

Gendered Innovations

Designing Better Research

What happens when you bring together sixty scientists, engineers, medical researchers, and gender experts in a series of international, collaborative workshops? You get something radically new. That's the goal of Gendered Innovations – a large collaborative project involving the European Commission, the U.S. National Science Foundation, and Stanford University. How do we harness the creative power of gender analysis to discover new things?



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Thirty years of research has revealed how expensive and wasteful gender bias can be. For example, between 1997 and 2000, ten drugs were withdrawn from the U.S. market because of life-threatening health effects. Eight of these posed greater health risks for women than for men. Not only did these drugs cost billions of dollars to develop – but when they failed, they caused human suffering and death. We can't afford to get it wrong. How can researchers avoid such mistakes and design excellent research from the start? Gendered Innovations provide scientists and engineers with a place to start. The peer-reviewed website (<http://gendered-innovations.stanford.edu/>) offers practical methods for sex and gender analysis. Analyzing gender can stimulate new knowledge and technologies. Gender analysis acts as an additional "control" (or filter for bias) to ensure excellence in science, health & medicine, and engineering research, policy, and practice. The methods of sex and gender analysis are one set of methods among many that researchers bring to a project. Take stem cell research, for example. The sex of a cell matters. A researcher told me that he had done some experimental bone marrow transplants in rodents, and all of his male animals inexplicably died. He had not considered the potential interactions between the sex of the donor cells, and the sex of the recipients. Therapeutic use of stem cells holds great promise, and we need to get it right. Important will be a few basic research steps, such as utilizing cells of both sexes in sufficient quantities to detect or rule out sex differences (not all sex

differences will be significant). Simply reporting the sex of cells in experiments allows for systematic review and meta-analysis. Taking sex into account can advance basic knowledge regarding stem cells – and we need to get it right.

Or take osteoporosis, the weakening of bones with age that becomes significant as the population ages. Osteoporosis has long been defined as a disease of postmenopausal women. Why is this a problem? Men account for a third of osteoporotic hip fractures after the age of 75 – and when men break their hips, they die more often than women. We don't know why. The gendered innovation in this case has been developing good diagnostics and treatments in men – across cultures. The following three examples in technology and design present some of the "ah-ah" moments from our Gendered Innovations workshops.

Public Transportation: The Mobility of Care

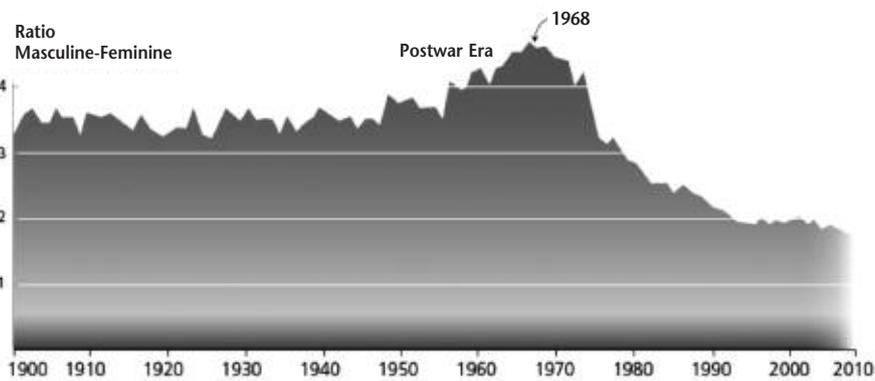
Governments and civil engineers collect data to understand how people use trains, subway, and bus systems. Their goal is to create systems that best serves the public's needs.

Here a gendered innovation is to reconceptualize how data are collected and analyzed. Traditionally, civil engineers collect information about public transportation trips in eight categories that include employment, education, shopping, leisure, and the like. None of these categories capture travel for caring work; i. e., caring for children, the elderly, and households. Women and men who simply travel to work tend to travel directly from home to work and back again. Those who work and are also care givers have different travel patterns: They tend to travel from home to the daycare and on to work. Leaving work they may hit the grocery store, the dry cleaners, daycare, and then head home. These so-called "chained trips" become important.

The gendered innovation in this example is conceptualizing "caring work" as a category in data collection. When doing so, it becomes the 2nd largest category of trans-

Ratio of Masculine to Feminine Pronouns in U.S. Books, 1900-2008

Changes parallel increases in women's labor force participation, education, age at first marriage, etc.



Data from American English corpus of the Google Books database (~1.2 million books).
Reproduced from Twenge et al., 2012.

portation trips. Considering the mobility of care creates public transportation that better serves both men and women involved in caring work and produces a more efficient transportation system, potentially reducing costs and enhancing quality of life.

Considering Gender Leads to Better Machine Translation

In March 2011, I was interviewed by a Spanish newspaper and, when I returned home, put the story through Google translate. I was shocked that I was referred to repeatedly as "he". It turns out that Google Translate and its European equivalent, Systran, have a "male default." Google is a great company. How could such a cool company make such a fundamental error? Google Translate defaults to the masculine pronoun because "he said" is more commonly found on the web than "she said." We know from NGram (another Google product) that the ratio of "he said" to "she said" has fallen from a ratio of over 4:1 in the 1960s to 2:1 since 2000. This parallels exactly the women's movement and massive governmental funding to increase the numbers of women in science. In one fell swoop, Google wiped out forty years of revolution in language and government funding to support women. And they did not mean to. This is unconscious gender bias.

The fix? Last July as part of our Gendered Innovations project we held a workshop

where we invited top natural language processing researchers from Google and Stanford. They listened for about twenty minutes – they got it. And they said, "we can fix that!" It turns out that fixing this simply annoying problem will lead to innovations in translation overall. Once they got it, we got an innovation.

Water Infrastructure in Sub-Saharan Africa

Nearly one billion people worldwide lack reliable access to water. In sub-Saharan Africa, women and girls spend some 40 billion hours annually carrying water. Because water procurement is women's work, many women have detailed knowledge of soils and the water they yield – knowledge that is vital to civil engineering and development projects, for instance, in determining where to place wells and water taps. Such community participation vastly improves water services. Easy access to improved water supplies can immediately increase school attendance for both girls and boys – helping to break the cycle of poverty. It's a win-win situation. There are many Gendered Innovations we could discuss. Through the Gendered Innovations project we have developed twenty-four specific examples treating different sub-fields of science and engineering from the design of video games to assistive technologies for the elderly, the genetics of sex determination, and climate change – just to name a few.

Next Steps

Next steps involve researchers, policy makers, institutional leadership, and industry. Important next steps include:

- The current generation of researchers can be brought up to speed in gender analysis. Researchers can learn how to exploit the creative power of sex and gender analysis in their research design.
 - Granting agencies can ask applicants to explain how sex and gender analysis is relevant to the objectives and methodologies of their proposed research. The European Commission has made this an important part of Horizon 2020, its next funding framework. Evaluators can be trained to carry out gender reviews of proposals, using a template with a checklist.
 - Hiring and promotion committees can evaluate researchers and educators on their success in implementing gender analysis. Knowledge and use of methods of sex and gender analysis can be one factor taken into consideration in hiring and promotion decisions.
 - Editorial boards of peer-reviewed journals can require sophisticated use of sex and gender methodology when selecting papers for publication. A number of journals do this: Nature, for example, has a limited policy. Journals should also enforce consistent use of keywords such as "sex" and "gender" to facilitate meta-analysis.
 - Companies can incorporate the smartest aspects of gender to open new markets and enable innovation in products, processes, services, or infrastructures. Gender expertise – whether developed internally or brought in by consultants – can help industry bring new ideas to market. Products that meet the needs of complex and diverse user groups enhance global competitiveness and sustainability.
 - Students can be taught sex and gender results and methods. Such information can be integrated into textbooks and curricula, including basic science, medicine, and engineering courses.
- Innovation is what makes the world tick. Gendered Innovations spark creativity by offering new perspectives, posing new questions, and opening new areas to research. Gendered Innovations add value to research and engineering by ensuring excellence and quality in outcomes; add value to society by making research more responsive to social needs; and add value to business by developing ideas, patents, and technology. We can't afford to ignore such opportunities. ■