Challenges and Opportunities of Gender Inclusion Worldwide in Open-Source Software
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Solving problems relevant to Software Industry and Society

Software data for signals

Member of IPN and Informatics Europe’s Equity, Diversity, and Inclusion working group
Gender diversity in Open Source Software

Marginal rise in gender diversity

Eastern Asia and North America leads in gender diversity

How to build inclusive communities?

Insights for research and stakeholders including software industry and government
To make better software and society,

MAKE BETTER SOFTWARE TEAMS
97% of applications and 90% of companies use open-source code.

https://octoverse.github.com/
Background
Gender gap garners attention worldwide

Women earning computing degrees rose since mid-1990s, yet they comprise a quarter of computing professions.

— NCWIT, US

“Women are concentrated at lower career levels and there are fewer women in top positions in IT companies in India.”

NASSCOM, India —

If more women enter the digital job market, it could create an annual EUR 16 billion GDP boost for Europe.

— European Commission

https://ncwit.org/resource/scorecard/
https://www.nasscom.in/knowledge-center/publications/women-and-it-scorecard-india
Gender pay gap ranges from less than 5% to more than 18%

Digital and online engagement can shift across geographic regions in addition to gender

Software Engineering
Gender

No difference in work practices

Contributions from women less likely accepted

Vertical and horizontal segregation
Disparity in code evaluation regionally

White developers have higher chances of code acceptance than non-white developers
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Informatics Europe webinar on Gender Equality

by Ayushi Rastogi, Assistant Professor in Software Engineering
State-of-practice
Gender diversity in Open Source Software

Mined archived software data on GitHub*

21,456 software projects

non-toy projects

infer location and gender

https://github.com/
Gender diversity is low worldwide.
Slight increase in gender diversity in last 5 years

<table>
<thead>
<tr>
<th>Region Level 2</th>
<th>Diversity index: 2014</th>
<th>Diversity index: 2019</th>
<th>diff</th>
<th>#users 2014</th>
<th>#users 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Africa</td>
<td>0.00</td>
<td>0.11</td>
<td>0.11</td>
<td>9</td>
<td>91</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>0.00</td>
<td>0.07</td>
<td>0.07</td>
<td>55</td>
<td>273</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western Europe</td>
<td>0.05</td>
<td>0.08</td>
<td>0.03</td>
<td>2963</td>
<td>10637</td>
</tr>
<tr>
<td>Australia and New Zealand</td>
<td>0.08</td>
<td>0.10</td>
<td>0.02</td>
<td>573</td>
<td>1870</td>
</tr>
</tbody>
</table>
Percentage of women entering GitHub remains the same.
Gender diversity != Geographic diversity

<table>
<thead>
<tr>
<th>Region and Gender diversity</th>
<th>Correlation</th>
<th>Statistical Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1 (e.g., Africa)</td>
<td>-0.06</td>
<td>0.00*</td>
</tr>
<tr>
<td>Level 2 (e.g., sub-Saharan Africa)</td>
<td>-0.10</td>
<td>0.00*</td>
</tr>
<tr>
<td>Level 3 (e.g., Eastern Africa)</td>
<td>-0.10</td>
<td>0.00*</td>
</tr>
<tr>
<td>Location (e.g., Ethiopia)</td>
<td>-0.11</td>
<td>0.00*</td>
</tr>
</tbody>
</table>
Gathering perspectives
Challenges and opportunities

Understand local achievements
Identify unique problems

Reasons to join, participate, and leave project

Role of peer parity

Challenges and opportunities
Survey instrument

Stratified sampling balancing gender and geographic region
– 50 per gender per region

Responses linked to specific projects

118 survey responses

contacted 1500 developers (8% response rate)
1 response from woman for 4 responses from men
Women developers emphasize social aspects

Select a project with friends and colleagues than men

Women – 64% important; Men 25% important

Shared identity?

Women – 37% important; Men 1% important

Important for Americas (17%), Europe (11%), and Asia (4%)
Not important for Africa (0%)
Money as incentive

Gender matters

Women – 64% important; Men 35% important

Location matters

bigger motivation for Africa

Few developers from the region are being paid
Less common outside Europe and Americas
How to build inclusive communities?
Build friendlier communities

“Promoting use of and enforcement of code of conduct”

Organization; policy makers

**Enforce and incentivize Code of Conduct** – currently used by less than 10% of projects

**Social metrics for community self-evaluation** - to assess quality and limit misuse of code of conduct (like Glassdoor)
Highlight role models

“More women reviewers. More women acting directly on the governance of large open source projects.”

Organization; policy makers

Proximity based mentorship – opportunity for cultural adaptations

Highlight role models from underrepresented- e.g., GitHub Explore and talks
Research with social considerations

**Automated project recommender**... which developer a user follows
**Addition:** number of current contributors known from a gender and region

**Automated documentation improvements**... barrier to entry
**Addition:** automated documentation localization

**Automated developer assignment**... focus on speed over diversity
**Addition:** distribute challenging tasks
Call for research

Quantify and set baseline... help assess change over time

Create awareness... take concrete observations to alleviate diversity issues

In-depth regional explorations... focus on region specific achievements and issues
Summary
State of practice

Low gender diversity across regions worldwide

Since 2014, small improvement in gender diversity amongst contributors in North America and South-Eastern Asia
How to build inclusive communities?

Develop friendlier communities – community, organization

Highlight role models - organization

Promote diversity with software engineering tools - research
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