GENDER DIVERSITY IN COMPUTING

Joanne Atlee
David R. Cheriton School of Computer Science

International Women's Day, 6 March 2015
<table>
<thead>
<tr>
<th>Company</th>
<th>Women %</th>
<th>Women %</th>
<th>Women %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google</td>
<td>10</td>
<td>17</td>
<td>14.88%</td>
</tr>
<tr>
<td>Apple</td>
<td>20</td>
<td>18</td>
<td>11%</td>
</tr>
<tr>
<td>Facebook</td>
<td>15</td>
<td>17</td>
<td>11%</td>
</tr>
<tr>
<td>Twitter</td>
<td>10</td>
<td>17</td>
<td>11%</td>
</tr>
<tr>
<td>Microsoft</td>
<td>17</td>
<td>17</td>
<td>11%</td>
</tr>
<tr>
<td>Yahoo</td>
<td>15</td>
<td>7</td>
<td>7%</td>
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<tr>
<td>LinkedIn</td>
<td>17</td>
<td>1%</td>
<td>1%</td>
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<tr>
<td>Pandora</td>
<td>18</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Pinterest</td>
<td>21</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>HP</td>
<td>18</td>
<td>12</td>
<td>7%</td>
</tr>
<tr>
<td>Pinterest</td>
<td>17</td>
<td>17</td>
<td>11%</td>
</tr>
<tr>
<td>New Relic</td>
<td>20</td>
<td>13</td>
<td>11%</td>
</tr>
<tr>
<td>GitHub</td>
<td>6</td>
<td>18</td>
<td>11%</td>
</tr>
<tr>
<td>Yelp</td>
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<tr>
<td>Dropbox</td>
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<td>7</td>
<td>7%</td>
</tr>
<tr>
<td>Qualcomm</td>
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<td>13</td>
<td>11%</td>
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<tr>
<td>Mozilla</td>
<td>9</td>
<td>13</td>
<td>11%</td>
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<tr>
<td>ThoughtWorks</td>
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<td>13</td>
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<tr>
<td>Tapad</td>
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<td>Perforce</td>
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<td>Venmo</td>
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<td>22</td>
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<tr>
<td>Rent the Runway</td>
<td>22</td>
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<tr>
<td>Manilla, LLC</td>
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<td>Inkling</td>
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<td>Quora</td>
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<td>17</td>
<td>11%</td>
</tr>
<tr>
<td>Simply Measured</td>
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<td>11%</td>
</tr>
<tr>
<td>TheLadders</td>
<td>17</td>
<td>17</td>
<td>11%</td>
</tr>
<tr>
<td>uSwitch, London</td>
<td>3</td>
<td>26</td>
<td>11%</td>
</tr>
<tr>
<td>Khan Academy</td>
<td>26</td>
<td>10</td>
<td>11%</td>
</tr>
<tr>
<td>Outpace Systems</td>
<td>10</td>
<td>15</td>
<td>11%</td>
</tr>
<tr>
<td>HootSuite</td>
<td>15</td>
<td>10</td>
<td>11%</td>
</tr>
<tr>
<td>Redfin</td>
<td>23</td>
<td>2</td>
<td>11%</td>
</tr>
<tr>
<td>Edmodo</td>
<td>2</td>
<td>11</td>
<td>11%</td>
</tr>
<tr>
<td>thoughtbot</td>
<td>11</td>
<td>11</td>
<td>11%</td>
</tr>
</tbody>
</table>
WHY SO FEW WOMEN?

Men are innately better programmers than women are.

Women are much less interested than men in computing.

Grade School (Math)
- 50% Men
- 50% Women

University (Technical)
- 59% Men
- 41% Women

University (Computing)
- 82% Men
- 18% Women

Workplace (Computing)
- 85% Men
- 15% Women

International Women's Day, 6 March 2015
Field of programming was initially dominated by women. Women were called “computers” because they caused the machines to compute various functions.
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WOMEN IN UNIVERSITY CS PROGRAMS


International Women’s Day, 6 March 2015
DECLINE OF WOMEN IN CS

International Women's Day, 6 March 2015
Nowadays, social media, rather than computer games, is the gateway to heavy usage of computers.
WOMEN CATCH UP

• Start university with less programming experience
• Report nearly equal mastery of programming concepts after intro courses
• Have equal CS GPAs on graduation

International Women’s Day, 6 March 2015
Women leave the field at twice the rate that men leave.

<table>
<thead>
<tr>
<th>Field</th>
<th>Quit Rate</th>
<th>Women who quit</th>
<th>Women who stayed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science</td>
<td>47%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineering</td>
<td>39%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology</td>
<td>56%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Each figure represents 10% of the total.

Used by NCWIT with permission from "The Athena Factor: Reversing the Brain Drain in Science, Engineering, and Technology" by Sylvia Ann Hewlett, et al. © 2008 by Harvard Business Publishing; all rights reserved.
WHY WOMEN LEAVE

Working Conditions
too many hours, too much travel, be available 24/7

Hostile Culture
feeling isolated, unwanted attention, excluded from “old boy’s network”

Compensation
no advancement, low salary, career stalled

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SYSTEMIC DISCRIMINATION

• Hiring and promotion
  » male and female managers are more likely to hire a man for a technical position
    • Yurkiewicz, “Study shows gender bias in science is real,” Scientific American, 2012
SYSTEMIC DISCRIMINATION

• Salary
  » gender gap in salary for technical positions (e.g., software architect, software engineer)

SYSTEMIC DISCRIMINATION

• Performance evaluation
  » male and female managers are more likely to evaluate male employees more favourably, constructively

SYSTEMIC DISCRIMINATION

• Fewer opportunities for advancement
  » technical men are 2.7 times more likely to hold high-level positions than technical women

• Implicit Bias
  » unintentional, deep-seated bias
“BROGRAMMER” BEHAVIOUR

• public sexual jokes and innuendo
• networking socials in strip clubs
• “booth babes” at trade shows
• boorish come-ons, sexual harassment
• online bullying and threats against women who speak out against sexism and misogyny
WHY IS DIVERSITY IMPORTANT?

**Ethically** – creative, interesting, and lucrative tech careers should be open to women and minorities

**Economically** – companies with greater racial and gender diversity have greater

**Innovation** – diversity adds multiple perspectives to problem solving and product design; improves innovation

- Sales revenue, Number of customers, Relative profitability, Relative market share, Return on invested capital


International Women’s Day, 6 March 2015
# DIVERSITY ENHANCES PERFORMANCE

<table>
<thead>
<tr>
<th>Strongest Correlation</th>
<th>Moderate Correlation</th>
<th>No Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average social intelligence of group members</td>
<td>Average intelligence of group members</td>
<td>Group cohesion</td>
</tr>
<tr>
<td>Equal distribution of how often each member speaks</td>
<td>Maximum intelligence of group members</td>
<td>Motivation</td>
</tr>
<tr>
<td>Proportion of females in the group</td>
<td></td>
<td>Satisfaction</td>
</tr>
</tbody>
</table>

- Hong and Page, “Groups of Diverse Problem Solvers can Outperform Groups of High-ability Problem Solvers”, National Academies of Science, 2004
CRITICAL MASS (15%-35%)

Skewed group (15% vs 85%)
- dominants control the group and its culture
- members of underrepresented type treated as “tokens”

Tilted group (35% vs 65%)
- dominants are simply a “majority”
- minority members can influence group’s culture
- minority members are individuals rather than tokens

Balanced group (40% vs 60%)
- “majority” and “minority” are simply potential “subgroups”
- issues centre around other structural and personal factors
  - Kanter, Men and Women of the Corporation, Basic Books, 1977

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WHAT YOU CAN DO TO HELP

• Speak out against sexist behaviour that you witness
• Draw attention to your company’s demographics
• Advocate for a Code of Conduct at work, at conferences
• Request (management) training on diversity, sexism, racism, and explicit and implicit bias
  https://www.youtube.com/watch?v=nLjFTHTgEVU
• Create teams that have a critical mass of females
• Promote good work that is done by women

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HOPEFUL FOR THE FUTURE

Positive trends in
• girls’ participation in computing activities, camps
• percentage of females in university computing courses, programs
• corporate goals in hiring, retaining, and promoting women in tech

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