



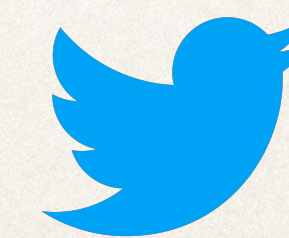
THE UNIVERSITY OF  
**AUCKLAND**  
Te Whare Wānanga o Tāmaki Makaurau  
NEW ZEALAND

# Creating Better Software by Centering Diversity, Equity, and Inclusion

Dr Kelly Blincoe

Human Aspects of Software Engineering Lab

University of Auckland, New Zealand

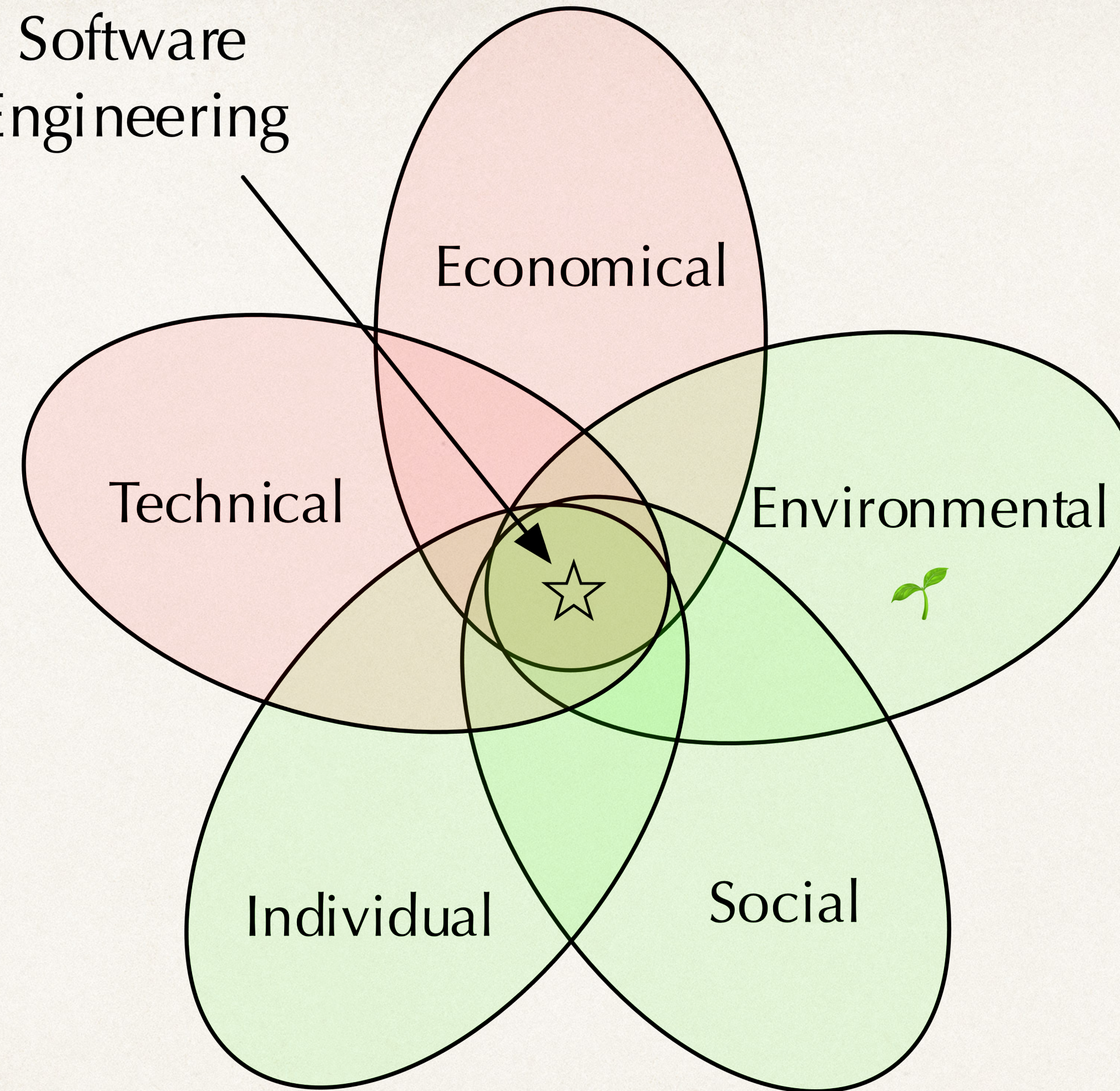


@KellyBlincoe


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*International Conference on ICT for Sustainability (ICT4S), June 2022*

# Sustainable Software Engineering



Duboc, L., Betz, S., Penzenstadler, B., Kocak, S. A., Chitchyan, R., Leifler, O., ... & Venters, C. C. (2019, September). Do we really know what we are building? Raising awareness of potential Sustainability Effects of Software Systems in Requirements Engineering. In 2019 IEEE 27th international requirements engineering conference (RE) (pp. 6-16). IEEE.



*Exclusion happens when we  
don't consider all the possible  
users and their use cases*

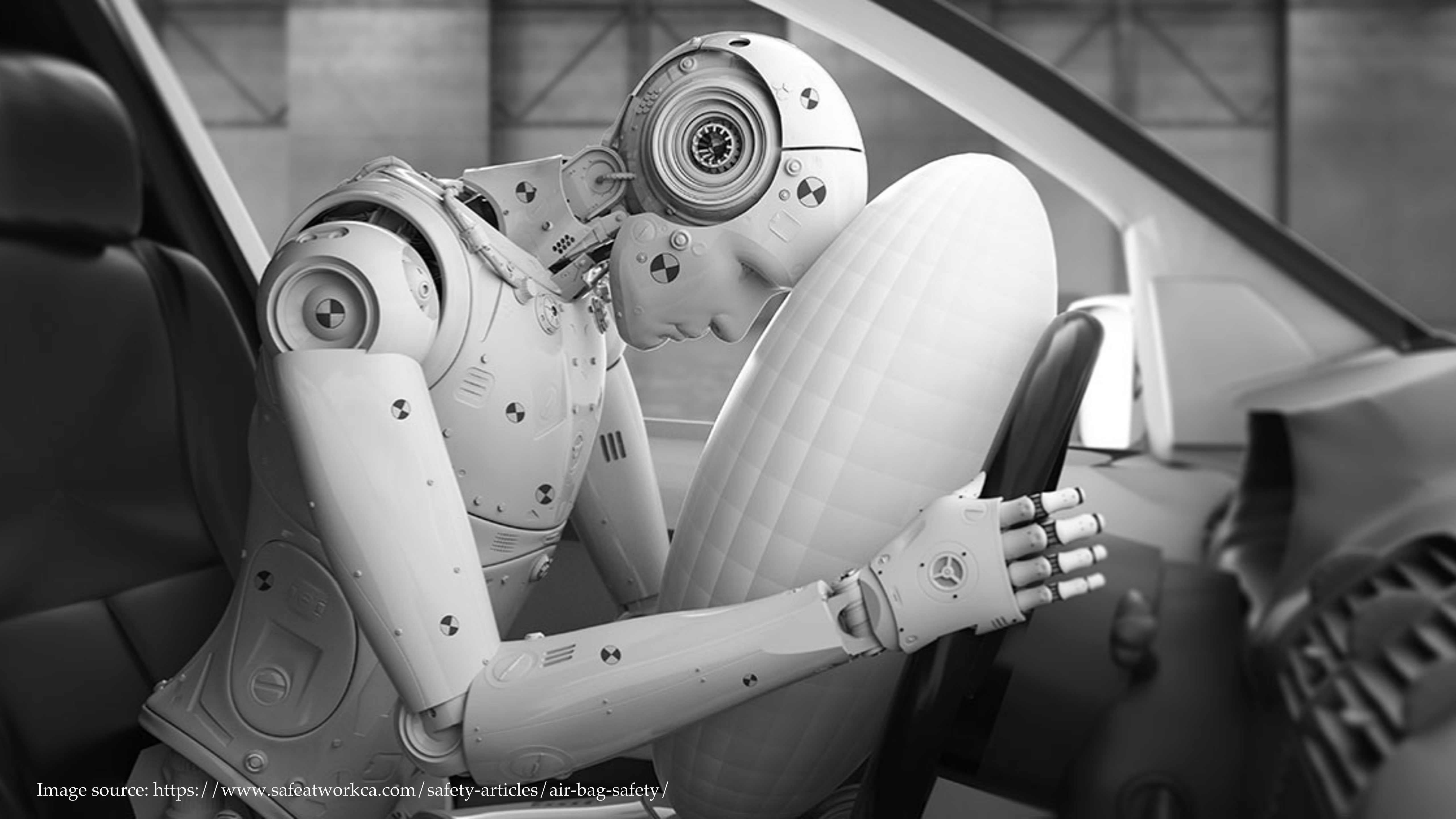
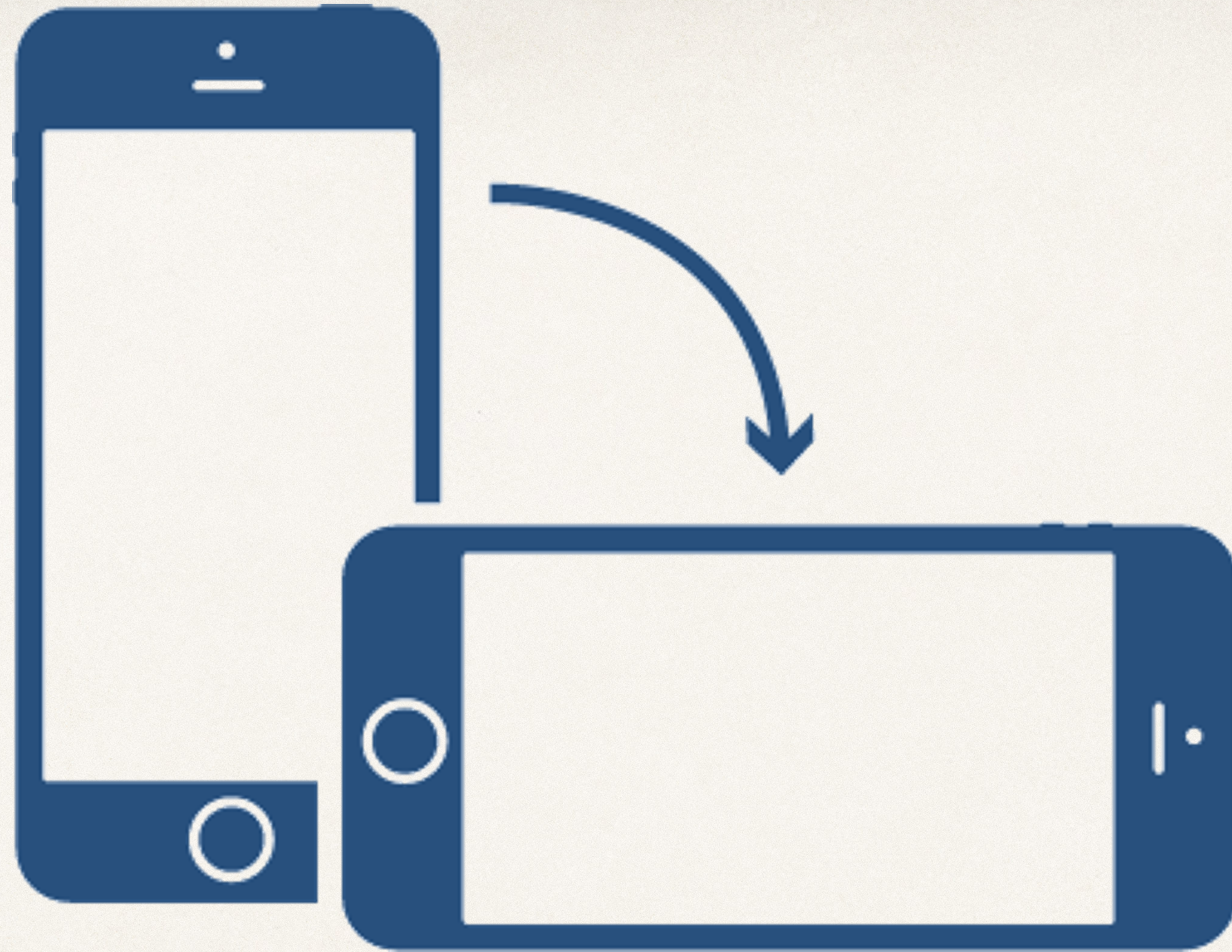
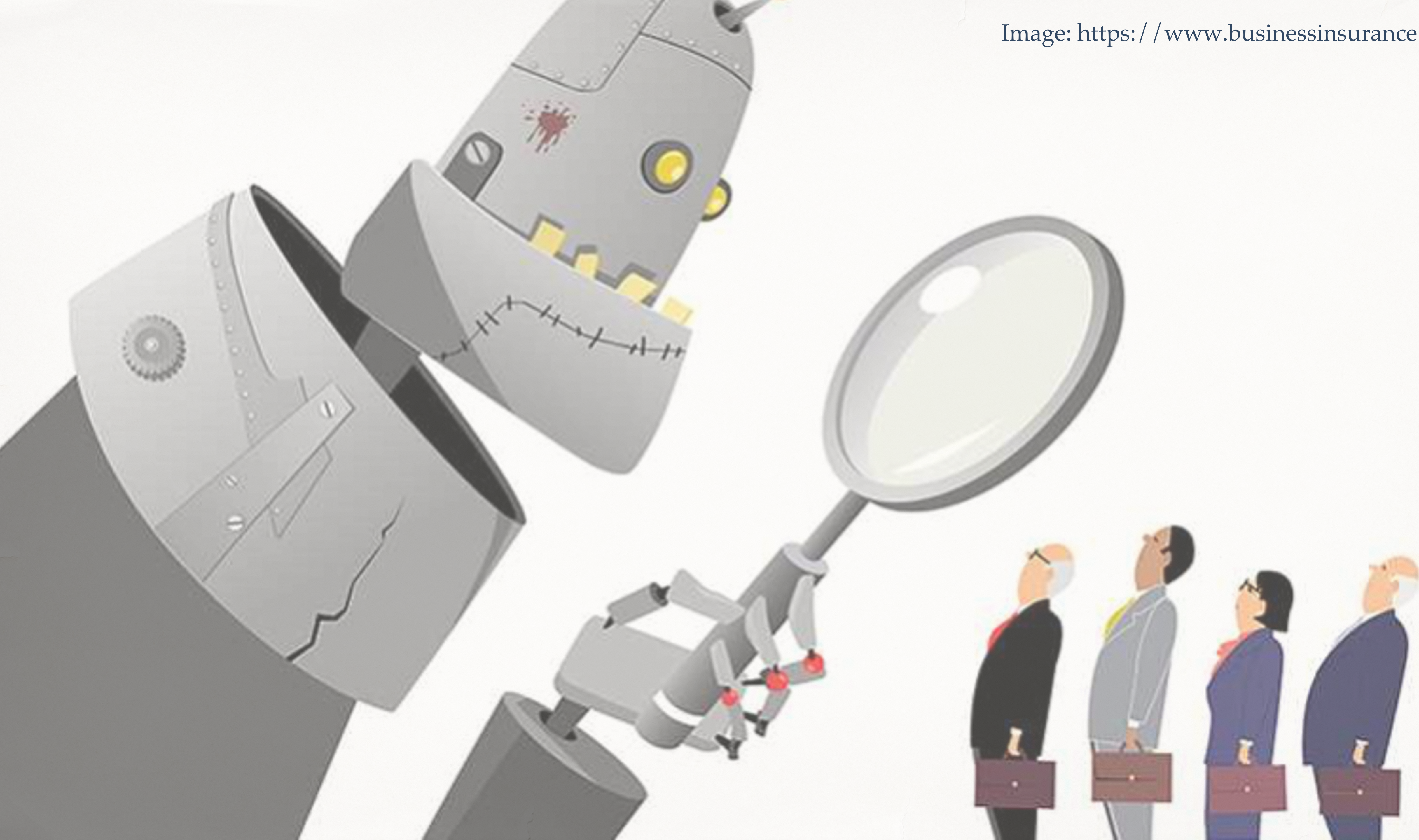


Image source: <https://www.safeatworkca.com/safety-articles/air-bag-safety/>







# Twitter tries to fix problematic image crops by not cropping pictures anymore

*Twitter is testing a new 'what you see is what you get' image preview*

By [Nick Statt](#) | [@nickstatt](#) | Mar 10, 2021, 12:34pm EST

# Amazon scraps secret AI recruiting tool that showed bias against women

By Jeffrey Dastin

8 MIN READ





*The needs of all of society need to be considered when creating software*





Image source: <https://dacnw.org/newsletter/history-of-curb-cuts-99-invisible/>



wheelchairs



strollers



bikes



skateboards



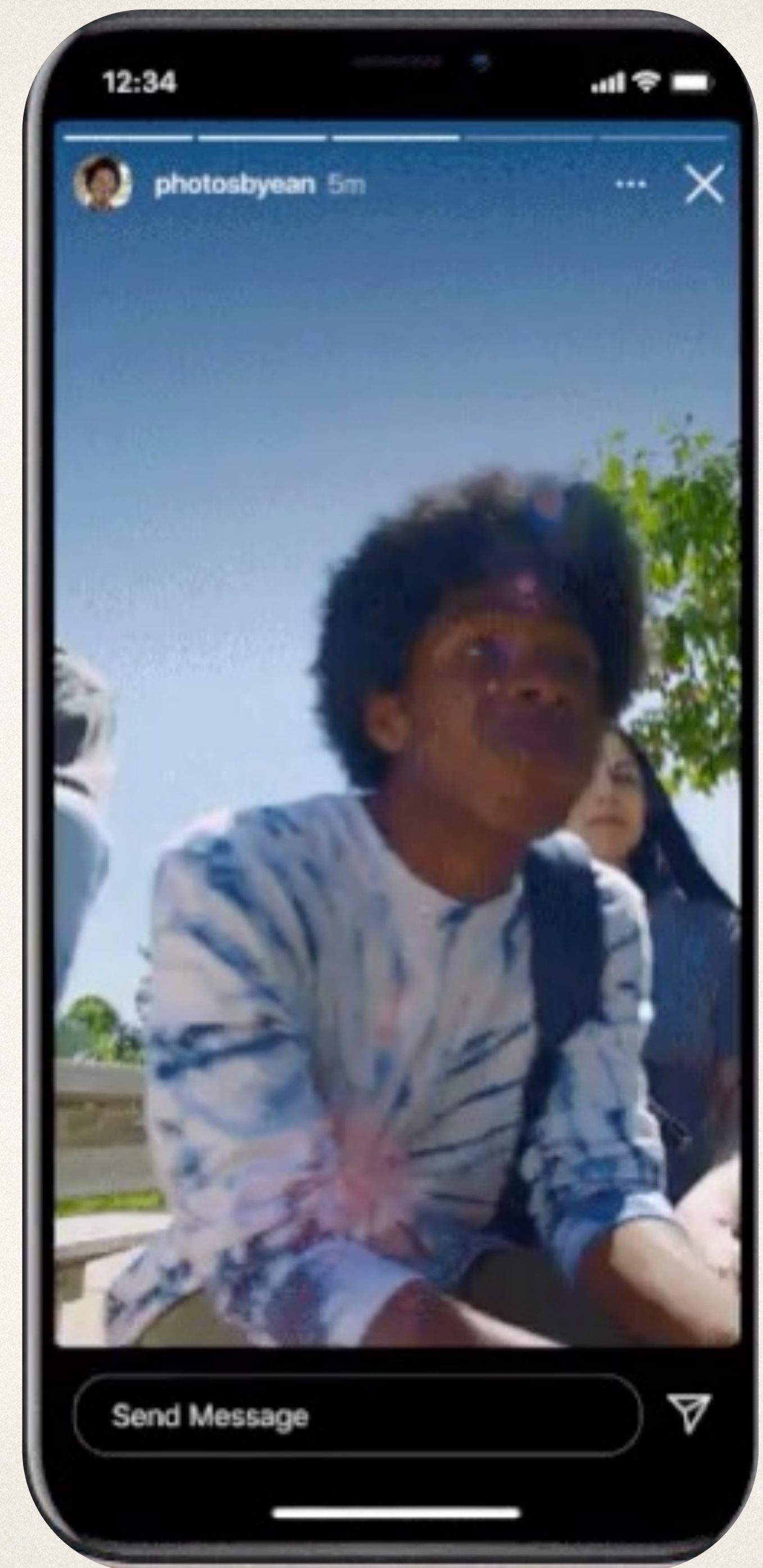
walking aids



suitcases



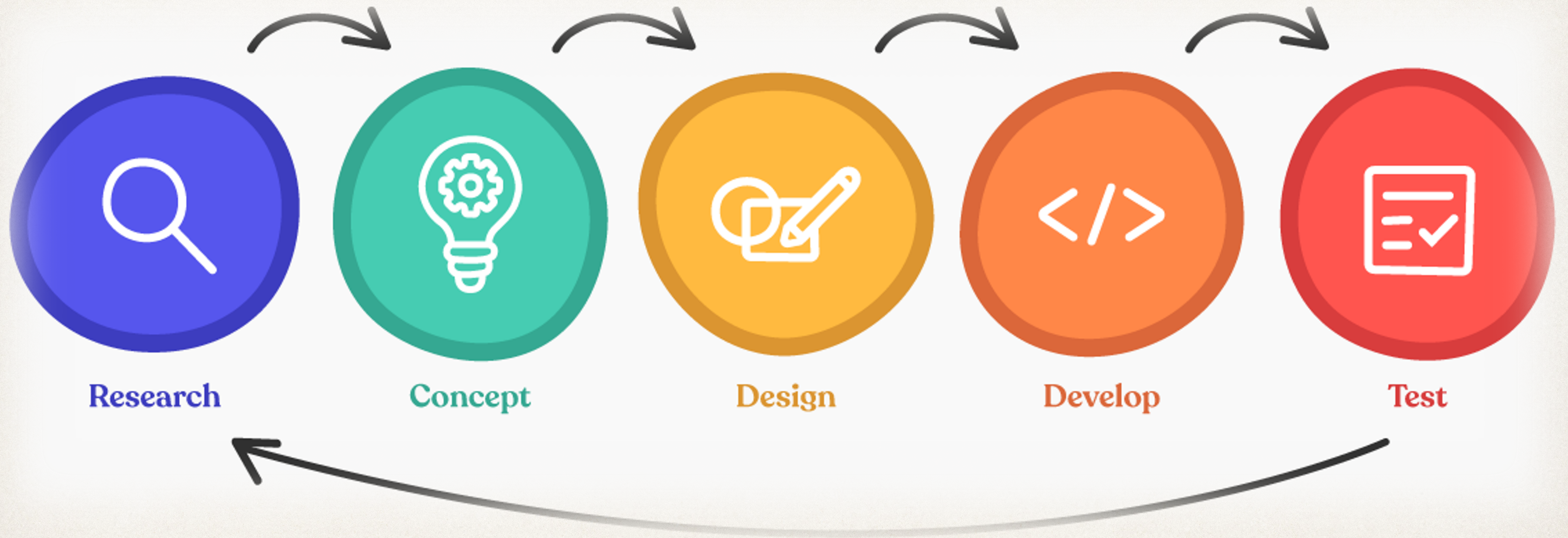
packages



# *Requirements Elicitation*



# *User-centered design process*



*“Inclusive requirements engineering in a software project, requires intensive communication between all participating stakeholders.”*

- ❖ Cognitive walkthrough using personas
- ❖ Five cognitive factors:
  - ❖ Motivations to use software
  - ❖ Information processing styles
  - ❖ Computer self-efficacy
  - ❖ Attitudes toward risk
  - ❖ Style of learning new technologies





## App

4 Aug

★★★★☆ by Customer40523662

The app is great, but first of all you should fix search box, because you can't search certain users. Secondly you should add reply box so people could answer the questions, and make it so everyone could see. Looking forward!



@twitter u guys really need to add the direct return to home button in Twitter APP.

#suggestion #app #MuchNeededChange #ThanksInAdvance



Image: <https://www.clipartkey.com/>

# Online user feedback

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Google Play



**App Store**

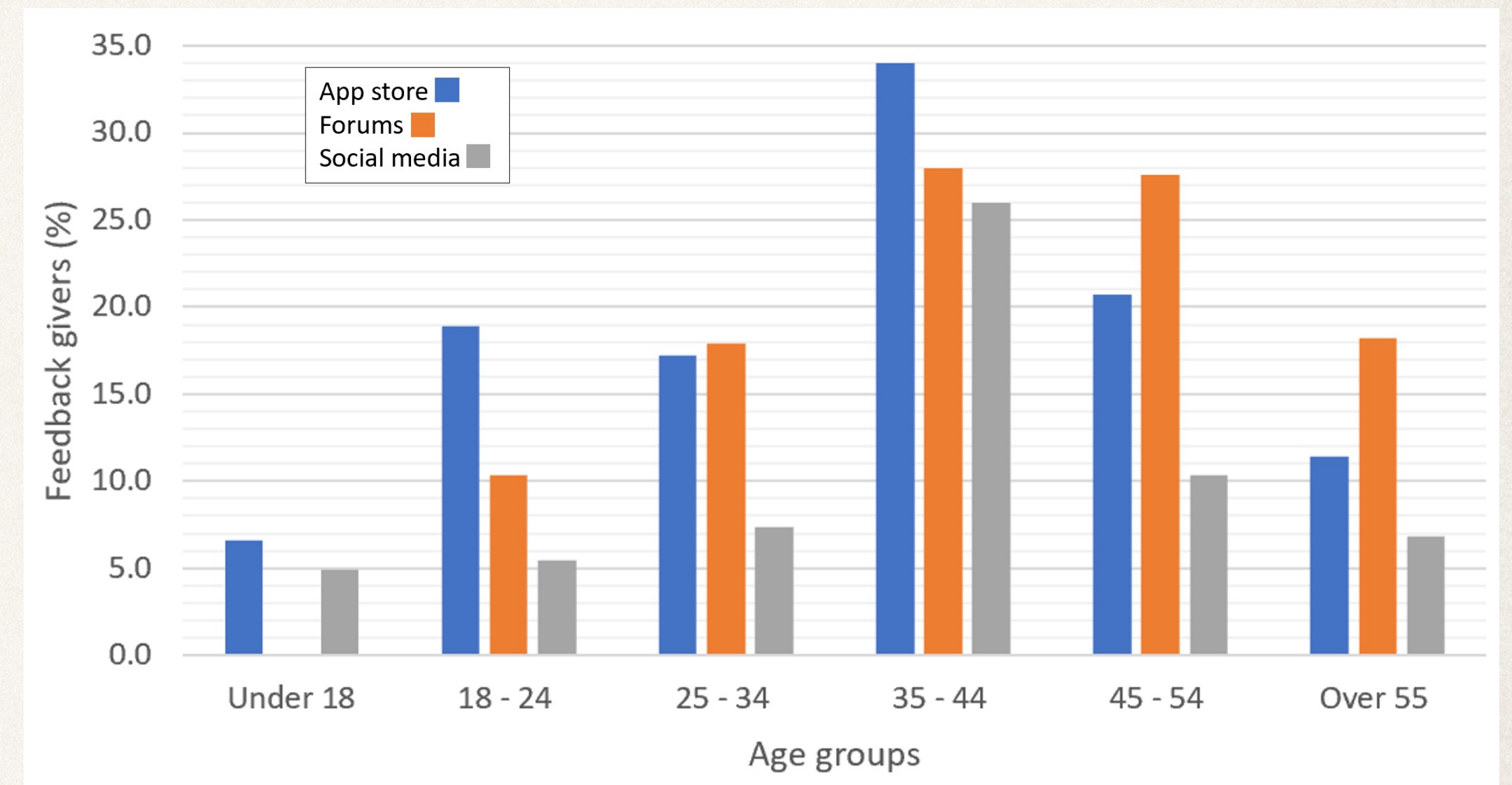
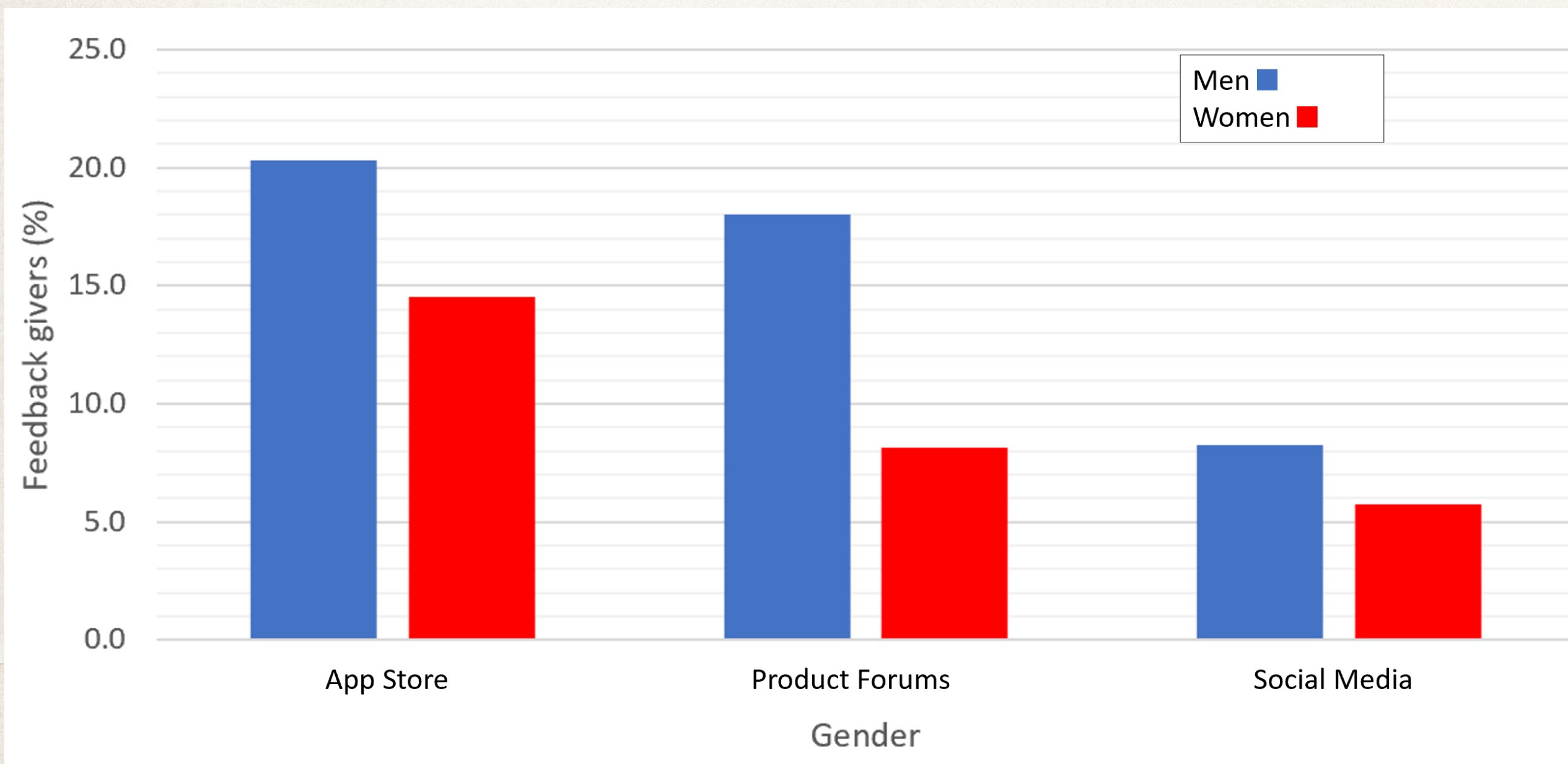


twitter



- ❖ bug reports
- ❖ feature requests
- ❖ user experiences

# Is online user feedback representative?



# Prioritization of online user feedback

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- ❖ Sentiment, ratings
- ❖ Frequency
- ❖ Retweets, likes, number of followers
- ❖ *Prioritizing the majority*



# Benefits of diversity

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- ❖ Improved productivity
- ❖ Increased innovation
- ❖ More usable software



Vasilescu et al., CHI 2015; 2. Østergaard et al., Research Policy 2011; Burnett et al., CHI 2016

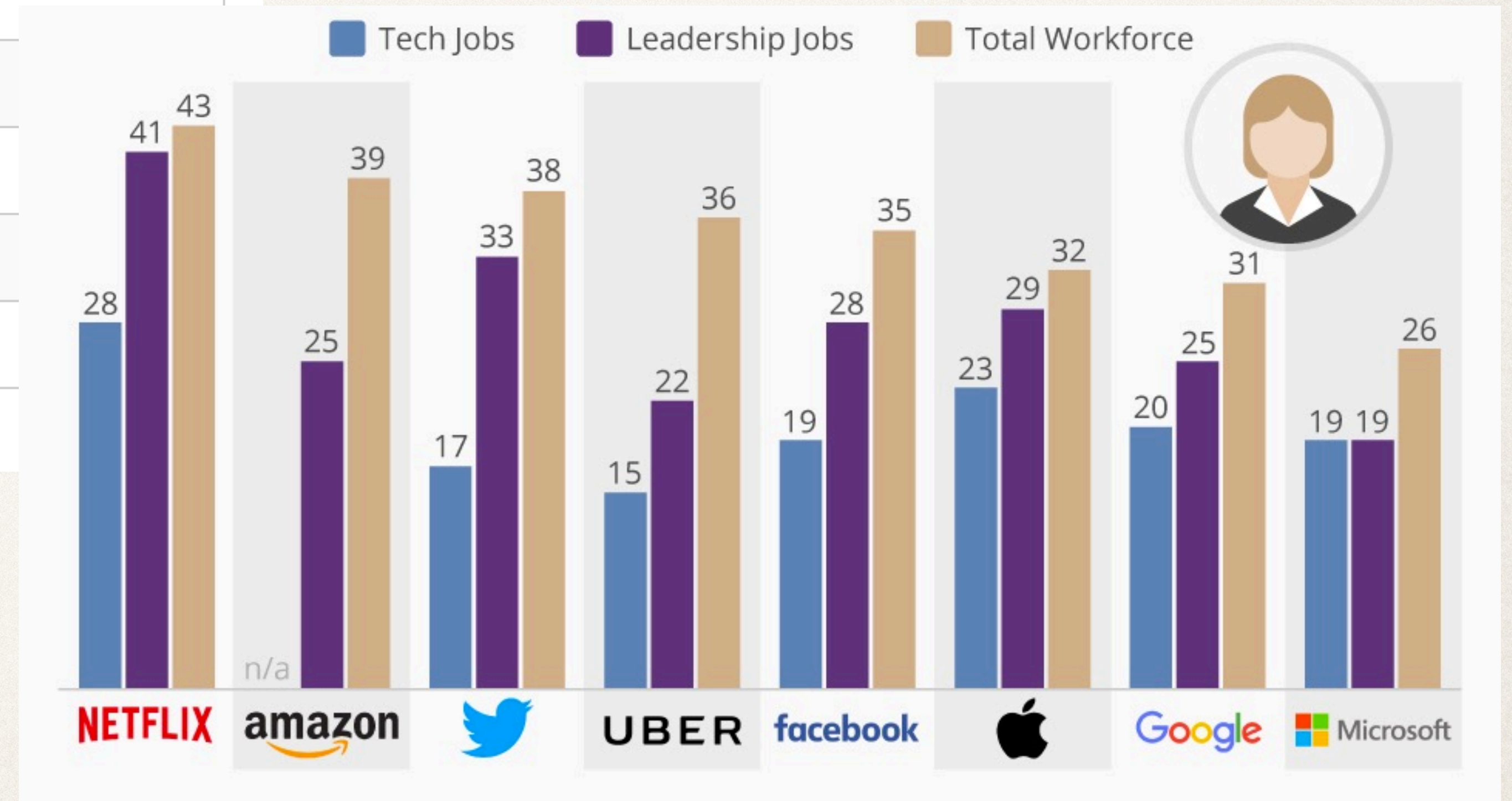
Image: <http://www.theinclusionsolution.me/what-is-diversity-part-2-diversity-of-thought/>

# Tech's Diversity Problem

## New Zealand diversity stats for tech

Ethnicity	New Zealand population	N.Z. information media and telecommunications industry proportion
White/European	70%	72%
Māori	16%	8%
Asian	15%	19%
Pacific peoples	8%	5%
Other	1%	NA

Source: New Zealand 2018 Census







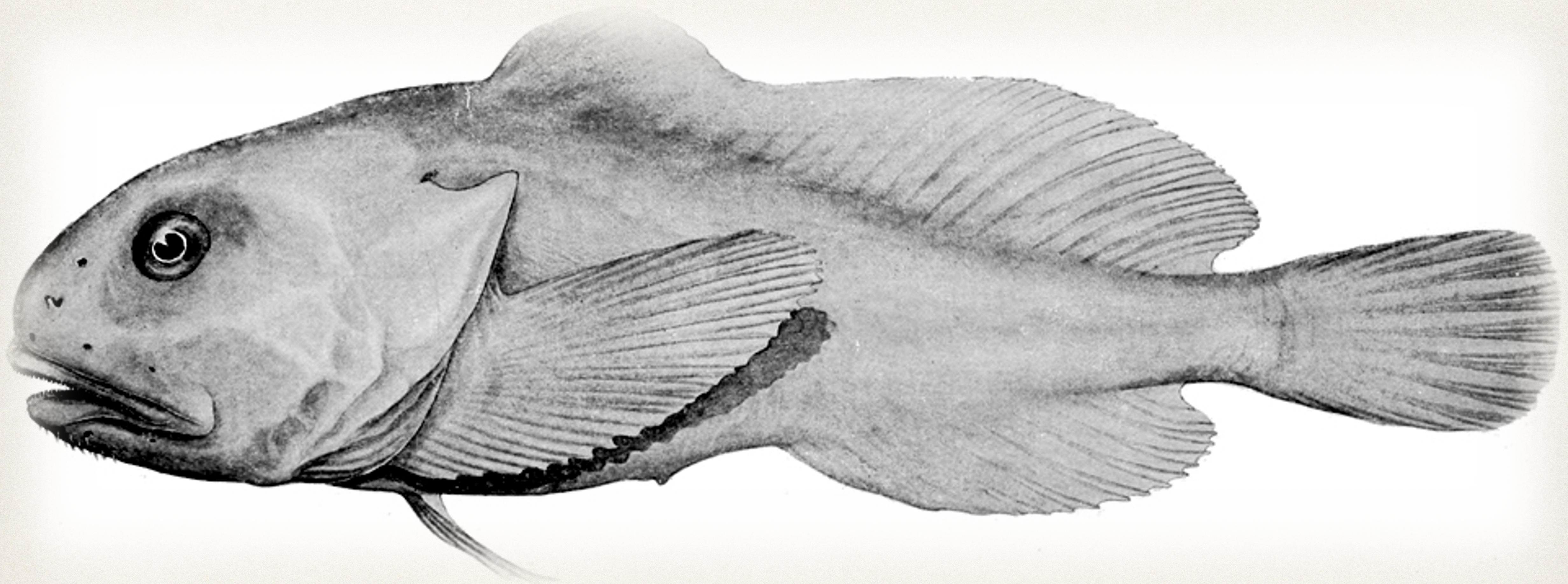


Illustration of a Smooth-head Blobfish, *Psychrolutes marcidus*, by Allan R. McCulloch, 1918. Source: A.R. McCulloch 1916 Zoological results of the fishing experiments carried out by F.I.S. "Endeavour" 1909-10 under H.C. Dannevig. License: Public Domain

# A Toxic Environment

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## ❖ Negative sentiment and emotion

[Tourani et al, CASCON 2014; Gachechiladze et al., ICSE-NIER 2017]

## ❖ Discrimination

[Nafus, New Media & Society 2012; Terrell et al., PeerJ Computer Science 2017; Imtiaz et al., ICSE 2019; Blincoe et al., IEEE Software 2019]

## ❖ Profanity, insults, and toxic discussions

[Squire and Gazda, HICSS 2015; Raman et al., ICSE 2020]

## ❖ Pushback during code review

[Engelman et al., ICSE 2020]

 Engadget

### Report: Apple is a sexist, toxic work environment

Some of the complaints Mic reported on include a female engineer whose "male-dominated" team made jokes about an office intruder coming to...

### Tech's gender discrimination

Let's just look at where women stand when it comes to some of the most valuable tech companies. Of the 291 unicorns — private companies with a...

2 days ago

 The Guardian

### I worked on Facebook's Trending team – the most toxic work experience of my life

I worked on Facebook's Trending team – the most toxic work experience of my life ... Working at Facebook, even as a contractor, was supposed to be...

# Codes of Conduct

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## Contributor Covenant

A Code of Conduct for Open Source Projects.

[contributor-covenant.org/](https://contributor-covenant.org/)



Sign up

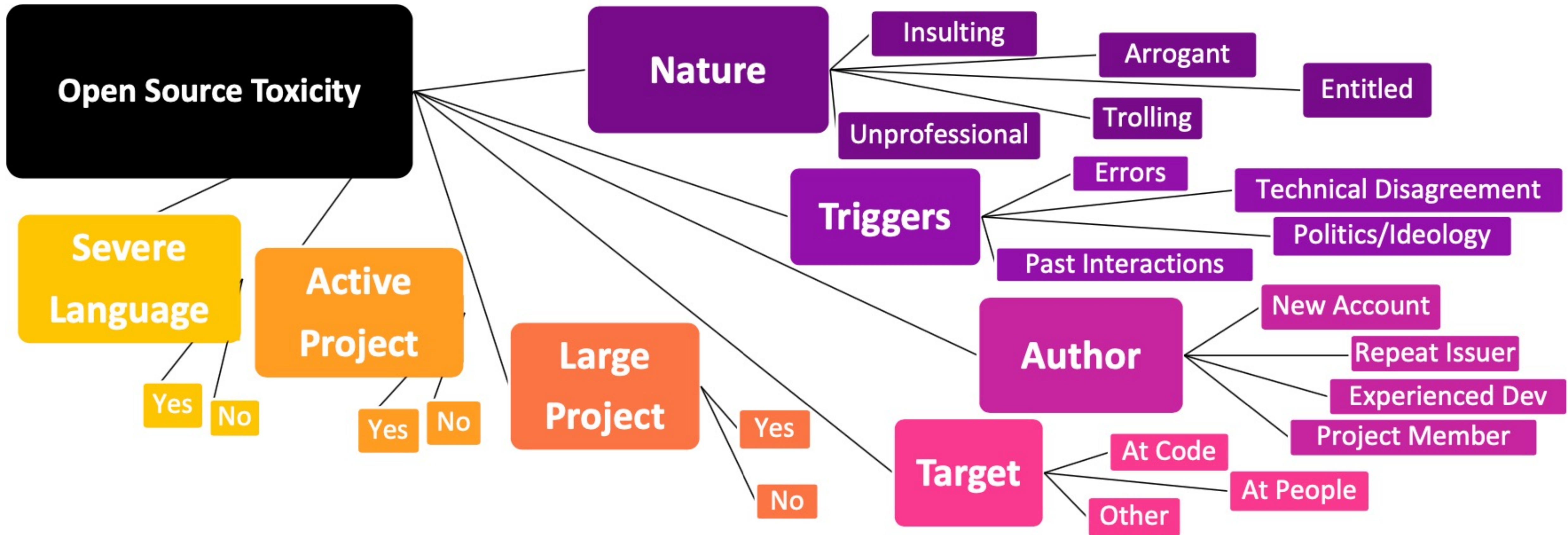


[domgetter](#) / [NCoC](#) Public

No Code of Conduct: A Code of Conduct for Adults in Open Source Software

“We are all adults. Capable of having adult discussions.”

# Toxicity in Open Source



# Software Code Review

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**I Am Developer**

@iamdeveloper

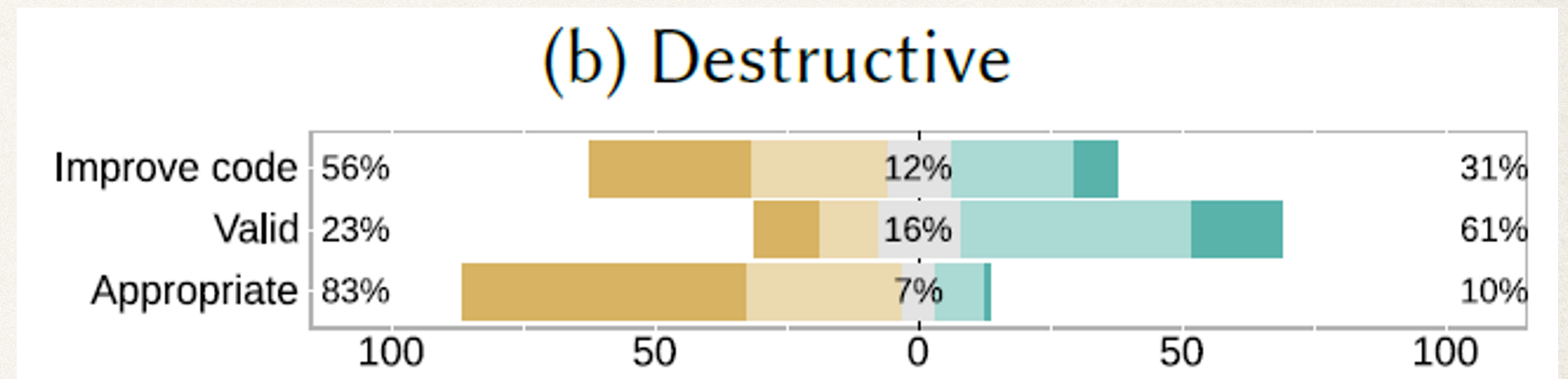
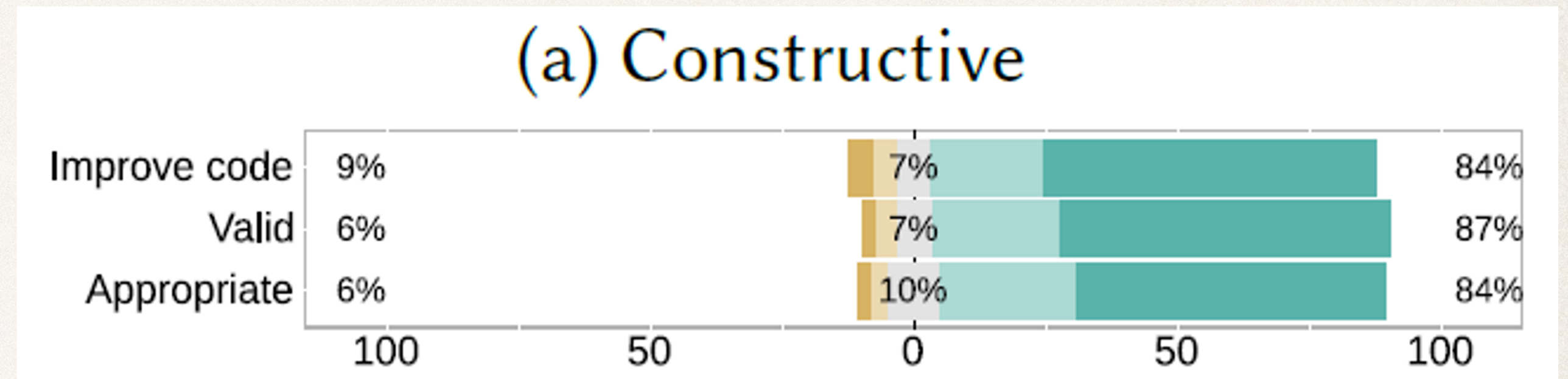
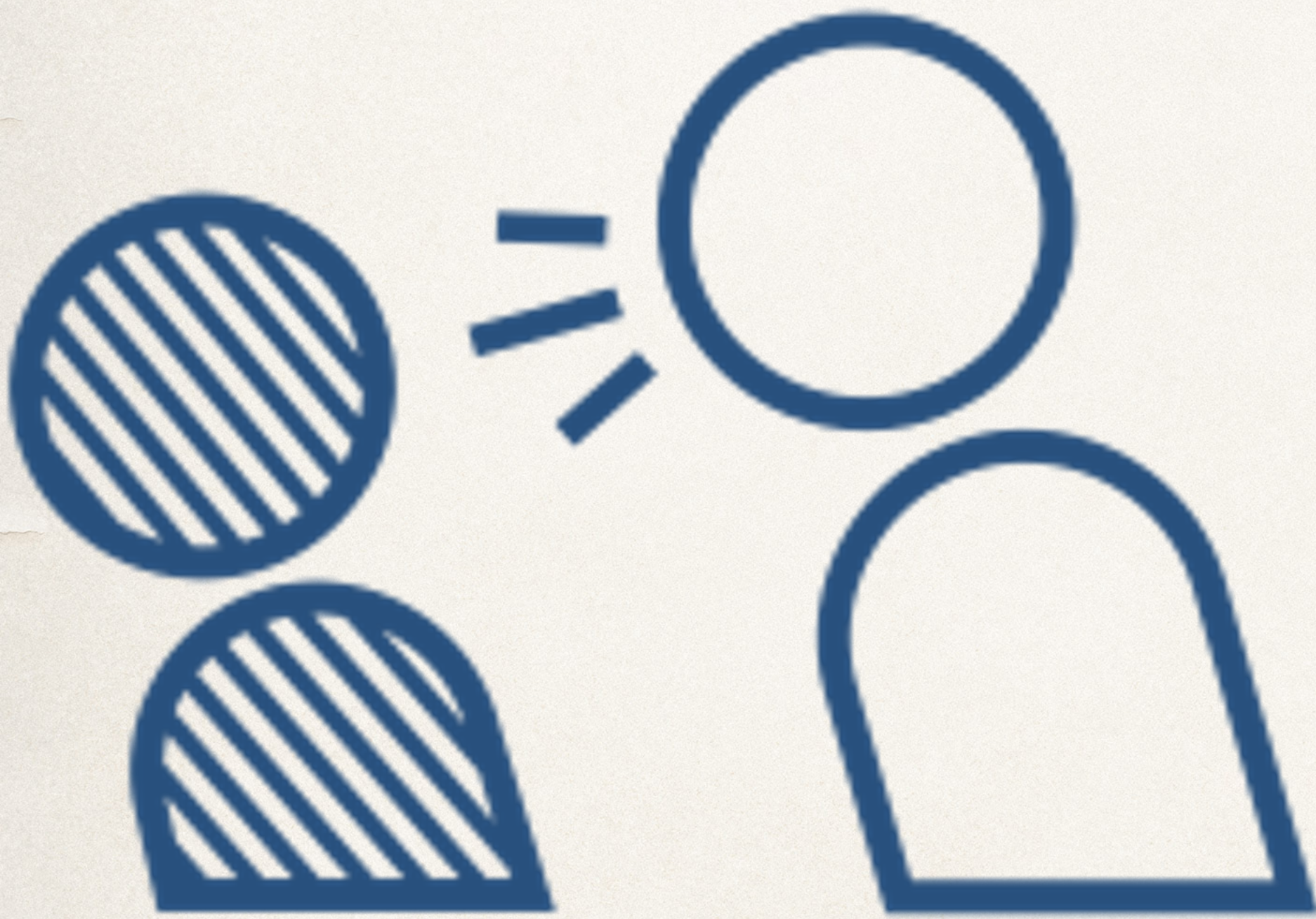
Code review can be:

- honest
- nice

Pick one...

# Studied perceptions of feedback in code review

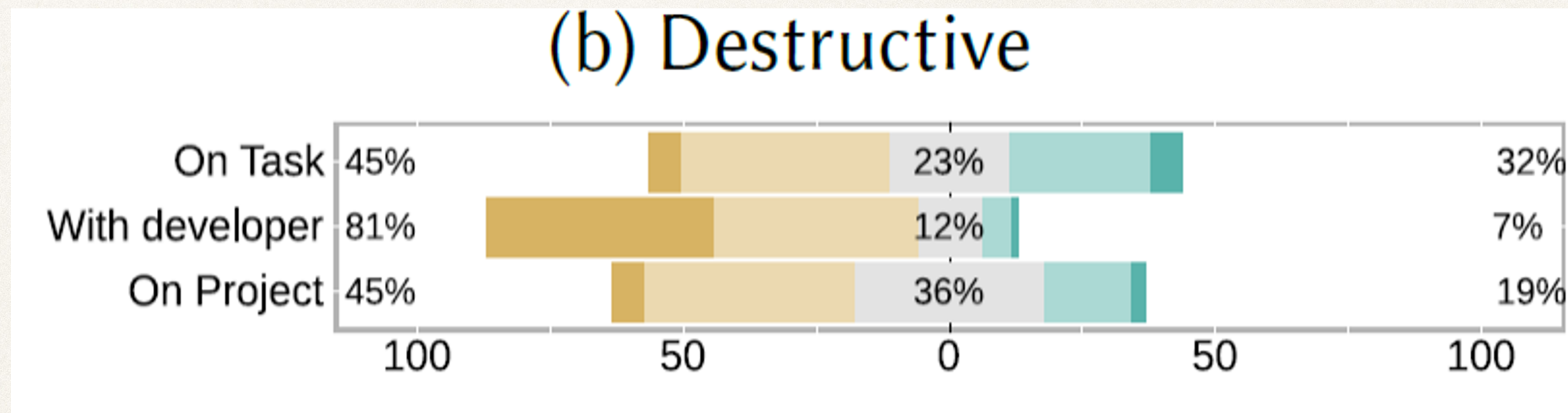
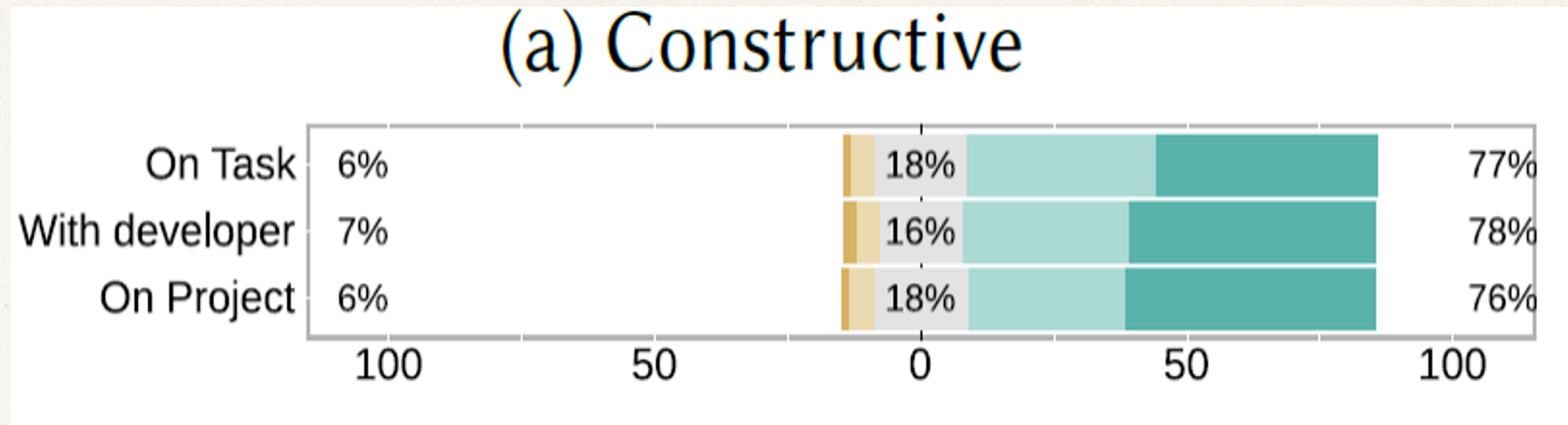
*This is seriously obtuse*



Strongly disagree Somewhat disagree Neither agree nor disagree Somewhat agree Strongly agree

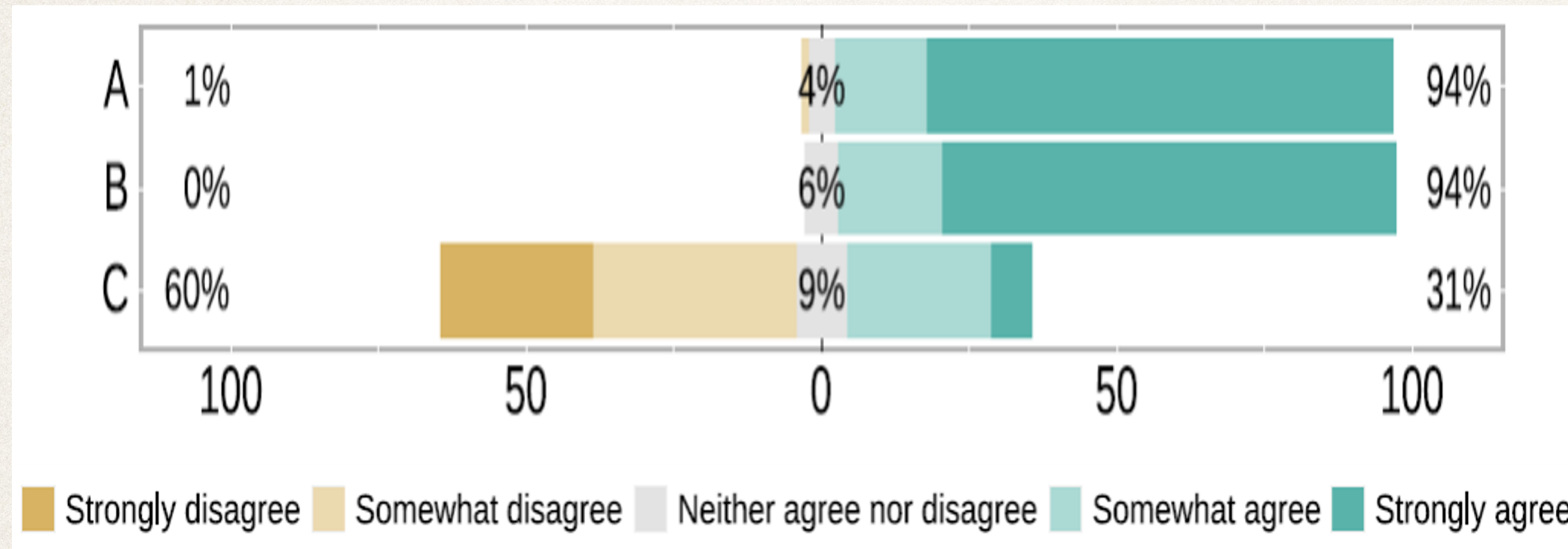
Sanuri Dananja Gunawardena, Peter Devine, Isabelle Beaumont, Lola Garden, Emerson Murphy-Hill, and Kelly Blincoe. 2022. Destructive Criticism in Software Code Review Impacts Inclusion. CSCW 2022.

# Motivation to continue working



Very unmotivated Somewhat unmotivated Neither motivated nor unmotivated Somewhat motivated Very motivated

# Conflicting opinions



**A** - *“Destructive criticism is harmful”*

**B** - *“Destructive criticism will cause a negative reaction for the recipient”*

**C** - *“When receiving code review comments, I don’t mind getting inconsiderate feedback as long as the feedback helps to improve the code quality”*

## ❖ Women

- ❖ Perceive as less appropriate
- ❖ Less motivated

## ❖ Less experienced developers

- ❖ Less likely to call it out



# Other known differences

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- ❖ Debugging strategies gender differences

[Grigoreanu et al. IS-EUD 2009]

- ❖ Code reading comprehension strategies gender differences

[Zohreh Sharafi et al. ICPC 2012]

- ❖ GitHub has inbuilt gender biases

[Mendez et al. ICSE 2018]

- ❖ Pull request acceptance rates differences across genders, race, nationality

[Terrell et al. Peer] Computer Science 2017; Nadri et al. IEEE Software 2020; Furtado et al. IEEE Software 2020]

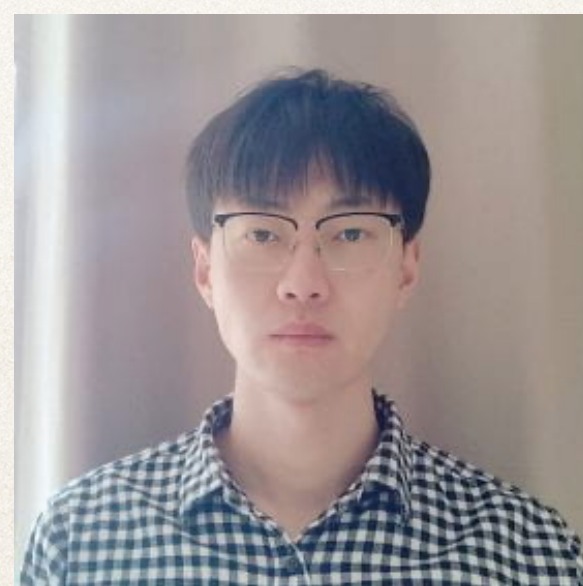
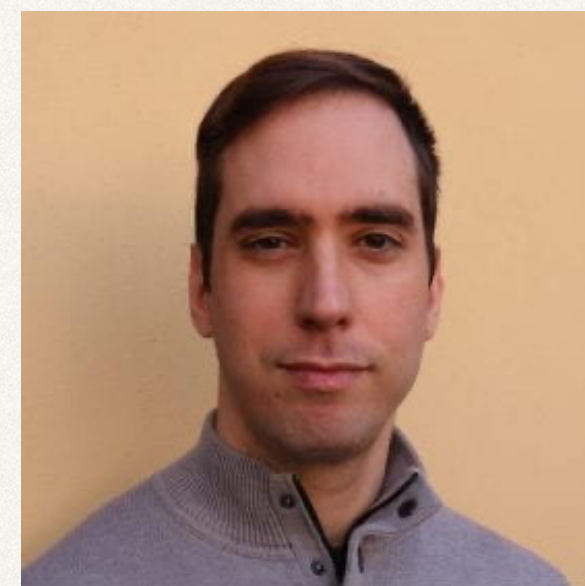
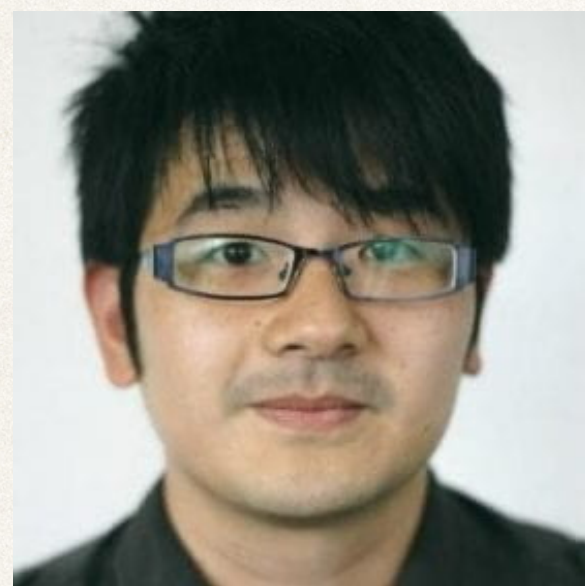
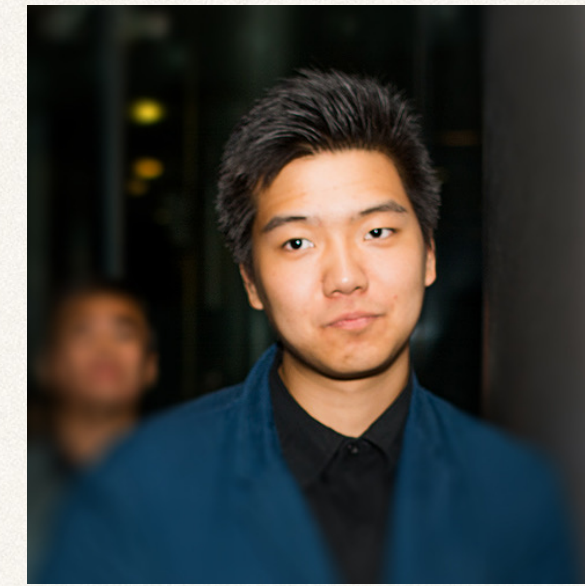


*How can we reimagine software  
engineering tools and practices to  
center DEI?*

# Thanks to my collaborators

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## Human Aspects of Software Engineering Lab



<https://hasel.auckland.ac.nz>

# Let's discuss

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❖ A call to center  
diversity, equity,  
and inclusion for  
more sustainable  
software

Dr Kelly Blincoe

Human Aspects of Software Engineering Lab

University of Auckland, New Zealand

<https://hasel.auckland.ac.nz>

<https://kblincoe.github.io>

[k.blincoe@auckland.ac.nz](mailto:k.blincoe@auckland.ac.nz)



@KellyBlincoe