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Real-world Effects of Team/Employee Diversity In Tech: Do More Viewpoints Provide Actual Benefits

## **Introduction**

Within Tech (for the purposes of this paper “Tech” is limited to the computer hardware and software fields, not the entirety of Science, Technology, Engineering, and Mathematics, “STEM”), the issue of employee and team diversity is a hotly-debated, at times rancorous issue. How far does a company go to ensure diversity? Does it end at hiring, or is there more to it than just having different faces in an annual report photo. The issue of diversity has caused severe, long-lasting problems for companies such as Uber (Their CEO stepped down over serious mishandling of diversity issues) and Google (the fallout from the James Damore posting.) The diversity issue has also sparked larger societal discussions about power, privilege and intersectionality across all layers of society, not just tech employment practices.

For the most part, those discussions are focused on larger, almost meta-issues, centered on the social, ethical and moral implications of diversity, or lack thereof. This has contributed to the overall rancor of said discussions, as those are issues with deep roots within American society. But few of them discuss the implementation results of increased diversity, as it were. There is not a lot of verbiage or study given to the results of diversity, which seems odd. Objective results can help show real-world results of a strategy or highlight unintended consequences of same.

This paper is going to take a look at, as best as possible, the actual real-world results of diversity in tech, and argue that there are real world benefits to that diversity that can be broken down into two areas:

- 1) Does employee diversity help avoid actual real-world problems?
- 2) Does employee diversity help a company design measurably better products for a wider range of customers?

## **Literature Review**

**Buolamwini, Joy. "InCoding—In The Beginning." 16 May 2016. *Medium*. 17 October 2017.**

In her article talking about the need for inclusive coding, Buolamwini talks about her history as a student, both undergrad and graduate in computer science, and how a lack of diversity in terms of software testing can lead to ongoing problems. Her article specifically centers on the problems of using libraries for facial recognition that haven't been tested on a wide enough range of facial types. She relays her experience working with libraries in 2009 that required her to use a "fake" face to test the code she was working on, and then how, in 2011, in Hong Kong, she encountered the same problems with a completely different system due to the use of the same coding libraries. In both cases, "I assumed someone would fix the problem, so I completed the tour and moved on." (Buolamwini)

**Chander, Anupam. "The Racist Algorithm?" *Michigan Law Review* (2017): 1023-1046.**

Chander's paper concentrates on the dangers of algorithms controlling significant parts of our interaction with the world that allow no form of independent introspection into their function. We are required to blindly trust that the algorithm is doing the right thing at all times. However, Chander goes beyond simple transparency, suggesting that is not enough. "Even a

transparent, facially neutral algorithm can still produce discriminatory results.<sup>9</sup> What we need instead is a *transparency of inputs and results*, which allows us to see that the algorithm is generating discriminatory impact.” (Chander) Chander suggests this is critical, given how complex algorithms are becoming, and the level of formerly human control we have ceded to them. Chander’s paper centers on an analysis of another work by Frank Pasquale, “The Black Box Society: The Secret Algorithms That Control Money and Information.”, which Chander uses as a framework to make his points that simple transparency of code is not enough.

**Eveleth, Rose. "The Inherent Bias of Facial Recognition." 21 March 2016. *Motherboard*. 17 October 2017**

Eveleth’s article is an overview of the bias we see cropping up in facial recognition products and algorithms. Beginning with a history of some of the more venial sins of facial recognition, “Or when Nikon's cameras designed to detect whether someone blinked continually told at least one Asian user that her eyes were closed.” (Eveleth), she expands into the real problems with facial recognition and how a small group of researchers predicted these problems. Eveleth shows examples of how the inability of facial recognition to recognize trans faces becomes not a theoretical problem, but a real world problem of the first order: “TSA agent Bramlet told me to get back in the machine as a man or it was going to be a problem.” (Eveleth) Eveleth argues that the solution to these issues is both societal and technological, and both are required for any real progress to be made.

**Garnero, Andrea, Stephan Kampelmann and François Rycx. "The Heterogeneous Effects of Workforce Diversity on Productivity, Wages, and Profits\*." *INDUSTRIAL RELATIONS* (2014): 430-478.**

Garnero et al's paper is an analysis of the results of labor diversity, for good and ill across multiple industries and diversity types based on Belgian employer data from 1999-2006. The paper analyzes the relationship between labor diversity and firm productivity, and how the results of labor diversity are shared between workers and firms by analyzing the impact on wages. Garnero finds that the results of diversity are not consistent across either diversity types or industries. The size of the firm, the type of diversity, the industry the firm is in can all change the effects. For example, they found that educational and gender diversity did not have outsize effects on productivity, while age diversity did have a large effect. However, in tech firms, gender diversity was associated with a definite increase in productivity, with the reverse happening in more traditional industries.

**Garvie, Clare and Jonathan Frankle. "Facial-Recognition Software Might Have a Racial Bias Problem." 7 April 2016. *The Atlantic*. 17 October 2017**

Garvie and Frankel also take on the issue of racial bias in facial recognition with more of a focus on what the lack of accuracy in recognizing African-American faces can do when such software is used by government agencies, in particular, law enforcement agencies. They bring up examples of problems in Chicago, Dallas, and West Virginia where law enforcement is relying on systems with known accuracy problems. They point out that vendor claims of accuracy are almost impossible to verify, and that the algorithms involved are not required to undergo any form of public/independent verification. They cite examples of how the location where the software is developed can have an effect on the accuracy of the system: "A [2011 study](#), co-authored by one of the organizers of NIST's vendor tests, found that algorithms developed in China, Japan, and South Korea recognized East Asian faces far more readily than Caucasians.

The reverse was true for algorithms developed in France, Germany, and the United States, which were significantly better at recognizing Caucasian facial characteristics.” (Garvie and Frankle)

**Kennedy, Pagan. "To Be a Genius, Think Like a 94-Year-Old." 7 April 2017. *The New York Times*. 17 October 2017.**

Kennedy’s article for the *Times* is a short piece that takes a look at the assumption many within tech have about older people and their ability to be productive or creative. She uses the example of John Goodenough, who recently filed a patent application for a revolutionary kind of battery, growing his earlier work as the co-inventor of the modern lithium-ion battery used in most modern electronics. Dr. Goodenough’s latest patent application was filed after he’d turned 94. She uses statistics from the Nobel Prize for Physics, the U.S. Patent and Trade Office, and other studies to show that contrary to popular belief, creativity seems to be enhanced, not limited by age and experience.

**Oliveria, Justina M. and Charles Scherbaum. "Effects of Activating Team Diversity Dimensions on Member Perceptions of Conflict, Trust, and Respect." *The New School Psychology Bulletin* (2015): 21-37.**

Oliveria et al examine the day-to-day effects on diversity on teams within the workplace. Their paper is based on an experiment on team diversity based on 212 undergraduate students from the US and China, with the ethnic backgrounds being split evenly among the participants. The results were varied, as with other studies on the subject. Diversity was beneficial in more complex tasks requiring deeper thought and teamwork, while for simpler, more cut-and-dried tasks, it didn’t seem to have a large effect. Oliveria also discovered that social grouping issues could have an effect on team efficacy outside of technical issues.

**Schneid, Matthias, et al. " The influence of cultural context on the relationship between gender diversity and team performance: a meta-analysis." *The International Journal of Human Resource Management* (2015): 733-756.**

Schneid et al's paper is a meta-analysis of 63 different studies on the effects of gender diversity on team performance. What they found is in line with other studies. The effects, for good or ill, are greatly dependent on the type of work, industry, and social issues. For example, a process strongly tied to social identity could be adversely affected by gender diversity in terms of group dynamics. The specific problem the team is attempting to solve and the processes tied directly to that problems were less affected by social dynamics, but still, in cultures where gender egalitarianism has been low, these social issues could bleed out into actual productivity of the team.

**Sydell, Laura. "At 90, She's Designing Tech For Aging Boomers." 19 January 2015. *npr.org*. 17 10 2017.**

Sydell's article focuses on Barbara Beskind, a 90-year-old designer for IDEO in San Francisco. The article is less a technical analysis than an example of how a wide range of viewpoints can affect a company, both culturally and in terms of productivity. Rather than causing issues at IDEO, they have found Beskind's age and experiences to enhance their design processes. Having someone on staff in her age range has helped IDEO avoid problems with products currently in the pipeline, and given them insight into a range of products they would otherwise never have considered.

## **Methods**

As a part of this effort, I created a short three-question, open-ended survey to get a feel for what people in my professional peer group (systems administrators) were seeing in their

world. I put the link up on both Facebook and the MacAdmins Slack channel, <https://macadmins.slack.com/>. Given a rather small amount of time to collect results, I was only able to get twenty-three overall respondents. Not every response highlighted any particular advantage to employee diversity, but the majority of responses were positive. As a caution, there was no way of verifying any of the answers, and this was not intended to be a scientifically valid survey. (See Appendix 1 for survey details.)

The background of the respondents:

- 1) Gender: 21 male, 2 female
- 2) Line of work: All but one directly working in tech in some form, with the outlier being in PR, but having been “shanghaied into a tech support role”.
- 3) Company sizes ranged from 2 to just under a thousand employees
- 4) No racial or other information was provided.

## Results

The first question: “Would you consider your workplace to be diverse?” was uniformly answered as “yes”. While I did attempt to define what I intended by a diverse workplace, we are left to trust that the respondents “played by the rules.” The answers showed that among the respondents, gender diversity was fairly solid, with a rough mean of 43.2% women on staff (calculated from responses with actual numbers.) Only one respondent talked about age diversity, “Out of the 11, 2 are under 35, both being 23 and 24.”, two specifically mentioned education levels, and there were some mentions of race, but in fairly vague terms. “Range of races/ethnicity”, “Some racial diversity among permanent staff.” (Appendix 1) This would seem to show that currently, gender is the main diversity characteristic being focused on in tech, although again, this survey should not be taken as scientifically valid. This is fairly in line with

what we see in the major news stories coming out of tech on the subject. Many, if not most focus on gender diversity, almost to the exclusion of other forms.

The second question was dependent on the first, and yielded a more balanced set of answers. “If you answered “yes” to question one, can you list any specific benefits and/or advantages you have seen as a result of this diversity?” The answers, positive and negative centered less on specific instances, but more of an overall workflow benefit. “By starting with a diverse group, you automatically get diversity in how to approach everything.”, “Generally speaking, the more diverse teams are better equipped to tackle thornier problems that are both holistic and systemic.” (Appendix 1)

The answers here are in line with what we would expect. Since most of the respondents are sysadmins more than developers, they are not directly involved with product (whether hardware or software) creation. Rather, they are more involved with supporting people and systems within an organization, so the kinds of work they do and the problems they focus on are reflected in their answers.

The third question’s responses skewed the other way in terms of positive to negative. “If you answered “yes” to question one, can you list any specific instances where a more diverse team helped you avoid possible pitfalls.” The “No” answers seemed to center on the specific nature of the question. “Not many pitfall opportunities as such when maintaining a large number of public use desktops, servers, ridiculous software and licensing stacks and designing classrooms in higher ed.” “I can’t recall any specific, since I’m not on the product teams and it’s difficult to keep track of that when you’re on the periphery, especially at the size our company is at currently.”



The “Yes” answers covered a variety of reasons, from specific instances to again, overall workflow. “The diversity has definitely helped with looking at the details from multiple facets.”, “When deploying a new internet filter with enhanced abilities to report on self-harm, our diversity helped us see sides of the resulting potential blowback that we would not otherwise have seen.”

While again, clearly not a scientific survey, I found the answers to this paralleled many other sources. For example, Oliveria and Scherbaum (2015) point out that in terms of information and decision making, a diverse makeup is beneficial:

The information/decision making view argues that diversity is beneficial to team outcomes because it brings about more ideas, discussion, and integration of knowledge, which can in turn aid in team tasks (Homan et al., 2007; van Knippenberg et al., 2004; van Knippenberg & Schippers, 2007). Other researchers have found that this informational diversity also leads to more error detection, information processing, team effectiveness, and team problem solving (Gruenfeld, Mannix, Williams, & Neale, 1996; Phillips, Mannix, Neale, & Gruenfeld, 2004). (Oliveria and Scherbaum 22)

They also point out the that there are real advantages to diversity as more and more companies have to compete not just against local (in terms of nationality) companies, but companies around the planet. Interestingly, there are some limits on how diversity benefits. For example, Oliveria et al found that a heterogeneous team was better at more difficult tasks, while at simpler tasks, where a uniform viewpoint is less important, homogenous teams did better. Diversity was also a benefit in terms of brainstorming.

This does seem to align with what I and others in the industry have observed. When dealing with complex problems that can have far-reaching consequences, for both good and ill, the wider the range of worldviews brought to bear on a problem, the better the solution used tends to be. When even a minor change to a process or procedure can affect thousands, if not tens of thousands of people, the ability of a diverse group to find issues before it is “too late” is of great value. But when dealing with more simple problems, the emphasis there tends to be on speed and “just get it done”, so the benefits of a diverse team are lessened. A problem that can best be solved by one or two people is not going to be better solved by ten, aka “nine women cannot make a baby in a month.”

Oliveria et al also found that while problem-solving is enhanced by diversity, social issues within a group can be negatively magnified by diversity due to cultural in/out group issues. This is supported by other studies, for example, from Schneid et al (2015):

The positive effects of diversity result from the beneficial elaboration of task-relevant information that occurs when a team has access to a larger variety of resources in the form of distinct experiences, skills and knowledge that are nonredundant. ...The detrimental effects of diversity are a result of intergroup biases that evolve from social categorization. These intergroup biases disrupt the elaboration of task-relevant information and perspectives. However, it is not social categorization itself that evokes the negative reactions, but intergroup biases between subgroups that may follow from social categorization (Schneid, Isidor and Li 735)

There is some logic to this, especially given the almost forced socialization in modern startup culture. When social relationships gain the same level of priority as professional ones, the

normal in/out-group issues that exist in any group of humans become more important than they might otherwise be. This can create problems from the blatant, such as some of the harassment issues we have seen in tech, (i.e. Susan Fowler and Uber) to more subtle behaviors, such as talking over women or people of color, assuming older co-workers will not be up to speed on more modern forms of technology, etc. Social groups and relationships can be of great benefit to overall company culture, but care must be applied to ensure some perspective is maintained.

In some cases, the specific types of industry and diversity can have differing effects, with tech benefitting the most from gender diversity (Garnero et. al, 2014) :

Findings, based on the generalized method of moments (GMM) and Levinsohn and Petrin (2003) estimators, show that educational diversity is beneficial for firm productivity and wages. In contrast, age and gender diversity are found to hamper firm-level added value and average earnings. The magnitude of these effects is relatively big: Estimates notably suggest that when age or gender diversity (educational diversity) increases by one standard deviation, productivity drops (rises) on average by around 4 percent (almost 3 percent). Yet, the consequences of gender diversity are found to depend on the technological/knowledge intensity of firms. Gender diversity generates gains in high-tech/knowledge-intensive sectors: productivity is found to rise on average by between 2.5 and 6 percent following a one-standard-deviation increase in gender diversity. The reverse result is obtained in more traditional industries. Overall, findings do not point to sizeable productivity–wage gaps associated with educational and gender diversity. Age diversity, on the other hand, is generally found to decrease firms' profitability. (Garnero, Kampelmann and Rycx 456 & 461)

This aligns with what we see from within the tech sector. A diverse team is able to see the range of potential customer needs and issues better than a more homogenous one. This is critical when a company's target audience is not "truck drivers" or "companies that need steel beams" but rather "everyone who can afford and use a smartphone". As well, unlike more traditional industries, where physical strength or endurance was a primary requirement (one does not see a large number of lumberjacks who are 5'0" and 99lbs), the tech industry is much more of a mental industry. What a worker can bench press has no impact, for good or ill, on their ability to think logically. There is no connection between height and programming ability. A network flow analysis does not work better based on race or age. The one point I did find interesting, was that educational diversity seems to be universally "good" as it were. This is a fascinating counterpoint to the usual binary thinking on education levels in the workplace.

One of the more notable examples of how the ability to do well in tech is disconnected from physical fitness levels or ability is that of Barbara Beskind, a 90+-year-old designer and inventor who works part-time for IDEO, a design firm noted for designing the first Apple Mouse. (Sydell 2015)

Beskind's age and background differences bring a viewpoint that is not often seen in a typical design firm, which as a rule, skew youngish. For example, in one case, IDEO was working on "smart" bifocals, that would dynamically change prescription values at the swipe of a hand. Originally, the glasses would be powered by small batteries. Beskind pointed out an issue with that:

Initially, the designers wanted to put small changeable batteries in the new glasses. Beskind pointed out to them that old fingers are not that nimble.

"It really caused the design team to reflect," Addi says. They realized they could design the glasses in a way that avoided the battery problem. "Maybe it's just a USB connection. Are there ways that we can think about this differently?"

(Sydell)

Beskind's age difference also leads to product ideas a younger group might never think of:

Beskind has macular degeneration and only has peripheral vision. So she draws her designs with easy-to-see thick black felt pens. She hands me a design for glasses that would help people like her. One of the features is that they take a photo as people walk up and introduce themselves. The glasses also have a small speaker. "So that the next time as you approach within 10 or 12 feet, something in my ear would say it's Laura," she says. (Sydell)

There's also growing evidence that the oft-repeated idea that young people are able to learn quicker or, in the words of Facebook CEO, Mark Zuckerberg, are "just smarter" (Kennedy) is incorrect. There is some data to suggest that the experience and education one picks up over time can lead to an enhanced ability to solve problems, such as that of Dr. John Goodenough, who at 23, was told he was "too old" to succeed in the world of physics:

Recently, Dr. Goodenough recounted that story for me and then laughed uproariously. He ignored the professor's advice and today, at 94, has just set the tech industry abuzz with his blazing creativity. He and his team at the University of Texas at Austin filed a patent application on a new kind of battery that, if it works as promised, would be so cheap, lightweight and safe that it would revolutionize electric cars and kill off petroleum-fueled vehicles. His

announcement has caused a stir, in part, because Dr. Goodenough has done it before. In 1980, at age 57, he coinvented the lithium-ion battery that shrank power into a tiny package. (Kennedy 2017)

In terms of objective measurement, there seems to be a good deal to support the idea that age is a benefit to thinking and problem-solving, not a detriment:

Similarly, professors at the Georgia Institute of Technology and Hitotsubashi University in Japan, who studied data about patent holders, found that, in the United States, the average inventor sends in his or her application to the patent office at age 47, and that the highest-value patents often come from the oldest inventors — those over the age of 55.

This also carries over into realms other than inventors. “A study of Nobel physics laureates found that, since the 1980s, they have made their discoveries, on average, at age 50. The study also found that the peak of creativity for Nobel winners is getting higher every year.” (Kennedy)

The evidence, it would seem is fairly clear: diversity, not just gender diversity, but diversity across the range of humans is a benefit. Keeping that in mind can be important, especially given the current focus on gender diversity to the exclusion of other kinds of diversity. Both of the previous examples show clear evidence that a wider range of experience, along with worldview, can be of significant benefit to a tech company. Given the aging of not just the Baby Boomer and Generation X cohorts, but the fact that the earliest Millennials are preparing to enter their 40s, the “young people are just better” ideology that has permeated the tech industry is going to change. It will not have a choice, given the majority of tech’s customer base will no longer be considered “young”.

There is also strong evidence that employee and team diversity helps avoid problems that can be not only embarrassing, but cause people's lives to be upended. The clearest examples of this come via facial recognition software. There have been a plethora of stories about what happens when facial recognition algorithms are not trained across a wide enough range of faces:

There are plenty of anecdotes to start with here: We could talk about the time Google's image tagging algorithm labeled a pair of black friends "gorillas," or when Flickr's system made the same mistake and tagged a black man with "animal" and "ape." Or when Nikon's cameras designed to detect whether someone blinked continually told at least one Asian user that her eyes were closed. Or when HP's webcams easily tracked a white face, but couldn't see a black one. (Eveleth 2016)

Some of it almost sounds like some form of dark comedy. The Asian person being told their eyes are closed. The black people who cannot be recognized at all. To be fair, the issue is not complex as much as expensive. It takes time and resources to test and correct facial recognition systems to work with the fairly massive range of faces across the globe. A company with resources such as Apple, who was able to literally test its new "FaceID" system with test subjects from around the world can avoid many of these problems. But for a smaller company, it is not as easy. "I don't think my engineers or other companies engineers have any hidden agenda to give more attention to one ethnicity," said Greenshpan. "It's just a matter of practical use cases." (Eveleth).

The bias that shows up in these cases is not intentional. No one is deliberately excluding non-white faces from their software. It is a case of resource limitations and often, unconscious privilege.

And folks who work on algorithmic bias, like Suresh Venkatasubramanian, a professor of computer science at the University of Utah, say that's generally what they're seeing too. "I don't think there's a conscious desire to ignore these issues," he said. "I think it's just that they don't think about it at all. No one really spends a lot of time thinking about privilege and status, if you are the defaults you just assume you just are." (Eveleth)

It is also not “just white people”. Often, even a programmer who is not white will not have the time or ability to test recognition algorithms with a wide range of faces, and instead hopes someone else will fix it. “The mirror experience brings back memories from 2009. While I was working on my robotics project as an undergraduate, I “borrowed” my roommate’s face so that I could test the code I was writing. I assumed someone would fix the problem, so I completed my research assignment and moved on.” (Buolamwini 2016).

The problem of course, is that often, there is no need to “fix” the code, as in terms of what the programmer using it needs, it is not “broke”. It works well enough across the immediate needs of the programmer, until it does not.

Several years later in 2011, I was in Hong Kong taking a tour of a start-up. I was introduced to a social robot . The robot worked well with everyone on the tour except for me. My face could not be recognized. I asked the creators which libraries they used and soon discovered that they used the code libraries I had used as an undergraduate. I assumed someone would fix the problem, so I completed the tour and moved on. (Buolamwini)

This is almost humorous, but it shows a real danger as well. An algorithm, or a code library, or a framework will be thought of as working “correctly” if it returns expected results



when tested and used. In the United States for example, an inability to recognize non-white faces still means it works for the majority of use cases, and given current racial disparities in tech, it will work for the vast majority of programmers. So by most normal definitions, a facial recognition framework that has some problems with non-white faces may never cause the right people (the programmers) enough problems to be considered “broken”, and given the real resource requirements to fully test this kind of code, a small company may not be able to fix it, even if they do consider it broken.

However, the lack of diversity in testing and maintaining facial recognition code creates real world problems beyond inconvenience. For example, the U.S. Border Patrol and TSA are both using facial recognition software to control access to the United States. The software they are using has a real problem with trans faces:

Trans people traveling through TSA checkpoints have all sorts of humiliating stories of what happens when their scans don't "match" their stated identity. Shadi Petosky live-tweeted her detention at the Orlando International Airport in Florida, where she said that "TSA agent Bramlet told me to get back in the machine as a man or it was going to be a problem." Since then, several more stories of "traveling while trans" have emerged revealing what happens when a biometric scan doesn't line up with what the TSA agent is expecting. (Eveleth 2016)

This is not a theoretical problem or an inconvenient one. This is a case of a government organization basing decisions on who is allowed to fly within the United States almost entirely on poorly-performing algorithms. Given that most people will never have access to the algorithms that control much of their lives, even accidentally encoded discrimination can create a litany of problems most of us will never think about. “Facebook now owns a patent on a process

by which a user can be denied a loan because of the creditworthiness of his or her friends. IBM purports to offer an algorithm that can distinguish refugee from terrorist, “the sheep from the wolves.” (Chander 1025)

A facial recognition system used by a company to match potential employees to a government database of known criminals that is not as close to perfectly accurate as possible for the range of facial possibilities is again, not a joke. It is a problem with both immediate and long-lasting consequences. A “mostly” working facial recognition software algorithm used by law enforcement can cause even more dire problems.

In 16 “undisclosed locations” across northern Los Angeles, digital eyes watch the public. These aren’t ordinary police-surveillance cameras; these cameras are looking at your *face*. Using facial-recognition software, the cameras can recognize individuals from up to 600 feet away. The faces they collect are then compared, in real-time, against “hot lists” of people suspected of gang activity or having an open arrest warrant. (Garvie and Frankle 2016)

The margin for error in these cases is slim and the results permanent, yet law enforcement groups use software that has, in terms of accuracy, rather shocking error rates:

Similarly, a study conducted in 2012 that used a collection of mug shots from Pinellas County, Florida to test the algorithms of three commercial vendors also uncovered evidence of racial bias. Among the companies evaluated was Cognitec, whose algorithms are used by police in California, Maryland, Pennsylvania, and elsewhere. The study, co-authored by a senior FBI technologist, found that all three algorithms consistently performed 5-to-10 percent worse on African Americans than on Caucasians. One algorithm, which failed to identify the right

person in 1 out of 10 encounters with Caucasian subjects, failed nearly twice as often when the photo was of an African American. (Garvie and Frankle)

## **Conclusion**

Over and over again, we see the same issues: A lack of diversity in tech does not cause potential problems, it causes real problems. It can cause everything from the inconvenient, (“smart” bifocals that are hard to use by older people) to the devastating, (being unable to get a job because a poorly-tested recognition algorithm keeps incorrectly telling potential employers that you have a criminal record.) Given the secrecy that these algorithms are kept under, it is imperative that the companies creating and maintaining them be held responsible for their accuracy.

The solution(s) are clear, and somewhat obvious – diversity, not just gender diversity, but age, gender identification, race, the entire range benefits tech. It helps them find solutions to problems that might otherwise elude them. It helps them avoid problems that not only affect the company making the product, but the millions of people who can be affected by the use of that product. It helps them, literally, think better, to solve problems better, and it helps them find new ideas that a homogeneous group would have a great deal of difficulty comprehending. Outside of the social/ethical/moral implications, the evidence shows, I feel, that employee/team diversity in tech is clearly beneficial to all.

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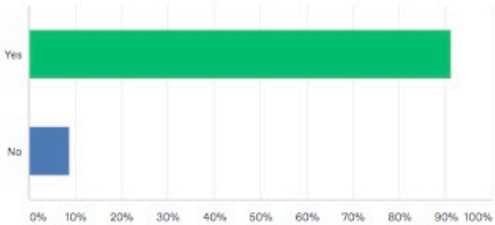
Appendix 1

SurveyMonkey Analyze - short diversity survey

11/7/17, 15:25

SurveyMonkey Analyze - short diversity survey

11/7/17, 15:25



ANSWER CHOICES	RESPONSES
Yes	91.30% 21
No	8.70% 2
TOTAL	23

Comments (0)

RESPONSES (9) TEXT ANALYSIS MY CATEGORIES

PAID FEATURE  
Use text analysis to search and categorize responses; see frequently-used words and phrases. To use Text Analysis, upgrade to a paid plan .

UPGRADE Learn more »

Categorize as... Filter by Category

Search responses

Showing 9 responses

I live and work in Thailand. Things are very different here. Around 40% of our technical staff is female, for example.

10/30/2017 10:22 PM [View respondent's answers](#)

Around 80 staff. Interns are the most diverse. Pretty diverse in terms of sexual orientation and very diverse in terms of gender (CEO, Publisher and Controller are all women). Some racial diversity among permanent staff.

10/30/2017 8:04 PM [View respondent's answers](#)

We are small, yet we have two women and to men.

10/30/2017 6:05 PM [View respondent's answers](#)

My workplace IT organization of 300+ people is quite diverse. 5/9 of the senior executives are women, and the staff roll as a whole is seems reasonably balanced. However, my immediate desk top support workgroup is a veritable sausagefest, with only two women (one senior, one junior).

10/30/2017 5:54 PM [View respondent's answers](#)

Diversity is a focus at our company, but some departments are more diverse than others, and non-management is more diverse than management on the whole.

Q2

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If you answered "yes" to question one, can you list any specific benefits and/or advantages you have seen as a result of this diversity? This could be anything from "Having a diverse team helped us understand our potential user/customer base's need(s) better." to "We were able to design our work to be usable by people with color-blindness from the start."

Answered: 22   Skipped: 1

ANSWER CHOICES	RESPONSES
Yes	63.64% 14
No	36.36% 8
TOTAL	22

Comments (17)

RESPONSES (17)

TEXT ANALYSIS   MY CATEGORIES

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Showing 17 responses

Because customers are often biased against tech advice given by women, I often ask my male business partner to repeat points I have made so that customers will a) hear them, and b) consider them. We call it "bringing out the baritone". When competing against other consultants in specific customer settings, such as women-owned businesses, schools, or other woman-centric businesses, it is helpful to have a woman to speak to other women. Over time, the bias towards tech advice from men still applies, but initially there is additional trust with a woman on the team.

11/6/2017 11:08 AM [View respondent's answers](#)

Having a diverse team help us with developers in other languages, identify important requirements and allow us to explore our attempts to expand more

11/2/2017 6:16 PM [View respondent's answers](#)

I manage IT for a disability advocacy agency and several of our staff have a disability. Providing the appropriate assistive tech for them helps me to understand the diverse needs of others.

11/2/2017 8:44 AM [View respondent's answers](#)

n/a

10/31/2017 1:11 PM [View respondent's answers](#)

...

Q3

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If you answered "yes" to question one, can you list any specific instances where a more diverse team helped you avoid possible pitfalls. This can be everything from avoiding offensive marketing tropes to having facial recognition software work with more than just white males in their 20s to not assuming all potential customers have easy access to unlimited high-speed internet.

Answered: 21 Skipped: 2

ANSWER CHOICES	RESPONSES
Yes	47.62% 10
No	52.38% 11
TOTAL	21

Comments (11)

RESPONSES (11) TEXT ANALYSIS MY CATEGORIES

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Search responses

Showing 11 responses

SurveyMonkey Analyze - short diversity survey11/21/17, 15:25

It was easier for us as a company to not fall into typical biases when approaching customers. Often, I think we contrasted without trying against other consultants who didn't check their gender bias.	11/6/2017 11:08 AMView respondent's answers
Identifying a developer team in another language hand us a message stating our software was at fault was just Korean for 'An error has occurred' with a status code of their own app.	11/2/2017 6:16 PMView respondent's answers
It makes you aware that not everyone accesses technology in the same way. People with disabilities have very different relationships with technology. It can be as simple as a blind person needing a screen reader, but seeing that a website or software doesn't support screen readers well or require a mouse for input.	11/2/2017 8:44 AMView respondent's answers
n/a	10/31/2017 1:11 PMView respondent's answers
Teammates from different backgrounds can indeed perceive what might be intended well but might land poorly.	

ENGLISH

