorical differences between team members, for example at the highest level of variety every member will correspond to a single age group, and at the lowest level all members will share the same (e.g., all members are 39 years' old or younger). Moreover, analyzing diversity as variety aligns with our model as it's more related to arguments on information and idea sharing that imply the benefit of a variety of resources rather than a separation (two conflicting groups of members) or a disparity of values (one distinctive member). In line with this, we calculate Blau's index of heterogeneity (1977) which goes from 0 to 1, which means that the higher the value the more members will belong to different age groups. The index's computational formula is: $1 - \sum p^2$, being p the proportion of team members in one age group. For measuring diversity we asked each team leader to indicate the age group (at 5 year intervals) of each of the team members he or she manages. In total, team leaders managed 2429 employees where the majority (40.18%) was between 50 to 59 years' old. Based on this, and by dividing the young, middle aged and senior employees, we proposed the following three categories which were used to calculate Blau's index: 20 to 39 years' old, 40 to 59 years' old, and more than 60 years' old.

2.3.3.2. Team creativity

We evaluated the generation of new ideas with a 3-item scale going from 1 (never) to 5 (always) adapted from Janssen's (2000) scale to refer to the team. The idea generation phase is thought to concern creativity and, therefore, creativity is considered as a part of the innovation process (Anderson, Potočnik, & Zhou, 2014). Next, a sample item for the scale is: "The team that I lead creates new ideas for difficult issues".

2.3.3.3. Perceived WGI

We used King and Bryant's (2016) WGI subscale with 4 items going from 1 (strongly disagree) to 5 (strongly agree). Item 1 ("I believe that my work environment is a healthy one for people of all ages") was not included in the questionnaire due to organizational and HR concerns. A sample item is "workers of all ages are respected in my workplace".

2.3.3.4. Control variables

In addition, we integrate previous research on team diversity and leadership styles by adding two control variables: ETRI and empowering leadership (EMP). The analysis of these control factors will be based on previous research results and arguments of their effect on our model (c.f., Spector & Brannick, 2011). As the first factor, ETRI has been used theoretically and empirically to explain the contingent effects of team diversity on team outcomes. Originally proposed by van Knippenberg, De Dreu, and Homan (2004), ETRI occurs when team members actively create, discuss, and integrate information about the task at hand. Moreover, ETRI adds a sense of attaining better results by the collective effort rather than individually, which is evidenced by the scale item: "as a team, we generate ideas and solutions that are much better than those we could develop as individuals" (Kearney, Gerbert, & Voelpel, 2009, p.587). Empirical findings evidenced that team diversity is related to ETRI (e.g., Kearney, Gerbert, & Voelpel,

2009), and that its presence positively affects team creativity (Hoever, van Knippenberg, van Ginkel, & Barkema, 2012). The ETRI scale comprises 4 items and was developed by Kearney, Gebert, and Voelpel (2009), a sample item is “the members of this team carefully consider the unique information provided by each individual team member”.

The second control factor, EMP, refers to leader behaviors that are related to encouraging followers to participate in decision-making, offering them authority and responsibilities, keeping them informed about organizational elements, and showing concern for their wellbeing (c.f., Arnold, Arad, Rhoades, & Drasgow, 2000). We decided to control for the effects of EMP as it has been found to be positively related to team creativity (e.g., Hon & Chan, 2013; Zhang, Chen, & Kwan, 2010). In addition, we contemplate that empowering behaviors may be also beneficial to age diverse teams and perceived age inclusiveness due to several reasons. More participation in decision making will not only make possible to profit from the available information due to diversity, but also hinder feelings of exclusion, preferential treatment, and uselessness in team members. Employees of all ages will feel useful when participating in team or company decisions and, additionally, this may address concerns by older employees related to age stereotypes and their sense of worth (c.f., Armstrong-Stassen & Lee, 2009). Next, providing higher autonomy and responsibilities to employees will not also help to reduce these concerns, but also potentially challenge team members in their everyday work, promoting collaborative behaviors and information sharing which are crucial for team creativity (e.g., Li, Lin, Tien, & Chen, 2017; Paulus & Nijstad, 2010). Finally, if the team leader communicates to their followers about age-inclusive policies, decisions, or initiatives they will be informed about their company’s values and may perceive a better climate of inclusion. In accordance with these arguments we expect

empowering leadership to have an impact on our model so we added 18 items of the Empowering leadership questionnaire (Arnold, Arad, Rhoades, & Drasgow, 2000).

2.4. Results

Descriptive statistics and the correlation matrix are shown in Table 5. Mplus version 7.4 was used for the CFA (Muthén & Muthén, 2015) which showed the following results: Team creativity's model fit was saturated and satisfactory at one factor χ^2 (.00, N = 201), df = 0, confirmatory fit index (CFI) = 1.00, root-mean-square error of approximation (RMSEA) = .00; WGI's model fit was also saturated and satisfactory at one factor χ^2 (.00, N = 207), df = 0, CFI = 1.00, RMSEA = .00; concerning our control variables, ETRI's model fit was satisfactory at one factor at χ^2 (.11, N = 201), df = 2, CFI = 1.00, RMSEA = .00, and EMP model fit was also satisfactory at a second order factor at χ^2 (238.88, N = 201), df = 131, CFI = .92, RMSEA = .06. Moreover, PROCESS for SPSS with a 10.000 bootstrap to test our model hypotheses (Hayes, 2013). Preliminary results show a positive although weak correlation between age diversity and team creativity; additionally, we identify a positive correlation between our control variables and team creativity, and a high statistical mean for WGI.

Table 5.

Means, standard deviations, and inter-correlations AI

Variables	M	SD	1	2	3	4	5
1 Age diversity	.38	.166	-				
2 WGI	3.85	.60	-.03	(.74)			
3 Team creativity	3.05	.72	.16*	.16*	(.84)		
4 ETRI	3.71	.51	-.09	.28**	.43**	(.74)	
5 EMP	4.35	.41	.07	.18*	.43**	.34**	(.92)

Notes: Cronbach's alphas are shown in the intersections. N = 201-207; M = Mean, SD = Standard deviation. * $p < .05$ (two-tailed); ** $p < .01$ (two-tailed).

2.4.1. Hypothesis testing

The regression results are shown in Table 6 which confirm our model hypotheses. We identified a significant model at $F(5, 162) = 15.55, p < .001, R^2 = .32$, where our first hypothesis was validated as age diversity was positively related to team creativity at $B = .72, SE = .28, p < .05$. This result indicates that, for our sample, age diverse teams evidenced more idea generation behaviors than more homogeneous teams.

Table 6.

Regression Analysis Results A1

Variables	B	SE
Intercept	-1.04	.55
Age diversity	.72*	.28
WGI	.01	.08
Age diversity x WGI	1.04*	.50
ETRI	.48**	.10
EMP	.53**	.12

Note: $N = 168$ teams.

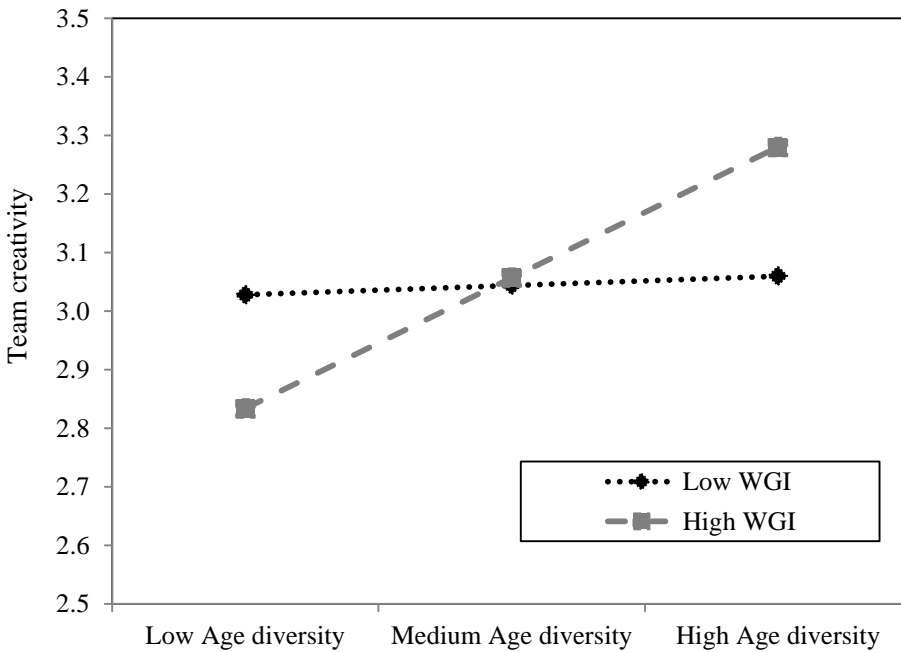
* $p < .05$; ** $p < .01$.

Furthermore, regarding our second hypothesis on the role of WGI, results indicate that WGI moderates the relationship between age diversity and team creativity (see Figure 1). The interaction effect was significant at $B = 1.04, SE = .50, p < .05$, where the R^2 increased by .02 $F(1, 162) = 4.32, p < .05$. The conditional effects at levels of the moderator show that at low levels the effect of age diversity on team creativity is non-significant at $-.60 (SE = .43, p = .82)$, at medium levels the effect is significant at $.72 (SE = .28, p = .01)$, and at higher levels the effect is stronger at $1.34 (SE = .40, p = .00)$. This shows the benefits of perceiving a healthy climate of inclusion for employees of all ages. In a brief manner, WGI could help team members benefit from their teams' age diversity and collectively be more creative. On the contrast, this possible

utilization of age diverse resources for team creativity is not identified when low levels of WGI are perceived.

Figure 1.

Moderating effect of WGI for the age diversity – creativity relationship



Concerning our control variables, the results identify the effects of ETRI and empowering leadership. Both ETRI and empowering leadership were related to team creativity at $B = .48$, $SE = .10$, $p < .00$, and $B = .53$, $SE = .12$, $p < .00$, respectively. This confirms the importance of actively discussing information in teams and the value of the team leader to empower members for team creativity.

2.5. Discussion

The present study has found a positive relationship between age diversity and team creativity in a postal organization. This contradicts other research on age diversity which found no relationship with creativity or innovation (e.g. Bell, Villado, Lukasik, Belau, & Briggs, 2011);

however, our study evaluated teams of a postal organization concerned by innovation due to recent needs in the postal industry. Moreover, the organization is well aware of the age diverse teams that they manage as they're involved in a European project concerning the training and improvement of intergenerational teams. As we know, there's evidence that there're many cases of negative stereotypes towards older employees (North & Fiske, 2015), but this was not the case for our sample maybe due to the age mean for team leaders (47 years' old) and the median for managed team members (50 to 59 years' old). We hypothesize that these contextual aspects may have had an important role for our sample in determining the positive effect of team diversity on creativity. Again, this may be caused not only by the positive value that the organization accorded to generational differences and innovation but also by preceding initiatives on age discrimination awareness. This is supported by works arguing that age effects are, in grand part, socially generated (Lawrence, 1988) which is then a question of norms and expectations about age based on context (c.f., Joshi & Neely, 2018). Furthermore, team diversity effects may be negative when team functioning is disrupted due to social categorization processes, if not, heterogeneous teams may outperform more homogenous teams due to the wider pool of resources aimed at accomplishing the task and innovating (e.g., De Dreu & West, 2001; van Knippenberg, De Dreu, & Homan, 2004).

Additionally, we studied the effects of age diversity by identifying WGI as a moderator and by controlling for a key team process (ETRI) and a leadership style (EMP). We identified that the relationship between age diversity and team creativity is stronger when high levels of workplace inclusiveness are perceived. This means that an inclusive work environment, characterized by people of all ages being respected, and where there's a perception that co-working with employees of different ages improves the quality of work life, will enhance the effect of age diversity on team creativity. Indeed, valuing team member dissimilarities has been

related to positive outcomes like helping behaviors and performance (e.g., Oosterhof, Van der Vegt, Van de Vliert, & Sanders, 2009; Homan, van Knippenberg, Van Kleef, & De Dreu, 2007). Concerning our control variables, the positive effect of ETRI on team creativity confirms the study of Hoever, van Knippenberg, van Ginkel, and Barkema (2012) where heterogeneous teams were more creative than homogeneous teams through ETRI. Finally, the positive effect of EMP on creativity also confirms previous studies which identified moderators for this effect such as task interdependence and task complexity (Hon & Chan, 2013; Zhang, Chen, & Kwan, 2010).

2.5.1. Theoretical implications

The present study looked into the relationship between age diversity and team creativity which, to our knowledge, had not been previously tested within the postal industry. Adding to this, we also studied age diversity in a manner of variety which regards age groups as different categories (Harrison & Klein, 2007). We consider that each of these age groups possesses different levels of experience but also, qualitatively, different methods and perspectives, as well as being a possible facilitator of member satisfaction and group commitment. Moreover, we've enlarged the literature on team diversity by adding a perceived organizational climate variable (WGI) as a moderator for the link between age diversity and team outcomes. Furthermore, this study explored the effects of ETRI and EMP on team creativity; this provides a further confirmation on the multiple factors that may facilitate creativity and innovation, as well as an interesting take on the Postal sector in need of new solutions and creative initiatives of age diverse teams.

2.5.2. Managerial implications

Based on our results, we propose organizations to address age discrimination through HR policies and practices (e.g., training and reverse mentoring) that could promote a healthy climate of inclusion. Valuing diversity should be a clear statement that could reduce age salience and negative stereotypes, as well as following and sharing the view that employees of all ages are valuable agents that should work together, ultimately facilitating team creativity. Lastly, we expect that these results also shade a light on the value of collective work, on team-level processes like the creation and exchange of task information, as well as the importance of empowering employees through team leader behaviors.

2.5.3. Limitations and directions for future research

This study is not without its limits. Although our sample size was considerable we could only evaluate the team leader's perception due to logistical and organizational barriers. Identifying the point of view of the team members on our factors of interest would have been a great addition to our study; this is especially true for the effects of the control variables as, due to their nature, they address between-member interactions (ETRI; c.f., van Knippenberg, De Dreu, & Homan, 2004) or can suffer from self-rated inflation (EMP; c.f., Fleenor, Smither, Atwater, Braddy, & Sturm, 2010). Moreover, although team creativity or idea generation was evaluated, team innovation could have been more beneficial as a dependent variable for analyzing the practical implications of these ideas. We have no evidence that a collective creativity, identified through the advice of the team leader, could have produced innovative solutions, new products, or practices within the workplace. Nevertheless, studying team creativity is sometimes even considered different from innovation and, through this study, we may uncover interesting aspects

on how dissimilarities produce collective new ideas. Next, our idea on the possible contextual effects to explain the positive relationship between age diversity and team creativity could not be addressed. Future studies could test a multi-level model where several organizations are compared evaluating their WGI and the effect that this could have on team creativity and innovative behavior. Furthermore, a longitudinal design to justify for causality is imperative; in the present article we based our results on correlational analyses that only identify relationships between several psychosocial factors. Finally, we also propose future works on this topic to explore the more recently addressed multi-level nature of diversity and its contingent effects (e.g., Bunderson & Van der Vegt, 2018), as well as the role of team emergent states and processes on this type of interactions (e.g., Joshi & Neely, 2018).

2.6. Additional analyses

During the analysis of the model presented within this chapter we decided to also evaluate team age diversity as separation and disparity (Harrison & Klein, 2007). This means that the models tested were the same except that team age variety was measured as separation or disparity. Although the different diversity types are not complementary they still refer to between-member differences, and thus, this analysis provides a more complete understanding of how diversity interacts within our model. As we know, age *variety* concerns categorical differences and thus, its maximum value will exist when all team members belong to different age groups; age separation and disparity focus on other aspects related to team member differences. On one hand, age *separation* concerns distance or the interval between teammates, and its maximum value will exist when half of the members of a team belong to an age group that's as far as possible to the others' half age group. This is a very common organizational issue when young employees need to interact and cooperate with older employees. This is said to clash

different perspectives and skills as well as easily provoke social categorization processes (e.g., Kunze, Boehm, & Bruch, 2013), which will arguably mean that separation may probably have a negative effect on team creativity (e.g., Wang, Rode, Shi, Luo, & Chen, 2013). On the other hand, age disparity concerns inequality, where an isolated team member is as different as possible from the other team members. Although age is more commonly studied as separation, disparity may also be interesting to analyze as, in its maximum value, it will implicate that a single member is an older employee compared to the rest (which will be very young), or vice versa. This may cause other psychosocial issues like tokenism and isolation affecting individual satisfaction and team functioning (probably through turnover, e.g., Leonard & Levine, 2006). For more information on diversity types see the subchapter on team diversity in Chapter 1. Age separation was measured through the mean age standard deviation and age disparity through its coefficient of variation as stipulated by Harrison and Klein (2007). Through these analyses using PROCESS model 1, we find that neither diversity types were directly related to team creativity nor interacted with WGI. Separation had an insignificant and non-valid effect on creativity at $B = .00$, $SE = .00$, $p = .88$, which was the same for disparity at $B = .00$, $SE = .01$, $p = .65$. The interaction effect of separation with WGI was $B = -.01$, $SE = .01$, $p = .29$, and that of disparity with WGI was $B = -.02$, $SE = .02$, $p = .26$. Detailed results will be attached to the annex of this dissertation.

2.7. Additional study 1

Workplace age discrimination: A study of factor invariance in two European countries

As we had at our disposal data from middle managers for both Italy's Postal Organization (Sample 1) and Bulgaria's Postal Organization (Sample 2) from the Innov'age Erasmus + project, we decided to carry out a second-order multi-group measurement invariance for the WICS. This test will help to uncover the psychometric properties of this recently developed scale as well as provide insight on its use in different contexts. In synthesis, a test of invariance has the purpose of determining if a scale measures a construct in the same way regardless of different conditions (like time of measurement or cultural backgrounds)⁶. We hypothesize that the WICS is understood equally across cultures and thus, we expect the results of this procedure to represent measurement invariance across both groups: Sample 1 (Italy) and Sample 2 (Bulgaria).

2.7.1. The age discrimination scale

The WICS concerns five dimensions that measure attitudes and perceptions about employees of different age groups in the workplace (King & Bryant, 2016). The first factor, Lack of Generational Stereotypes (LGS) concerns the cognitive component of intergenerational attitudes so it asks about stereotypes of employees outside of the respondents' generation. The second one, Positive Intergenerational Affect (PIA) measures how the respondent feels (affect) about interacting with employees outside their generation. So this subscale asks if the respondent feels comfortable with people from another generation conversing with him or her. The third one, Intergenerational Contact (IC), corresponds to the behavioral aspect of attitudes towards other generations. Items concerns actively discussing with people of other generations and the

⁶ Measurement invariance may also refer as measurement equivalence or factor invariance (for SEM models).

frequency of these conversations (by asking *how often*). Moreover, the fourth factor is WGI which was explained in Article 1 (Chapter 2), emphasizing cooperation between the respondent and employees outside of his or her generation as well as his or her perception that the work environment is healthy and respectful of people of all generations. Finally, the fifth factor is Workplace Intergenerational Retention (WIR) which deals with tensions regarding succession. This subscale asks respondents about their perception on the treatment that employees of other generations receive and how these employees treat the respondent (e.g., I feel pressure from older workers to step down; reverse coded). The WICS was related to workplace mentoring, job satisfaction, and opinions about older workers in the studies developed by King and Bryant (2016). Moreover, this scale is said to allow for a more precise and integral multidimensional view of ageism (age discrimination), however a precision needs to be made. The scale centers on a generational differences perspective and not on an age group diversity perspective. The WICS doesn't necessarily reflect age factors but relies on the idea that individual attitude differences are based on socio-historical influential events (Profili, Innocenti, & Sammarra, 2017). We reiterate that we view generations and generational phenomena as being similar to age groups and that any apparent causes or consequences within teams are due to age diversity dynamics. Although this doesn't affect our test of the scale's properties it's important to note our stance on how do we interpret any findings related to this scale (Chapter 2, Article 1).

2.7.2. Method

Based on the model structure presented by King and Bryant (2016), and with the purpose of testing the CFA models for data fit through MPLUS (version 7.4, Muthén & Muthén, 2015), we encountered several research-derivative obstacles. To start, due to organizational reasons several scale items were not added to the survey that was sent to the middle managers. Reasons

for this revolved around the idea that some items were too direct and that they may trigger feelings of being blamed for age discrimination. This led to a 14-item scale (the original is composed by 20 items) where only one item represented the PIA dimension which had to be left out of the model as a single item can't represent a latent factor. Moreover, the only dimension that was left with its original four items was LGS. Concerning IC, WGI, and WIR, they were left with three, three, and two items respectively.

For Sample 1, 209 team leaders correctly answered the WICS section of the questionnaire. Of these leaders, 33% were women and 63.2% were men (3.8% missing values), and their mean age was 47.65 (SD = 7.21, min = 33, max = 62). Age groups go from 20-24 years old to 60-65 years old where the vast majority of team leaders were between the ages of 40 to 59 years old (79.9%). On the other hand, 123 team leaders from Sample 2 correctly answered the WICS section of the questionnaire. The sex distribution was 77% women and 15.4% men, and the mean age was 48.15 (SD = 8.08, min = 23, max = 63). Age groups are equivalent to Sample 1 and the vast majority of leaders are also between the ages of 40 to 59 years old: 74.8%. Finally, team leader's mean age for the two samples is 47.83 (SD = 7.53) and the sex proportion is somewhat even: 49.4% women, 45.5% men, and 5.1% missing values.

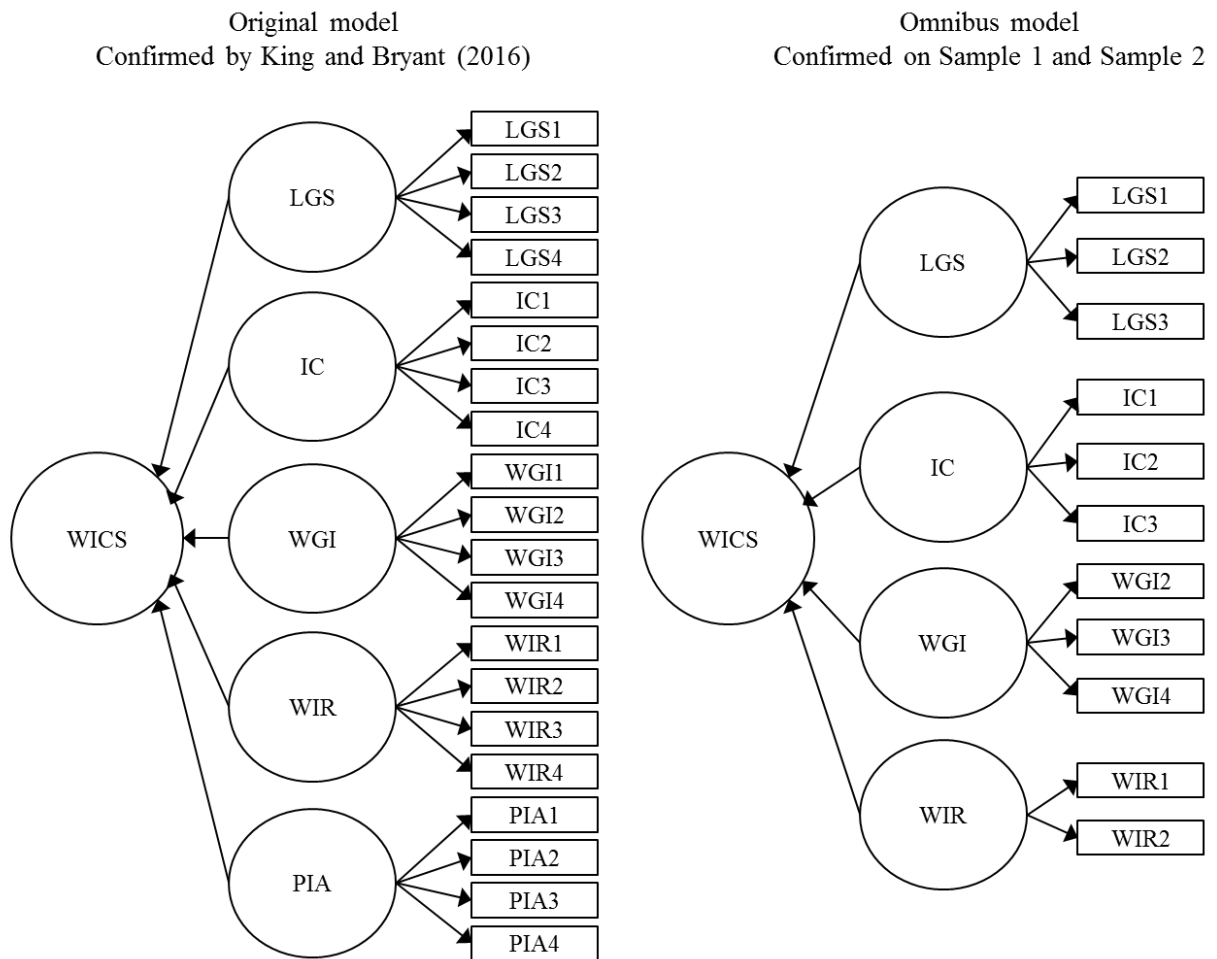
2.7.3. Results and discussion

Concerning the CFA, the tests for a second-order factor showed that the item LGS4 – which stands for “co-workers outside my generation tend to work differently than co-workers my age do” (reverse coded) – correlated with several latent factors in the modification indices. This situation was true both for Sample 1 and Sample 2, and with the latter the factor loading was higher than .90 ($p = .000$), based on these elements we decided to delete LGS4 finding an

acceptable model fit. This new confirmed model for both samples is called the Omnibus model and can be seen next to the original scale model of King and Bryant (2016) on Figure 2.

Figure 2.

Original model and Omnibus model ASI



Notes: The omnibus model (Model 0) was confirmed in both samples and will be used for the measurement invariance analyses.

Sample 1's model resulted satisfactory at $\chi^2(58.06, N = 209), df = 40, CFI = .94, RMSEA = .04$, and Sample 2's model was acceptable at $\chi^2(78.26, N = 123), df = 40, CFI = .92, RMSEA = .08$). We note that Sample 2 also had a Tucker Lewis Index (TLI) of .895 which

approximates very closely but doesn't necessary show a satisfactory fit (which is attained at $>.90$), we still decided to continue our analyses due to its bordering value. A correlation table for both samples can be seen in Table 7 which also shows the mean and SD for each dimension and for the WICS variable (Cronbach's alpha = .81). As expected, all dimensions correlated positively and significantly with the WICS; they were between .69 and .77.

Table 7.

Means, standard deviations, and inter-correlations ASI

Variables	M	SD	1	2	3	4
1 LGS	3.35	.80				
2 IC	3.86	.82	.296**			
3 WGI	4.11	.78	.362**	.574**		
4 WIR	3.89	.95	.413**	.197**	.375**	
5 WICS	3.81	.66	.720**	.697**	.774**	.711**

Notes: N = 332; M = Mean, SD = Standard deviation.

* $p < .05$ (two-tailed); ** $p < .01$ (two-tailed).

Afterwards, by following the procedure presented by Dimitrov (2010) on second-order factor invariance, we tested the WICS invariance for the two groups. When performing a measurement invariance for higher-order CFA models one needs to test both the first-order and second-order factor properties (Dimitrov, 2010). This adds additional steps on a sequential approach that starts by testing a baseline model without invariance (Model 0) to a more nested model with invariant factor loadings (Model 1A) to more and more nest models; this follows an increasing level approach (or staircase approach) which proposes that if a scale fails to show invariance in less nested models (Model 0) it will certainly fail to show invariance in more constrained models (e.g., Model 1A). Results of this procedure can be seen on Table 8. Although these results suggest that *configural* invariance is supported (constructs are measured by the same

items), there's a lack of *metric* invariance for first-order factor loadings. This means that one or more items of the scale contribute unequally to their latent construct (e.g., LGS1 to LGS). In other words, constraining the loadings across groups significantly affects the model fit showing that the way that both groups understood one or more dimensions of the scale is different.

Table 8.

Tests of Multi-group Measurement Invariance of the WICS

	χ^2	<i>df</i>	χ^2_{diff}	Δdf	DTSC	$\frac{SBS\Delta}{\chi^2}$	RMSEA	CFit	CFI	TLI
<u>Single-group solutions</u>										
Sample 1 (n = 209)	58.06*	40					.046	.563	.940	.917
Sample 2 (n = 123)	78.26**	40					.089	.019	.924	.895
<u>Measurement-invariance</u>										
M0. Omnibus model	137.56**	80					.066	.083	.929	.902
M1A. Invariant first-order factor loadings	158.75**	87	19.294	7	.938	23.018	.070	.030	.912	.888
M1B. M1A with non-invariant LGS & WGI	139.47**	83	24.475	8	1.139	1.902	.064	.107	.930	.908

Notes. N = 332. * $p < .05$; ** $p < .01$. DTSC = Difference test scaling correction (used for the $SBS\chi^2$). $SBS\Delta\chi^2$ corresponds to the Satorra-Bentler scale chi-square difference (Satorra, 2000; Satorra & Bentler, 2010). M1A and M1B are compared to M0. This table is based on Brown's (2015, P.247) results table concerning measurement invariance.

We can observe this difference through the value of CFI from Model 1A that, compared to Model 0, is -.017 (higher than -.01, c.f., Cheung & Rensvold, 2002). Taking into account that CFI is less sensitive to sample size differences (Fan, Thompson, & Wang, 1999) compared to chi-square values (c.f., Dimitrov, 2010; Kim, Cao, Wang, & Nguyen, 2017), we can omit the values from the $SBS\Delta\chi^2$ test (our groups have different sample sizes) and confirm the lack of full metric invariance for the scale. Furthermore, for identifying the unequal factor loadings, or to know which factors were understood differently, we added non-invariant loadings for each factor.

After observing that the changing CFI values were not sufficiently close enough to the CFI of Model 0 we added two factors conjointly. When factors LGS and WGI were added (Model 1B) the Δ CFI was exactly .01 (positive value) showing invariance for this corrected model (Cheung & Rensvold, 2002). This means that LGS and WGI are the two factors that were understood differently for the two samples: LGS was the one that improved the CFI the most when added alone (CFI = .922) compared to WGI (.920). We think that one of the reasons for these differences may be the scale translation: Sample 1 and Sample 2 items were translated from the original scale in English which was developed and confirmed by King and Bryant (2016) in the US. Additionally, the age groups were somewhat evenly distributed in King and Bryant's (2016) studies compared to our study which was mainly answered by employees between the ages of 40 to 59 years old. Results from these analyses show that researchers and practitioners that use the WICS must take into account a possible lack of measurement invariance for the scale factors LGS and WGI; comparing average results of these factors from organizations of different cultures is not recommended, even if the organization type is the same (e.g., postal services).

2.7.4. Limits and directions for future research

Various notes on our limitations need to be considered. The difference in our groups sample sizes is not recommended and may pose problems when searching for invariance (Meade, 2005; Meade & Bauer, 2007; Meade & Kroustalis, 2006). Although a sample size of 100 per group may suffice, a minimum of 200 per group is recommended; this was attained by Sample 1 (209) but not by Sample 2 (123). Additionally, models with few items and factors (like the Omnibus model tested) show higher standard errors in RMSEA (Cheung & Rensvold, 2002). These are some of the reasons why we observed the changes in CFI more than the chi-square difference tests or the RMSEA values. Furthermore, it is evident that based on this study we are

unable to make assumptions on the invariance of the complete scale (WICS) as, due to organizational obstacles, our tested measurement model was significantly smaller than the original model by King and Bryant (2016, see Figure 2). We encourage that, in the future, a complete measurement invariance test of the WICS is performed across various organizations in different cultures and at different times. Finally, we couldn't accurately determine why the differences in LGS and WGI dimensions took place; a more qualitative study must be implemented in both organizations to fully understand the differences in scale comprehension.

Chapter 3 – Article 2

Transactive memory and team innovation: The moderating role of team diversity in military teams

Short title: TMS, diversity, and innovation in military teams

Abstract

This study investigates the moderating effect of two team diversity attributes: military grade variety and team tenure variety for the relationship between Transactive Memory System (TMS) and team innovation. Both the effect of TMS on team innovation and the study of team diversity as a contextual factor have not yet been tested in military teams. We evaluated 48 military units from Italy's Air Force which showed that TMS contributed to team innovation, and that this relationship was negatively moderated by military grade variety. We discuss these results and the value of studying diversity as a moderating factor.

Keywords: military teams, team diversity, team innovation, transactive memory system

3.1. Introduction

As the military is characterized by having strict chains of command and hierarchical structures (Shamir & Ben-Ari, 2000), military organizations could be perceived as less suitable for innovation. This is a misconception as events like wars have pushed these organizations to develop novel strategies on military defense and war technology (c.f., e.g., Parker, 1996). Today, papers on military innovation are still being published with topics like how to better address multi-disciplinarity (Griffin, 2016), or the societal and political contributors of military power

development (Weiss, 2017). These articles are focused on strategy and international security issues, but the field of organizational research has also studied the military, producing a plethora of articles advancing and improving the literature on, for example, climate (e.g., Hung & Tsai, 2016) and performance (e.g., Halfhill, Nielsen, Sundstrom, & Weilbaecher, 2005; Salas, Bowers, & Cannon-Bowers, 1995). Teamwork has also been a well-developed topic (see Salas, Bowers, & Cannon-Bowers, 1995), and recent studies have tested, for example, how it's affected by extreme environments, team resilience, and teamwork training (Driskell, Salas, & Driskell, 2017; Mjelde, Smith, Lunde, & Espevik, 2016; McEwan, Ruissen, Eys, Zumbo, & Beauchamp, 2017, respectively). Moreover, as innovative initiatives are dependent on teamwork (Salas, Shuffler, Thayer, Bedwell, & Lazzara, 2014), and military organizations deeply rely on the use of teams (Boies & Howell, 2009), we consider innovation at the team level as being essential to military success, and thus, we argue that research on teams should be particularly useful in improving teamwork in military organizations.

The study of teams in organizational research has often supported the idea that the process of innovation, at the team-level, can be improved or harmed depending on how team members elaborate, share, and use information (see Hülshager, Anderson, & Salgado, 2009). This is particularly enhanced by how members process information collectively and how they shape and store shared and differentiated understandings (DeChurch & Mesmer-Magnus, 2010; Kozlowski & Ilgen, 2006). We suggest that TMS, a collective cognitive structure that refers to shared and differentiated knowledge from different aspects of a team, provides an interesting view of teamwork evidenced by its relationship with team performance (Mell, van Knippenberg, & van Ginkel, 2014). We propose that TMS could potentially increase team innovation; a relationship already explored by some publications (Fan et al., 2016; Peltokorpi & Hasu, 2014, 2016). In this article, we argue that teams that perform TMS behaviors can benefit of a context of diverse

perspectives and knowledge in order to produce more innovations, or be disrupted by categorization processes due to this context, preventing information sharing and novel ideas of being discussed and implemented. Team diversity refers to differences in member characteristics – also called attributes – that can go from task-related traits like educational background or expertise, to sociodemographic characteristics like age, sex, or ethnic background (see van Knippenberg & Mell, 2016). We advance the idea that, as a contextual factor, team diversity could moderate the level in which TMS has an effect on team innovation. We predict that two diversity attributes can moderate the relationship between TMS and innovative behaviors of military teams: military grade variety and team tenure variety.

Our study contributes to the literature on military teams by identifying that structural cognitions (TMS) have a relationship with team innovative behaviors. This will suggest that the improvement of military teams and organizations must consider the level in which team members know each other's expertise, their believe and trust in each other's' ideas, their effort coordination, and the predictors of transactive memory like mutual experience, communication, and expertise sharing (see Ren & Argote, 2011). This proposes an opening for studies on military team innovation and emergence, and it further promotes the value of TMS which is, additionally, already considered a predictor of task performance (DeChurch & Mesmer-Magnus, 2010). Finally, we identify how grade variety affects the level in which TMS relates to innovative behavior. This is a particularly useful way of studying diversity in work contexts as it adds to the various ways that team differences are analyzed and helps to develop new understandings on the interaction between team processes, outcomes and diversity (see Joshi & Roh, 2013).

3.2. Theoretical background and hypotheses

We consider innovation as a process comprised by two stages; the first one refers to the generation of creative ideas and the second one to their implementation (Anderson, Potočnik, & Zhou, 2014). Moreover, innovation can also be composed by an additional stage of idea promotion, between idea generation and idea implementation, which encompasses the communication and diffusion of novel ideas to other colleagues, the supervisor, or the organization (Kanter, 1988a; Scott & Bruce, 1994). Through the execution of innovative behaviors, teams can also innovate or be configured for the purpose of innovating (e.g., new product development teams). This type of innovation is often studied via the input-process-output (IPO) model of team performance (Farr, Sin, & Tesluk, 2003; Mathieu, Maynard, Rapp, & Gilson, 2008) as a way of classifying how predictor variables can affect an outcome (e.g., innovation) through certain processes or under certain conditions (see also Ilgen, Hollenbeck, Johnson, & Jundt, 2005). In the present article, we adopt this framework for identifying if TMS (input) is related to team innovation (output), and if this relationship is moderated by team diversity (moderator).

Our perspective considers teams as complex and adaptive systems composed by individuals that make the choice of sharing information and collectively create task-relevant knowledge. Moreover, research on team innovation has often identified team-level processes that enable and/or enhance the sharing and further implementation of novel ideas. Members that share information on their own expertise can more easily develop a transactive system which, in turn, may help organize and give access to collective information and ideas. Furthermore, as innovations require informational resources to be conceived and time for being tested (Caldwell & O'Reilly, 2003; Fan et al., 2016), we propose TMS as a predictor variable based on how it

provides a collective storage of task and team information, and how it improves the teams' efficacy offering members the time to test new ideas.

3.2.1. TMS and team innovation

TMS describes the compound knowledge possessed by individual members about who-knows-what within the team (TMS structure) and the mechanisms that the team uses for operating this transactive knowledge (TMS processes) (Lewis & Herndon, 2011; Wegner, Giuliano, & Hertel, 1985). The latter can be studied in terms of behavioral indicators, first proposed by Liang, Moreland, and Argote (1995), which are: specialization which refers to memory differentiation, credibility or the reliability on the knowledge of other team members, and coordination or working smoothly as a result of this transactive knowledge (c.f., Lewis, 2003). Finally, TMS has been an important concept of team research studies as it has been positively related to team performance, satisfaction, learning, and reflexivity (e.g., Michinov, Olivier-Chiron, Rusch, & Chiron, 2008; Zhang, Hempel, Han, & Tjosvold, 2007).

While some authors have already linked TMS and team innovation conceptually, in team-level research the empirical support for this relationship is still scarce. Some studies have unraveled a positive relationship with team innovation upon certain conditions. For example, Peltokorpi and Hasu (2014) found a curvilinear relationship of TMS on team innovation, where moderate levels of TMS were the most effective in terms of innovation (measured as the number of produced patents). Also, Peltokorpi and Hasu (2016) examined how task orientation affected team innovation in a technological research organization, and TMS partially mediated this relationship. Adding to this, Fan et al. (2016) found that TMS had a positive relationship with team innovation and individual innovative work behavior – thus examining a multilevel model for TMS – they argued that the way that TMS affects team innovation has received little research

attention, and that TMS could have, additionally, a positive integrative influence on individual and team engagement in innovation-related tasks. More recently, Zhang and Kwan (2018) found that TMS mediated the relationship between team learning goal orientation and innovation, and that the effect of goal orientation on TMS was strengthened by task interdependence.

Moreover, the study of Gino, Argote, Miron-Spektor, and Todorova (2010) assessed how prior experiences affect team creativity while testing the mediating role of TMS for this relationship. We consider creativity as being different from innovation in that the latter is a process that can be classified into three phases: idea generation, diffusion and implementation where creativity refers to the first phase (Anderson, et al., 2014); and that innovation also has the purpose of being beneficial to society at any level (see Battistelli, 2014; West & Farr, 1990). However, the authors in the referenced study ascribed team creativity as product quality and development. Their results showed a mediating role of TMS for the relationship between prior experience and team creativity. The authors argue that TMS reduces redundant overlaps in knowledge, shared by team members, and clarifies the specialization of knowledge which leads to more efficient cognitive processing. This improved process results in higher creativity as members don't waste cognitive resources on activities that other members are assigned (coordination). As various authors have pointed out, and Gino and colleagues (2010) affirmed, "the potential to create novel ideas as a team is also dependent on team member's ability to efficiently exchange knowledge and build on each other's ideas" (p. 107), which is why TMS will improve team creativity. Based on these assumptions, they also argued that developed trust of other members' expertise, could lead to trust on team members' ideas (Gino, et al., 2010). According to our definition of innovation and the arguments drawn from this study, we can affirm that TMS can be related to the idea generation phase.

Furthermore, the link between TMS and innovation can further be explained as specialized knowledge helps teams identify and retrieve diverse resources, and actualize innovative tasks. Wegner (1986) suggested that task knowledge discussions could help teams – he referred to ‘close relationships’ – produce creative outputs which may be the case when team members develop credibility in each other’s expertise. Trust in other team members’ knowledge will reduce uncertainty, prevent team members from wasting time searching for valuable information, and possibly lead to trust on other members’ ideas. Finally, quality exchanges of information, smooth work due to effective coordination, and knowledge retrieval capacities will offer extra time for implementing creative ideas into the workplace.

Hypothesis 1. TMS is positively related to team innovation.

3.2.2. Team diversity research and team innovation

Diversity can be studied as variety which refers to categorical differences between team members (Harrison & Klein, 2007). For example, at low levels of variety a team will be composed only by engineers, and at high levels of variety each member will be of a different profession (a single engineer, a single psychologist, a single psychiatrist, etc.). Researchers that study diversity in terms of variety often focus on, for example, expertise and educational background which are related to the distributed knowledge and a richness of available information. We’ve decided to study diversity as variety as diverse knowledge and member expertise, related to effective decision-making and coordination, are highly relevant for military teams (e.g., Yammarino, Mumford, Connelly, & Dione, 2010). Adding to this, the innovation process may be favored or harmed by diverse perspectives and ideas which are based on categorical differences among team members (Harrison & Klein, 2007).

Several authors consider diversity as a challenge due to the overcoming issues that emerge from having people of different ages, with different levels of expertise and backgrounds working together. Technical language, methods, and even working perspectives can widely differ in these situations, possibly leading to ineffective coordination and troublesome behaviors like team conflict (e.g., Jehn, Northcraft, & Neale, 1999). However, innovative initiatives are often executed with multidisciplinary teams in mind. This is done under the assumption that diverse team members will offer a wider pool of resources, which will allow them to generate new and more adequate ideas or solutions. Indeed, team innovation research has often merged with team diversity research with the theoretical objective of understanding how individual differences can disrupt or promote innovative behavior. These two ways of examining diversity have often been the source of a multitude of studies focusing on stereotypes and discrimination, or on information sharing and elaboration. However, according to the most recent reviews on team diversity (Guillaume, Dawson, Otake-Ebede, Woods, & West, 2015; van Knippenberg & Mell, 2016), research should not exclusively center on how different attributes elicit negative or positive effects on team processes and outcomes without considering mediators and moderators; therefore, this stream of research adopts a contingency perspective on diversity which leaves behind the idea that sociodemographic attributes (e.g., age or sex) are mostly negative and that task-related attributes (e.g., job expertise or team tenure) are particularly positive to team performance.

Our study on diversity is particularly interested in the role of team diversity as a moderator. A few number of studies have recently investigated team diversity in this way (e.g., Lee & Chae, 2017; Mitchell, Boyle, Nicolas, Maitland, & Zhao, 2016) but arguments are not lacking. For our case, team diversity can moderate the relationship between TMS and team innovation. We argue that for diversity to directly affect the team, other processes and predictors

are more relevant (e.g., leadership, implicit attitudes, etc.), but our interest resides on how team diversity can be a contextual factor that allows or disrupts the effect of team processes on team outcomes. Some situations are particularly more appropriate than others for stimulating the practical use of cognitive resources (Barnes, et al., 2008), and some can even decrease the likelihood that individuals willingly share their ideas or provide alternative solutions to established problems.

Two diversity attributes are of particular importance to our study on military teams: military grade variety and team tenure. Military grades are institutional and hierarchical categories often related to the amount of time employees have worked in their military organization and to their educational background. Naturally, they can also be related to the level of expertise for each individual, offering an array of perspectives and professional techniques to the team. Military grade is related to the task that the employee must perform and it indicates their level of responsibility (e.g., chosen airman vs. chief airman). However, military grade denotes institutional hierarchy and can be used for categorization processes. This is due to its salience as it's easily perceivable by the uniform symbols and is of particular importance to employees of all levels of the organization. Individuals identify with salient characteristics for generating a positive affect towards others that belong to or have the same characteristics as them and a negative affect towards others that don't (e.g., Hogg & Hains, 1996; Hogg & Turner, 1985). Salient attributes can be detrimental, especially in small military teams where trust is an important component of performance affected by categorization and common group member processes (Adams & Webb, 2002). However, we expect that a variety of military grades within a team will make this attribute less salient. Rather than having a team where half of its members belong to a military grade and half to another, we expect that at high levels of age variety, where each member belongs to a different rank, differences will be more diffused. A lower distance

between differences means less isolated individuals and a reduced probability of tension between subgroups of same-level members (this is analogous to the effects of national variety, Milliken & Martins, 1996; e.g., Ayub & Jehn, 2014). For this reason, we don't expect a direct effect of military grade variety on team innovation.

Nevertheless, high military grade variety may not be all positive as a contextual factor; the existence of military ranks can often be an issue in teams where low level airmen work together with higher level sergeants which, we expect, will lead to less idea sharing and implementation in teams with a developed TMS. Changing already established procedures that are highly coordinated can be a particularly difficult subject to discuss as some members (e.g., higher level sergeants) may be engaged towards particular methods or operations that have worked in the past and that may still work effectively. In teams with high levels of military grade variety, members willing to share new ways of working may withhold their ideas in order to avoid being disrespectful to their superiors or be perceived as rebellious. Heterogeneous teams will suffer more of these circumstances than homogenous teams where all members, or the majority, work with colleagues from the same level which *speak the same language* and share common methods. Team members may also worry that their ideas may not meet certain requirements for being implemented or denigrate the coordinated efforts of their team due to their TMS. Team members will more easily worry that their ideas may be belittled or depreciated by members of different military grades that are accustomed to work in a certain efficient way.

Essentially, we argue that a high variety of military grades will hinder the effect of TMS on team innovation. Additionally, when there are low levels of military grade variety these inconveniences and obstacles are not present and team members will be more eager to share new ideas and they will be easier to implement into the work environment.

Hypothesis 2. The effect of TMS on team innovation will be lower when high levels of military grade variety are identified and higher when the inverse is observed.

On the other hand, team tenure variety, or differences in terms of the amount of time each team member has worked with their team, implies experience in precise tasks with specific individuals. Team members with prior experience together can develop a system of complex plans of action needed to effectively accomplish a task, new members need to adapt to this system at the same time that they will be eager to be socially integrated to the team. Arriving fairly late to an already established team could also lead to categorization processes (new vs. older members), nevertheless, new members (a.k.a., newcomers) could also bring novel ideas and different ways of working, challenge the status quo, and contribute to the implementation of better procedures favoring the execution of innovative behaviors (Choi & Levine, 2004). Furthermore, team tenure is not as salient as military grade (e.g., it's not imprinted on the uniform) and we also expect that a variety of team member tenure will not be related to innovation. Team members with different levels of experience will provide heterogeneous resources to the team in terms of ideas, perspectives, and methods, learned from previous experiences within the team, from previous experiences with other teams, or due to recent training activities. These arguments go in line with the knowledge integration perspective as this attribute may be related to informational diversity where more resources are available within the team (c.f., van Knippenberg, 2017). For these reasons, we consider that a context of team tenure diversity may be beneficial to team outcomes and facilitate the effect of TMS on team innovation.

Hypothesis 3. The effect of TMS on team innovation will be higher at high levels of team tenure variety and lower when low levels of team tenure variety are identified.

3.3. Method

3.3.1. Participants

Adopting a correlational research design, data were collected from Italy's air force (*aeronautica militare*), the aerial defense force of the Italian republic which possess approximately 43,000 employees. We administered a self-report questionnaire via a secured platform. All participants received a message inviting them to answer the questionnaire with additional description of our research objectives and its confidentiality. Moreover, measures were translated from English into Italian through a standard back-translation procedure; the innovative behavior measure was already used in previous studies (e.g., Battistelli, Montani, & Odoardi, 2013; Battistelli, Montani, Odoardi, Vandenberghe, & Picci, 2014; Montani, Odoardi, & Battistelli, 2014). Our sample comprised 453 employees composing 48 military teams (3 to 20 members each) being the mean team size 9.44 ($SD = 5.54$). The larger part of employees was male (97.4%), first class marshals (33.8%) or first marshals (27.6%), 46 to 50 years old (33.3%), high school grads (62.3%), and have worked during 26 to 32 years in the air force (40.4%).

3.3.2. Measures

3.3.2.1. TMS

TMS was measured using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) through a 17-item scale (five items for specialization, five for credibility and seven for coordination) developed by Lewis (2003). A sample item is: "I was confident relying on the information that other team members brought to the discussion" (credibility).

3.3.2.2. Team diversity (variety)

For both military grade and team tenure variety we've used Blau's index of heterogeneity (1977), which is the most common method for studying variety and one of the two options recommended by Harrison and Klein (2007). Blau's index goes from 0 (no variety) to 1 (total variety) and its computational formula is: $1 - \sum p^2$, being p the proportion of unit members in the category or K . Grade and team tenure diversity were measured by asking each employee their grade within the organization and the amount of time (years) they've been working with their team. Military grade had the following categories (18 in total): chief airman, chosen airman, major, first class marshal, second class marshal, third class marshal, first airman, chief first airman, chosen first airman, first chosen chief airman, captain, first marshal, first marshal lieutenant, sergeant, major sergeant, chief major sergeant, lieutenant, and lieutenant colonel. Finally, team tenure was classified into the following groups: less than 1 year (of working in the team), 1 to 2 (1 – 2) years, 3 – 5, 6 – 8, 9 – 12, 13 – 16, 17 – 20, and more than 20 years. The majority of respondents worked in their teams during less than 1 year (24.3%), then from 3 to 5 years (16.1%), and more than 20 years (16.1%).

3.3.2.3. Team innovation

Team innovation was measured via a 5-point Likert scale on innovative work behavior (Janssen, 2000). This scale contains nine items, three for each dimension: idea generation, promotion, and implementation. Sample items for each dimension are: "My team generates new ideas for difficult issues" (idea generation), "My team acquires approval for innovative ideas" (idea promotion), and "My team introduces innovative ideas into the work environment in a systematic way" (idea implementation).

3.3.2.4. Control variable

Team size was used as a control variable because of its possible relationship with innovation or related team processes (Hülshager, Anderson, & Salgado, 2009), for having a moderate variance in our sample (mean = 12.63, SD = 5.76, variance = 33.23), and for being correlated to team tenure variety (see Table 6).

3.3.3. Data aggregation

As our hypothesis testing involved the team-level of analysis we calculated the $rwg(j)$, ICC (1), and ICC (2) to justify for data aggregation (see Bliese, 2000; James et al., 1984; McGraw & Wong, 1996). Scores for $rwg(j)$ were above the suggested value of .70 (Bliese, 2000) being .74 for TMS and .74 for TIWB. Concerning the values for ICC (1) and ICC (2), TMS had an ICC (1) of .85 and an ICC (2) of .98 ($df1 = 452$, $df2 = 5436$, $F = 6.59$, $p < .001$), and TIWB had an ICC (1) of .91 and an ICC (2) of .99 ($df1 = 452$, $df2 = 906$, $F = 4.33$, $p < .001$). All scores were above the recommended value of .12 for ICC (1) and .60 for ICC (2) (James, 1982; Glick, 1985, respectively).

3.4. Results

Descriptive statistics and correlations are presented in Table 9. A CFA was performed using MPLUS 7.4 (Muthen & Muthen, 2015): for TMS the three dimensions composed a second-order factor (TMS). Five items were deleted during this procedure: item 1 for specialization, items 4 and 5 for credibility, and item 6 for coordination due to low loadings. We decided to fix the credibility continuous variable residual variance to zero due to a low negative and non-significant inter-correlation to TMS. Additionally, two items of coordination (items 3 and 4) were

inter-correlated due to their resemblance; this further corrected the fit of the scale. After these procedures, results showed a satisfactory model-fit: $\chi^2(206.85, N = 453)/df = 62$, confirmatory fit index (CFI) = .92, root-mean-square error of approximation (RMSEA=.07). Concerning team innovation, we inter-correlated items 2 and 3 for implementation and the one factor model was satisfactory resulting in: $\chi^2(114.48, N = 453), df = 26, CFI = .95, RMSEA = .08$. After doing this, and in line with our first hypothesis, results show an inter-correlation between TMS and team innovation. Our moderation model was tested at the team-level of analysis using PROCESS for SPSS by Hayes (2013).

Table 9.

Means, standard deviations, and inter-correlations A2

Variables	<i>M</i>	<i>SD</i>	1	2	3	4	5
1 Team size	9.43	5.54	-				
2 Military grade variety	.67	.12	.290*	-			
3 Team tenure variety	.72	.08	.471**	.416**	-		
4 Transactive memory system	3.71	.22	-.008	-.060	.066	(.86)	
5 Team innovation	3.28	.27	.074	.133	.186	.522**	(.93)

Notes: Cronbach's alphas are shown in the intersections.
 N = 48 teams. * $p < .05$ (two-tailed). ** $p < .01$ (two-tailed).

3.4.1.1. Hypothesis testing

The overall model was significant $F(6, 41) = 6.07, p < .001, R^2 = .47$. Results for the regression analyses are presented in Table 10. The first hypothesis suggested a relationship between TMS and team innovation, this was confirmed by a positive significant effect ($B = .66, SE = .14, p < .001$). Therefore, teams that have developed a compositional memory represented by specialization, credibility, and coordination tend to perform more innovative behaviors

Table 10.

Regression Analysis Results A2

Variables	B	SE
Intercept	3.30**	.07
Grade variety	.24	.28
TMS	.66**	.14
TMS X Grade variety	-5.24*	1.50
Team T Variety	.41	.47
TMS X Team T Variety	.44	2.13
Team size	-.00	.01

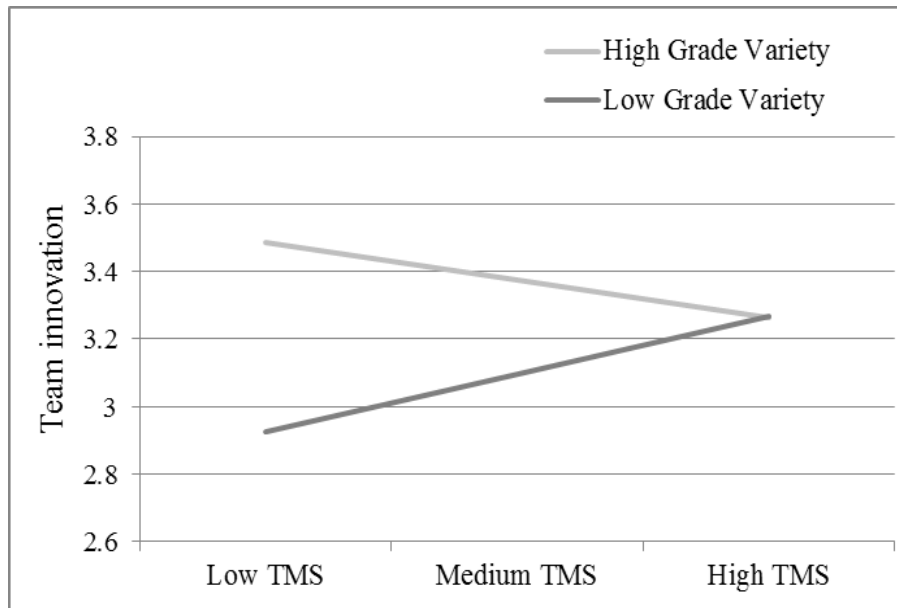
Note: $N = 48$ teams. T = Tenure.

* $p < .01$; ** $p < .001$.

Our second hypothesis, which proposed a moderating role of grade variety for the relationship between TMS and team innovation, was also confirmed by the results of the interaction effect ($B = -5.24$, $SE = 1.50$, $p < .05$), where the R^2 increased by .16 $F(1, 41) = 12.16$, $p < .05$. Conditional effects show that at low levels of grade variety the effect of TMS on team innovation is positive and significant ($B = 1.27$, $SE = .26$, $p < .001$), at medium levels the effect is diminished ($B = .63$, $SE = .22$, $p < .05$), and at higher levels the effect is not valid ($B = -.01$, $SE = .31$, $p = .96$; see Figure 3). When military teams are composed by members of different military grades the effect of TMS on team innovation is reduced until it's not significant. For this particular case results suggest a negative effect of a context of diversity for team processes and outcomes.

Figure 3.

Moderating effect of grade variety for the TMS – team innovation relationship



Note: Scores are taken from conditions where low levels of team tenure variety are observed.

Finally, our third hypothesis concerning the moderating role of team tenure variety was not statistically significant ($B = .44$, $SE = 2.13$, $p > .05$). The r-square change due to the interaction of both moderators is also significant $F(2, 41) = 6.28$, $p < .05$, $R^2 = .16$, however the incremental F was reduced ($F = 6.28$ vs. 12.16). The isolated effect of military grade variety is more valid $F(1, 41) = 12.16$, $p < .05$, $R^2 = .16$, showing that the effect of team tenure variety was not identified.

3.5. Discussion

Organizations sometimes mobilize employees of different disciplines, nationalities, and levels of expertise to work together in order to accomplish their objectives more adequately. While teams need to be effective in their day-to-day endeavors, we argue that teams are also complex systems capable of innovating based on shared cognitive structures. In support of our

first hypothesis, we've found a positive relationship between TMS and team innovation. Some studies have already found this effect (Fan et al., 2016; Peltokorpi & Hasu, 2014, 2016) however, to our knowledge, this is the first one that tests the relationship in military teams. Military teams often deal with ambiguity (Brown, Adams, Famewo, & Karthaus, 2008) and work in highly complex and potentially life threatening environments (Urban, Bowers, Monday, & Morgan Jr., 1995), new operative or technological solutions can save not only time in dangerous events, but also human lives during search and rescue missions or public calamities; therefore, exploring particularly dynamic team processes that foster innovative behaviors are important contributions of this article.

Furthermore, during the execution of their duties, team members will often be required to exchange information and to socially interact. These two processes shape how people collectively build a shared understanding of one another, the task, and their mutual work (Grand, Braun, Kuljanin, Kozlowski, & Chao, 2016). In this study, we've found that team diversity plays a role in how much a collective emergent process (TMS) contributes to innovative behaviors. Military grade variety reduced the level in which TMS positively affected team innovation. We assume that this effect is due to the importance of this attribute and the difficulty to share and implement new ideas within teams where members have already established an efficient system due to TMS. Team members may withhold new ideas for different reasons (c.f., Williams & O'Reilly, 1998) however, if these ideas are shared, we hypothesized that their understanding and implementation into the workplace may be harder in heterogeneous teams with a developed TMS.

Additionally, our third hypothesis concerning the moderating effect of team tenure for the relationship between TMS and team innovation was not confirmed. Team tenure neither improved nor reduced the effect of this relationship. We assume that differences in the time a member worked in their team doesn't provide enough informational resources or are not of

particular importance to our sample, at least not to a high enough degree as to affect the way a team with high levels of TMS will share new ideas and implement them. Additionally, team tenure is not a highly salient attribute in the military compared to military grade which may explain why this factor did not cause negative nor positive effects within our sample.

Finally, we've studied team diversity as a context, this has been adopted relatively recently in some articles (Lee & Chae, 2017; Mitchell, Boyle, Nicolas, Maitland, & Zhao, 2016), and it can bring a further understanding of differences into team research. Diversity as a contextual factor could influence team member behaviors and their response to certain activities and understandings. This context may encourage or harm the way that certain processes affect the team outcomes; our idea is that research should further discover these interactions. However, we still consider that diversity may directly affect team processes. One of our main challenges as researchers is to explore and uncover these interactions for different types of teams and to unravel how particular attributes of diversity can be beneficial or hurtful even as contextual factors. This study does this by expanding research on military teams about the modulating role of military grade variety and the importance of promoting TMS to facilitate innovative behaviors.

3.5.1. Limitations and directions for future research

Even though our study tested a moderating model and denoted a relationship between our variables we can't fully justify for causality effects. Future studies could be longitudinal or follow an experimental design, even perform simulations and training, to explore more thoroughly the effects of TMS on team innovative behavior. Additionally, we acknowledge that the type of measure for our dependent variable is relevant. Team innovation was self-rated which could lead to common method and social desirability bias (see Hülshager, Anderson, & Salgado, 2009). Further studies could profit of more objective ways of evaluating team innovation in military

teams by evaluating the quality of operational improvements or the number of inventions proposed by a team.

Moreover, the emergence of TMSs can also be studied. Future research could explore the temporality of TMS and if fresh vs. established TMSs may affect innovation differently. We also suggest to further studies to consider the importance of the leadership style for military teams as studied by Boies and Howell (2009), the way the leader manages diversity and how employees perceive member differences plays an important role in the team process – outcome relationship (e.g., Homan & Jehn, 2010). Moreover, Boies and Howell (2009) also found that shared mental models, a cognitive emergent process similar to transactive memory, is related to effectiveness in military teams, it could be interesting to analyze how these cognitive structures are related to innovative outcomes in diversity contexts. Finally, future studies could longitudinally study these processes to test more effectively how they interact and if the same effects are displayed over time.

3.6. Additional analyses

As with age diversity on Chapter 2, we also tested military grade separation (MGS) and military grade disparity (MGD) as moderators in our model. Following the recommendations and differences between the team diversity types (Harrison & Klein, 2007) we explain the two attributes: MGS and MGD. The first one concerns the distance between employees with low military grades and those with higher military grades. In a team with maximum levels of MGS, two subgroups exists where half of the team members have a military grade as low as possible and the other half the highest (e.g., a team consisting of low rank airmans and high rank generals).The maximum value is, however, utopic for a military organization where hierarchical

order involves a chain of command that can't allow teams only consisting of airmans and generals; however, the highest real value of MGS (e.g., airmans and sergeants) will still be different from the lowest real value (airmans and chief airmans). Concerning the latter diversity type, MGD, the maximum real ratio will consist of probably leaders with the highest rank possible managing multiple airmans or, the inverse, a single airman with a heavy amount of high-rank leaders. It's not completely clear how both diversity types will affect team functioning due to a lack of studies concerning these types of intra-team military differences. We expect that, on the one side, MGS may easily produce social categorization processes that may directly hinder team innovation, and that the moderating effect may still lower the strength of the relationship between TMS and innovation. On the other side, MGD will probably affect team functioning through isolation or tokenism – even dissent if the isolated individual possess a differing perspective due to their grade –, however, our teams had a unit leader which is also the member with the highest rank (this counts as disparity), meaning that the effect of the inverse case, where there's an isolated low-level military employee, should not be significant and neither does the moderating effect with TMS. The two models were the same as the one tested in this chapter. We analyzed team size as control and we used PROCESS model 1 (single moderator).

Results for the model with separation confirm partially our expectations. Although MGS had no direct effect on team innovation at $B = .01$, $SE = .02$, $p = .59$; the interaction effect was negative and significant at $B = -.27$, $SE = .09$, $p = .00$, where the conditional direct effects of TMS on team innovation changed from $B = 1.05$, $SE = .19$, $p = .00$ at low levels of MGS, to $B = .32$, $SE = .19$, $p = .10$ at high levels. Although weaker than the effects seen in the current chapter from military grade variety (R^2 increased by .06 $F(1, 43) = 7.90$, $p < .05$ for separation against the R^2 increase of .16 $F(1, 41) = 12.16$, $p < .05$ by variety), the effect still manages to suggest that a

separation of grades within the same team hinders the way that TMS facilitates team innovation. We explain these results similarly to military grade variety assumptions, where TMS effects on team coordination and effectiveness coupled with diversity promote less eagerness to change what is already efficient. Finally, the results for diversity as disparity confirm the non-significant effect of MGD in our model. MGD had no direct effect on team innovation at $B = .16$, $SE = .22$, $p = .46$, nor it interacted with TMS to affect team innovation at $B = -.32$, $SE = 1.22$, $p = .79$. To our knowledge, this is also the first time that separation and disparity of military grades are analyzed in military units. Detailed results will be attached to the annex of this dissertation.

Chapter 4 – Article 3

A moderated mediation model of perceived organizational values and team innovation: the role of task-relevant information and team age diversity

Abstract

This study intends to find a relationship between the employee perception of organizational values and team innovation. We propose a moderated mediation model with ETRI as a mediator for this relationship and age diversity as a contextual factor. To test this model we evaluated 453 employees composing 48 military teams from Italy's Air Force. Results confirm that the organizational value of innovation (VIN) is positively related to ETRI, the latter has a positive effect on team innovation, and this relationship is moderated by age diversity in such a way that at high levels of the moderator the effect of ETRI is reduced. Theoretical backgrounds, results, limitations, and directions for future research are discussed.

Keywords: organizational values, information sharing, team diversity, team innovation

4.1. Introduction

At the present time, thriving within the ever-changing business environment is analogous with teams and innovation. While organizations rise and fall, and new technologies emerge to boost efficiency, create new ways of working, and promote green developments (c.f., Cascio & Mon-tealegre, 2016), innovation – or the lack of it – lies at the base of it all. We argue that teams and employees need to be not only inclined to innovate but also perceive that their organization is open to, and cares about, innovation. In this article, we test the idea that the organizational values perceived by employees relate to the way that teams behave in their everyday work, and that this

can promote new ideas, products, and procedures being generated and introduced into the workplace.

Additionally, studies on perceived values in teams are lacking as research has often centered on individual-level processes and outcomes by studying value congruency or perceived support (e.g., Ahammad, Tarba, Liu, & Glaister, 2016). As teams are more and more used in organizations, we center on the importance of teamwork on guiding perceived values towards team extra-role results, like team innovation. In order to confirm a connection with team outcomes, team-level processes and composition must be addressed. Based on this, we decided to discuss and empirically test the importance of ETRI (van Knippenberg, De Dreu, & Homan, 2004) in producing innovation, as research shows that the innovation process is dependent on how team members elaborate, share, and use information (c.f., Hülsheger, Anderson, & Salgado, 2009). Furthermore, referring to team diversity as the differences in team member socio-demographic (e.g., age or sex) or task-related attributes (e.g., profession) and how they relate to team processes and outcomes (c.f., van Knippenberg & Mell, 2016), we decided to identify its contextual role for this relationship.

Specifically, hereby we test these relationships empirically by integrating theory on organizational values, team processes, and team diversity. The study of these interactions is particularly important to organizational research due to the value of identifying an effect of perceived values on team processes, which show the significance of encouraging and advocating for aspects related to innovation within organizations. Additionally, this study delineates the importance of analyzing team diversity as a contextual factor, which has often been studied as a predictor (c.f., Guillaume, Dawson, Otaye-Ebede, Woods, & West, 2015), expanding on its value

for teams, helping to decipher its effects, and unraveling the ways in which to manage it more effectively.

4.2. Theoretical background and hypotheses

The literature on innovation has explored different ways in which perceived organizational values promote innovative capabilities and facilitate new technology implementation at the organizational-level (e.g., Khazanchi, Lewis, & Boyer, 2007). On the same idea at the individual-level, several authors have found a relationship between contextual factors – related to values – and employee outcomes. For example, Choi, Anderson, and Veillete (2009) found that an unsupportive organizational climate, a concept related to perceived values, has a negative effect on individual creativity. In addition, Avery, McKay, Wilson, and Tonidandel (2007) found that racial differences in absenteeism were related to how much employees felt that their organization placed value on diversity. These effects are only an example of how the organizational culture and climate shapes how employees behave due to perceived support, identification or value-fit (e.g., Ahammad, Tarba, Liu, & Glaister, 2016; Liden, Wayne, Liao, & Meuser, 2014).

Perceived organizational values are determined by what employees believe is important to their organization. These values can be ideas regarding standards of behavior as well as the type of goals that employees should follow and attain (Schein, 2010); this means, for example, that employees that perceive that their organization adopts a value of ‘quality’ will be more focused on detail than those that perceived a value of ‘quantity’. Although organizational perceived values are often related to company and employee results, few studies have analyzed their relationship with team-level creativity and innovation. Discussing this topic, we consider teams

as a group of employees that interdependently work to accomplish a task, have a common goal, and are embedded in a multi-level system (c.f., Kozlowski & Bell, 2003). Moreover, we acknowledge teams as the *basic building blocks of organizations* vital for their functioning (Mathieu, Tannenbaum, Donsbach, & Alliger, 2014). In this article, we argue that the perceived values held by an organization will shape how teams react as a collective and build a collaborative effort towards new ideas and practices. We propose a relationship between perceived values and team innovation, a valuable resource now considered the direct course towards developing a competitive advantage. As with employees, innovation in teams refer to a process composed by two phases: the generation of new ideas (often called creativity) and the implementation of these ideas into the workplace (Anderson, Potočnik, Bledow, Hulsheger, & Rosing, 2016).

We propose that a relationship between perceived organizational values, particularly aspects related to *innovation*, and team innovation can be established through team processes. Before pursuing this, we define VIN as how much the members of a team perceive that their organization gives importance to innovation by supporting, for example, experimentation, flexibility, initiative, cooperation, and information sharing in their employees. This value is based on the taxonomy made by McDonald and Gandz (1991, 1992) and on Finegan's (2000) article on values and organizational commitment. We propose that VIN may shape the way that team members share and discuss information, encouraging ideas to be created and then implemented into the workplace. Finally, by testing the effect of the organizational context (perceived values) on team-level innovation we answer to recent research needs for this literature (c.f., van Knippenberg, 2017).

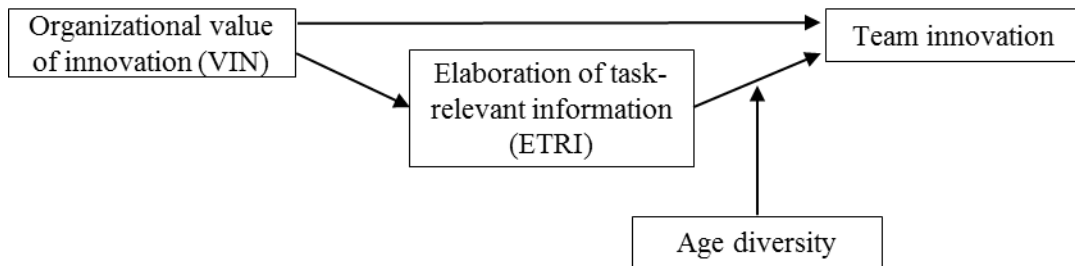
4.2.1. A mediation model

The first part of the mediation model refers to the relationship between perceived values and ETRI (see Figure 4 for our model hypotheses). The latter is a team-level process that encompasses the active creation and discussion between team members of important information about their task. ETRI comes from the literature on team diversity and was proposed by van Knippenberg, De Dreu, & Homan (2004) as a way of partially explaining how diversity has an effect on team results through other factors – one of these factors being ETRI. The existence of this variable in teams has been found to be related to better decision quality (Kooij-de Bode, van Knippenberg, & van Ginkel, 2010) and team creativity (Hoever, van Knippenberg, van Ginkel, & Barkema, 2012). Our proposition concerns the idea that team members that perceive that their organization values innovation will be more eager to discuss task information with their teammates; this is because task information is primordial to employees that want to create new ideas about their work with the purpose of improving something (which requires information about things they may not know about) or changing an aspect of their work that's inefficient or dissatisfactory (which may require information about new ways of working). For example, in order to encourage experimenting with a new technology, team members may inform others about the previous experiences they had had with similar machinery, or for actively adapting to a changing business environment team members could inform others about a new software, training, practice, or method, that may improve the way they currently work. Furthermore, based on the person-organization value fit theory (e.g., Kim, Cable, & Kim, 2005; Kristof, 1996) we also expect that employees will seek ways of being congruent with the value of innovation they perceive, and engage in behaviors where they share and discuss relevant information.

Hypothesis 1. VIN will be positively related to ETRI.

Figure 4.

A moderated mediation model of the VIN – team innovation relationship.



The second part of the mediation concerns the relationship between team processes and innovation, or the way that ETRI may promote new idea generation and idea implementation in teams. The role of ETRI as a team process related to team innovation has been theorized by the knowledge integration perspective. Van Knippenberg (2017) argues that there's evidence that ETRI (and other processes like internal and external communication) determines if new information is processed through discussions, which will facilitate knowledge being integrated by the team. This may, in turn, cause creativity and innovation as information may come from different sources and provide a better, more updated, and refined way of doing things. Previous studies have found a relationship between ETRI and team creativity (e.g., Hoever, van Knippenberg, van Ginkel, & Barkema, 2012) as well as with quality of innovation (Kearney, Gebert, & Voelpel, 2009). Teams that perform this kind of behavior have a high chance of innovating due to the way that different information – encompassing work perspectives and beliefs – enlarges the available resources that members can use to generate new ideas that benefit their collective effort. Moreover, ETRI also encompasses developing new information collectively (van Knippenberg, De Dreu, & Homan, 2004); this means that new ideas will be not only task-focused but also more refined, as they were gathered based on the expertise of each team member that participated on the discussions. This means that new ideas through ETRI may

be even more adequate for the work environment which will improve their probability of being implemented.

Hypothesis 2. ETRI will be positively related to team innovation.

Following these arguments, our idea focuses on how the effect of VIN on team innovation is fully mediated by ETRI. Being aware and in synchrony about the extent in which the organization values innovation is important, however, the real influence comes from the task-oriented and adaptive behaviors that employees carry out to attend these standards. Without these actions, VIN will not be related to team innovation as creative ideas and their implementation are dependent on information, experience, and perspectives being discussed or created through ETRI.

Hypothesis 3. ETRI will mediate the relationship between VIN and team innovation.

4.2.2. Team diversity as a moderating variable

Team diversity is a current phenomenon in organizations that refers to the differences between team members. Attributes are characteristics of team members that can differentiate or assimilate members among themselves, like their sex, profession, or ethnicity. The effects of heterogeneous teams, that is, teams with high levels of diversity, have been both rich and contradictory as we've discussed in previous chapters (c.f., Guillaume, Dawson, Otaye-Ebede, Woods, & West, 2015; Williams & O'Reilly, 1998). Studies have not only explored the immediate effects of diversity on performance or innovation, but also indirect effects based on mediation and moderation models where other factors are claimed to determine the plethora of these effects (e.g., van Knippenberg, De Dreu, & Homan, 2004). In this article, we've decided to study team diversity again as a contextual factor. This is done with the purpose of displaying team diversity as a variable that can be multi-modal in its nature, having a direct effect in some

team processes or indirectly influencing the way that team members understand, judge, and behave; although diversity is more commonly studied as a predictor variable, this is an argument for contingency concluded by the most recent reviews (Guillaume, Dawson, Otaye-Ebede, Woods, & West, 2015; van Knippenberg & Mell, 2016). Additionally, exploring diversity as a contextual factor allows for a substantial opening of research possibilities where statistical models are more integrative and exhibit a larger array of interactions.

This moderating role of team diversity has been explored by other studies with fruitful results (e.g., Greer, Jehn, Thatcher, & Mannix, 2008; Heavey & Simsek, 2014; Lee & Chae, 2017; Mitchell, Boyle, Nicolas, Maitland, & Zhao, 2016). For example, Lee and Chae (2017) tested the effect of leader-member exchange differentiation on team performance moderated by gender and age diversity. Both factors negatively moderated this relationship as demographic diversity will make team members more sensible and hold negative attitudes towards their leader's differential behaviors. For our particular research, we argue that team diversity will moderate the relationship between ETRI and team innovation (see H2). We support the proposition on this moderation as authors have called for research on the contextual factors that may have an effect on creativity and innovation (e.g., Anderson, Potočnik, & Zhou, 2014). This is done with the purpose of not only defining the causes but also to properly identify and manage any factors that may disrupt or benefit the way that employees and teams create new ideas and implement them in organizations. In this article, we are interested in age as the attribute of choice due to the following reasons: different age groups within the same team (also known as intergenerational teams) are often problematic due to a disconnection between young and old employees; for example, there's a well-known issue based on different age groups not sharing the same language (c.f., Lyons & Kuron, 2014), which is an imperative for idea sharing based on group interaction (1). Moreover, research has shown that salient attributes, or characteristics that

are easily perceivable (e.g., age and sex opposed to personality or educational background), are more easily used as the base for social categorization processes where individuals will classify themselves and others into groups. This may provoke subgrouping and intergroup bias causing tension, conflict, isolation, and group polarization (e.g., Jackson, May, & Whitney, 1995; van Knippenberg, Dawson, West, & Homan, 2011; Williams & O'Reilly, 1998), ultimately disrupting new idea sharing when team members withhold their contributions or waste time carrying out uncoordinated work (2). Finally, age is related to hierarchy where members with more responsibilities are also the oldest. Status differences based on age could be detrimental to team outcomes as age is a socially-defined status contrary to expertise-based (Jackson, 1996). Therefore, young or old members are not necessarily skillful in considering, discussing, or adopting new solutions solely due to their age. Additionally, salient differences between team members can eventually deter the effect of effective information sharing on the generation and implementation of new ideas due to social categorization processes (3). During this dissertation however, we've proposed and confirmed a positive effect of age diversity on team creativity (Chapter 2), which may implicate mixed results concerning the direct effects of age differences in teams (4). We predict that a higher variety of age groups within a team will translate into less perceivable differences between team members by making more diffuse the separation between young and old employees. Differences become less pronounced with high levels of variety (likewise with national variety, c.f., Milliken & Martins, 1996; e.g., Ayub & Jehn, 2014) and thus, it will not cause negative outcomes like intragroup conflict or subgrouping; on the other hand, a positive effect on team innovation is not probable. Creativity only concerns absolute novelty which may be facilitated by age variety like in our first study, whereas innovation must overcome implementation barriers like resistance to change and resource-allocation processes

(c.f., De Dreu, Nijstad, Bechtold, & Baas, 2011), for these reasons, we don't expect a direct relationship between age diversity and team innovation.

Nevertheless, we still propose that high levels of age variety will hinder innovation in teams that actively discuss and elaborate task-relevant information. Although ETRI functions as a driver of knowledge integration (van Knippenberg, De Dreu, & Homan, 2004) and collective idea generation (Hoever, van Knippenberg, van Ginkel, & Barkema, 2012), we argue that, in teams with high levels of age diversity, ETRI will not be related to innovation due to the amount of time and effort needed to process information between members of different age groups. Age differences may still not be informationally different enough to produce new and efficient ideas, especially compared to other attributes like professional diversity, however these differences may still be strong enough to cause a disconnection between team members. As teams must search and exchange information through individual-level communication (c.f., Hinsz, Tindale, & Vollrath, 1997), what the team decides to do with this information determines if it is, for example, systematically and deliberately processed (De Dreu, Nijstad, & van Knippenberg, 2008), which may later be transformed into creativity and innovation as end-states (De Dreu, Nijstad, Bechtoldt, & Baas, 2011). During the exchange, discussion, and elaboration of information (ETRI) between members of different ages, information is still being processed systematically; however, we argue that age-related disparities will hinder how members share and understand new information; which are essential aspects of knowledge integration and innovation. Slowly integrating information in teams that don't have the direct objective to innovate may use time needed to accomplish the main task which will increase time pressures, reducing creative problem-solving (Schultz & Searleman, 1998) and cognitive flexibility (e.g., De Dreu & Nijstad, 2008), which are related to team innovation (c.f., De Dreu, Nijstad, & Baas, 2011; West & Altink, 1996). We consider important to note that we observe innovation as being

voluntary extra-role behavior (c.f., Potočník & Anderson, 2016) and we're not studying teams that have the objective to innovate. Furthermore, at the other side of the spectrum, in teams with low levels of age variety ETRI will be more easily conducive to knowledge integration as members with different perspectives will use less time and effort to share and make others understand the new information. An example of this may come from age differences in attitudes towards technology and related skills (Chang, Choi, Bazarova, & Löckenhoff, 2015; Morris & Venkatesh, 2000; Shedletsky, 2006; Van der Kaay & Young, 2012), as new information may come or be based on software which may be easier to understand and integrate in similar age teams than on age diverse teams (e.g., software like cloud space technologies to save files or project management software). Along with these arguments, we predict that in teams with high levels of age variety there will be active discussions between members, however, these discussions will flow less easily, the elaboration and integration of new information may have more obstacles compared to homogenous teams, and therefore, ETRI may be less conducive to innovation due to more time pressures, less problem-solving, less cognitive flexibility, as well as less available time to test and implement new ideas into the work environment.

Hypothesis 4. Age diversity will moderate the relationship between ETRI and team innovation. At higher levels of age diversity, the relationship will be weaker, and at lower levels the relationship will be stronger.

4.3. Method

4.3.1. Data and sample

Our correlational research study took place in Italy's aerial defense force which is comprised by 43,000 workers. Our sample of 453 employees was organized in 48 military teams

where the mean team size was 9.44 ($SD = 5.54$). The population evaluated from this research was divided in two different sites in Italy. The majority of employees were male (97.4%), first class marshals (33.8%) 46 to 50 years old (33.3%), high school grads (62.3%), and have worked during 26 to 32 years in the air force (40.4%). Team leaders were male (93.8%), captains (29.2%), 41 to 45 years old (25.0%), high school grads (41.7%), and have worked during 26 to 32 years (25.0%) in the air force. The leaders had additional authority for decision-making but worked within the team as members themselves. Concerning the organization, the air force centers on multiple operational activities and initiatives that include aircraft rescue and search-and-rescue missions. Moreover, the air force implements training activities that address tactical leadership, international and national polygons, personnel recovery, and interoperability cooperation, among others.

4.3.2. Procedure

We choose teams of three to twenty members with a team leader to compose the 48 military teams ending with 43 team leaders in total (as five were not available). We translated from English into Italian all measures through a standard back-translation procedure. After this, we used two questionnaires: one for the employees which had all study measures except for team innovation, and one for the team leaders with all study variables included. We administered these questionnaires via a secured platform within the air force through a message inviting them to participate in the study. Within each message we explained the research objectives, the confidentiality of their responses, and the necessary follow-up procedures if they desired to receive their results.

4.3.3. Measures

4.3.3.1. Perceived organizational value of innovation

The variable VIN was measured through 5 items where we asked team members the importance that the Air force attributed to particular orientations corresponding to flexibility, information sharing, cooperation, and initiative. We elaborated this scale using McDonald and Gandz (1991, 1992) taxonomy of values where one of their proposed classifications concerned aspects related to change and mainly the propositions of Finegan (2000) on the organizational value factor of vision. We used a 5-point Likert scale going from ‘not at all important’ (1) to ‘totally’ (5), where a sample item is: For the Air Force it’s important to... “Develop and experiment with new ways of solving a problem”.

4.3.3.2. Elaboration of task-relevant information

We used the scale developed by Kearney, Gebert, and Voelpel (2009) that measured ETRI based on van Knippenberg, De Dreu, and Homan (2004). This scale consists of 4 items on a 5-point Likert scale going from ‘strongly disagree’ (1) to ‘strongly agree’ (5), where a sample item is “The members of this team carefully consider the unique information provided by each individual team member”.

4.3.3.3. Supervisor rating of team innovation

Team innovation was evaluated by the team leaders to reduce the probability of common method bias (c.f., Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). We used a 6 item Likert-scale going from 1 (never) to 5 (always) taken from Janssen (2000) and modifying it to refer to the team. There were three items for idea generation and three for idea implementation, for example: “My team generates new ideas for difficult issues” (idea generation), and “My team

introduces innovative ideas into the work environment in a systematic way” (idea implementation).

4.3.3.4. Team age diversity as variety

For the moderating variable team diversity, age differences were measured as variety (Harrison & Klein, 2007) using Blau’s index of heterogeneity (1977), which goes from no variety with a score of 0 to total variety with a score of 1. This index has the following computational formula: $1 - \sum p^2$, p referring to the proportion of members in a category or K. Age variety was measured by asking each team member their corresponding age group among the following possibilities: less than 26 years old, from 26 to 30 (26-30), 31-35, 36-40, 41-45, 46-50, 51-55, and more than 56 years old (8 categories in total).

4.3.3.5. Control variables

We controlled for team challenging assignment and support for innovation due to their relationship with team innovation. The former refers to “activities that (a) are new and ask for nonroutine skills and behaviors; (b) test one’s abilities or resources; (c) give an individual the freedom to determine how to accomplish the task; and (d) involve high levels of responsibility and visibility” (Preenen, Van Vianen, & De Pater, 2014, p. 650). We evaluated the team leaders’ perception about the extent to which the activities that he or she established were challenging. For this, we used 4 items, with a 5-point Likert scale going from ‘not at all’ (1) to ‘completely’ (5), based on the scale developed by Preenen, De Pater, Van Vianen, and Keijzer (2011) to target team leaders. One sample item is “I entrust my team with tasks that require high levels of responsibility”. Finally, job challenges have been related to innovative behaviors as they, for example, facilitate implicit motivation which is crucial for creativity (Amabile, 1988; De Jong & Kemp, 2003). On the other hand, support for innovation refers to the perceived practical aid for

introducing new ideas into the workplace (c.f., Anderson & West, 1998). We evaluated team members using a 5-point Likert scale going from ‘not at all’ (1) to ‘completely’ (5), where a sample item is “I share the goals set for my team”. Support for innovation is a classic predictor of innovation in teams since its development (c.f., Anderson & West, 1998; van Knippenberg, 2017). Perceiving support for innovation is related to having important resources available for innovating like time to test new procedures, cooperation, and support for implementing new ideas into the workplace.

4.3.4. Data aggregation

Calculating for data aggregation was needed to compile employee scores to the team-level. The following results correspond to the $rwg(j)$, ICC (1), and ICC (2), of the aggregated variables: VIN = .73, .87, .99; ETRI = .77, .86, .98; and support for innovation = .73, .91, .99. All scores for $rwg(j)$ were above .70 (c.f., Bliese, 2000), above .12 for ICC (1), and above .60 for ICC (2) (c.f., James, 1982; Glick, 1985, respectively) so data aggregation was justified.

4.4. Results

We present descriptive statistics and correlations in Table 11. We used MPLUS version 7.4 (Muthen & Muthen, 2015) for the CFAs which showed satisfactory model fits: for VIN the fit was $\chi^2(5.62, N = 452)/df = 4$, CFI = .99, RMSEA = .03 at one factor, for ETRI the fit was $\chi^2(5.01, N = 452)$, $df = 2$, CFI = .99, RMSEA = .05 also at one factor, which was also the case for team innovation at $\chi^2(8.44, N = 43)$, $df = 8$, CFI = .99, RMSEA = .03. Additionally, we used PROCESS for SPSS by Hayes (2013) with a 10,000 bootstrap to test our model hypotheses. Preliminary results show an inter-correlation between VIN and ETRI but no significant correlation between ETRI and team innovation. Concerning our control variables, we identify a

positive correlation between support for innovation and ETRI, and between challenging assignments and team innovation.

Table 11.

Means, standard deviations, and inter-correlations A3

Variables	M	SD	1	2	3	4	5	6
1 VIN	3.68	0.25	(.89)					
2 ETRI	3.74	0.26	.51**	(.87)				
3 Team innovation	3.14	0.93	0.14	0.26	(.93)			
4 Age diversity	0.63	0.17	-0.02	-0.16	-0.20	-		
5 Support for innov.	3.45	0.33	0.19	.43**	0.25	.36*	(.91)	
6 Challenging assign.	3.69	0.88	-0.19	-0.10	.63**	-0.17	0.01	(.85)

Notes: Cronbach's Alphas are shown in the intersections.

N = 48 teams; for Team innovation and Challenging assignments N = 43.

M = Mean, SD = Standard deviation, Innov. = Innovation, Assign. = Assignments.

* $p < .05$ (two-tailed); ** $p < .01$ (two-tailed).

4.4.1. Hypothesis testing

Using PROCESS for SPSS (Hayes, 2013) allows testing for a mediated relationship in which a variable moderates the relationship between the mediator (ETRI) and the dependent variable (team innovation); this is labeled as model 14. Carrying out the regression analysis produced an index of moderated mediation which was significant: -3.76 (-8.62 to -.08); results are shown in Table 12. We observe that VIN was positively related to ETRI at $B = .48$, $SE = .14$, $p = .00$ which confirms our first hypothesis. However, the analysis didn't identified an effect of ETRI on team innovation at $B = .57$, $SE = .53$, $p = .29$, as the effect was not significant, rejecting hypothesis 2. Furthermore, the mediating role of ETRI however, was identified at low values of age diversity. The interaction effect was negative and significant at $B = -7.81$, $SE = 3.45$, $p = .03$; where low levels of diversity showed an indirect effect of VIN on team innovation at $B = .94$, $SE = .58$, $LLCI = .07$, $ULCI = 2.42$; however, at medium and higher levels the effect was reduced and was not significant.

Table 12.

Moderated Mediation Model Regression Analysis Results A3

Variables		B	SE B	<i>p</i>		
ETRI as dependent variable						
Intercept		-2.58**	.59	.00		
VIN		.48**	.14	.00		
Challenging assignments		-.00	.04	.88		
Support for innovation		.24*	.10	.02		
Team innovation as dependent variable						
Intercept		-2.66	2.32	.26		
ETRI		.57	.53	.29		
VIN		.27	.51	.61		
Age diversity		.02	.73	.98		
Interaction (Moderator)		-7.81*	3.45	.03		
Challenging assignments		.66**	.12	.00		
Support for innovation		.67	.38	.09		
Conditional effects						
Levels of age diversity		VIN on team innovation through ETRI	SE	B/SE	<i>LLCI</i>	<i>ULCI</i>
Low	-.1759	.94*	.94	.58	.07	2.42
Medium	.0000	2.57	1.51	2.23	-.15	1.04
High	.1759	1.94	.86	2.25	-1.23	.20

Note: $N = 48$ teams, $N = 43$ leader scores for team innovation and challenging assignments.
* $p < .05$; ** $p < .001$.

Due to these results, we performed a simple moderation model (labelled by PROCESS as model 1) to specify the direct effect of ETRI on team innovation and elaborate Figure 5. Results were similar to the moderated mediation model and are presented on Table 13; ETRI was not related to team innovation at $B = .70$, $SE = .47$, $p = .15$, although the p -value was closer to .05, the interaction effect was also negative and significant at $B = -8.26$, $SE = 3.30$, $p = .02$, and the effect of ETRI on team innovation was significant at low levels of age diversity at $B = 2.15$, $SE = .71$, $p = .00$. This effect was reduced and not significant at medium and higher levels of age diversity, indicating that ETRI is only related to team innovation, and mediates the relationship

between VIN and innovation, at low levels of age diversity. Therefore, hypothesis 2 and hypothesis 3 (mediation) are partially confirmed as they're contingent to the level of age diversity, and hypothesis 4 (moderation) is confirmed in its entirety.

Figure 5.

Moderating effect of age diversity for the ETRI – team innovation relationship

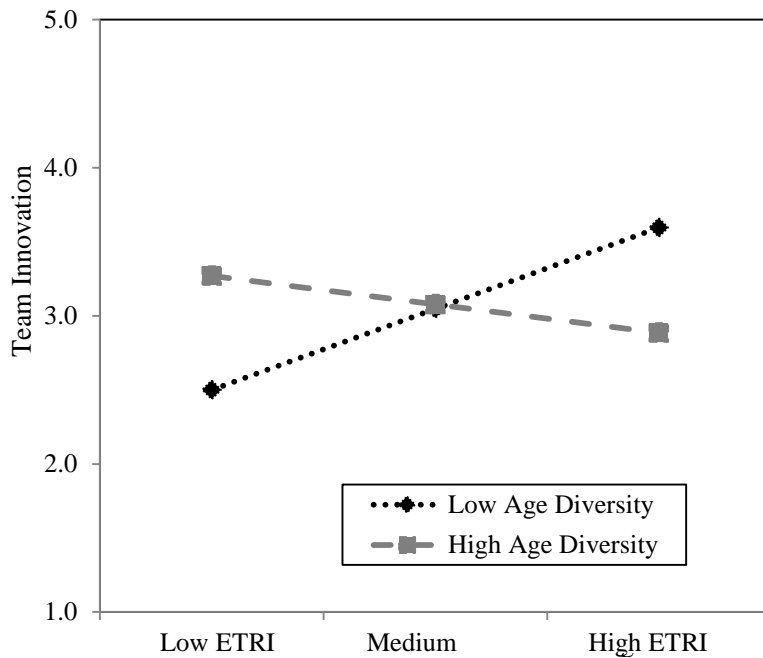


Table 13.

Regression Analysis Results – moderation segment A3

Variables	B	SE	<i>p</i>
Team innovation as dependent variable			
Intercept	-1.66	1.30	.21
Age diversity	.09	.71	.90
ETRI	.70	.47	.14
Interaction (Moderator)	-8.26*	3.30	.01
Challenging assignments	.65**	.11	.00
Support for innovation	.67	.38	.08
Conditional effects			
Levels of age diversity	Effect of ETRI on	SE	<i>p</i>

		team innovation		
Low	-.1759	2.15**	.71	.00
Medium	.0000	.70	.47	.14
High	.1759	-.75	.78	.34

Note: $N = 48$ teams, $N = 43$ leader scores for team innovation and challenging assignments.

* $p < .05$; ** $p < .001$.

Finally, our analysis of control variables shows that challenging assignments were positively related to team innovation at $B = .66$, $SE = .12$, $p = .00$. Additionally, support for innovation was positively related to ETRI at $B = .24$, $SE = .10$, $p = .02$. As expected, the simple moderation model results showed similar effects for both variables; these and all other results are discussed in the next section.

4.5. Discussion

Focusing on the conditional indirect effects of perceived organizational values, and by addressing research calls on the contextual factors related to creativity and innovation, we've identified that VIN is positively related to ETRI, which in turn promotes team innovative behavior only at low levels of team age diversity. VIN facilitates ETRI as team members are more eager to discuss and elaborate information with the possible purpose of innovating. We argued that this effect is due to employees perceiving that their organization values, for example, flexibility and information sharing which are behaviors related to innovation. Moreover, we've found that the effect of ETRI on team innovation is reduced by age diversity as scores are weaker and non-significant at medium and high levels of this moderator. These results indicate that VIN, although relevant for promoting team innovation, doesn't directly encourage team members to collectively generate and implement new ideas into the workplace. For teams to carry out these behaviors, it's also necessary that employees actively create, share, and discuss information about their task. However, for our sample, this was only possible at low levels of age diversity. These

results highlight the importance of identifying the level of age diversity within the team as, for our case, more of it translated into less creative ideas being shared and implemented into the workplace.

Moreover, by observing the effects of the control variables, we've found that, interestingly, support for innovation was positively related to ETRI and not significantly related to team innovation. The first relationship may be caused by how members perceive a team climate that encourages them to voice their opinions and perspectives. This is surely related to ETRI to the extent that team members actively discuss their views and focus on task-related information. However, concerning the lack of a relationship with team innovation, although the effect was identified but not significant ($p = .08$) other factors, like ETRI, may have a more direct role as predictors of innovation; additionally, the literature has studied the role of team processes as mediators of the relationship between team climate and team outcomes (e.g., González-Romá & Hernández, 2014) which could explain this result. Furthermore, the positive effect of challenging assignments on team innovation concords with previous arguments and research on individual innovative behavior (Amabile, 1988; De Jong & Kemp, 2003).

4.5.1. Theoretical implications

This study contributes to the literature on team innovation and team diversity by integrating arguments for perceived organizational values and by identifying age diversity as a contextual factor. Our results favor the idea of observing how team members perceive that their organization values aspects related to innovation, and the fundamental role of team processes like ETRI to transform their effect into idea generation and implementation in teams; to our knowledge, this relationship has not been explored yet. Moreover, although ETRI has been previously found to be related to creativity (Hoever, van Knippenberg, van Ginkel, & Barkema,

2012), its relationship with innovation is not as straightforward, we contribute to research on team diversity by showing that the relationship between ETRI and innovation is contingent on the level of age diversity. Indeed, the contextual effect of team diversity has begun to be explored (e.g., Mitchell, Boyle, Nicolas, Maitland, & Zhao, 2016), and recent studies favor the idea that complex dynamics may be the case for diversity in teams (c.f., Joshi & Neely, 2018), further justifying research like ours on the different roles that diversity may have other than that of a predictor variable. Finally, we find these interactions in groups embedded in a military context also adding to research on military teams. Our study further develops the understanding and the effects of age differences in the military and the importance of collective information sharing for boosting innovation in military contexts.

4.5.2. Managerial implications

For organizations, our results confirm the idea that information sharing between team members may promote innovation in teams depending on the level of diversity. Furthermore, valuing, providing support, and encouraging experimentation, flexibility, cooperation and the implementation of changes within the organization may help teams to better coordinate their efforts, take better decisions, and innovate, which are outcomes related to ETRI (e.g., Hoever et al., 2012; Kooij-de Bode, van Knippenberg, & van Ginkel, 2010). Employees perceive the values that their organization embraces and react congruently; if innovation is cherished, employees may be eager to share information and orient their efforts towards innovative solutions. Additionally, our model is particularly important for designing managerial strategies that take into account the need to support innovative initiatives but that don't consider team collaborative processes.

Moreover, our results can be complemented by the importance of team leaders in representing the organizational values that the employees perceive (Kalshoven & Den Hartog,

2009), shaping the way that team members cooperate and participate, ultimately encouraging innovation; as Montani, Battistelli, and Odoardi (2015) argued: “when supervisors enthusiastically embrace new ideas and solutions, encourage innovative contributions, and work with followers to develop and apply new ideas, they convey the information that the organization values and rewards innovative activities” (p. 9). In addition, we judge relevant to identify the salient member characteristics that may be related to the way that employees share new ideas within their teams. Covering the team diversity literature, there’s evidence that diversity is a complex phenomenon and that its effects are dependent on other factors (c.f., van Knippenberg & Mell, 2016); these may concern for example, the beliefs that the team members and their leader hold about diversity (e.g., Nishii & Mayer, 2009), or the presence of stereotypes towards senior and junior employees (c.f., Lyons & Kuron, 2014). The need for identifying these factors and to effectively manage them is the way in which diversity may indeed improve team outcomes rather than the opposite. Finally, we recommend innovative strategies to not only center on employees generating new ideas, but also to emphasize on teams, as different people offer a larger pool of resources in which to create new and better solutions, and to guide these initiatives towards their implementation to make the new ideas useful.

4.5.3. Limitations and directions for future research

This study is not without its limitations. Although we found a relationship between our variables confirming the proposed moderated mediation model, our results are drawn from correlational methods that do not necessarily justify for causality. Carrying out longitudinal design studies, or through experimentation, may allow us to draw conclusions on the causal interactions of our model. Furthermore, our study only comprised 48 teams (and 43 team leaders) which may be considered a small sample size, however, finding relationships and moderation

effects with small samples indicates large effect sizes (Cohen, 1992). Additionally, we could've also used more objective criteria for measuring innovation (e.g., number of suggestions implemented), compared to only asking the team leader about their team's behavior, as more reliance can be placed on these measures (c.f., Hülsheger, Anderson, & Salgado, 2009). Future studies could analyze our model by adopting a longitudinal design, gather a larger sample size, and use objective criteria for innovation to further test the results found in this article.

Interestingly, concerning the effects of ETRI, arguing that in some cases this process may negatively affect the team is rare but has been recently addressed by van Dijk, Meyer, and van Engen (2018). According to the authors, ETRI may negatively affect performance when attributions of competence (within the team) don't correspond to actual competences. This may be due to member stereotypes when they perceive other members as more or less competent based on irrelevant attributes (e.g. gender). Moreover, ETRI is not necessarily an equal process and is more than logical to believe that information flows unequally among team members for various reasons; like when members that are perceived as competent share more information compared to members who are perceived as less competent (c.f., Franz & Larson, 2002). We have reasons to believe that in age diverse teams an inaccurate attribution of competences may also take place: it may be that older employees may be perceived as more experienced even if they're not and younger employees may be wrongly perceived as less competent. Research has shown that team members use differences in characteristics for attributing competence and take decisions based on this (Loyd, Wang, Phillips, & Lount, 2013; Srikanth, Harvey, & Peterson, 2016). Although we didn't address competence attribution in the current article, we encourage future studies to test the role of the accuracy of competent attributions for the relationship between ETRI and team outcomes in age diverse teams.

Finally, it could be interesting to explore the multilevel interactions related to the used variables. For example, future studies could trace a link between HR strategies with team innovation by exploring how these managerial activities can influence the way that employees perceive the values that the organization cares about, and then how these perceptions promote or disrupt innovative behaviors. These future studies can also confirm the importance of the team leader in shaping these perceptions, examine the effects of team temporality in our model (e.g., recent teams vs. experienced teams), and further analyze the contextual role – or the different modalities (e.g., Bunderson & Van der Vegt, 2018) – that diversity can adopt within organizational settings.

4.6. Additional analyses

We additionally tested our model with age separation and disparity (for more details on the effects of age separation and disparity see the additional analyses section of Chapter 2). We expected that the first model with age separation would have a direct negative effect on team innovation while also reducing the strength of the effect of ETRI. This is due to the easiness to socially categorize others which is related to this attribute at high levels of separation (c.f., Williams & O'Reilly, 1996; Wegge, et al., 2012). Concerning the second model, we don't expect that a single team member isolated will have an effect on team innovation nor that it will interact with ETRI. Age disparity will take into its calculation the team leader which will be most commonly the oldest and more experienced member; this is common in military organizations and the higher age of the team leader will probably not have any effect on team functioning. Both models were tested in the same way as for the model of Article 3 (including the control variables and the use of PROCESS for SPSS).

Results for the model with age separation as diversity partially confirm our expectations. Age separation had no direct effect on team innovation at $B = -.09$, $SE = .25$, $p = .70$, and the interaction effect was negative and borderline significant at $B = -2.20$, $SE = 1.10$, $p = .05$, where the conditional indirect effects of VIN on team innovation, passing through ETRI, changed from $B = .71$, $SE = .47$, $LLCI = .02$, $ULCI = 1.94$ (significant) at low levels of age separation, to $B = -.30$, $SE = .39$, $LLCI = -1.35$, $ULCI = .28$ (non-significant) at high levels. These results show weaker effects compared to those of age variety from the current chapter (the interaction effect was of $B = -7.81$, $SE = 3.45$, $p = .03$), and additionally the index of moderated mediation was not significant at -1.06 (-2.61 to $.04$). These results suggest a lack of validity for the overall model with age separation. Finally, the results for diversity as disparity confirm the non-significant effect in our model. The direct effect on team innovation was non-significant at $B = 2.42$, $SE = 1.75$, $p = .17$, as well as the moderating effect at $B = -6.47$, $SE = 5.00$, $p = .20$. Detailed results will be attached to the annex of this dissertation.

4.7. Additional study 2

Comparing the mediating effects of TMS and ETRI: Testing models on the relationship between perceived values, innovation, and team diversity

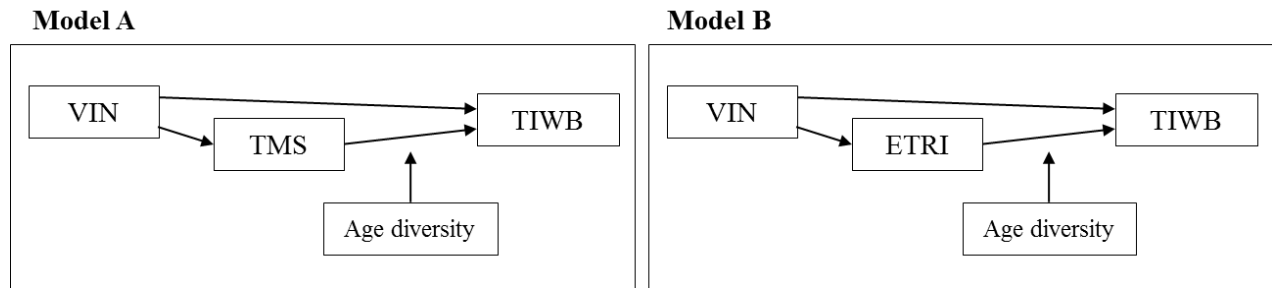
Based on the results of Article 2 and 3, we hereby compare two models on the mediating role of ETRI and TMS for the relationship between VIN and team innovation; including the moderating role of age diversity. The findings of this study concerning emergent states and team processes are briefly compared and discussed within this section.

4.7.1. Theoretical background and hypotheses

The appellative “emergent states” has been recently used to differentiate between dynamic and enduring bottom-up team properties or *states* from collective *processes* (e.g., group cohesion and intragroup conflict respectively). Emergent states are somewhat deeply related to team processes in that their ‘state’ affects and is, in turn, affected by these processes (c.f., Marks, Mathieu, & Zaccaro, 2001). Research on teamwork has recently called for the study of the relationship between team inputs, emergent states, team processes, and team outcomes (Driskell, Salas, & Driskell, 2018). Forwardly, although an IPO-style heuristic would not be adequate to test this kind of interaction, our main goal in this additional section is to propose and observe the possible dissimilar effects of an emergent state (TMS) and a team process (ETRI) in a team-level model concerning innovation (see Article 3). Moreover, the effects of TMS and ETRI will be compared separately with the purpose of confirming their mediating role within the model (see Figure 6). We consider important to point out that only the hypotheses that have not been proposed before are detailed here (e.g., the relationship between VIN and TMS).

Figure 6.

Moderated mediation models tested AS2



Note: Both models were tested with challenging assignments and support for innovation as control.

To start, our proposed model for TMS as the mediator (Model A) refers to a direct positive effect of VIN on TMS. We predict that team members that perceive that their organization values innovation will have more reason to share their expertise, as well as be aware of who-knows-what and of what is necessary to accomplish the task, compared to members of a team that doesn't. This is because an eagerness to innovate due to VIN will promote information sharing and shared experiences; as team members need to have information on team functioning specificities in order to innovate, members will communicate and discuss about the task leading to a more accurate TMS (Hollingshead & Brandon, 2003). Moreover, similar to the effect of VIN on ETRI (preceding section, Article 3), the improvement or change of a work element needs to take into account current teamwork and taskwork which are also related to team shared experiences and familiarity; which are antecedents of TMS content (e.g., Gino, Argote, Miron-Spektor, & Todorova, 2010; Moreland, Argote, & Krishnan, 1996; c.f., Ren & Argote, 2011). For example, for enhancing a rescue operation military units must already know what the current state and tactics for rescue is, and what possible inefficiencies or contingencies this operation has. Later, a collective innovative idea tackling these elements may rise, be understood, accepted, and

then be implemented into the work environment. Due to these considerations we propose that VIN will facilitate the development and manifestation of TMS.

Hypothesis 1a. VIN will be positively related to TMS.

As with our propositions from Article 2 (Chapter 3), we expect TMS to be related to team innovation, and thus, to mediate the relationship between VIN and team innovation as, to our knowledge, perceiving that the organization values innovation needs new ideas being generated, shared, and implemented which will be explained by how TMS offers time to test new ideas, structures team member expertise and task specificities for problem-solving, and facilitates trust in others ideas.

Hypothesis 2a. TMS will be positively related to team innovation.

Hypothesis 3a. TMS will mediate the relationship between VIN and team innovation.

Concerning the moderating role of age diversity, we expect similar effects as with military grade diversity (as well as with the effects of ETRI, Article 3). High levels of age diversity will facilitate misunderstandings and present a disconnection between members of different ages; this will hinder idea sharing and implementation in highly coordinated teams (TMS) due to a fear of disrupting efficient work or having trouble explaining and implementing a new idea to dissimilar age members.

Hypothesis 4a. Age diversity will moderate the relationship between TMS and team innovation. At higher levels of age diversity, the relationship will be weaker, and at lower levels the relationship will be stronger.

As a next step, our model with ETRI as mediator for the relationship between VIN and team innovation (Model B), predictions are analogous to Article 3 as it's the same model. Based on this, and following our predictions and results from the preceding section, hypotheses are labelled as follows:

Hypothesis 1b. VIN will be positively related to ETRI.

Hypothesis 2b. ETRI will be positively related to team innovation only at low levels of age diversity.

Hypothesis 3b. ETRI will mediate the relationship between VIN and team innovation only at low levels of age diversity.

Hypothesis 4b. Age diversity will moderate the relationship between ETRI and team innovation. At higher levels of age diversity, the relationship will be weaker, and at lower levels the relationship will be stronger.

4.7.2. Method

For this additional test we used the same data from the 453 employees organized in 48 military teams where the mean team size was 9.44 (SD = 5.54). Moreover, all measures were the same as our preceding CFA procedures and data aggregation analyses were satisfying – team innovation was rated by the team leader as in Article 3. Nevertheless, we decided to change the TMS factor due to a high correlation with ETRI. Although this may suggest a lack of difference between the two, theoretical assumptions concerning the similarities between TMS and ETRI are known. Following our discussion on the differences between emergent states and team processes, as well as their close interaction (c.f., Marks, Mathieu, & Zaccaro, 2001), we explain this

correlation as both factors deeply rely on information being shared, both are related to between-member experiences (on discussions for ETRI and as antecedents for TMS), and both consist on the creation and use of distributed task-related resources (c.f., Lewis, 2003; Lewis & Herndon, 2011; van Knippenberg, De Dreu, & Homan, 2004). After observing a correlation matrix between the items of TMS and the mean of ETRI, we decided that the dimension of coordination was the most related to ETRI. This is probably because a highly coordinated team has to discuss and structure the most efficient tactics beforehand, and that a good coordination based on TMS may facilitate information exchange and integration for a better task accomplishment due to clearer roles and understandings. Based on this, we left the coordination dimension out of the TMS factor during the CFA procedure. After deleting two items from specialization and two for credibility, the model-fit for TMS composed by six items, two dimensions, and one factor was acceptable at: $\chi^2(30.43, N = 453), df = 8, CFI = .95, RMSEA = .07$ (Cronbach's alpha was .74). Finally, the same control variables from Article 3 were used in our models: support for innovation (team-rated) and team challenging assignments (supervisor-rated).

4.7.3. Results

As usual, descriptive statistics and correlations are presented in Table 14. The same software was used for the CFA's (MPLUS, Muthen & Muthen, 2015) and for the hypothesis testing (PROCESS for SPSS with a 10,000 bootstrap, Hayes, 2013). We observed that, although the coordination dimension from TMS was left out, the correlation between this variable and ETRI is still high and significant. Nevertheless, we still decided to continue the analyses.

Table 14.

Means, standard deviations, and inter-correlations AS2

Variables	M	SD	1	2	3	4	5	6	7
1 VIN	3.68	.25	(.89)						
2 TMS	3.76	.23	.61**	(.74)					
3 ETRI	3.74	.26	.51**	.79**	(.87)				
4 Age diversity	.63	.17	-.02	.05	-.16	-			
5 Team Innov.	3.14	.93	.14	.20	.26	-.20	(.93)		
6 Challenging assign.	3.69	.88	-.19	-.21	-.10	-.17	.63**	(.85)	
7 Support for Innov.	3.45	.33	.19	.31*	.43**	.36*	.25	.01	(.91)

Notes: Cronbach's Alphas are shown in the intersections.

N = 48 teams; for Team innovation and Challenging assignments N = 43.

M = Mean, SD = Standard deviation, Innov. = Innovation, Assign. = Assignments.

* $p < .05$ (two-tailed); ** $p < .01$ (two-tailed).

4.7.3.1. Hypothesis testing

For testing our model hypotheses we examined two models: the first one included TMS as a mediator and the other one included ETRI (see Figure 5). Results were paired by mediator and can be seen in Table 15.

Table 15.

Moderated Mediation Model Regression Analysis Results AS2

Variables	Model A (TMS)			Model B (ETRI)		
	B	SE B	<i>p</i>	B	SE B	<i>p</i>
Mediator as dependent variable						
Intercept	-2.25**	.60	.00	-2.58**	.65	.00
VIN	.54**	.12	.00	.48**	.17	.00
Challenging assignments	-.02	.03	.38	-.00	.04	.89
Support for innovation	.10	.11	.36	.24	.16	.14
Team innovation as dependent variable						
Intercept	-.06	2.07	.97	-2.65	2.04	.20
Mediator (TMS / ETRI)	1.41*	.57	.01	.57	.62	.36

VIN		-.34	.56	.55	.26	.60	.66
Age diversity		-1.43*	.55	.01	.02	.69	.97
Interaction (Moderator)		-10.77**	1.10	.05	-7.80*	2.87	.01
Challenging assignments		.67**	.10	.00	.66**	.11	.00
Support for innovation		.57	.39	.15	.67	.39	.10
Conditional indirect effects							
	Levels of age diversity	VIN on innovation through TMS B	<i>LLCI</i>	<i>ULCI</i>	VIN on innovation through ETRI B	<i>LLCI</i>	<i>ULCI</i>
Low	-.1759	1.81*	.67	3.41	.93*	.08	2.49
Medium	.0000	.77*	.17	1.60	.27	-.15	1.08
High	.1759	-.26	-.88	.46	-.38	-1.23	.22
Index of moderated mediation		-5.90*	-10.94	-1.87	-3.76*	-8.79	-.10

Notes: N = 48 teams, N = 43 leader scores for team innovation and challenging assignments. Index of moderated mediation added for comparison.

* $p < .05$; ** $p < .001$.

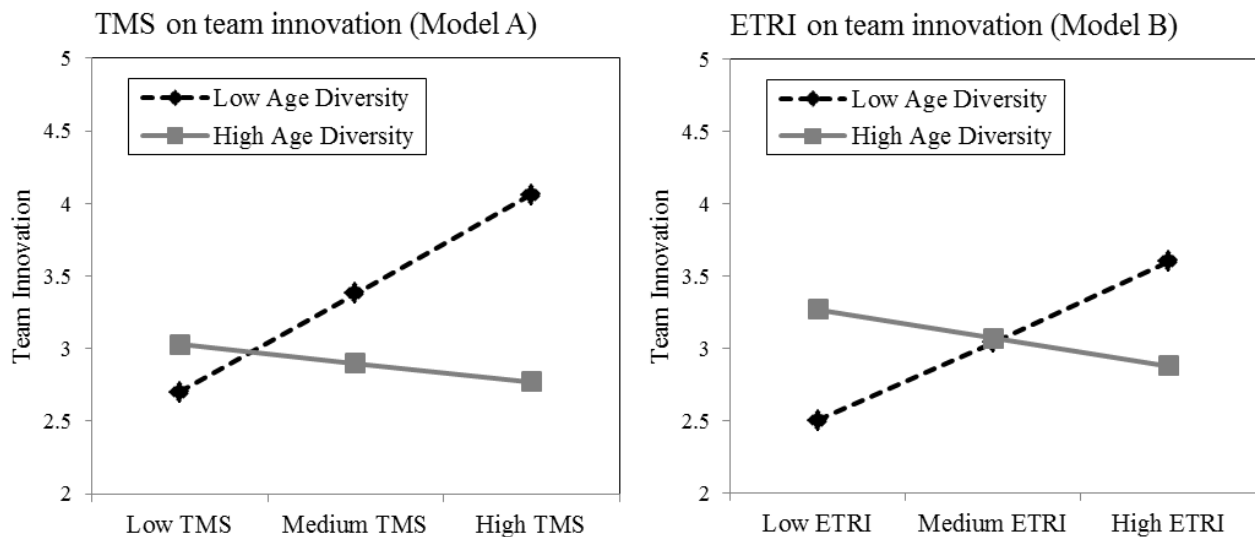
Results show that VIN is positively related to both ETRI and TMS. The difference between the two is simply $B = .54$ for TMS and $B = .48$ for ETRI. These results confirm our hypotheses 1a and 1b on the relationship between VIN and our mediator variables. Furthermore, we observe that TMS is related to team innovation at $B = 1.41$, $SE = .57$, $p = .01$, confirming hypothesis 2a and 3a. Moreover, on the effect of ETRI on team innovation, the same results from Article 3 are shown, where ETRI is related to team innovation at low levels of age diversity and adopts a contingent mediating role (Hypotheses 2b and 3b).

Next, concerning the moderating role of team diversity, results from both models show that at higher levels of age diversity the effect of the chosen mediator on team innovation is reduced or non-significant (the interaction effect is negative and significant). The highest score for this interaction was seen on Model A with TMS at $B = -10.77$, $SE = 1.10$, $p = .05$, where

conditional effects show that at lower levels of age diversity the indirect effect of VIN on team innovation through TMS is at its highest point at $B = 1.81$, $LLCI = .67$, $ULCI = 3.41$, this effect is reduced at medium levels of age diversity at $B = .77$, $LLCI = .17$, $ULCI = 1.60$, and non-significant at higher levels at $B = -.26$, $LLCI = -.88$, $ULCI = .46$. Conditional effects from these models showed this pattern where at higher levels of age diversity the indirect effect (the effect of VIN on innovation through the mediator) is non-significant and, at lower levels, the effect is positive and significant which confirms hypotheses 4a and 4b. The only difference concerns medium levels of age diversity where only the effect on Model A (TMS) was still positive and significant. Very briefly, results from simple moderations tests are very similar to these findings and are presented as a graph in Figure 7 and in Table 16. Finally, concerning our control variables, and by ignoring the effects already found in Article 3, results show that support for innovation is not related to our mediator variables or to team innovation, and that challenging assignments is not related to TMS.

Figure 7.

Graphic representation of the results from simple moderation models



Note: Both models controlled for support for innovation and challenging assignments.

Table 16.

Regression Analysis Results – moderation segment AS2

Variables	MA (TMS)			MB (ETRI)			
	B	SE	<i>p</i>	B	SE	<i>p</i>	
Team innov. as dependent variable							
Intercept	-1.28	1.36	.35	-1.66	1.51	.27	
Age diversity	-1.37*	.55	.01	.08	.67	.89	
Mediator	1.20**	.40	.00	.69	.42	.11	
Interaction (Moderator)	-9.97**	2.81	.00	-8.26**	2.25	.00	
Challenging assignments	.68**	.10	.00	.65**	.11	.00	
Support for innov.	.55	.35	.12	.67	.36	.07	
Conditional effects							
Levels of age diversity		TMS			ETRI		
		on team	SE	<i>p</i>	on team	SE	<i>p</i>
		innov.			innov.		
Low	-.1759	2.96**	.66	.00	2.15**	.58	.00
Medium	.0000	1.20**	.40	.00	.69	.42	.11
High	.1759	-.55	.61	.37	-.75	.58	.20

Notes: N = 48 teams, N = 43 leader scores for team innovation and challenging assignments. Independent variable tested is shown in parenthesis at the right of the model. Innov. = Innovation. M = Model. * $p < .05$; ** $p < .001$.

4.7.4. Discussion

Results from this additional testing concerning TMS (Model A) add valuable insight to the way that VIN indirectly affects team innovation, and to how diversity moderates the relationship between team functioning and innovation. First, we found that VIN affected TMS more strongly than ETRI. Although the difference was very small, this effect suggests that perceiving that the organization denotes importance to innovation-related behaviors doesn't only boosts sharing and discussing information, but also facilitate the development of TMS. Second, we add the value of TMS as an emergent state capable of mediating the effect of VIN on team

innovation. When ETRI failed to be positively related to team innovation at average levels of age diversity, TMS had still an effect of innovative behavior. This result suggests that TMS is more strongly related to innovation compared to ETRI; we consider this plausible due to the extra time available to highly coordinated teams as well as the facilitation of problem-solving behaviors and better judgment due to a developed transactive memory structure. This is more related to implementation barriers as the team will be aware of which ideas are possible and useful at the same time that they consider the way that they may coordinate their efforts due to a developed TMS. Furthermore, as a third point, we have found that age diversity also moderates the relationship between TMS and team innovation. The interaction effect was even higher than with ETRI; probably due to the stronger connection between TMS and innovation.

We conclude that although TMS may seem as more conducive to innovation, both variables are important parts of team functioning. As one is an emergent state and the other a team process, we know that both are deeply interrelated (evidenced by their correlation) and there may be a possibility that ETRI needs TMS to positively affect team innovation and vice versa. This type of interaction however, needs to be tested in other ways and through other methods of evaluation as our variables were, unfortunately, too correlated to one another. Furthermore, although we tried to reduce their similarities, by doing so, we affected the way that we can correctly measure TMS. As Lewis and Herndon (2011) argued, the most adequate way to evaluate TMS through its behavioral representations is when these dimensions compose one factor. This means, briefly, that there may be teams with high levels of specialization and credibility but no coordination, that don't possess a developed TMS. Or highly coordinated teams with low specialization and credibility, which could present the same case. Therefore, the idea is to observe these three behavioral dimensions as manifestations and not as components. One of our main contributions from this study concerns the comparison between TMS and ETRI, which

are particularly valuable factors for team functioning and for facilitating team innovation in military units. We propose future research to test and more adequately model how these factors interact and how they promote team innovation in different contexts.

Chapter 5 – General discussion

5.1. Discussion Drafting Plan

It is imperative to denote that a specific discussion for each article was presented at the end of each chapter. Therefore, hereby we present a brief review of each of our research studies as well as a general discussion on the implications of the current dissertation. Afterwards, we describe the limitations of our work to finally review and propose several ideas for future research.

5.2. Brief review of developed articles

The current dissertation had the objective of exploring the role of team-level variables on the relationship between team diversity and innovation. These variables, identified throughout the main models of our articles – which are synthesized in Table 17 –, were workplace generational inclusiveness (WGI), transactive memory system (TMS), elaboration of task-relevant information (ETRI), and the perceived organizational value of innovation (VIN); abbreviations are recalled for facilitating reading. The first one, WGI, moderated the relationship between age diversity and creativity in a postal organization. We found that at higher levels of WGI the effect of age diversity on team creativity was stronger, possibly due to higher levels of respect, commitment, and a lower tendency towards stereotyping and discrimination. The second variable, TMS, was one of our focus factors as it has been related to creativity and innovation in previous instances (Fan et al., 2016; Peltokorpi & Hasu, 2014, 2016), as well as being an emergent state, dynamic in nature, and key for team functioning (DeChurch & Mesmer-Magnus, 2010). We effectively found TMS to be related to team innovation through analyzing a number of military teams. TMS may not only increase the time that members have to actively experiment with new ideas, but also

provide an essential structure – of expertise and trust – effective for collectively developing new solutions, products, and procedures.

Table 17.

Synthesis of dissertation studies

Short title (Chapter)	Main proposition	Result / Conclusion
Age diversity and team creativity: analyzing the role of WGI (Chapter 2)	Age diversity effects on creativity are dependent on the levels of perceived WGI.	Age diversity positively affected team creativity and this relationship was stronger at high levels of WGI.
A second-order multi-group factor invariance of the WICS (Chapter 2)	The WICS measuring age discrimination will be invariant across two different European samples (Italy and Bulgaria's Postal Office Organizations).	LGS and WGI dimensions were understood differently between samples. Configural invariance was supported but there was a lack of metric invariance.
TMS and team innovation: the moderating role of team diversity (Chapter 3)	TMS enhances team innovation depending on military grade diversity and team tenure diversity.	TMS is positively related to team innovation. Teams with high levels of military grade diversity showed fewer innovations.
VIN and team innovation: the role of ETRI and age diversity (Chapter 4)	VIN indirectly facilitates team innovation through ETRI and depending on the level of age diversity.	ETRI mediated the relationship between VIN and innovation only at low levels of age diversity.
Comparing the mediating effects of TMS and ETRI (Chapter 4)	TMS will mediate the relationship between VIN and innovation also depending on the level of age diversity.	TMS and ETRI are highly correlated. TMS mediated the relationship between VIN and innovation at low and medium levels of age diversity.

Next, the third variable was ETRI, which is a recent but well-established team process key for CEM arguments (van Knippenberg, De Dreu, & Homan, 2004). We confirmed its value in positively improving team innovation – as a control variable in a postal organization and as an antecedent in a military organization – through the active discussion and elaboration of information which may create, theoretically, the adequate conditions for team members to develop and implement new ideas; in one of our studies this was only true at low levels of age

diversity. Finally, concerning the fourth variable, VIN was constructed as a way of evaluating the employee perceptions of how much their organization valued innovation. Through our study on military teams we confirmed that its relationship with team innovation is indirect and fully dependent on ETRI. VIN had a positive effect on ETRI as members will perceive support towards innovating and be more eager to share information with the purpose of developing, testing, and searching for new ideas.

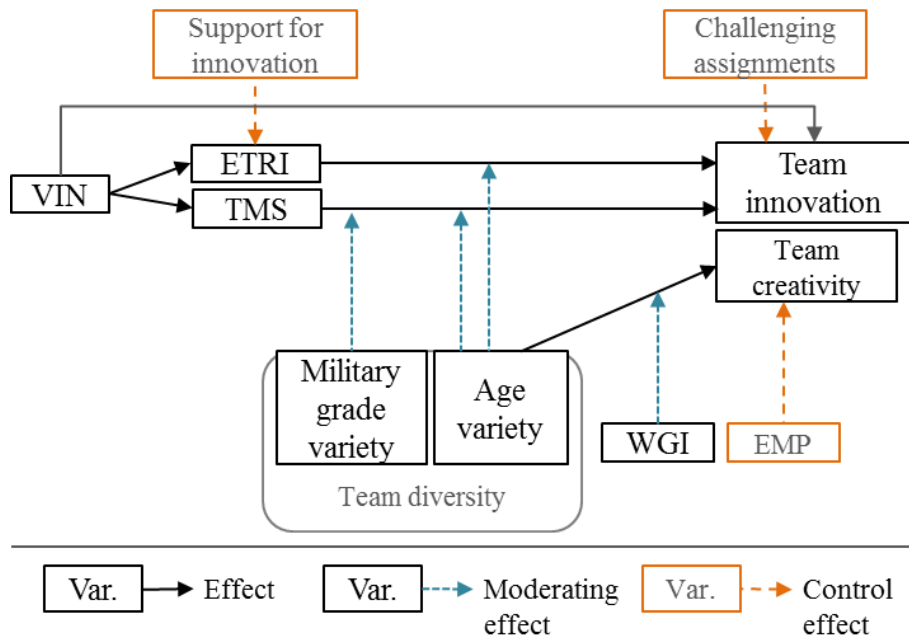
Furthermore, we also proposed and tested the contextual role of team diversity as an influencer of the relationship between team-level variables and team innovation. Analyzing diversity as a moderator enriches the study on team composition as, in some cases, diversity may not directly affect team process variables like ETRI, or outcomes like team innovation, but influence team functioning. In our studies, we observed the importance of the salience of the diversity attribute for our population (c.f., van Knippenberg, De Dreu, & Homan, 2004; van Knippenberg & Mell, 2016), as high levels of military grade diversity suppressed the positive relationship between TMS and team innovation. Moreover, age diversity also reduced the effect of ETRI on team innovation in military units. We explained these results based on precise interactions with TMS and ETRI, that is, team members prefer to avoid sharing and implementing new ideas due to the presence of several dissimilar members, which are different in status or age, coupled with coordinated and efficient teams (TMS) or as a result of task-related discussions (ETRI). This will not happen in teams with higher levels of diversity as separation where dyads or triads of members with similar attributes will possibly share their new ideas between themselves (in a subgroup matter); this may still produce innovation in military units that deal with emergency situations where is essential to improve procedures. Based on these findings, our research supported the effect of team diversity as a moderating factor, and we also

identified the importance of our team-level variables for improving team creativity and innovation.

Additionally, by analyzing control variables in our studies we confirmed the positive effect of different team-level variables on improving team creativity and innovation. Among them, EMP was positively related to team creativity and team challenging assignments which, in turn, was positively related to team innovation (results analogous to previous studies, e.g., Hon & Chan, 2013). Finally, through our additional study, we analyzed the effect of both TMS and ETRI on team innovation and identified TMS – for our sample and the particular moment that we evaluated our variables – as a stronger predictor of team innovation than ETRI in military units. This last finding is straightforward but enriches the need for more studies on the relationship between TMS and team innovation, which may be more complex than previously thought (Peltokorpi & Hasu, 2014). Finally, as a matter of visual representation and synthesis of the significant findings found by this doctoral dissertation we elaborated Figure 8.

Figure 8.

An integrative figure of the effects found in the current dissertation



Notes: Only significant effects showed. This figure integrates the interactions found on the factors that affect team innovation and the role of team diversity. The position of a variable is not an indicator of its effect type, temporality, or progression in our studies.

5.3. Implications

Based on the analysis of our findings, and by taking into account the implications and matters raised by our studies, we are able to present our theoretical and practical connotations into three general points. We established that team diversity may have a larger role in influencing team innovation – than that of a predictor variable – by interacting with team processes or emergent states. This has been recently the focus of some studies on organizational behavior (e.g., Lee & Chae, 2017; Mitchell, Boyle, Nicolas, Maitland, & Zhao, 2016) but team research is still centered on the analysis of diversity as a predictor variable and on other team factors as mediators or moderators of its relationship with team outcomes (Guillaume, Dawson, Otaye-

Ebede, Woods, & West, 2015). Therefore, one of the main implications of this dissertation concerns the idea that objective team diversity may also be a moderating factor capable of influencing the way that team-level variables relate. As it's natural for a moderating variable, and similar to the CEM proposals (van Knippenberg, De Dreu & Homan, 2004), diversity effects on innovation are contingent on the factor it interacts with (e.g., TMS) and on other possible influencing factors like mediators and moderators of its effect (e.g., existence of stereotypes or team identity). However, this last idea needs to be tested thoroughly through, for example, moderated moderation models (c.f., Hayes, 2013). Diversity as a moderator reinstates the importance of identifying salience attributes, like military grade for military units, and the need to address stereotypes and discrimination through inclusive practices and diversity training (c.f., Rico, Sánchez-Manzanares, Antino, & Lau, 2012 ; Roberson, Kulik, & Tan, 2013).

Additionally, we confirmed the relationship between team-level variables and team innovation as well as their dependency on team diversity on diminishing and suppressing their effects. The beneficial role of team diversity as a moderator may be possible, however, maybe our chosen attributes (military grade and age) are more easily used as the base for social categorization processes and less capable of promoting idea sharing due to their salience; maybe even more in the type of organization that we evaluated due to the importance of status based on traditional hierarchical structures (the military). This implication further establishes the need to identify the complex interactions and effects of team processes, shared cognitions, and outcomes on defining and redefining team functioning as well as the importance of context (including maybe even cultural differences). In line with this, discussing team innovation in the military is crucial for their advancement and development. One of our contributions is testing and confirming our hypotheses concerning several team-level variables, and the moderating role of grade and age diversity, in the military.

Moreover, in our three articles we studied diversity as variety (Harrison & Klein, 2007) even for attributes like age which are more commonly studied as separation (representing a distance between young and old employees). Our reasoning on the effect of having several age groups within the same team is one of our contributions. We consider important not only to consider the differences between groups (separation), that could be interpreted as generations by some authors if we're studying age, but also to consider that in some cases different groups, more than the distance between two groups, may be beneficial (Chapter 2) or somewhat harmful (Chapter 3 & 4) for team outcomes. To our knowledge, age as an attribute of diversity hasn't been studied before as variety; even if any attribute can be studied as any type of diversity depending on the underlying arguments and research focus (Harrison & Klein, 2007). This last idea shows that our view on diversity needs to be broader and provide an understanding of how diversity could interact with other factors to affect team outcomes.

As Salas, Reyes, and McDaniel (2018) have recently argued, it's necessary to close the gap between theory and practice by describing more clearly the applications of our study findings. Therefore, concerning more practical implications, we propose that people responsible of teams must identify diversity in order to promote a climate of inclusiveness and assess any factor that may affect information and idea sharing, like stereotypes. This is nothing new, but within this dissertation we've found further evidence that inclusion and diversity must be studied side by side, and that a healthy climate concerns valuing and integrating differences. Finally, effectively managing work discussions is very important to innovation. Our studies on the effects of ETRI and TMS show that these team-level variables may promote innovative behavior depending on the level of team diversity, however, work discussions can offer the opportunity to elaborate and share new ideas, therefore it's important to identify and address long and tedious

discussions and help team members to understand and integrate new valuable information. On the other hand, it's also necessary to facilitate discussions of improvement or change even when procedures are already effective, like in the case of highly experienced teams with a more developed TMS. This focus on discussions and reflexivity is starting to gain recognition in the study of, for example, team debriefs where team members learn *after-action* about incidents. This can help to reduce categorization-bias and even develop a better sense of belonging to the team (Allen, Reiter-Palmon, Crowe, & Scott, 2018). Adequately managed meetings may help to uncover not only implicit attitudes towards others, but also address doubts about new procedures and practices, about new changes, as well as to foster the idea that the organization values initiative, experimentation, information sharing, and cooperation which we found to be related to both ETRI and TMS. After presenting the general implications of our studies, we continue this general discussion by addressing some limitations.

5.4. Limitations

Our research suffers from several constraints limiting our findings but common to our methodological decisions. First, our correlational research design, although heavily used by research on organizations and work, doesn't evidence the causality of our relationships. Some effects, like the effect of objective age diversity, are based on stable characteristics (van Knippenberg & Mell, 2016) and thus, can be interpreted as input variables – causes and not consequences –; however, team processes, and more particularly emergent states like TMS, change over time which poses a more difficult endeavor. The state of these factors may as well affect other factors which were interpreted as causes. For example: TMS may have be related to innovative behavior, however, previous well-developed innovations may also promote TMS, which will, in turn, increase the probability of newly implemented innovations.

Furthermore, our use of supervisor-rated questionnaires in Chapter 2 (Article 1) and the use of solely self-report questionnaires in Chapter 3 (Article 2) can be considered a limitation (see their respective developed discussions). Additionally, this is also a constraint concerning the type of measure used for team innovation. In our articles, we evaluated perceived innovative behaviors rather than objective measures of innovation where there's a certainty that the innovative idea is identified and implemented or published (e.g., as a patent). However, to our knowledge, this last methodological decision was the most adequate as the teams we evaluated weren't particularly composed to innovate (e.g., product development teams) and published patents don't concern, for example, improvements in collaborative – tactical-operative – procedures. Finally, we didn't take into account cultural variables in our articles to identify their effect in our models. This analysis could have led to a more thorough insight on the contextual aspect of team innovation, as well as a richer understanding of shared perceptions, team processes, and emergent states.

5.5. Research perspectives

After discussing the implications and limitations of this research, we proceed to propose some openings for future studies. First, to address our limitations, we suggest research to develop longitudinal studies to uncover the way that our variables interact over time. Like this, more insight may be drawn on the path that TMS takes over time (c.f., Brandon & Hollingshead, 2004; e.g., Guchait, Hamilton, & Hua, 2014), or if certain processes really improve after diversity training programs (e.g., ETRI). Moreover, longitudinal studies may also help to clarify theoretically known relationships that have not been empirically explored enough, like the connection between the idea generation and idea implementation phases (e.g., Somech & Dravy-Zahavy). Additionally, although other theoretical constraints can take place, future studies can

also be experimental in nature and even address topics that could be interesting to our models like the creation and tenure of TMS, or explore the way that individual information shifts into new and useful collective ideas through communication. For example, by artificially creating two sets of teams (experimental & control), it may be possible to test task-related training effects on collective learning, if this learning is related to TMS development, and how both factors may encourage innovation by observing communication patterns (interaction).

Second, as we mentioned in our general implications, it's important to address the possible mediators and moderators of the moderating effect of team diversity. Although we mainly found a harmful moderating effect of diversity for the relationship between team-level variables and team innovation, it's possible that other conditions and mechanisms could change this effect. These variables may be leadership styles like transformational leadership, individual attitudes, job characteristics, or personality traits, to name a few, which have been identified as moderators in previous studies of diversity as predictor (e.g., Higgs, Plewnia, & Ploch, 2005; Kearney & Gebert, 2009). Evidently, addressing other attributes (e.g., professional diversity), as well as other types of diversity for these attributes (e.g., separation or disparity), will be a rich contribution to identify and confirm the effects of diversity in its contextual role.

Third, we only controlled and confirmed empowering leadership as an antecedent of innovative behavior within Chapter 2 (Article 1). Nevertheless, more needs to be explored on the importance of leaders, and specially perceived leader values and behaviors, for the contextual effects of team diversity as well as for team innovation. For example, although it has already been related to the moderating role of professional diversity (Mitchell, et al., 2015), leader inclusiveness is an interesting factor to observe along with team innovation in diverse teams. Inclusiveness refers to “words and deeds exhibited by leaders that invite and appreciate others’

contributions” (Nembhard & Edmondson, 2006, p.941) which has been found to enhance team performance by increasing team identification at high levels of professional diversity (Mitchell, et al., 2015). The way that inclusion leads to beneficial effects of diversity bears resemblance to our finding on Italy’s postal office on the moderating role of WGI (Chapter 2), however, it has not been confirmed yet if leader inclusiveness may translate into the creation of new and useful ideas in diverse teams and by taking into account salient attributes like age or gender diversity. Additionally, this also accounts for the study of other leadership styles like transformational, transactional, participative, and more recent modalities like shared and distributed leadership (c.f., Pearce & Conger, 2003) which may interact with *diversity as a context* in their own respective way.

Fourth, our studies evaluated teams of a private and a public organization, and we only established the moderating effect of diversity in the military. Although this may be one of our contributions, there’s a need to test our models in the social sector to further generalize our findings. The difference between public, private, and social organizations has been a center of discussion of various studies. Although they possess many similarities concerning employees, tasks, the use of teams, and formal structures, their differences in values, institutional contingencies, and managerial practices may interact with our findings (c.f., Aycan, 2005; Boyne, Jenkins, & Poole, 1999). Moreover, as a fifth opening, research must focus on the different facets of diversity, as well as on the multilevel nature of our interactions. This includes recent propositions on the complexity of research on diversity in organizations (Bunderson & Van der Vegt, 2018; Li, Meyer, Shemla, & Wegge, 2018; van Knippenberg & Mell, 2016), concerning changes on team composition, open systems, inequality, but also on the effect of organizational and emerging factors on team functioning (a.k.a., top-down and bottom-up approaches respectively). Additionally, concerning these facets, diversity has recently been studied at the

individual-level. According to Tasheva and Hillman (In press), *personal range* may interact with team-level diversity by complementing or substituting it. Personal range refers to the variety of human capital (functional experiences), social capital (personal and professional ties), and demographics (one or more demographic characteristics e.g., multiple ethnic backgrounds) of an individual. This idea that diversity levels may interact and be represented by multiple sources is highly valuable and further advances research on teams by providing a new facet of diversity.

Finally, as a sixth and final opening, we propose studies on team diversity to connect more thoroughly with the literature on workplace inclusion. Diversity studies seeking the improvement of performance or innovation must not forget that diversity may enable greatness but that its benefit comes first from the inclusion of employee differences. We can see this type of integrations on, for example, the study of leader inclusiveness (Nembhard & Edmondson, 2006), member differences on perceived inclusion (e.g., Findler, Wind, & Mor Barak, 2007), or on our work of age inclusive climate and team diversity (Chapter 2), however, more work is needed on the role of inclusion to muffle or boost the effects of diversity. We based this proposition on the integrative model of Shore, Cleveland, and Sanchez (2018) which, by delineating the importance of inclusive practices at different levels of the organization, has the purpose of providing a healthy environment that facilitates growth, promotes psychological safety, and fosters innovation.

5.6. Conclusion

The endeavor of studying the aspects that relate to team innovation is often difficult. Nevertheless, within this dissertation, we had the opportunity to identify several factors that have a role in facilitating or harming collective innovations. In the upcoming years, we believe that studies will continue to analyze team processes, shared perceptions, and emergent states. Therefore, one direction remains clear: research will provide a deeper understanding on these interactions, as well as more consistent findings – or at least more comprehensive – on the study of team member differences. Finally, the interplay that we've decided to focus on is outlined by rich possibilities, complex topics, and practical advantages which, in theory, underlie cooperation, sharing, and inclusion, as drivers of progress through collective innovations.

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Annex

6.1. Chapter 2 Additional Analyses

For Article 1, we additionally observed the moderating role of WGI for the direct effect of age separation and age disparity on team creativity. Two models were tested, one with separation as predictor and the other with disparity. The inter-correlations table combines the three diversity types (age variety was used on Article 1).

Table A1.

Means, standard deviations, and inter-correlations AAI

Variables	M	SD	1	2	3	4	5	6	7
1 Age Separation	10.05	7.37	-						
2 Age Variety	0.39	0.17	-.277**	-					
3 Age Disparity	5.47	3.76	.986**	-.238**	-				
4 WGI	3.86	0.60	.069	-.027	.059	(.99)			
5 Team creativity	3.05	0.73	-.031	.163*	-.008	.166*	(1.00)		
6 ETRI	3.71	0.51	-.067	-.090	-.077	.279**	.432**	(1.00)	
7 EMP	4.35	0.41	-.029	.073	-.022	.182*	.428**	.339**	(1.00)

Notes: Cronbach's Alpha are shown in the intersections.

N = 201-207; M = Mean, SD = Standard deviation.

* $p < .05$ (two-tailed); ** $p < .01$ (two-tailed).

Table A2.

Regression Analysis Results AAI

Variables	Model with age separation		Model with age disparity	
	B	SE	B	SE
Intercept	-1.21*	.52	1.22*	.52
Age diversity	.00	.00	.00	.01
WGI	.01	.07	.00	.07
Age diversity x WGI	-.01	.01	-.02	.02
ETRI	.49**	.12	.49**	.12
EMP	.56**	.14	.56**	.14

Notes: N = 168 teams. No conditional effects shown as $p > .05$.

Dependent variable is team innovation.

* $p < .05$; ** $p < .01$.

6.2. Chapter 3 Additional Analyses

For Article 2, we additionally observed the moderating role of separation and disparity diversity types for military grade (MGS and MGD respectively) for the direct effect of TMS on team innovation. Two models were tested, one with MGS as moderator and the other with MGD. The inter-correlation table combines the three diversity types where military grade variety (MGH; *H* for heterogeneity) was the one we used on Article 2.

Table A3.

Means, standard deviations, and inter-correlations AA2

Variables	M	SD	1	2	3	4	5	6
1 Team size	9.44	5.55	-					
2 MGS	2.52	1.33	.198	-				
3 MGH	.67	.12	.290*	.637**	-			
4 MGD	.31	.13	.232	.224	.240	-		
5 TMS	3.71	.22	-.008	-.185	-.060	.146	(.86)	
6 Team innovation	3.28	.28	.074	-.007	.133	.163	.522**	(.93)

Notes: Cronbach's Alphas are shown in the intersections.

N = 48 teams. M = Mean, SD = Standard deviation.

* $p < .05$ (two-tailed). ** $p < .01$ (two-tailed).

Table A4.

Regression Analysis Results AA2

Variables	Model with MGS		Model with MGD	
	B	SE	B	SE
Intercept	3.22**	.07	3.25**	.08
Team diversity	.01	.02	.16	.22
TMS	.68**	.14	.63**	.19
TMS X Team diversity	-.27**	.09	-.32	1.22
Team size	.00	.00	.00	.00
Conditional effects				
Levels of team diversity	TMS on team innovation		TMS on team innovation	
	B	SE	B	SE
Low	-1.34	1.05**	.68**	.23
Medium	.00	.68**	.63**	.19
High	1.34	.32	.59*	.27

Notes: N = 48 teams. Dependent variable is team innovation. * $p < .01$; ** $p < .001$.

6.3. Chapter 4 Additional Analyses

For Article 3, we additionally observed the moderating role of age separation and disparity for the indirect effect of VIN on team innovation (ETRI as a mediator). Two models were tested, one with age separation as the moderator and the other with age disparity. The inter-correlation table combines the three diversity types where age variety was the one we used on Article 3.

Table A5.

Means, standard deviations, and inter-correlations AA3

Variables	M	SD	1	2	3	4	5	6	7	8
1 VIN	3.68	.25	(.89)							
2 ETRI	3.74	.26	.51**	(.87)						
3 Team innovation	3.14	.93	.14	.26	(.93)					
4 Age separation	1.18	.47	.01	-.05	-.17	-				
5 Age variety	.63	.17	-.01	-.16	-.20	.70**	-			
6 Age disparity	.22	.05	-.18	-.24	.30*	.46**	.27	-		
7 Support for Innov.	3.45	.33	.19	.43**	.25	.20	.35*	.00	(.91)	
8 Challenging Assign.	3.69	.88	-.18	-.09	.62**	-.14	-.16	.31*	.01	(.85)

Notes: Cronbach's Alphas are shown in the intersections. N = 48 teams; for Team innovation and Challenging assignments N = 43. M = Mean, SD = Standard deviation, Innov. = Innovation, Assign. = Assignments. * $p < .05$ (two-tailed); ** $p < .01$ (two-tailed).

Table A6.

Moderated Mediation Model Regression Analysis Results – Age Separation AA3

Variables	B	SE B	<i>p</i>
ETRI as dependent variable			
Intercept	-2.58**	.65	.00
VIN	.48**	.17	.00
Challenging assignments	-.00	.04	.89
Support for innovation	.24	.16	.14
Team innovation as dependent variable			
Intercept	-1.82	2.26	.42
ETRI	.42	.60	.48
VIN	.22	.63	.72
Age diversity (Separation)	-.09	.25	.70
Interaction (Moderator)	-2.20*	1.10	.05
Challenging assignments	.66**	.12	.00
Support for innovation	.48	.39	.23

Conditional effects					
Levels of age diversity		VIN on team innovation through ETRI B	B / SE	LLCI	ULCI
Low	-.4801	.71*	.47	.02	1.94
Medium	.0000	.20	.28	-.26	.85
High	.4801	-.30	.39	-1.35	.28

Note: $N = 48$ teams, $N = 43$ leader scores for team innovation and challenging assignments.
* $p < .05$; ** $p < .001$.

Table A7.

Moderated Mediation Model Regression Analysis Results – Age Disparity AA3

Variables	B	SE B	p
ETRI as dependent variable			
Intercept	-2.58**	.65	.00
VIN	.48**	.17	.00
Challenging assignments	-.00	.04	.89
Support for innovation	.24	.16	.14
Team innovation as dependent variable			
Intercept	-1.81	2.00	.37
ETRI	.94	.58	.11
VIN	.51	.58	.38
Age diversity (Disparity)	2.42	1.75	.17
Interaction (Moderator)	-6.47	5.00	.20
Challenging assignments	.64**	.14	.00
Support for innovation	.19	.43	.65

Conditional effects					
Levels of age diversity		VIN on team innovation through ETRI B	B / SE	LLCI	ULCI
Low	-.0499	.61*	.47	.00	1.63
Medium	.0000	.45	.28	-.00	1.31
High	.0499	-.30	.39	-.10	1.26

Note: $N = 48$ teams, $N = 43$ leader scores for team innovation and challenging assignments.
* $p < .05$; ** $p < .001$.