The Difference

How the Power of Diversity Creates Better Groups, Firms, Schools, and Societies

by Scott E. Page
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Take-Aways

• Diversity brings real, tangible benefits. It can make your organization more effective.
• The most useful kind of diversity is cognitive diversity: thinking differently.
• Identity diversity (race, gender) often entails cognitive diversity, but not always.
• Identity diversity conveys benefits and improves performance, but only sometimes.
• Think of people as individual collections of “mental” problem-solving tools that can be applied to many different domains.
• Diverse groups solve problems more effectively than homogeneous ones.
• Diverse groups make more accurate predictions than homogeneous ones.
• For diversity to provide benefits, the situation must satisfy some basic conditions.
• Diverse values and preferences in a group can hinder decision making.
• Organizations can and should recruit, test for, encourage and use cognitive diversity.

Rating (10 is best)

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Relevance

What You Will Learn
In this Abstract, you will learn: 1) What diversity is and how it works, according to a rigorous description; 2) How diversity helps solve problems and makes accurate predictions; 3) What difficulties come with diversity; and 4) How to use diversity in your organization.

Recommendation
Are two heads better than one? Or do too many cooks spoil the broth? For a large class of problems, argues mathematician and social scientist Scott E. Page, two heads are better. That is the benefit of diversity, particularly cognitive diversity. Skeptical? You won't be after you follow Page’s methodical, quirky and often funny analysis of diversity’s logic. getAbstract recommends this book to readers who want a truly rigorous, formal description of how diversity brings benefits to organizations. Be prepared, however, to encounter much math-speak (for example when he asks readers to “Consider an arbitrary sno-cone design denoted by P”). The author also notes that some of the models showing the impact of diversity that he cites in the book have been tested via computer simulation only, and not in practical settings. Still, Page’s results are innovative and beautiful, he maps out inviting avenues for further exploration, and brings welcome clarity to the important and contentious issues raised by human diversity.

Abstract

“Diversity Trumps Ability”
During World War II, the Nazis developed “Enigma,” an ingenious, inscrutable code system for encrypting military messages. To decrypt these messages, the British established a code-breaking group using the sort of experts you would expect. But, in addition to the usual mathematicians, the group included many people with less obviously relevant skills: linguists, crossword puzzle-masters, philosophers, historians and even classicists. The result? They had more than a few disagreements, but they cracked the code and saved many lives. In fact, this is not the exception but the rule: Diverse groups solve many problems more effectively than homogeneous groups. Diversity can often overcome inexperience and superior ability (as measured by, say, IQ). Surprisingly, “diversity trumps ability” for solving a large class of problems.

To achieve this remarkable result, not just any kind of diversity will do; the relevant asset is “cognitive” diversity. Different people are equipped with diverse cognitive tools. These tools come from a variety of sources, among them experience, education, temperament, intelligence, ethnicity, gender and age. The tools may be calculus, statistics and mathematical logic, or painting, origami and knitting – even butchery, baking and basket weaving provide interesting ways to view diverse problems. Almost anything can be a tool given the right context, the right problem and the right criterion for a successful solution. In fact, you could consider every individual as a sort of “mental toolbox” for solving problems and making forecasts. The toolboxes result from the four main kinds of cognitive diversity: diverse “perspectives,” diverse “interpretations,” diverse “heuristics” and diverse “predictive models.”

“Identity diversity team, cities and societies can perform better, but they often fail to do so.”

“The logic of groupthink rests on our desire to conform. If a majority of people thinks of a problem in one way, they often compel others to do so.”
1. **Perspectives** – A perspective is a way of representing objects, events and situations. Formally, a perspective assigns a unique “word” or representational token to each unique object, event or situation. For instance, you can represent a point in space by using different kinds of coordinates, but the point remains the same. For any problem, there are perspectives that make the problem more soluble, perspectives that make it less soluble and some that make it insoluble. The more perspectives a person or group can use to encode a problem, the higher the likelihood they’ll find a solution.

2. **Interpretations** – An interpretation is fuzzier than a perspective: it’s a set of what psychologists call “categories.” Formally, an interpretation assigns a word to one or more objects, situations, problems or events. For instance, suppose you see three dogs: a black Newfoundland, a black Scottish terrier and a brown Chihuahua. Using one interpretation (“dog-color”), you see two classes of dogs. Using another (“dog-size”) you see three classes (small, medium, large). Many times, an interpretation ignores some attributes of the classified objects. Other times, an interpretation takes all the attributes into account, and highlights a relationship between them or their relative degree. Perspectives are the building blocks of interpretations.

3. **Heuristics** – A heuristic is a rule used to solve a problem. It’s not guaranteed to solve the problem, but often it either generates a better solution or a new set of solutions to consider. If you’re playing chess, a useful heuristic is, “consider what your opponent will do in response to your move.” Heuristics come from many sources, including training, experience and culture. Some heuristics apply to many domains (“maintain accurate records”), others to few (“solve for \( x \) by plugging the known value of \( y \) into the equation”). Heuristics fall into four categories: topological heuristics (look for “nearby” solutions, such as “grab the next apple in the bin if this one has a worm”); gradient heuristics (increase the value of an attribute, such as size); error-allowing heuristics (the acceptable “error rate” or other parameters that change as you search for a solution); and population heuristics (such as evolution: try many different things, cull the losers and recombine the winners).

4. **Predictive Models** – A predictive model helps you move from the known to the unknown: It describes what you think will happen, given a certain interpretation. For instance, suppose you have an interpretation (think: classification scheme) about clouds. You classify clouds into fluffy clouds, rain clouds and wispy clouds. You want to know if it will rain and recall that generally, rain clouds precede rain (this is your prediction). You see a rain cloud. You conclude, “It will probably rain.” Congratulations! You’ve just used a predictive model: an interpretation plus a prediction. Note that interpretations alone are (usually) less useful than interpretations plus predictions. Without the prediction part, you just have another description of phenomena.

**Solving Problems and Making Predictions**

Computer simulations of problem solving using perspectives and heuristics show that, given certain conditions, a diverse group of problem solvers beats a homogeneous group. To discover this, researchers represented the set of solutions to a problem topologically – as a three-dimensional surface (picture a three-dimensional map of a mountainous region, like you might see if you use Google Earth to “fly” over the Chamonix valley). The researchers represented each possible solution by three points \( x, y, \) and \( z \) (which was the vertical dimension). The “best” solution was the highest peak (it had the largest value of \( z \)). After building this landscape, the researchers set loose two groups of agents (that is, little computer programs) on it. One group contained homogeneous agents; the other,
diverse agents with different perspectives and heuristics. The diverse group found the highest peak – the best solution. The homogeneous agents got stuck in the foothills.

For the diverse group to find the best solution, some conditions had to be satisfied. First, the problem had to be difficult. Second, the solvers had to be relatively smart. They had to have a certain base level of competence, though it didn’t need to be that high, depending on the problem. Third, some subset of the diverse group had to be able to spot a better solution when “stuck” on a lesser one (a lower peak in the solution landscape), even if the new solution was only slightly better. Fourth, the diverse collection had to be fairly big and drawn from a large population.

Diverse predictive models yield similarly good results. This is the familiar “wisdom of crowds.” To borrow a phrase from Walt Whitman, crowds typically “contain multitudes”: their members have diverse predictive models. Even where no one in the crowd gets the right answer, when the answers are aggregated, a more accurate answer emerges. Prediction markets use this logic. In prediction markets, people can buy “stock” in an outcome (say, Brad Pitt winning the Oscar). The stock price equals the subjective probability of the outcome. Prediction markets include the Hollywood Stock Exchange (for movie-related forecasts, such as box office sales), the Iowa Electronic Markets (for politics) and Tradesports.com (for sports and politics). These markets are shockingly accurate, often beating polls or expert opinions. This happens because crowds aggregate dispersed information, and use diverse perspectives and interpretations to “lump” reality differently.

**The Problem of Preferences**

Unfortunately, not all of the news on diversity is good. Diverse toolboxes are good. Diverse preferences (tastes, values, desires) are not so good. Problems arise when diverse preferences need to be aggregated – when a group must decide what it wants.

The most common example of preference aggregation is voting, which has four big defects. First, there may be no collective preference. That is, individual preferences are so heterogeneous they fail to aggregate. Imagine: Thirty-one children go to the ice cream parlor to get one flavor of ice cream, to be chosen by majority vote. Unfortunately, there are 31 flavors and each child wants a different one. Oops. Second, voting processes sometimes result in arbitrary choices that satisfy no one (this is called “cycling”). Third, voters can manipulate voting systems. Controlling the voting system can determine the outcome, as many politicians know. Fourth, voting systems may underprovide “public goods” (say, clean air, clean water and open spaces that benefit everyone). If a group with diverse preferences can’t agree on the kind of public goods it wants (clean water? clean air?), it may not agree on a preferred option, leaving everyone worse off.

Voting systems have other well-known problems, but they may be overstated. Often, the disagreement is over “instrumental” preferences (how to achieve a result) rather than “fundamental” preferences (which result). Everyone wants less crime. The issue is how to reduce it. Groups often can overcome problems with instrumental preference aggregation.

**Implementing the Logic of Diversity**

How can you actually leverage the logic of diversity in your organization? Like this:

- **Experiment** – When solving a problem or making a prediction, try different perspectives, interpretations, heuristics and predictive models.
- **“Contain multitudes”** – Diversity applies not only within groups of people, but also within people. Fill your mental toolbox with diverse tools.
• **Use dissenters** – Dissenters and outsiders (analysts, consultants, visiting scholars) can bring in needed new perspectives, interpretations, heuristics and predictive models.

• **Ensure relevance** – When you add diversity, make sure it’s relevant – or at least not likely to be irrelevant. For instance, if you’re designing an LCD television, getting help from a !Kung San tribesman who has never seen a TV is probably not going to help. (Then again, it might!)

• **Use prediction markets** – Prediction markets are cheap, easy to set up and uncannily accurate. More and more companies and governments are using them. Try them.

• **Share your tools** – Share perspectives, heuristics, interpretations and predictive models with others. Apply the logic of physics to epidemiology, and the epidemiology’s logic to economics. Apply marketing ideas to product development, and product development ideas to sales.

• **Carefully distinguish fundamental versus instrumental preference diversity** – When groups differ on their goal, making progress toward that goal can be difficult if not impossible. But when groups differ only on the means, they are more likely to generate novel solutions. Even differences in fundamental preferences can yield good results in the right context (for instance, predictive models).

• **Admit, hire and appoint diversity with a purpose** – If you give a candidate extra points for diversity, make sure you’re really getting diverse tools from that candidate.

• **Avoid disincentives for diversity** – The norms, rules and policies in your organization may be stifling diversity. For instance, many students should take more math. But math is hard, the median grades in math classes can be low and students optimize for a high GPA, so they take easier classes. This decreases students’ cognitive diversity.

• **Test for diversity** – Measure cognitive diversity in your organization. Make sure new members add relevant diversity. Give tests that provide people with more than one way to solve a problem.

• **Don’t forget that ability matters** – Able and diverse groups perform best.

• **Accept some dissonance** – Diversity entails differences, and differences can cause confusion and conflict. Too much conflict and confusion is counterproductive, but a certain amount is inevitable and may be a signal that you’re on the right track.

• **Don’t obsess over identity** – “Identity,” such as ethnic identity, race or gender may not be a proxy for cognitive diversity. A white male and an African-American woman who both graduate with electrical engineering degrees from MIT may be more cognitively similar to each other than the white male is to another white male electrical engineer from another college who grew up in Lapland raising reindeer.

• **Mirroring may not create diversity** – Many diversity programs try to “mirror” the attributes of a larger population. This may not provide true cognitive diversity.

Leveraging cognitive diversity is not easy, and diversity doesn’t yield instant results. It’s not magic pixie dust that will transform your organization overnight. Diversity must be balanced against ability. Still, there is reason to believe diversity spurs innovation, creativity and progress, and believing in diversity, empirical research shows, makes its benefits more likely. So believe. It’s the logical thing to do.

**About The Author**

Scott E. Page is Professor of Complex Systems, Political Science and Economics at the University of Michigan, and an external faculty member at the Santa Fe Institute.