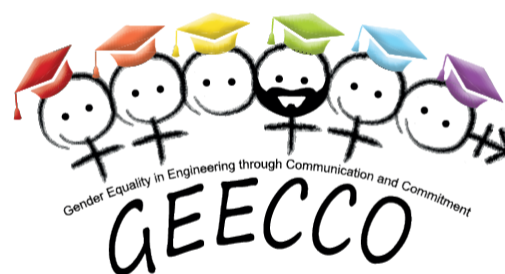


INTEGRATING THE GENDER DIMENSION IN THE CONTENT OF RESEARCH AND INNOVATION



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The consideration of the gender dimension in research and innovation is added value in terms of excellence, creativity and business opportunity. This research principle:

- helps researchers to question gender norms and stereotypes as well as to rethink standards and reference models
- leads to a comprehensive understanding of the needs, behaviour and attitudes of all genders
- increases the social relevance of the knowledge, technologies and innovations
- contributes to the production of goods and services that are better suited to potential markets (from: H2020 Online Manual)

Garage doors that open for deep voices and remain motionless for higher ones; medication that is less effective for women than for men; mobile phone apps that know only heterosexual desires – the list of examples of inadequate innovations goes on and on. The common denominator: the lack of a gender-sensitive research approach.

The consideration of gender-specific dimensions is not trivial. While the biological sex plays a role in some research questions, it is irrelevant in other areas of research.

GENDER IN RESEARCH: A RESEARCH PRINCIPLE

Over the last years, it has become more and more important for researchers to address the gender-specific aspects of the content of their research. The European Commission and many national research promotion bodies require that gender-specific dimensions are included in research where needed.

In most scientific disciplines, research that considers the gender-specific dimension already exists. In this research, gender is:

- part of the research design;
- a category that is systematically controlled during the entire research process;
- but not necessarily the focus of the analysis.

The same applies gender, i.e. socio-cultural factors shaping behaviors and attitudes related to sex. This exhibition explains the fundamental principles of the integration of both “sex” and “gender” in scientific research and innovation, presents case studies and provides important resources.

The German word sex means both: the biological sex and the social gender. In English there are two words: sex and gender.

gender:
“gender” relates to the social . All humans are assigned gender-specific abilities. Moreover, we have gender-specific expectations of people, irrespective of their gender identity. Hence, gender is based on social dynamics, it is changeable and variable within and between cultures and accordingly not restricted to just two options. It defines roles, obligations, constraints, opportunities and privileges.

The distinction between “sex” and “gender” is not absolute. The extent to which gender-specific differences can be traced back to genes, brain structure and hormone levels or whether learning and experience is decisive (or a combination of all known factors) is unclear.

More than two sexes and two genders:

There are more than sexes and two two genders: for example, intersex people have sexual characteristics (chromosomal, anatomical and/or hormonal) that mean they cannot be clearly categorised as male or female. Transgender persons, in turn, were categorised at birth as female or male but identify with another gender (or none). People’s self-experiences have many different variants and cannot be reduced to just two identities – one male and one female.

SEX & GENDER

sex:
The English word “sex” describes the biological categorisation of a person as male, female or intersex, including physical appearance, chromosomes, hormones, reproductive organs and secondary sexual characteristics.

As a rule of thumb, we can say:

- “sex” = biology and individual characteristics. This comes down to the biological differences, for example with regard to primary and secondary sexual characteristics, distribution of body fat, bone density, average height, etc.
- “gender” = social and cultural factors that have an effect on the way people interact with things. For example, social norms code certain occupations as “women’s work”, which has an effect on the number of men working in these professions and on the overall image of the workplace.

Digression: More than two sexes in law

Some countries, such as Australia, Malta, India, Germany and Austria, formally recognise the existence of more than two sexes. In the respective legal systems, it is variously regulated as to who may use this “third option” in their civil status. In Austria and Germany, for example, a medical certificate is required stating that a “variant of the sex development” exists.

Research and innovation in natural sciences and technology often concentrate on two central perspectives:

- Is the product economically successful?
- Is the product ecologically acceptable?

Integrating gender perspectives into research means posing more questions.

It is not about making things better for women; it is about achieving an improvement for everyone. This means that more questions are posed of research, e.g.:

Gender perspectives have added value for:

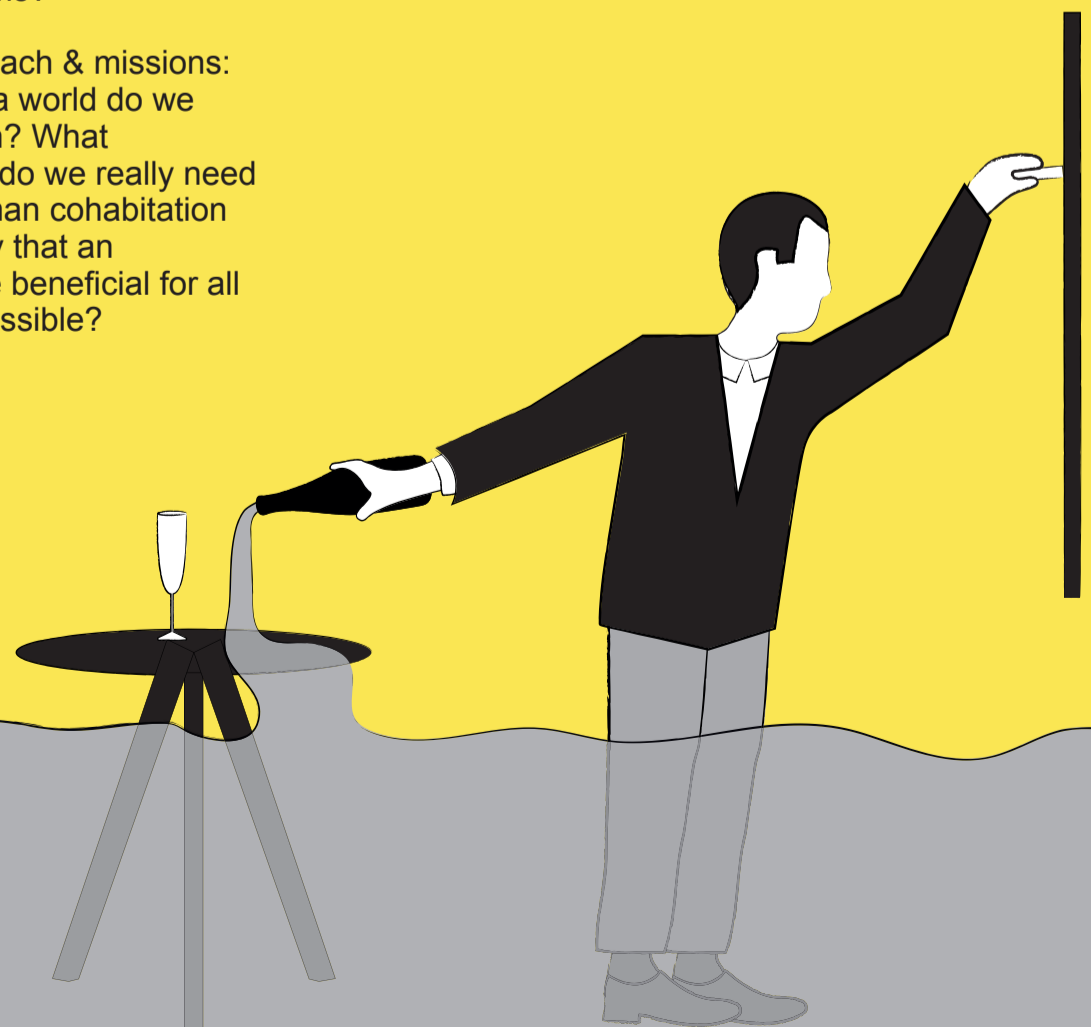
- Research and technology: Ensuring the excellence and quality of the results, increasing sustainability

GENDER IN RESEARCH: EXTENSION OF PERSPECTIVES AND QUESTIONS

It is important to understand that this research does not necessarily focus on the differences between women and men. According to the European Commission, the integration of the gender dimension involves questioning gender norms and stereotypes, rethinking standards and reference models and the examining the needs, attitudes and behaviour of all genders.

- User perspectives: Who will the research benefit? Who is or will still be excluded?
- Problem orientation & challenges: What sort of world do we live in and what are today's urgent problems? What do we need to solve these problems?
- Design approach & missions: What sort of a world do we want to live in? What technologies do we really need to shape human cohabitation in such a way that an ecological life beneficial for all humans is possible?

- Society: stronger orientation of research and technology projects towards the needs of society and the environment
- Economy: Development of new ideas, patents and technologies



1

A GOOD LIFE (FOR ALL) ?

CASE EXAMPLE, ENERGY TRANSITION: INCREASING THE PROPORTION OF RENEWABLE ENERGIES AND ENERGY EFFICIENCY

The global north should reduce its energy consumption. This is one of the UNO goals of the “2030 Agenda for Sustainable Development” (Sustainable Development Goals, SDG 7). The question is, which energy interventions are successful from which perspectives?

The switch from fossil fuels to renewable energies has an impact not only on production but also on infrastructures and consumption patterns. The largest consumers in Europe are transport (33.1%), households (24.5%), industry (25.3%) and service providers (13.6%). Depending on whether research is performed with or without gender perspectives, different questions are posed, whose answers have gender-specific implications.

Unequal weighting 1:

A Swedish study looked at the effects of energy savings programmes on the distribution of household chores. The researchers established that the measures lead to a higher work burden for women, e.g. in connection with doing the laundry. When laundry time is shifted to the evening or night-time, the working day is extended for the person doing the household chores – primarily women. In addition, women were more strongly affected by lower temperatures inside the house than men. Because of the different metabolisms, men’s sensitivity to cold is different and, in comparison to women, they still feel comfortable at 5°C-lower room temperatures.

Unequal weighting 2:

Households with very low incomes:

- *are disproportionately headed by women (single mothers, older singles)*
- *mostly have no sufficient access to energy (no/little heating, etc.). This also leads to greater health risks in extreme weather conditions (heat, cold), affecting infants and older people in particular*
- *are more likely to be located in buildings with poorer structure (less insulation, outdated heating systems, etc.).*

Research and development takes place primarily in the area of the household, even though households are not the largest consumer.

Savings in households can be achieved accordingly through:

Changes in consumption behaviour

“Smart meters” and the associated “smart grid” have been promoted in the last few years - based on the assumption that the introduction of “real time prices” leads to a shift in load, since the consumption of electricity will be more expensive at peak times. Consumers themselves should then shift their consumption of energy from peak consumption times (early in the morning, evenings) to periods of lesser consumption (over midday, night-time).

New technologies

The development of alternative and sustainable technologies for the production of energy is breakneck. However, experts believe that the energy transition cannot be achieved with new technologies alone. Even the development of particularly energy-efficient devices for end-users doesn’t solve the problem. Here, the rebound effect means that the savings potential of an increase in efficiency is not or is only partially fulfilled.

Incentive systems

Incentives mainly aim at the purchase of new technologies which are subsidised or made favourable in terms of taxes. Another type of incentive is the actual decrease in the energy consumption is rewarded (e.g. through a bonus or cheaper tariffs).

WITHOUT A GENDER PERSPECTIVE



Fundamental questions: Why is research on energy savings and behavioural changes undertaken primarily in the “female domain” of the household? Are there gender aspects in the field of industry? The focus of research is very strongly on the individual – what about infrastructures?

Changes in consumption behaviour

Women change their energy behaviour at home more frequently than men and encourage others (mostly family members) to do the same. Studies from various European countries show: more women than men are prepared to change their habits in order to save energy, for example by driving less by car, eating less meat or saving electricity by heating the house less or washing clothes at lower temperatures.

New technologies and gender scripts

Research shows that it is first and foremost men who reduce energy consumption by means of energy efficiency measures such as investing in thermal insulation, boilers and warm-water systems. But it also shows that objects, preferences and interests (e.g. in advertising) are coded in such a way that they are inherently in the male area of responsibility. For women, on the other hand, it is inappropriate, out-of-place or odd to occupy

themselves with such objects (e.g. solar energy systems) or express certain preferences and interests.

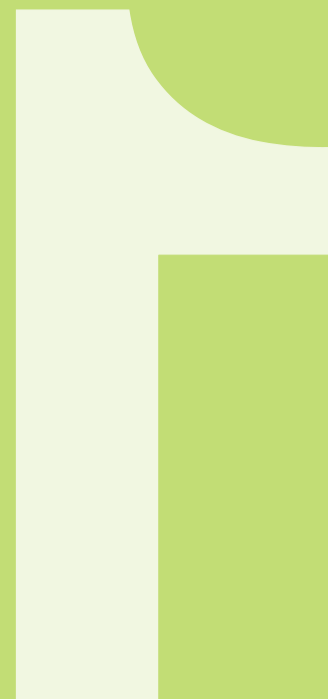
Incentive systems

Measures that lead to higher expenditure are disproportionately high for women because of their lower average incomes. The purchase costs of new technologies are still too high for poorer households, even with subvention. Incentives for the improvement of the building structure are not effective when the apartment is only rented (i.e. often poorer households). Control measures, that reward a reduction in the energy consumption, do not work in poorer households in which no more can be saved.

Changes in consumption behaviour and the adaptation to new technologies are researched for men and women but not for persons with other gender identities.

WITH A GENDER PERSPECTIVE

MEASURES THAT LEAD TO HIGHER EXPENDITURE ARE DISPROPORTIONATELY HIGH FOR WOMEN BECAUSE OF THEIR LOWER AVERAGE INCOMES.



RESEARCH AS ADVENTURE

SHAPING OUR LIVES IN THE TECHNOLOGICAL FUTURE

CASE EXAMPLE, ROBOTICS: DESIGN OF ROBOTS FOR THE HOUSEHOLD AND CARE SECTOR

Robots are machines that can register their environment. They can make decisions based on their calculations and carry out actions in the real world. To a certain extent the behaviour of robots is autonomous, or it at least appears to be autonomous.

The aspired areas of application for robots are diverse: from industrial assembly lines, household, care and medicine to combat robots and sex robots. Robotics are constantly advancing, particularly in the areas of sensor technology and algorithms. Significant progress in individual fields of application can thus be expected.

The development of robots is primarily driven by the market, important questions are discussed only peripherally. These include technical and economic challenges, legal conditions, security, ethics and also gender aspects. The inclusion or omission of a gender perspective can cement gender stereotypes in robotics – or question them.

WITHOUT GENDER PERSPECTIVE

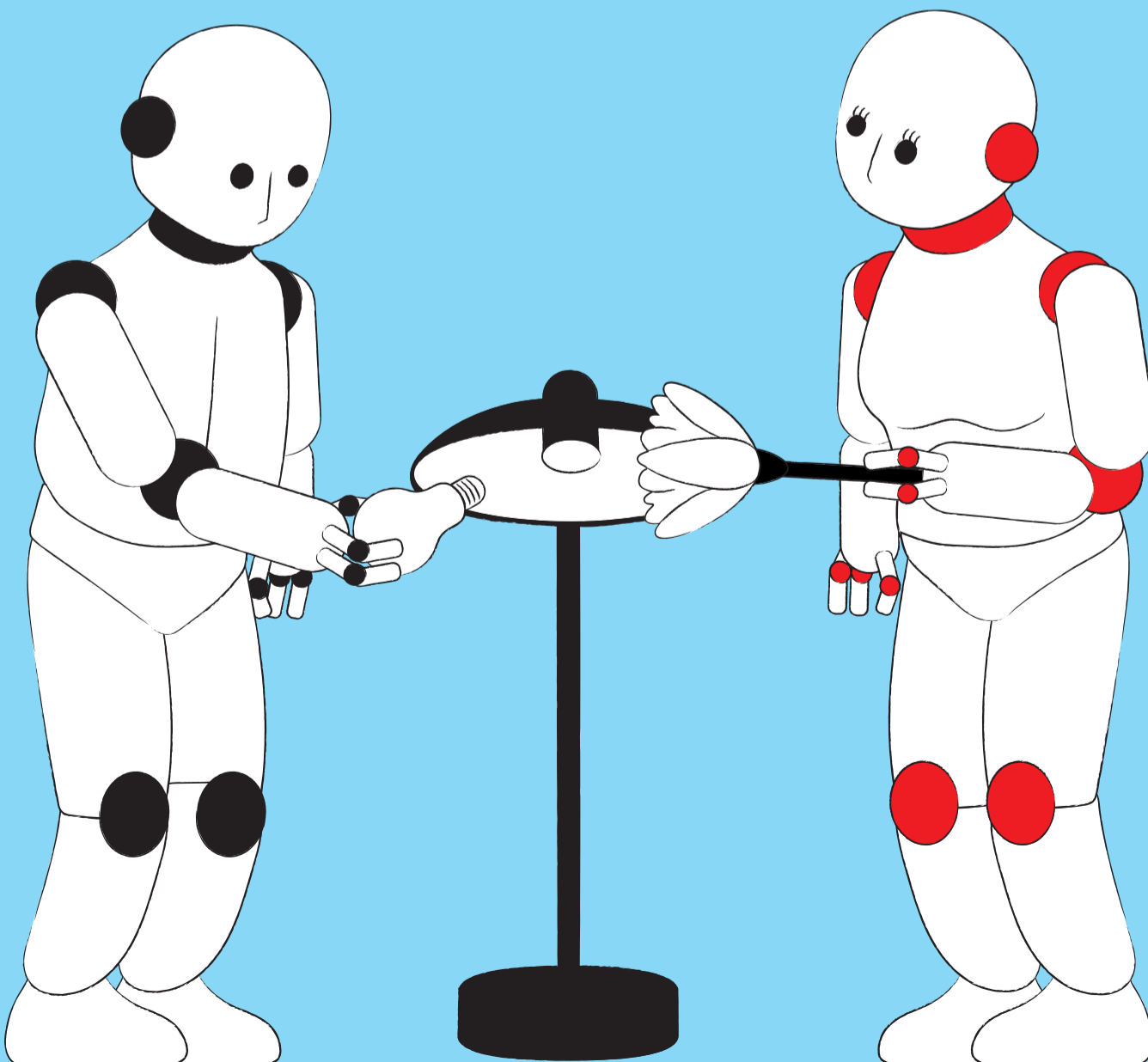
The robots are here

Robots are becoming more and more humanised so that they are more acceptable to humans. This is supposed to facilitate intuitive interaction with robots. Designers consciously build female characteristics into robots, for example, to make people more amenable to them. The opposite is the case when it comes to combat robots, which should seem powerful and are extremely masculinised in their design. The fallback to gender stereotypes is obvious but this sort of robot at the same time cements clichés about men and women.

References to a gender can be anchored in various ways in social robots. Even a single, minimalistic reference to a gender can trigger an interpretation of the gender as well as normative expectations with regard to behaviour. These include colours, voices, names, form and much more.

Many fields of duties in human society are allocated in a gender-specific way. Household tasks or healthcare are considered women-specific areas, for example, in which “female” robots can possibly achieve the best results because they conform to human expectations. Safety or mathematical lessons, in contrast, are seen as rather male fields and users may well prefer “male” robots.

There is the danger that gender stereotypes could be unintentionally strengthened in the design of robots.



ROBOTICS

Production Area

Industry

Health Care

Care

Prostheses

Surgery

Therapy & Rehabilitation

Agriculture

Agriculture & Forestry

Livestock Farming

Military Area

Reconnoitring

Disarming

Combat missions

Civil Area

Police

Search, emergency and rescue services

Environment protection

Scientific support

Commercial Area

Mining & Minerals

Supply & Services

Construction & Demolition

Logistics & Transport

Transporting passengers and goods

Warehousing

Consumer Robots

Domestic appliances

Entertainment

Education

Our lives with robots

Technology has an influence on human culture.

However, robotics researchers and/or their robots can challenge gender stereotypes in such a way as to make the users reconsider gender norms. When robotics researchers better understand how gender is embodied in robots, they can design robots in a way that promotes social equality.

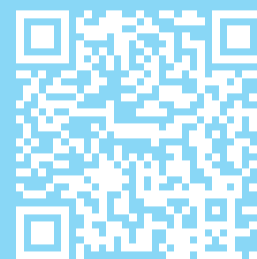
It would be essential for researchers to come up with controlled experiments in order to determine how the perceived robot gender influences the human gender norms. Does the gender of a robot promote or impede gender equality? What happens to our notions of masculinity, femininity and other gender identities? How does the perception of people and the mutual interaction with each other change?

WITH A GENDER PERSPECTIVE



The subservience of Siri, Alexa & Co.

“Obedient, compliant machines that masquerade as women are entering our homes, cars and offices”, says Saniye Gülser Corat, Director for Equality at UNESCO. “Their hardwired subservience influences how people speak with female voices and how women react to questions and express themselves. To change this course, we have to be much more aware of how, when and if AI technologies are gender-specific and who presents them as such.”



Creating alternatives

Concerning the question “Can robots be developed to promote social equality?”, Londa Schiebinger, Professor at Stanford University proposes the following clear-cut options for the design of robots:

- 1. Work against current gender stereotypes*
- 2. Design flexible robots whose specific function can be selected by the user*
- 3. Design “genderless” robots*
- 4. Design gender-specific robots in which the equality of gender is in the foreground*
- 5. Step away from the conventional social relationships between people with your design*
- 6. Design “robot-specific” identities that circumvent social stereotypes*

3

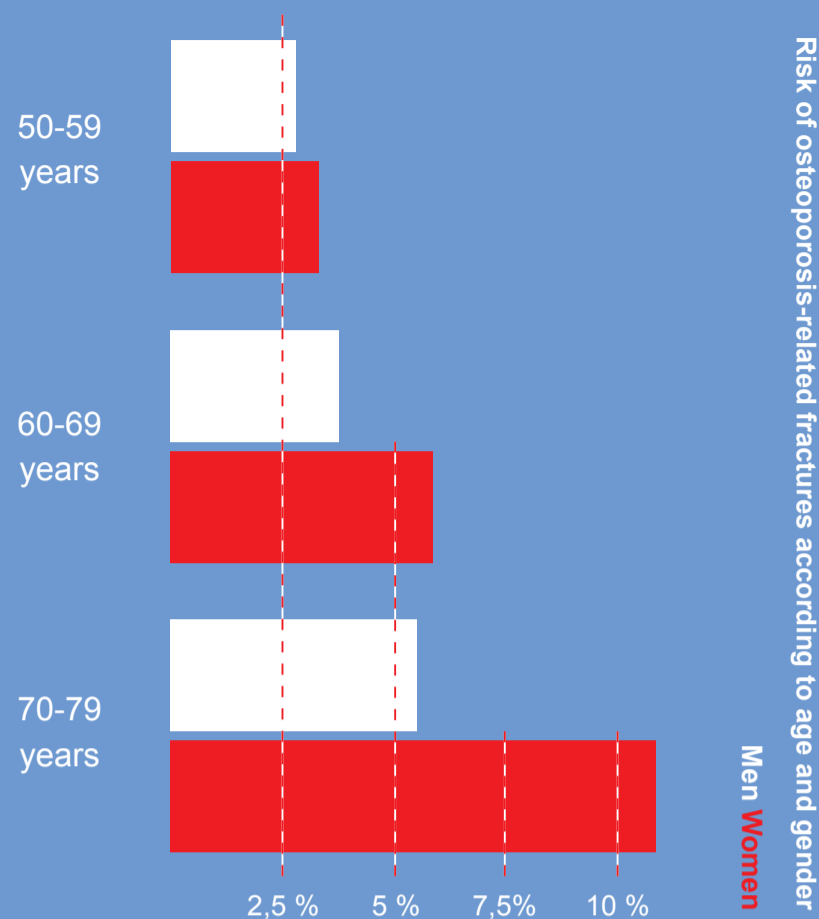
AVOIDING HARMFUL EXCLUSIONS

CASE EXAMPLE, MEDICINE: BONE DENSITY STANDARDS FOR OSTEOPOROSIS

Osteoporosis is an age-associated illness that is encountered all over the world, in which the bone mass decreases and the bone structure deteriorates. It becomes apparent in most cases when the bones break or, less commonly, during a screening. Osteoporosis patients can suffer from increased mortality as a result of bone breakages and experience a considerable loss in quality of life. One of the few ways to diagnose osteoporosis even before bone fractures occur is the measurement of bone density, which allows the risk of fracture to be estimated.

Taking gender seriously as a relevant category in osteoporosis research is decisive for the quality of treatment for all.

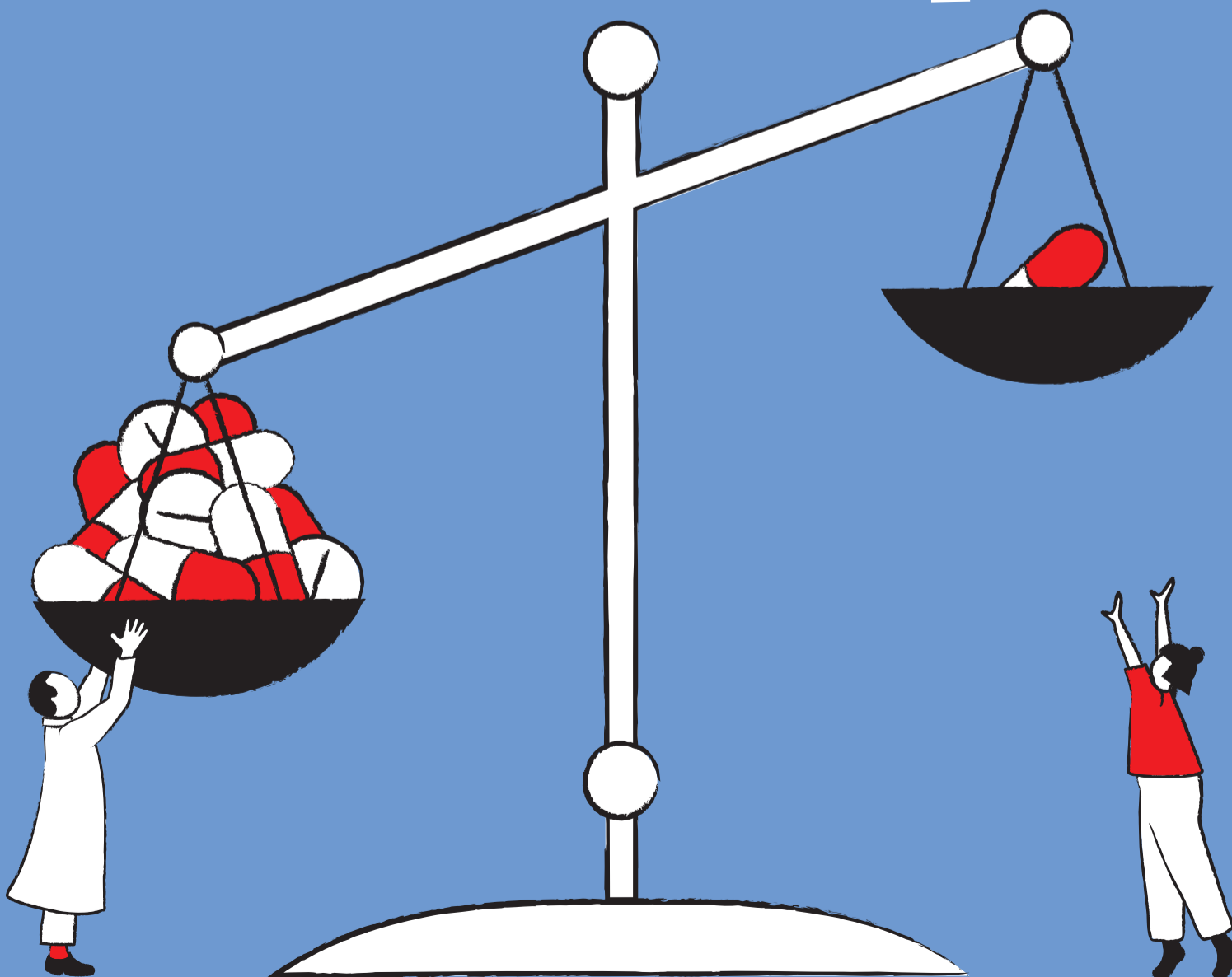
WITHOUT A GENDER PERSPECTIVE



Men ignored

Women are affected three-times as often as men, but men are more frequently affected by the secondary form of osteoporosis, in which bone fractures occur significantly faster and more often. In 2002, the American Center for Disease Control (CDC) established that, due to a lack of data, “there is currently no consensus on the definition of a reduced bone density in groups other than Caucasian women; it is clearly the case, however, that osteoporosis is not a disease that affects only Caucasian women.” In the case of osteoporosis, diagnosis models for women were developed that used the bone mineral density (BMD) of healthy, young, white women; criteria for identifying the risk among men are thus insufficiently available.

Although men make up almost a third of osteoporosis-related hip fractures in Europe and the USA, osteoporosis is seen by doctors primarily as a disease of post-menopausal women; men are seldom examined or treated. Even the majority of American men consider osteoporosis as being a “women’s disease”.





WITH A GENDER PERSPECTIVE

Sex

In the late 1990s, a reference population of young men was used to establish bone density norms for men, too. This led to a significant change in the rates of diagnosis. Using a female reference population, the prevalence of osteoporosis in men had been estimated to be 1%-4%; with a male reference population, it was shown to be around 3%-6%, however. More detailed statistical analysis also showed differences in the progression of the disease.

Building on this new data on bone density, the strategies for preventing osteoporosis in men (e.g. healthy eating, physical activity, no tobacco consumption) are currently being examined.

Transsexual and intersex persons can also have an increased risk of osteoporosis depending on the hormonal status; research work is needed here to provide evidence.

In addition, it has been shown that BMD alone is not a good predictor of bone fracture. New methods of diagnosis can predict the fracture risk of patients with more accuracy than BMD alone by analysing factors (e.g. consumption of alcohol and tobacco) that overlap with sex and gender.

Gender

Osteoporosis is a complex disease that occurs as a reaction to specific living conditions in the course of the life cycle. Gender roles influence the development of the bone density: in Europe and the USA, young girls are less physically active than boys. Together with biological factors, these gender-specific behaviour patterns mean that girls build up less bone in the teenage years than boys. Moreover, occupational distribution of work leads to men carrying out heavy physical work more often than women, for example in the construction industry. And older women are generally less physically active as older men. Inactivity can lead to bone atrophy and increase the risk of fracture.

Women ignored

For a long time, medicine was too heavily orientated towards one gender: medication was and is tested on men; guidelines are written by men. For women, this can be dangerous, as can be seen from the example of heart attacks. The classic symptom of a heart attack is an intense pain in the heart area that radiates out over the left shoulder and down the left arm. For 20 percent of women, the symptoms of a heart attack are completely different, however: they suffer shortness of breath and the stabbing pains don't radiate into the left shoulder but rather up into the jaw and neck. Women report considerably less pain in the chest but may experience nausea instead. A heart attack without the typical pathology means that women affected come into A+E significantly later and the risk of them being sent home without diagnosis is four times as great as a man with the classic symptoms.

Gender medicine

Biological differences are of major significance for the healthcare of men, women, transsexuals and intersex persons. Investigations have shown, for example, that the hearts and arteries of women are smaller than in men. Women have a lower level of activity in their kidneys and liver than men, which affects the metabolism and thus the dose of medication required. Although research has made strides, further knowledge is necessary on the sex-specific differences in relation to health and their correlation to gender-specific differences. In addition, the health-related impact of various living conditions of men, women, transsexual and intersex persons must be examined, i.e. structural, social and cultural conditions must be taken into consideration. Social inequalities with respect to relationships, financial status and decision-making power have an effect on the health of humans and their needs for medical care.

4

QUALITY OF RESEARCH – QUALITY OF PRODUCTS

CASE EXAMPLE, CONSUMER GOODS: MARKET FLOPS

The manufacturers of brand articles invest a significant portion of their overall expenditure on advertising, market research and image maintenance through public relations work when it comes to establishing the brand name. Consumer goods should speak to a wide range of customers. This makes it all the more regrettable when, due to blind spots in the research and product development, the result is a market flop and associated damage to the brand image.

Crash test dummies

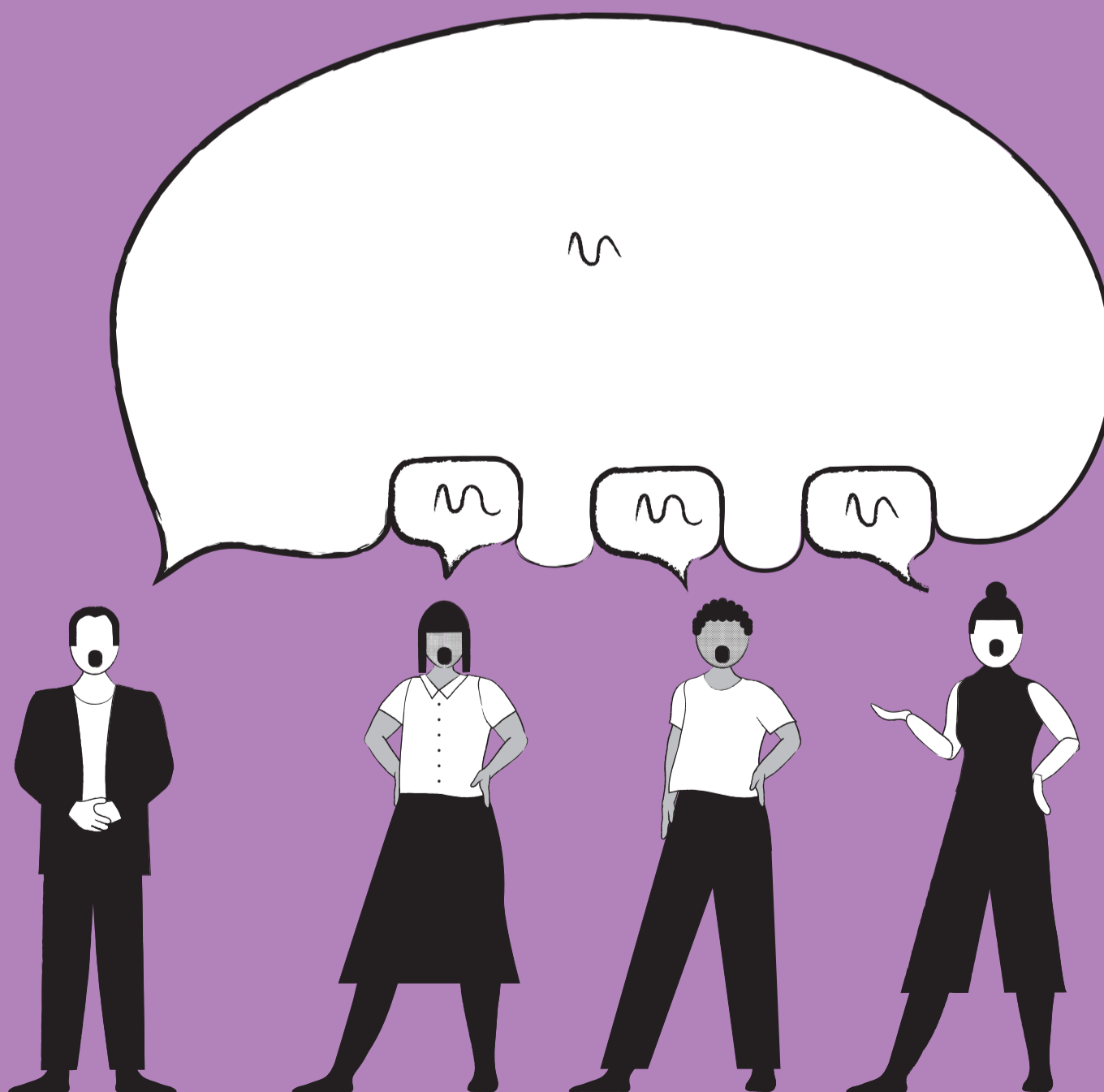
Men are involved in road traffic accidents more often than women. When we compare the number of male and female injured persons, however, it becomes clear that for women the risk of severe injury is 47 percent and of slight injury as much as 71 percent higher than it is for men. The risk of dying in an accident is 17 percent higher for women. Crash test dummies have been around since the 1950s - and for decades, only male dummies were used. The most common model is Hybrid III, the 50% man. He corresponds with the average male car driver as accepted by the manufacturers. For decades, research simply assumed that safety would be guaranteed for everybody this way. This has had, as the numbers above demonstrate, grave consequences. It has proven to be especially dangerous for pregnant women and their foetuses: in an accident, seat belts can be dangerous for the foetus, even if the mother is uninjured. For this reason, “pregnant” crash test dummies were introduced in 1996. They have yet to be used systematically, however.

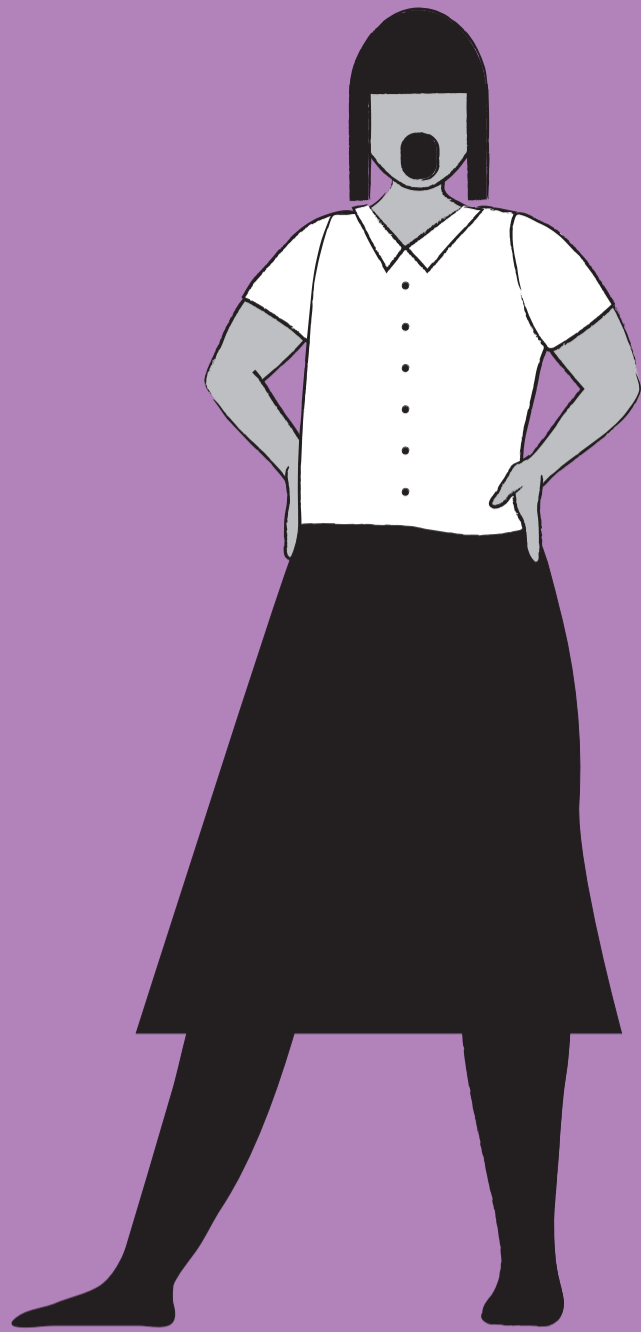
Speech recognition software

Speech recognition systems have struggled with gender problems from the very start. Well-known examples of this are the Microsoft Speech Recognition, Google Speech Recognition and Amazon Transcribe. They recognise male voices significantly better than female ones and regularly founder when it comes to dialects or voices of non-Caucasians. Such bias in the usability could have serious consequences for people’s lives. In the simplest example, the garage door opens for “him” but not for “her”. More existential: a native English speaker from Ireland doesn’t pass the required digital English-language test when she wants to immigrate to Australia. Dramatic consequences can also be seen in products in which safety plays a role, e.g. in the area of e-mobility, and where speech recognition can be a matter of life and death.

Why does this problem exist? The mid-level basic frequency for male voices typically lies at 120 Hz and at 200 Hz for women. Smoking, illnesses, ethnic background and further factors can all influence the basic frequency. Speech recognition systems are trained these days using databases that contain a lot of data on white, male voices and less data on female voices, different dialects or the voices of people of colour.

Incidentally, a similar problem exists in facial recognition systems: they work best in the case of white men.





Your office thermostat

The formula for determining the optimal office temperature was developed in the 1960s on the basis of the metabolic rate of an average man at rest. This formula takes into consideration factors such as air temperature, air speed, vapour pressure and clothing insulation. However, men and women do not have identical metabolic rates – in the case of light office duties, the metabolic rate of young, adult women is significantly below the standard value for men carrying out the same work. The formula for the optimal office temperature could overestimate the metabolic rate of women by up to 35%, meaning that offices in Germany are currently an average of 5°C too cold for women. This situation is not only unfair, it also attests to bad business sense: an undercooled team is an unproductive team.

Apple's HealthKit

Apple first introduced its HealthKit in 2014. The app lists an astonishing range of possible health indicators: sleep, body mass index, number of falls, weight, sodium, copper and even selenium intake. But the app failed to include one thing: menstruation cycles – something that most menstruating persons would like to record. Apple fixed this omission with the next operating system iOS9.

Systemically forgotten

Apple's HealthKit is not the first example of a technology product prioritising men over women. The overwhelming majority of technology firms is staffed by men, particularly on the development side. The consequences: smartphones are too big for the hands of many women. The latest artificial hearts fit 80 percent of men but only 20 percent of women. The list goes on and above all demonstrates one thing: development in homogenous teams very often misses large target groups and thus the market.

**DEVELOPMENT IN
HOMOGENOUS TEAMS VERY
OFTEN MISSES LARGE
TARGET GROUPS AND THUS
THE MARKET.**

RESOURCES



Gender Equality in Engineering through Communication and Commitment

http://www.geecco-project.eu/resources_results/geecco_deliverables/

This exhibition was realized as part of the project “Gender Equality in Engineering through Communication and Commitment”. It aims to inform and convince both, politicians and funding bodies, about the importance of gender sensitive research for the quality and reliability of new technologies to be developed. This exhibition aims at raising awareness and lobbying in research producing organisations (RPOs) as well as in research funding organisations (RFOs) and towards policy makers by providing significant case studies and fundamental



Gendered Innovations in Science, Health & Medicine, Engineering, and Environment

<http://genderedinnovations.stanford.edu/>



Yellow Window: Checklist for gender in research

<https://cca91782-7eea-4c09-8bff-0426867031ff.filesusr.com/>

WEB
REPORTS
LITERATURE
VIDEOS



What is the gender dimension in research? Case studies in interdisciplinary research.

Trine Rogg Korsvik & Linda Marie Rustad (2018): What is the gender dimension in research? Case studies in interdisciplinary research. Kilden genderresearch.no



UNESCO (2019): I'd blush if I could: closing gender divides in digital skills through education.

<https://unesdoc.unesco.org/ark:/48223/pf0000367416.page=1>

Sara Wachter-Boettcher (2017): Technically wrong: Sexist Apps, Biased Algorithms, and Other Threats of Toxic Tech. WW Norton & Co.

Caroline Criado Perez (2019): Invisible Women: Exposing Data Bias in a World Designed for Men. Chatto & Windus



Robots in our society

<https://youtu.be/bfXr29VAuwU>



Humans & Computers

<https://youtu.be/vrWx91RdmGo>



Canadian Institutes of Health Research: Assessing Sex and Gender Integration in Peer Review

<https://www.youtube.com/watch?v=Hlceez1Dx5E>



Canadian Institutes of Health Research: Learning about Sex and Gender

<http://www.cihr-irsc.gc.ca/e/50003.html>



European Commission: The gender dimension in research

<https://www.youtube.com/watch?v=67sbLrJAfIQ>



Gender in Design: Updated Gendered Innovations

<https://vimeo.com/257213025>



Vinnova: What is norm-critical innovation?

<https://youtu.be/pbJpANNFEJI>



Recruitment Bias in Research Institutes

<https://www.youtube.com/watch?v=g978T58gELo>