Where are we going with 4th industrial revolution?

Miyoko O. Watanabe

Japan Science and Technology Agency (JST)

Dec. 7, 2017, Gender Summit 12
"Creating a Better Future with S&T for the Latin American and Caribbean region:
Reviewing Needs and Opportunities through a Gender Perspective to Maximize Impacts"

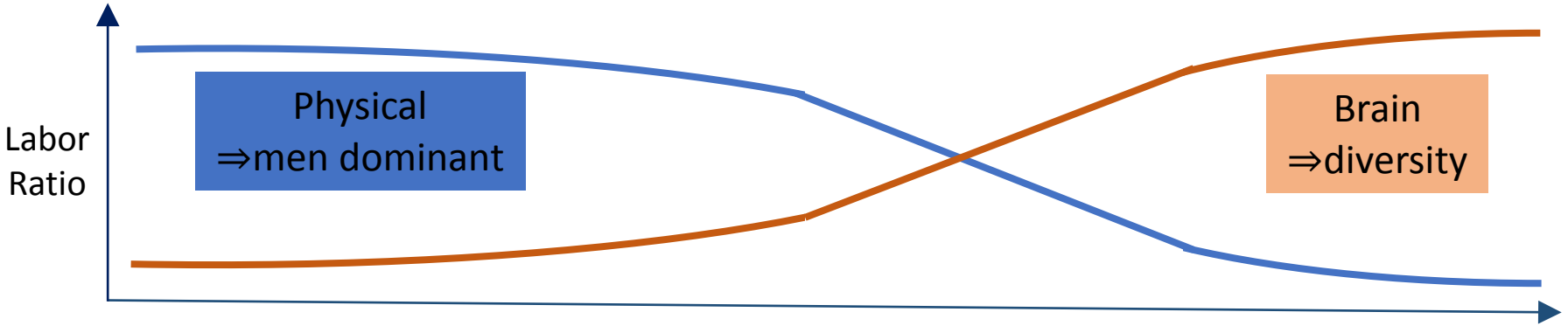
Society Changing

-from Society 1 to 5.0-

		1st & 2nd Revolution	3rd Revolution	**4th Revolution**
Society 1 Hunting	Society 2 Agriculture	Society 3 Industry	Society 4 Information	Society 5.0 Super-smart

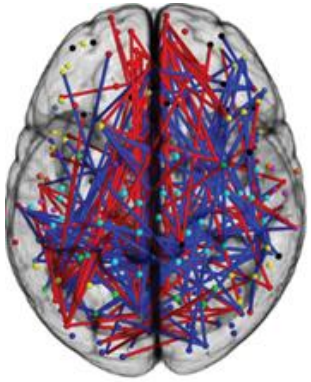




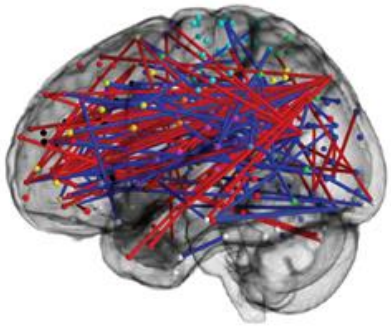


Gender Difference in Brain Connectivity, Cognition and Perception

Possible Biological Gender Differences in the Brain



Males>Females



Females>Males

✓Greater neuronal connectivity **within** hemisphere (intrahemispheric connectivity) has been observed **in males**,
✓and greater **between** hemispheres (interhemispheric connectivity) **in females**. **Number of nodes** connected to other nodes was larger **for women.**

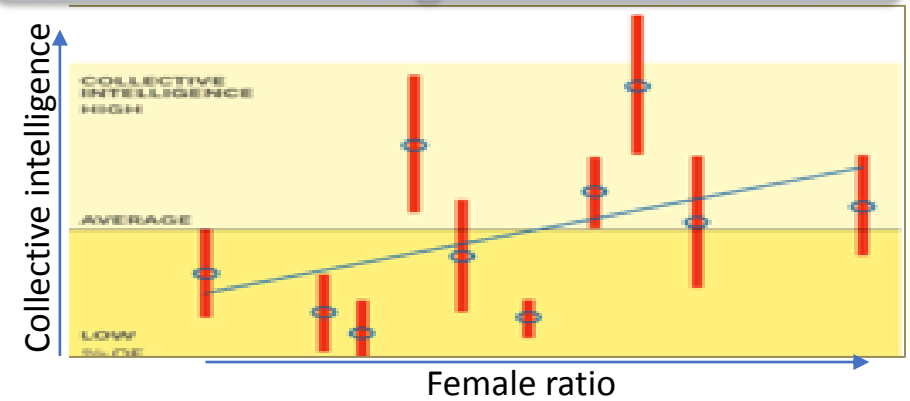
Satterthwaite, Theodore D., et al. "Linked sex differences in cognition and functional connectivity in youth." Cerebral cortex (2014): bhu036.

Gender differences in what to do when an experiment fails

	Replicate	Analyze	New method	Abandon	Continue
Women	15%	40%	26%	19%	0%
Men	0%	27%	50%	14%	9%

Kevin Dunbar, "How women and men scientists solve problems and interact when conducting experiments"
http://www.gender-summit.com/images/GS3NA_ppts/Dunbar.pdf

Gender balance affects collective intelligence of the team

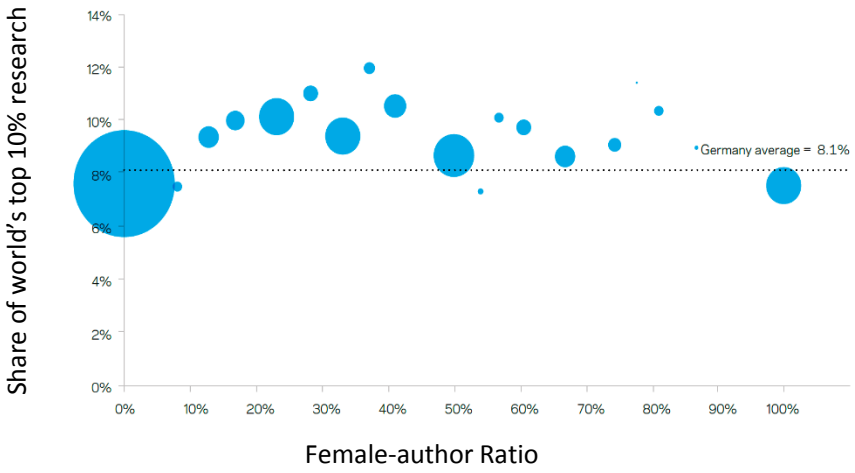


Anita Williams Woolley et al., "Evidence from a Collective Intelligence Factor in the Performance Human Groups", http://www.gender-summit.com/images/Docs/B3_Bear_Web.pdf

Value of Mixed-Gender Teams

Interdisciplinary Research（German）

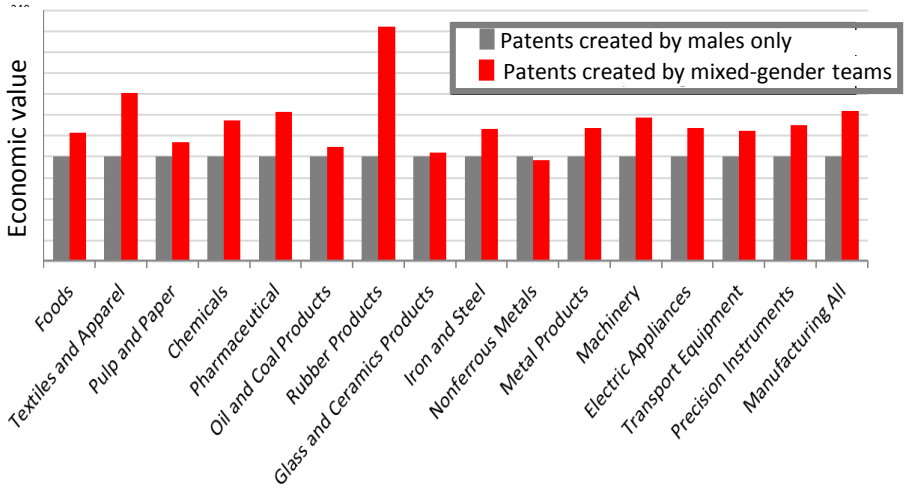
Relation between interdisciplinary research and female-author ratio



From Elsevier "Gender Map 2015"

Patents（Japan）

Value of mixed-gender teams／Value of male teams
＝１．２



Y. Mochi, "Greater Female Presence Means Better Corporate Performance How Patents Reveal the Contribution of Diversity to Economic Value"

Innovation created by dream and needs of blind researcher

by Dr. Chieko Asakawa, IBM Fellow, IBM Japan (GS10 Keynote Speaker)

Dr. Asakawa

- ✓ changed her disability to her ability whose criterion depends on viewpoint of each person
- ✓ hopes to be independent in daily life
- ✓ developed a Netscape browser plug-in and the IBM Home Page Reader, the most widely used web-to-speech system available
- ✓ contributed to innovation not only for blind people but also for everybody

SP says "You will arrive soon"

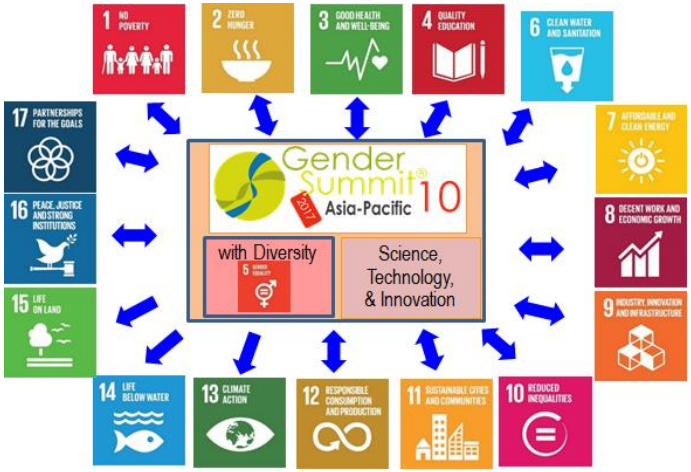
https://www.youtube.com/watch?v=f-mQIWnO3Ag

Tokyo Recommendation -BRIDGE-

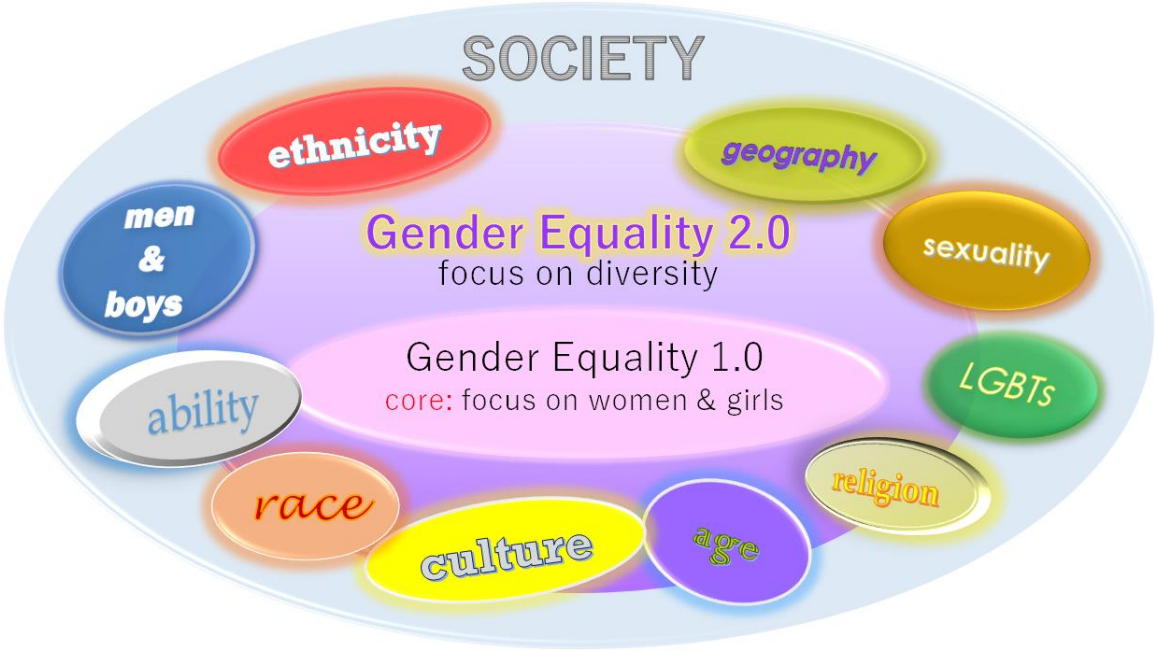
Better **R**esearch and **I**nnovation through **D**iversity and **G**ender **E**quality at Gender Summit 10 in Tokyo

<u>3 types of “Bridge”</u>

1. Bridge Gender and STI
2. Bridge SDGs
3. Bridge all People

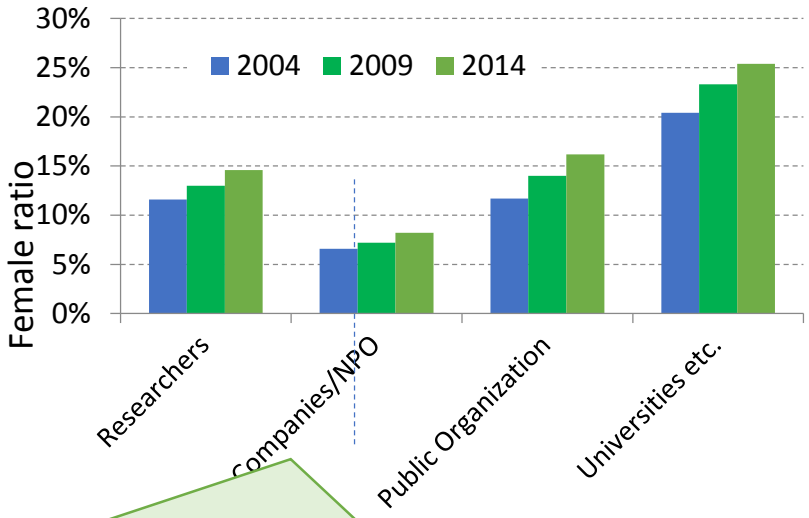


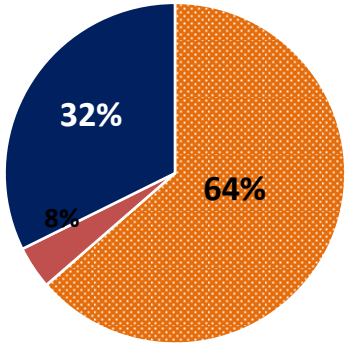
Gender Equality 2.0 based on Gender Equality 1.0



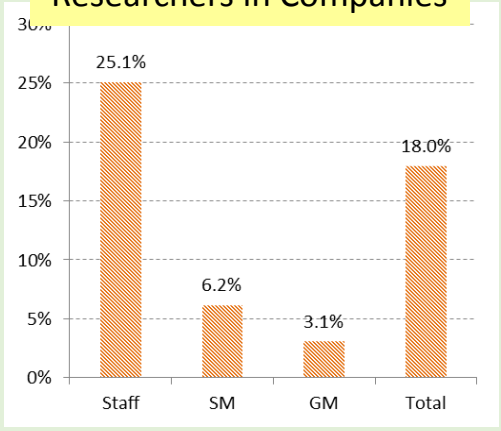
Female ratio of Researchers in Japan

Female ratio is especially small in engineers in companies

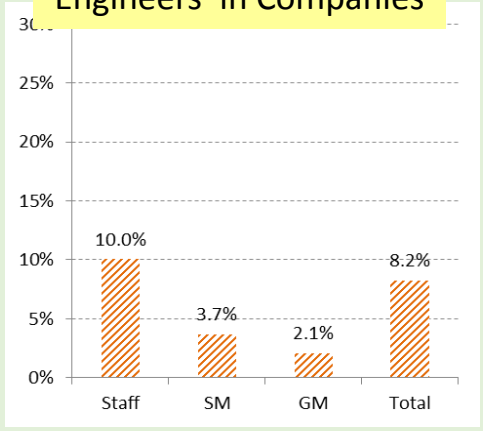




Researchers in Companies



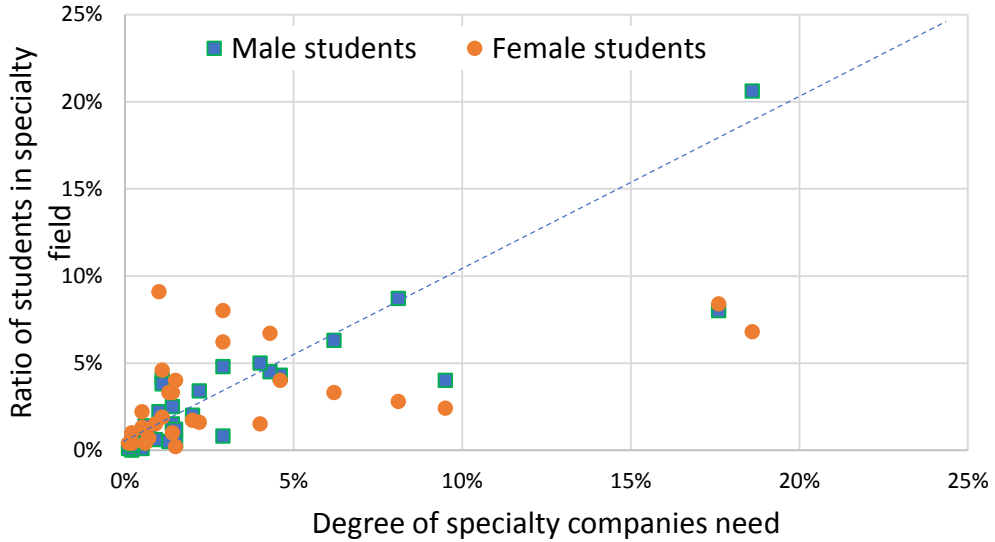
Engineers in Companies



Oct. 2014

Gap between Industry Needs & Female Student Specialty

Companies need engineering & computer science students, but female students like biology



Company needs>>Female students ratio

Specialty fields	Company needs (A)	Male specialty (B)	Female specialty (C)	Gap for male (A-B)	Gap for female (A-C)
Machine engineering	18.6%	20.6%	6.8%	-2.0%	11.8%
IT soft/hardware	17.6%	8.0%	8.4%	9.6%	9.2%
Itnetwork.DB	9.5%	4.0%	2.4%	5.5%	7.1%
Electrical/Electronic	8.1%	8.7%	2.8%	-0.6%	5.3%
Civil engineering	6.2%	6.3%	3.3%	-0.1%	2.9%

Company needs<<Female students ratio

Specialty fields	Company needs (A)	Male specialty (B)	Female specialty (C)	Gap for male (A-B)	Gap for female (A-C)
Molecular biology	1.0%	2.2%	9.1%	-1.2%	-8.1%
Chemistry	2.9%	4.8%	8.0%	-1.9%	-5.1%
IT interface	1.1%	3.8%	4.6%	-2.7%	-3.5%
Designe	2.9%	0.8%	6.2%	2.1%	-3.3%
Food/microbe	1.5%	1.2%	4.0%	0.3%	-2.5%

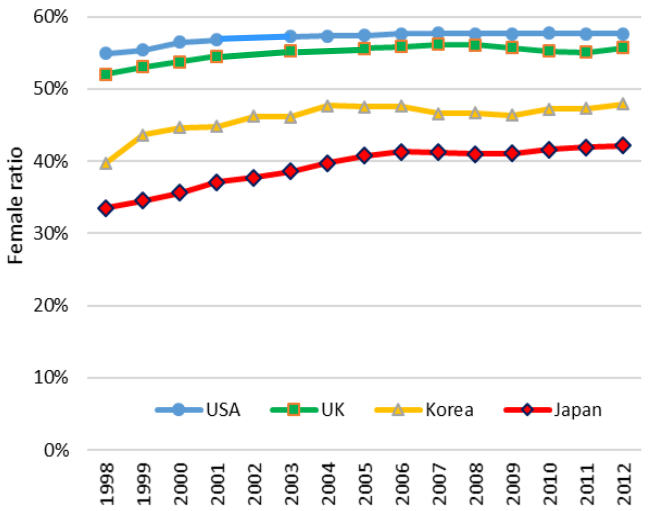
Engineering & Computer Sci.

METI, “Industrial Technology Research Project "Quantitative and Quantitative Supply and Demand Mismatch Study of Human Resources of Industry and Educational Institution”(2014)

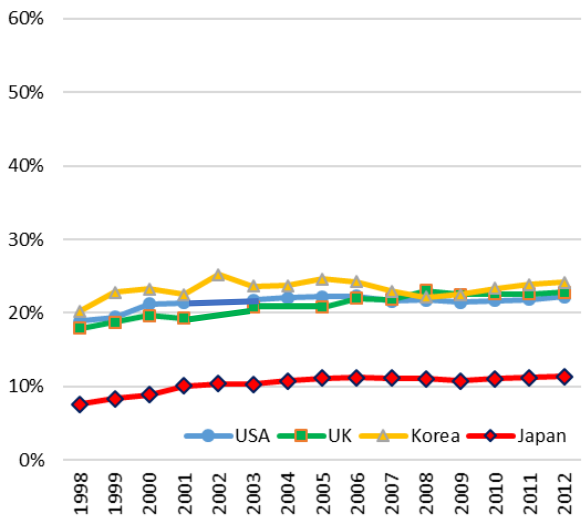
Female Ratio of University Students

Female students are still minority at engineering.
Why female ratio is decreasing at computer science???

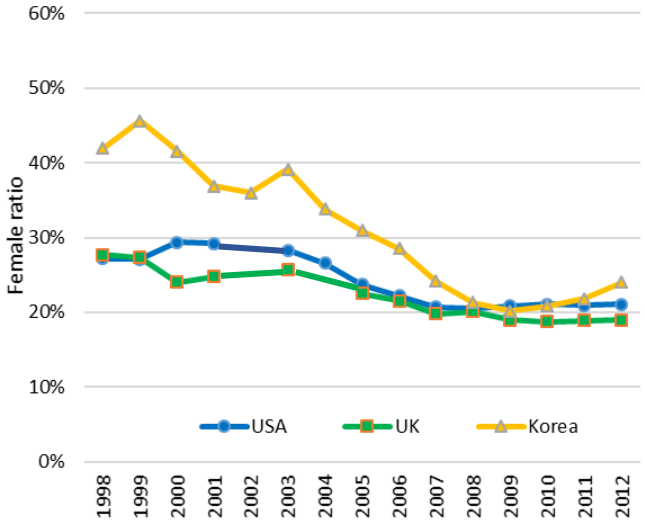
Total overall fields



Engineering



Computer science



Data from OECD Statistics
https://stats.oecd.org/Index.aspx?DataSetCode=RGRADSTY#

Male-dominant 4th Industrial Revolution
⇒ Everybody-concerned 4th Industrial Revolution

4th Industrial Revolution so far

- Being independent of Gender Equality
  Less contribution of women and girls
- Extension of the past revolution
  without human revolution

Improvement

- More diversity
  All kinds of gender, GE2.0
  More contribution from each region
- Promotion of GE in Industry