

How Diversity Makes Better Engineering Teams

David C. Mays



Key Takeaways

Diversity, equity, and inclusion offer a win-win for engineers working together to serve the public.

Cognitive diversity helps teams produce more and better ideas through their different perspectives; identity diversity promotes cognitive diversity by inspiring members of a project team to listen and prepare better.

Diversity is not enough—progress also requires equity and inclusion so that every team member feels safe to share ideas.

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Over the past few years, our awareness of diversity, equity, and inclusion (DEI) has grown significantly. This article shows how DEI fits within the professional practice of engineering, in particular focusing on how teams with DEI lead to better outcomes.

If you want to be a good engineer, you need to develop an appreciation for DEI because engineering is not just about mathematics, science, and economics. The calling of engineering is to “advance the health, safety, and welfare of the public,” quoting from the Code of Ethics of the American Society of Civil Engineers (ASCE; ASCE 2020). Stated another way, “It is incumbent upon us to practice and execute our duties with regard to the public interest,” quoting from AWWA’s code of ethics (AWWA n.d.). Many engineering organizations have similar statements.

ASCE’s code of ethics (2020) gets even more specific in the section on Society, stating engineers have an ethical responsibility to “treat all persons with respect, dignity, and fairness, and reject all forms of discrimination and harassment.” DEI is the opposite of discrimination and harassment, and it is fundamental to what engineers do as they work to serve the public.

Engineering Teams

Engineers typically work on teams, sometimes within their organizations, but often in project-based collaborations. Depending on the project, technical teams can include engineers from various disciplines, as well as designers, construction partners, chemists, geologists, and ecologists—the list is long. Broader projects can involve teammates in business and communications, elected officials, and groups from the general public. The days when engineers would spend most of their time alone in a cubicle are mostly over.

As a profession, the thing that makes us engineers is the application of judgment to open-ended problems—we have to bring our brains but also our hearts. In 2022, most basic engineering problems have been solved; the focus these days is on facing challenging problems that cannot be solved by anyone working alone.

Teamwork is fundamental to engineering. Moreover, teaching teamwork is fundamental in engineering education—so fundamental, in fact, that it constitutes one of the student outcomes for any engineering degree program under the Accreditation Board for Engineering and Technology. Specifically, the board’s Student Outcome 5 requires engineering graduates to demonstrate “an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.” (ABET 2021).

Defining DEI Terms

To frame the following discussion, here are the definitions of DEI terms as provided by the Extension Foundation serving Land Grant Universities (Extension Foundation 2021).

- Diversity is the presence of differences that may include race, gender, religion, sexual orientation, ethnicity, nationality, socioeconomic status, language, (dis)ability, age, religious commitment, or political perspective.
- Equity is promoting justice, impartiality, and fairness within the procedures, processes, and distribution of resources by institutions or systems.
- Inclusion is an outcome to ensure those that are diverse actually feel, and/or are welcomed; inclusion outcomes are met when you, your institution, and your program are truly inviting to all.

Evidence From Business

There is a legitimate social justice motivation for promoting DEI in engineering, but it’s not the only reason. In the past 10 years, a growing body of evidence has shown that DEI helps teams achieve more, and a great deal of the research on diverse teams has been done in the world of business. This works well here because engineering is a business.

One of the most highly cited business reports addressing DEI comes from the management consulting firm McKinsey & Company, which identified a correlation between the identities of the people on a company’s corporate board and its profitability (Hunt et al. 2015). This study found that gender-diverse companies were 15% more likely to have above-median earnings, and even more impressively, ethnically diverse companies were 35% more likely to have above-median earnings. Five years later, McKinsey & Company released a follow-up study that showed companies whose executive teams were in the top quartile of gender diversity were 25% more likely to experience above-average profitability compared with peer companies in the fourth quartile. This is a 10% gain in just five years, although still less than the 36% bonus for ethnically diverse companies (Hunt et al. 2020).

These impressive results have been confirmed by others. For example, the World Economic Forum reports that diverse companies are 25%–36% more likely to outperform on profitability and enjoy up to 20% higher rates of innovation (World Economic Forum 2020).

Academic Impact

As an engineering professor, I’m expected to publish in publications that measure impact in part by citations from other academics. On this key metric, it has been

shown that diverse teams do better. Freeman and Huang (2014) reported that academic papers by multiethnic teams get 5%–10% more citations. University of Michigan professor Scott Page reported a study by others that looked at 22 million research papers; other things being equal, having coauthors teaching at different schools made the papers 8%–10% more likely to be “highly cited,” defined as getting at least 100 citations (Cass 2017).

Regarding the bottom line, the late Columbia University professor Katherine Phillips relayed that “[d]iversity jolts us into cognitive action in ways that homogeneity simply does not” (Phillips 2014). The key is cognitive action, a concept we can explore with help from the multinational business school INSEAD (Fontainebleau, France), which distinguishes two kinds of diversity in its Global Talent Competitive Index 2018 (Lanvin & Evans 2018).

- Identity diversity—visible demographic categorizations that have traditionally been used to circumscribe diversity, such as gender, ethnic background, religious belief, sexual preference, nationality, and age
- Cognitive diversity—diversity of knowledge, experience, perspectives, or ways of tackling problems

INSEAD states that cognitive diversity, which allows teams to avoid the trap of like-minded groupthink, is the essential ingredient leading to better team outcomes (Lanvin & Evans 2018). Page has also published a number of books that point to cognitive diversity as the key ingredient, leading to what he calls a “diversity bonus” (Cass 2017).

Cognitive Diversity

It is theoretically possible to have cognitive diversity in a group lacking identity diversity. Think about your own family members—they may look alike, but it’s likely they don’t agree on everything (this is what makes family gatherings so interesting). But the essential symbiosis between identity and cognitive diversity is that teams with identity diversity are more likely to have cognitive diversity. People with different gender, race, and so on have different life experiences that provide the foundation for different perspectives. There is certainly no guarantee—two people who look quite different can easily have similar sets of skills and perspectives—but more often, different life experiences lead to cognitive diversity, which makes teams work better.

Hewlett and coauthors (2013) defined two-dimensional diversity as combining identity diversity and cognitive diversity. They found that companies with two-dimensional diverse leadership were 45% more likely to grow market share, and 70% more likely to capture new market. Levine noted that women either directly make or influence up to 80% of all purchases, which is consistent with the observation that companies with

gender-balanced leadership teams have a higher return on investment (Levine 2020). Levine also reported that when at least one team member shares a client’s ethnicity, the team is more than twice as likely to understand that client’s needs. Understanding a diverse range of clients is very much the essence of engineering.

The World Economic Forum (2020) also found that diverse teams make better decisions, in part, because they have up to 30% greater ability of spotting and reducing business risks. Sometimes you need a different perspective to understand why a certain design may be culturally inappropriate and, therefore, a bad idea.

Katherine Phillips (2017) compared identity diverse groups with homogeneous groups, and besides confirming the diversity bonus, she went on to explain that part of why diverse groups work better is that people prepare better and listen better when working with colleagues who are different from themselves. This is true whether the difference is between racially or politically diverse groups.

Finally, returning to Freeman and Huang’s (2014) finding that multiethnic teams get 5%–10% more citations, they reckon this bonus stems from two things. First, they suspect multiethnic teams benefit from better cognitive diversity. They also reckon that multiethnic teams have broader social networks and professional networks, which helps their shared research gain more visibility and thus more citations. Both are good reasons to collaborate outside your own identity group.

Equity and Inclusion

Taken together, all of this means that diversity helps teams. Cognitive diversity generates more and better ideas, and identity diversity fuels cognitive diversity. But regarding equity and inclusion—diversity does not work without them. However, as Lanvin and Evans (2018) acknowledged, “it is not easy to work in a diverse team or organization.” In fact, reaching a point of DEI can take more time, as illustrated in Figure 1, according to Tapia & Polonskaia (2020).

Figure 1 sketches productivity versus time for well-managed homogeneous and diverse teams. In the first phase, “forming,” the homogeneous team gains productivity faster than the diverse team. But in the second phase, “storming,” the homogeneous team reaches a plateau, while the diverse team continues to gain. In the third phase, “norming,” the diverse team reaches a plateau higher than the homogeneous team does, providing a graphical illustration of the diversity bonus. Finally, in the fourth phase, “performing,” the higher productivity of the diverse team provides a fundamental advantage.

Levine (2020) also described this initial challenge of diverse teams to achieve equity and inclusion,

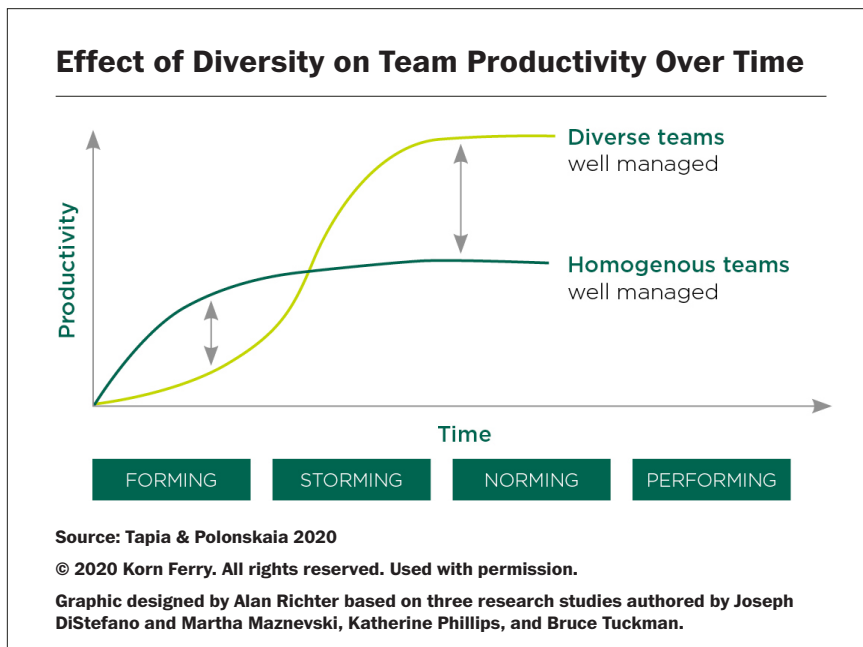


Figure 1

noting that “differences among team members force each person to anticipate that there will be alternative and unexpected viewpoints to consider and evaluate. Reaching consensus will take more effort. People must work harder to communicate their own thinking, and they need to broaden their own views to consider unexpected perspectives of others. This takes more work and preparation, but it’s significantly valuable.”

Realistically, it is not always easy to work in a diverse team, but engineers are not intimidated by a little challenge. Both identity diversity and cognitive diversity are necessary although not sufficient for a team to be successful. For that to happen, diverse teams (or any teams, for that matter) need everyone on the team to feel they are being treated fairly (equity) and that their ideas, concerns, point of view, sense of humor, and so on are recognized and valued (inclusion).

A Call to Action

In the McKinsey & Company report by Hunt et al. (2020), the authors offer five suggestions to make sure the diversity bonus really works:

- Ensure representation of diverse talent.
- Strengthen leadership accountability and capability for [inclusion and diversity].
- Enable equality of opportunity through fairness and transparency.

- Promote openness and tackle microaggressions.
- Foster belonging through unequivocal support for multivariate diversity.

This leads back to the basic premise of DEI as a win-win. As reported by the World Economic Forum (2020), positive employee engagement generates a statistically significant causal relationship to employee retention, not just for those who identify along one or more dimensions of identity diversity, but for all employees. That is a true win-win, and it makes for sound engineering and well-rounded engineers. 💧

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