



WIP: Cultural Diversity and Teamwork Effectiveness: A Systematized Literature Review

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Abstract

With the rapid progress of globalization, multicultural teams are prevailing in business practice to meet companies' needs, especially in transnational corporations, and in classroom teaching based on effective team-based learning pedagogy in engineering education settings. Multicultural teams have the potential to outperform monoculture teams, particularly on certain outcomes, such as creativity; however, the role of cultural diversity in teams is ambiguous. Therefore, it is worth investigating relevant literature in the impact of cultural diversity on teamwork effectiveness. This paper aims to explore the following questions: (1) what aspects of cultural diversity and teamwork effectiveness have been studied in research literature since 2010? (2) What is the relationship between cultural diversity and teamwork effectiveness? We explore three databases in both education and psychology, apply inclusion and exclusion criteria and finally select 14 papers to conduct this systematized literature review. We find out that both cultural diversity and team effectiveness are multi-faceted constructs. We also confirm the complex relationship between cultural diversity and team effectiveness, which could be moderated or mediated by mixed factors. In this paper, we identify the emphasis and gaps from literature on how to transform cultural collision into cultural synergy, to help increase culture and diversity awareness and suggest practical interventions to improve team effectiveness in the context of engineering education.

Introduction

With the developing process of globalization, both academy and industry are increasingly involved in multicultural contexts [1]-[3]. Therefore, multicultural teams, in which members possess different national or ethnic cultural backgrounds with various mental models, modes of perception and approaches to problems have become widespread and important around the world [4]-[5]. A surging amount of literature in multicultural teams exists not only in business management and industrial organization fields [4]-[5] but also in disciplines such as sports [6], [7], health care [8]-[10] and education [3], [11], [12].

Many researchers have investigated the relationship between culture/diversity and team outcomes and behaviors, while the relationship remains equivocal and mixed: some studies demonstrate positive effects of culturally diverse teams [13]-[15]; some studies present negative effects [16]-[18]; some researches show a curvilinear relationship [19]. However, some gaps remain unresolved, such as: a lack of comprehensive coverage of complex concepts of culture, diversity and team effectiveness, narrow or limited explorations on the roles of cultural diversity played in team effectiveness and very little literature in the engineering education field. Therefore, this study is proposed to specifically analyze the scopes and aspects of cultural diversity and team effectiveness presented in recent papers and the relationship between them.

Methodology

In this work-in-progress systematized literature review, we followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) procedure [19] to identify and evaluate the existing literature primarily in the education and psychology fields to best relate

to the audience of this paper in engineering education. The procedure included four steps: identification, screening, eligibility and inclusion. Specifically, we first identified ideal databases for this literature search in cultural diversity and team effectiveness, then iteratively finalized optimally related search strings. Later, we screened the titles and abstracts of included papers respectively based on inclusion criteria to narrow down the scope of literature and then read full text to determine the final eligible set of literature to conduct synthesis.

We identified and used the following three databases:

- ERIC (EBSCO): it's a major education field database and we want to see the study there.
- Education Source: it's another comprehensive education field database.
- PsycINFO: proposed research topics are well studied in the field of psychology and sociology and this database also includes studies conducted in management disciplines so that it is important to include this database to enrich the coverage of this literature review.

The natural topics in this study are culture, diversity, team and effectiveness. As mentioned in section 2.2, team effectiveness covers lots of areas and different scholar might use different phrases to describe what we call "effectiveness" in this study. With several trials in different combinations of search strings, we found that the inclusion of "effectiveness", "outcome" or "performance" overly restricted the scope of our sample, so we decided not to include this specific term but screened manually with our exclusion criteria to find eligible papers. Our search strings' Boolean/phrase is:

SU team* AND SU (cultur* or multicultural*) AND SU divers*

We decided to use subject as the field limitation for database search because some authors failed to include all included keywords in either titles or abstracts or chose a similar word to describe their works. Therefore, we believed using subject as the field limitation was the best strategy to capture the most inclusive set of related literature. We acknowledged the possible consequence that an excessive number of papers would be included.

In this study, we only searched for published peer-review journal papers published in English from these databases. More exclusion work was manually done with additional exclusion criteria in the screening stage. When manually examining papers in terms of their titles, abstracts and full texts respectively, we used the following exclusion criteria: (1) studied different goals within a team; (2) failed to explicitly discuss the impact of cultural diversity background on team's performance or effectiveness; (3) measured team effectiveness only related to creativity or innovativeness; (4) examined leadership as the only factor influenced by cultural diversity; (5) compared team face-to-face cooperation and virtual elaboration.

We excluded papers only focusing on relationship of cultural diversity and team creativity because Wang et al. conducted a meta-analysis study to confirm the positive effect of cultural diversity on team creativity and the paper was comprehensive and relatively new [4]. Similarly, there was also a meta-analysis on leadership's influence on team effectiveness [21]. Besides, in the context of engineering education, many teams are not constructed with a power hierarchy analogous to the manager or project leader role in industry, so we excluded this type of papers.

Lastly, studies of differences on virtual and in-person working environment was not of interest in this work, which resulted in their exclusion.

The initial search on October 14, 2019, resulted in a total of 197 papers (15 from Education Source, 52 from ERIC and 130 from PsycINFO), three duplicates were removed. We then automatically migrated all citations into Mendeley Desktop, a citation management tool, to support further work. However, the software failed to present 104 papers' published year and, due to the time constraint and the nature of this exploratory working in process study, we did not fix the issue but proceeded to review the remaining 90 papers. After examining titles and abstracts, we left 31 papers for full-text review and their published years range from 2006-2019. Because Stahl et al. conducted a good meta-analysis in 2009 [21], we then manually set the cut of year to be 2010 to review the most recent literature, which left 21 papers. Finally, we selected 14 papers, including two meta-analyses, for further synthesis. The figure below illustrates the whole selection process.

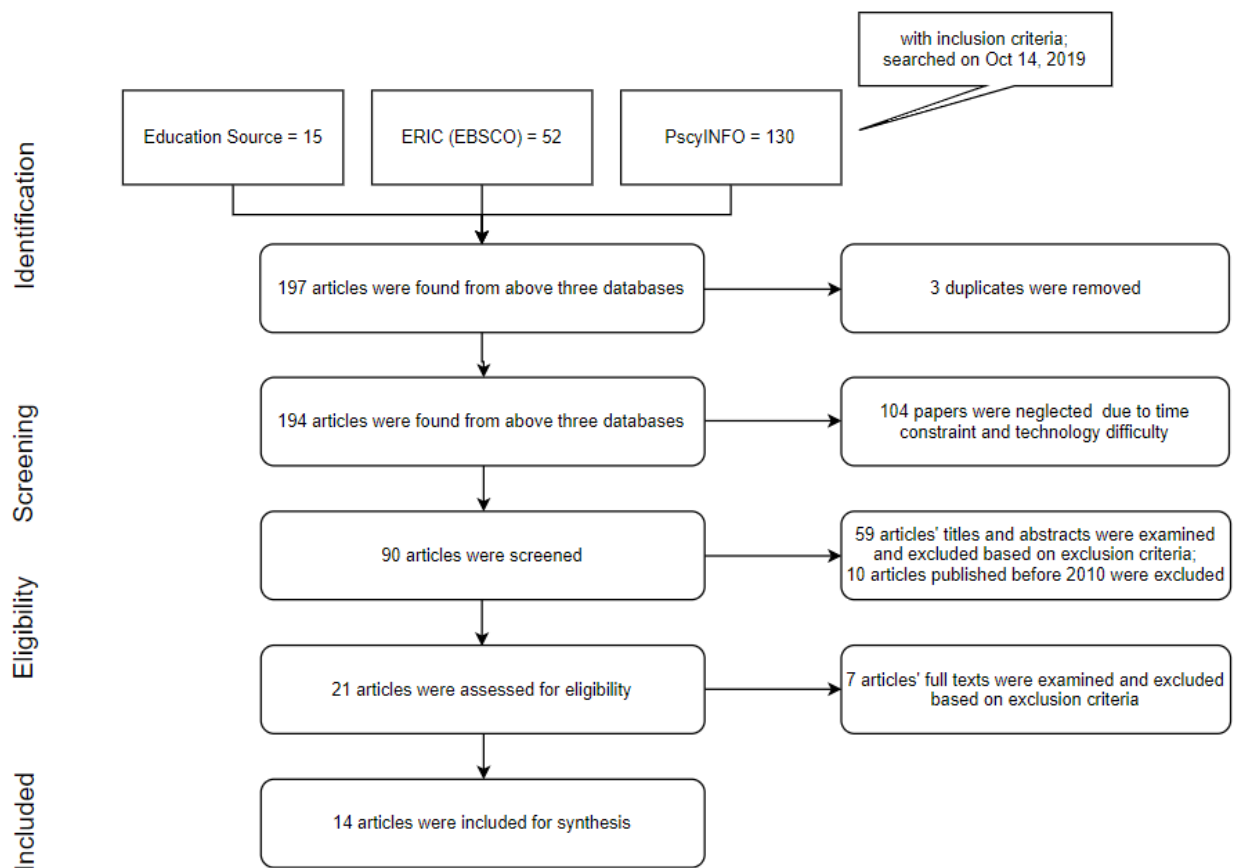


Figure 1. Adaptation of the PRISMA flowchart for described selection process [19]

In-Progress Results and Discussion

We conducted a systematized literature review on cultural diversity and team effectiveness in an exploratory way. We propose the concept of cultural diversity to include both invisible individual culture differences and visible demographic diversity. We present the commonly used theoretical frameworks used to analyze the relationship between cultural diversity and team

effectiveness. We state the factors of cultural diversity and team effectiveness investigated for their relationship and review how mediators and moderators work in the relationship. This systematized literature review centers on answering the two research questions mentioned earlier.

Cultural diversity contains multi-faceted components, which could be categorized into surface and deep level of diversity. Respectively, race/ethnicity/nationality and intercultural competency or cultural intelligence are drawn most attention on surface and deep level of diversity study. As anticipated of a complicated concept and a complex relationship, this work finds the influence of cultural diversity on team effectiveness has both negative and positive effects with various strength and sometimes results also show nonsignificant diversity-performance relationship.

Most of the papers reviewed focused on studying the effect of surface level of diversity, particularly national diversity on team outcomes, which assumes a culturally deterministic philosophy. However, people react to their environment and adapt their behaviors in response to it. For example, one study from our included papers conducted research in a developmental way and recognized the barriers and influence of tenure on team development and outcomes [20]. We hereby argue that further research should give more attention to the effect of cultural diversity on team development including both cognitive and non-cognitive factors and team effectiveness.

Engineering education researchers and instructors should critically consider the influence of cultural diversity on team effectiveness and the relationship between them in practice of team formation and mentoring with pedagogy related to team-based learning or project-based learning. How to effectively access the benefits of cultural diversity and overcome the concomitant barriers remains unanswered and further research attention is needed to guide teaching and mentoring.

We found that gender diversity could have a negative impact on team effectiveness. While instructors could consider addressing this when assigning students to teams, Schneid et al. [25] recommends that instructors instead make efforts to interrupt negative social categorization phenomenon that can be introduced by gender diversity (such as women being compelled to take on clerical roles rather than setting up and operating laboratory equipment).

There is another important remainder for engineering education researchers and instructors: over half of the selected articles are from industry where power distance is obvious and stable between team leaders / managers and employees. This phenomenon is less likely to be promoted or present in academic teams. The role of leadership moderating the relationship between cultural diversity and team effectiveness might not be a significant factor in the context of engineering education.

Limitation

There are two limitations of this paper relating to the sources of literatures we include and

analyze and the selection process. From the spectrum of included papers, we find that the majority is from psychology and management field. We only include databases from education field and psychology field, and we could improve the quality of this work by including databases from management field specifically to enrich the pool of literature we include. The lack of educational literatures indicates that our selection criteria, especially not including 104 papers due to the technology difficulty described earlier, possibly caused such papers to be excluded rather than our exclusion criteria. Therefore, in the future research we will address this issue to expand the practical guidance of the paper in the field of cultural diversity on team effectiveness in engineering education.

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References

- [1] W. Zhou and X. Shi, "Culture in groups and teams: A review of three decades of research," *Int. J. Cross Cult. Manag.*, vol. 11, no. 1, pp. 5–34, 2011.
- [2] A. S. Tsui, S. Nifadkar, and A. Y. Ou, "Cross-national, cross-cultural organizational behavior research: Advances, gaps, and recommendations," *J. Manage.*, vol. 33, no. 3, pp. 426–478, 2007.
- [3] S. Wei, D. M. Ferguson, M. W. Ohland, and B. Beigpourian, "Examining the cultural influence on peer ratings of teammates between international and domestic students," in *the American Society for Engineering Education Annual Conference & Exposition*, 2019.
- [4] J. Wang, G. H.-L. Cheng, T. Chen, and K. Leung, "Team creativity/innovation in culturally diverse teams: A meta-analysis," *J. Organ. Behav.*, vol. 40, no. 6, pp. 693–708, 2019.
- [5] G. K. Stahl, K. Mäkelä, L. Zander, and M. L. Maznevski, "A look at the bright side of multicultural team diversity," *Scand. J. Manag.*, vol. 26, no. 4, pp. 439–447, 2010.
- [6] R. J. Schinke, Y. Ge, B. Petersen, A. T. Blodgett, J. Dupuis-Latour, and D. Coholic, "Building a national team context based upon the identity challenges and intervention strategies of elite female boxers in their home training environments," *J. Sport Psychol. Action*, vol. 10, no. 2, pp. 94–105, 2019.
- [7] D. Maderer, D. Holtbrügge, and T. Schuster, "Professional football squads as multicultural teams: Cultural diversity, intercultural experience, and team performance," *Int. J. Cross Cult. Manag.*, vol. 14, no. 2, pp. 215–238, 2014.
- [8] C. Cook and M. Brunton, "The importance of moral emotions for effective collaboration in culturally diverse healthcare teams," *Nurs. Inq.*, vol. 25, no. 2, pp. 1–11, 2018.
- [9] A.-M. Aalto, T. Heponiemi, A. Väänänen, B. Bergbom, T. Sinervo, and M. Elovainio, "Is working in culturally diverse working environment associated with physicians' work-related well-being? A cross-sectional survey study among Finnish physicians," *Health Policy (New York)*, vol. 117, no. 2, pp. 187–194, 2014.

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- [10] A. Drach-Zahavy and R. Trogan, "Opposites attract or attack? The moderating role of diversity climate in the team diversity–interpersonal aggression relationship," *J. Occup. Health Psychol.*, vol. 18, no. 4, pp. 449–457, 2013.
- [11] R. A. Layton, M. L. Loughry, M. W. Ohland, and G. D. Ricco, "Design and validation of a web-based system for assigning members to teams using instructor-specified criteria," *Adv. Eng. Educ.*, vol. 2, no. 1, pp. 1–28, 2010.
- [12] E. Crede and M. Borrego, "From Ethnography to Items," *J. Mix. Methods Res.*, vol. 7, no. 1, pp. 62–80, Jan. 2013.
- [13] T. H. Cox, "Effects of Ethnic Group Cultural Differences on Cooperative and Competitive Behavior on a Group Task," *Academy of Management Journal*, vol. 34, no. 4, pp. 827–848, 1991.
- [14] E. Elron, "Top management teams within multinational corporations: Effects of cultural heterogeneity," *The Leadership Quarterly*, vol. 8, no. 4, Elsevier Inc, pp. 393–412, 1997.
- [15] C. B. Gibson, "Do they do what they believe they can? Group efficacy and group effectiveness across tasks and cultures," *Acad. Manag. J.*, vol. 42, no. 2, pp. 138–152, 1999.
- [16] S. Chevrier, "Cross-cultural management in multinational project groups," *J. World Bus.*, vol. 38, no. 2, pp. 141–149, 2003.
- [17] V. Govindarajan and A. K. Gupta, "Building an Effective Global Business Team.," *MIT Sloan Manag. Rev.*, vol. 42, no. 4, p. 63, 2001.
- [18] J. K. Henderson, "Language Diversity in International Management Teams," *Int. Stud. Manag. Organ.*, vol. 35, no. 1, pp. 66–82, 2005.
- [19] D. Moher, A. Liberati, J. Tetzlaff, and D. G. Altman, "Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement," *Ann. Intern. Med.*, vol. 151, no. 4, pp. 264–269, 2009.
- [20] P. R. Lourenço, I. D. Dimas, and T. Rebelo, "Effective workgroups: The role of diversity and culture," *J. Work Organ. Psychol.*, vol. 30, no. 3, pp. 123–132, 2014.
- [21] G. K. Stahl, M. L. Maznevski, A. Voigt and K. Jonsen, "Unraveling the effects of cultural diversity in teams: A meta-analysis of research on multicultural work groups," *J. Int. Bus. Stud.*, vol. 41, no. 4, pp. 690–709, 2009.

Appendix: References for Paper Included in this Study

- [22] D. G. Bachrach, K. Lewis, Y. Kim, P. C. Patel, M. C. Campion, and S. M. B. Thatcher, "Transactive memory systems in context: A meta-analytic examination of contextual factors in transactive memory systems development and team performance," *J. Appl. Psychol.*, vol. 104, no. 3, pp. 464–493, 2019.
- [23] J. Rupert, A. C. Homan, K. A. Jehn, and R. J. Blomme, "Diversity composition and team learning: The moderating role of error culture," *Gr. Decis. Negot.*, 2019.
- [24] A. Hajro, C. B. Gibson, and M. Pudelko, "Knowledge exchange processes in multicultural teams: Linking organizational diversity climates to teams' effectiveness," *Acad. Manag. J.*, vol. 60, no. 1, pp. 345–372, 2017.
- [25] D. Rosenauer, A. C. Homan, C. A. L. Horstmeier, and S. C. Voelpel, "Managing nationality diversity: The interactive effect of leaders' cultural intelligence and task

-
- interdependence,” *Br. J. Manag.*, vol. 27, no. 3, pp. 628–645, 2016.
- [26] M. Schneid, R. Isidor, C. Li, and R. Kabst, “The influence of cultural context on the relationship between gender diversity and team performance: A meta-analysis,” *Int. J. Hum. Resour. Manag.*, vol. 26, no. 6, pp. 733–756, 2015.
- [27] D. Maderer, D. Holtbrügge, and T. Schuster, “Professional football squads as multicultural teams: Cultural diversity, intercultural experience, and team performance,” *Int. J. Cross Cult. Manag.*, vol. 14, no. 2, pp. 215–238, 2014.
- [28] P. R. Lourenço, I. D. Dimas, and T. Rebelo, “Effective workgroups: The role of diversity and culture,” *J. Work Organ. Psychol.*, vol. 30, no. 3, pp. 123–132, 2014.
- [29] T. Moon, “The effects of cultural intelligence on performance in multicultural teams,” *J. Appl. Soc. Psychol.*, vol. 43, no. 12, pp. 2414–2425, 2013.
- [30] A. Nederveen Pieterse, D. van Knippenberg, and D. van Dierendonck, “Cultural diversity and team performance: The role of team member goal orientation,” *Acad. Manag. J.*, vol. 56, no. 3, pp. 782–804, 2013.
- [31] R. Nouri, M. Erez, T. Rockstuhl, S. Ang, L. Leshem-Calif, and A. Rafaeli, “Taking the bite out of culture: The impact of task structure and task type on overcoming impediments to cross-cultural team performance,” *J. Organ. Behav.*, vol. 34, no. 6, pp. 739–763, 2013.
- [32] K. H. Sakuda, “National diversity and team performance in low interdependence tasks,” *Cross Cult. Manag.*, vol. 19, no. 2, pp. 125–141, 2012.
- [33] D. M. Fisher, S. T. Bell, E. C. Dierdorff, and J. A. Belohlav, “Facet personality and surface-level diversity as team mental model antecedents: Implications for implicit coordination,” *J. Appl. Psychol.*, vol. 97, no. 4, pp. 825–841, 2012.
- [34] C. Cheng, R. Y. J. Chua, M. W. Morris, L. Lee, B. Mark, C., and T. William, H., “Finding the right mix: How the composition of self-managing multicultural teams’ cultural value orientation influences performance over time,” *J. Organ. Behav.*, vol. 33, no. 3, pp. 389–411, 2012.
- [35] S. Lloyd and C. Härtel, “Intercultural competencies for culturally diverse work teams,” *J. Manag. Psychol.*, vol. 25, no. 8, pp. 845–875, 2010.