

from IDEAS to MARKETS: the Gender Factor

Introducing how
gender dimension
can transform and
enhance research
ideas and open up
new markets for
science knowledge

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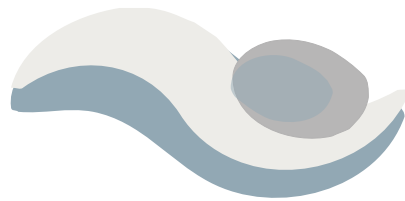
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from IDEAS to MARKETS: the Gender Factor

Introducing how gender dimension can transform and enhance research ideas and open up new markets for science knowledge



INTRODUCTION

The aim of this report is to demonstrate the significance of the gender dimension in research and innovation contexts and outcomes. The examples show that it can be a source of new ideas; a primary factor in investigation; a basis for fresh interpretations of research findings; and a door that can open up opportunities to previously overlooked markets for science knowledge.

It has become clear in the last few years that because historically women were excluded from studies as subjects and targets of research, and because the use of 'male' as the norm has dominated research, science has much more knowledge on males than on females and research outcomes are often less effective for women than for men. For example, out of the 10 prescription drugs withdrawn from the market in the US during 1999-2001, eight were more dangerous to women than to men.

There are serious gaps in toxicokinetic models used to explain the effects of exposure and susceptibility to chemical risk for women throughout their lives. What is understood at present about the effects of environmental pollutants is based primarily on studies that excluded females.

Elsewhere, there are concerns over the validity of current ionizing radiation dosimetry models, which do not fully or accurately reflect available radiobiological or physiological information, either because the models are outdated or because they were based on selective or uncritical use of data from measurements involving the bodies of white, middle-aged men and therefore do not provide sufficient support to minimise the degree of risk when radiation is used as medical intervention in the case of women, children and young men. The concern among medical professionals is growing, since the average annual radiation exposure has increased dramatically over the last 20 years. For instance, between 1982-2006, in the United States by 75 per cent, primarily due to medical uses. In Germany alone 140 million X-ray examinations are performed each year.

The main purpose of this report is to highlight the emerging understanding of the importance of considering sex-gender as a source of new research ideas that can lead to innovations with better outcomes for both women and men, and for society.

The traditional pattern of knowledge transfer has been from research-to-manufacture. This model of technological advancement is driven by commercialization interests and consumer markets where intellectual value could be protected by patents and licensing. But this is not the only way to create markets for science knowledge.

Knowledge itself can be transformed into a tool, for instance to create services that can advance Civil Society (e.g. enabling more effective adaptation to climate change), or a product in the form of specific know-how and expertise (e.g. management of conditions that modify team gender diversity effects).

These markets can develop both tangible products (e.g. e-courses, guidelines) and intangible form (e.g. professional advice, training research leaders on impacts of gender).

Our objective in this report is to show that considerations of gender can have quality- and outcome-enhancing roles in knowledge production and its applications that are relevant in a number of ways to the EU Europe 2020 policy strategy, and in particular Horizon 2020 and Innovation Union.

Gender has been assigned a cross cutting role in Horizon 2020 that includes transport, energy, food security, and environment. It is not as yet included among the Innovation Union's 34 criteria of success, however.

It should be because this will help translation of research results into new goods and services that support sustainable economic and societal advancement the EU2020 strategy aims to deliver.

A recent Eurobarometer study of the attitudes to innovation among Europe's citizens concluded that women are "anti-innovation", which demonstrates gender bias in understanding differences between what women want from innovation, which is usefulness and sustainability, and men, who tend to favour technological novelty.

Promoting the perception that women are anti-innovation reinforces barriers to engaging women in innovation process and overlooks their part in the available scientific human capital. Europe has invested in women's higher education and now 60 per cent of undergraduates and 50 per cent of PhD degrees are awarded to women. Women's participation in the labour markets has been also increasing. It has been estimated that worldwide women control \$20 trillion of consumer budgets, annually. Research and innovation that pays full attention to women's needs and interests is, therefore, much needed.

It is our hope, that this collection of examples will encourage researchers, innovators, policy makers, citizens, and others to take a fresh look at gender, and, specifically, consider its role as an important dimension of creativity, quality, and source of new opportunities to improve competitiveness, sustainability of technological and social advancement through knowledge.

More information about these topics can be found at www.gender-summit.com, the website of the Gender Summit, which was launched in 2011 as a platform for dialogue where scientists, policy makers and gender scholars could discuss latest research evidence and reach consensus on where, why and how sex-gender differences matter to research and innovation.

Since then four regional summits have been established: Gender Summit – Europe, Gender Summit – North America, Gender Summit – Africa, and Gender Summit – Asia Pacific. Details of each can be also found at www.gender-summit.com.

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21. Assistive systems can increase independence and mobility of women and men according to their different needs

Six examples of recent contributions to advancing evidence for addressing gender issues in research and innovation: genSET science leaders' Consensus Report; Portia's Creating Futures in Science project; Fraunhofer Discover Markets project; WIGSAT's Benchmarking Survey; AWIS' work-life balance survey; ETH's Women Professors Network

FROM IDEAS to MARKETS: the GENDER FACTOR - Biomarkers



BIOMARKERS for BETTER HEALTH for women and men enabling more accurate diagnostic and therapeutic approaches that recognise important biological differences, from the molecular to population levels.

SUMMARY

“The investigation of 131 serum metabolite concentrations of 3,300 population based samples revealed significant differences in the metabolite profile of males and females. Furthermore, a genome-wide picture of sex-specific genetic variations in human metabolism of 2,000 subjects showed differences in the effect of genetic variations on metabolites in men and women. Metabolites, which may be used as predictive biomarkers to indicate the presence or severity of a disease, have to be used selectively depending on sex.”¹

The global biomarker market was valued “at \$13.16 billion in 2011, growing at a steady pace of Compound Annual Growth Rate (CAGR) of 14.40%. It is expected to reach \$25.79 billion by 2016. The biomarker discovery technology market is the major contributor of this market followed by the application market. Oncology is seen to be the largest indication in terms of revenue, but cardiology is the fastest growing indication with a CAGR of 16.24% expected from 2011 to 2016. In both these areas, women as a topic for research have been studied in the past far less than men, suggesting that new opportunities for targeting women’s needs in the diagnostics and therapeutic biomarker markets may be overlooked, with the possible increase in risk for women from inadequately evidenced products.

North America is leading the market followed by Europe and Asia, which is the fastest growing region due to high adoption rate of high throughput technologies for biomarker discovery and rapid growth of IT industry in this region.”²



LEADING RESEARCH GROUPS

<http://www.helmholtz-muenchen.de/epi/epi-home/index.html>

KEY DISCIPLINES

Biochemistry, Genetics, Medicine, Molecular Biology, Bioinformatics, Proteomics, Metabolomics, Molecular Diagnostics

TARGET INDUSTRIES/MARKETS

Pharmaceuticals, Diagnostics, Health, Insurance, Regulatory industry

NEW PRODUCTS/SERVICES

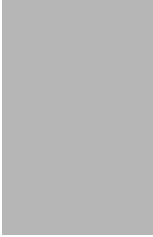
Personalised drug design, Predictive diagnostic tools, Computer analytics, Laboratory equipment (e.g. <http://www.lifetechnologies.com/uk/en/home.html>), Forensic technology

REFERENCES

1 Kirstin, Mittelstrass, K.; Janina S. Ried, Zhonghao Yu, et al. 2011, Discovery of sexual dimorphisms in metabolic and genetic biomarkers, PLoS Genetics 7(8):e1002215

2 <http://www.marketresearch.com/MarketsandMarkets-v3719/Biomarkers-Discovery-Technologies-Applications-Indications-6792106/>

FROM IDEAS to MARKETS: the GENDER FACTOR - Cancer Probe



LIGHT SCATTERING DEVICE IMPROVES accuracy of standard equipment used to diagnose patients at risk of develop colon cancer.

SUMMARY

Colon cancer is the second-leading cause of cancer death in the United States, killing 55,000 Americans each year. It occurs more or less equally in women and men. The disease is 90 percent preventable if precancerous polyps are detected early and removed. Current diagnosis guidelines are that everybody over age 50 is recommended to undergo colonoscopy at least once every 10 years. This would mean testing more than 90 million Americans over the age 50. Evidence shows that 70-80% of colonoscopies are negative and unnecessary and that 85% of the population receives no colonoscopic screening. Colonoscopic screening of the entire eligible population is impossible due to: 1) expense (annual cost would be ~\$50 billion); 2) insufficient number of endoscopists; 3) patient reluctance; 4) complication rates.¹

While colon cancer strikes roughly as many women as men, there are significant differences in how the disease presents itself. Women are more likely to have cancerous lesions in the proximal colon, the section of the colon furthest away from the rectum and the part of the colon that isn't examined during flexible sigmoidoscopy. Due to this discrepancy, studies have found that flexible sigmoidoscopy alone detected only one-third of colon cancer in women. With the estimated cost attributable to colon cancer treatment 1 year after diagnosis in the US at \$29,196, there are clear benefits to improve diagnosis for women.²

By using a novel light-scattering approach, scientists were able to detect an early increase in blood supply (EIBS) in the distal colonic mucosa, which served as a marker of field carcinogenesis and, hence, proximal neoplasia. The technology makes use of a biological phenomenon known as the "field effect," a hypothesis that suggests the genetic and environmental milieu that results in a neoplastic lesion in one area of an organ should be detectable throughout the organ and even in neighbouring tissue.



LEADING RESEARCH GROUPS

Department of Biomedical Engineering at McCormick at Northwestern University

KEY DISCIPLINES

Biophotonics, Biomedical Engineering, Imaging, Medical Diagnostics, Optical Microscopy

TARGET INDUSTRIES/MARKETS

Diagnostic equipment, Health

NEW PRODUCTS/SERVICES

Diagnostic equipment, Fibre optic probes

REFERENCES

1. N. Mutyal, A. Radosevich, B. Gould, J.D. Rogers, A. Gomes, V. Turzhitsky, V. Backman, A fiber optic probe design to measure depth-limited optical properties in vivo with Low-coherence Enhanced Backscattering (LEBS) Spectroscopy, *Optics Express*, 20(18), 19643-19657 (2012)
2. Hemant K. Roy, Andrew J. Gomes, Sarah Ruderman, 2010. Optical Measurement of Rectal Microvasculature as an Adjunct to Flexible Sigmoidoscopy: Gender-Specific Implications, *Cancer Prev Res*; 3(7); 844-51

FROM IDEAS to MARKETS: the GENDER FACTOR - Wounds



LED for BETTER WOUND HEALING in women and men enabling quicker repair of skin wounds by inducing skin blood vessels to stop bleeding faster.

SUMMARY

Wound healing, as a normal biological process in the human body, is achieved through four precisely and highly programmed phases: haemostasis, inflammation, proliferation, and remodelling. For a wound to heal successfully, all four phases must occur in the proper sequence and time frame.

Research has shown that “skin architecture displays inherent gender divergence: the dermis is thicker in males than females and the epidermis and hypodermis are both thicker in females.”¹ These differences can provide the basis for skin healing treatments that are different for women and for men.

In wound healing sexual dimorphism involves: “steroid sex hormones, macrofage migration inhibitory factor (MIF), plus other factors... Normalization of the hormonal milieu helps reveal underlying differences in the ways that wounds heal in males and females. These differences extend to the response to MIF, which worsens repair in females but not males...[with] important implications for the treatment of chronic wound pathologies.”²

“Non-healing wounds affect about 3 to 6 million people in the United States...[which] result in enormous health care expenditures, with the total cost estimated at more than \$3 billion per year.”³

LED induced photo-coagulation has been shown to “speed up the healing process... the specific absorption of the radiation wavelength by haematic components, without interacting with other tissues...it ensures the minimum invasivity of the technique.”⁴



LEADING RESEARCH GROUPS

<http://www.ipc.uni-jena.de/members.php?id=2&lang=en>, <http://www.lens.unifi.it/bio/>,
<http://www.photonics4life.eu>

KEY DISCIPLINES

Photonics, Biochemistry, Physiology, Medicine, Molecular Biology, Epidemiology

TARGET INDUSTRIES/MARKETS

Optical therapeutic instruments, Health Care, Insurance, Regulatory Industry

NEW PRODUCTS/SERVICES

Antihaemorrhagic treatments, for humans (e.g. closing shaving cuts) and animals (e.g. stopping bleeding in too closely clipped nails where the vein is located in the middle of the nail)

REFERENCES

- 1 Mathieu D, Linke J-C, Wattel F. (2006). Non-healing wounds. In: Handbook on hyperbaric medicine, Mathieu DE, editor. , Netherlands: Springer, pp. 401-427
- 2 Stephen C. Gilliver, Jayalath P.D. Ruckshanthi, Matthew J. Hardman et al (2008). Sex Dimorphism in Wound Healing: The Role of Sex Steroids and Macrophage Migration Inhibitory Factor. *Endocrinology*, Nov 2008, 149(11): 5747-5757
3. S. Guo and I.A. DuPietro (2010). Factors Affecting Wound Healing, *J Dent Res*. 2010 March; 89(3): 219–229
4. <http://www.light4tech.com/emoled.html>

FROM IDEAS to MARKETS: the GENDER FACTOR - Antenna



BREAST CANCER DIAGNOSIS IMPROVED for women and men through antenna technology used in land mine detection, changing the diagnostic equipment as well

SUMMARY

Developed at the University of Bristol (UK), MARIA is made from 60 antennas, which create a complete scan of the breast in only eight seconds, searching for areas with a high dielectric constant. In the human body, these areas are rich in blood and water, the hallmark signs of a tumour. The scanning technology was originally made for land mines, which also have a high dielectric constant around them. Patients simply lie on a table with a circular hole cut into it, which their breast hangs through, while the machine is hydraulically moved up to 'nestle' against the skin. It then scans the breast to pick up areas with a high dielectric constant - immediately highlighting them in a bright colour such as blue or red. Three successful trials involving more than 300 women at Bristol's Frenchay and Southmead hospitals were already carried out. Results from the latest trials, completed this year, showed a diagnostic success rate of 80 per cent, although the team are aiming to boost that to 90 per cent.¹

The most significant risk factors for breast cancer are gender (being a woman) and age (growing old). A man's lifetime risk of getting breast cancer is 1:1000 for women it is 1:8. In England, the breast screening programme is now estimated to cost around £96 million a year. A new study reported in the British Medical Journal suggested that experts overestimated the extent to which screening saved lives, and ignored the risks that come with it. The principal risk is misdiagnosis, which leads to unnecessary surgery and medication, and happens much more often than accepted until now. More effective screening policy and technology is needed to avoid risks of damage due to factors such as the type of attenuated radiation used for soft tissue visualisation, vigorous compression of the breast tissue and needless biopsies.²



LEADING RESEARCH GROUPS

Engineering Department, University of Bristol

KEY DISCIPLINES

Engineering, Medical diagnostics

TARGET INDUSTRIES/MARKETS

Medical diagnostics

NEW PRODUCTS/SERVICES

Cancer screening

REFERENCES

1. <http://www.maturetimes.co.uk/health/health-news/745-cancerdiagnosed-in-eight-seconds---with-landmine-technology.html>. 13 January 2012

2. BMJ 2012; 344 doi: 10.1136/bmj.d8279 (Published 6 January 2012)

FROM IDEAS to MARKETS: the GENDER FACTOR - Eggs



KNOWING SEX of CHICKEN EMBRYO can help egg and poultry industry better manage egg and bird production, as well as improve animal welfare.

SUMMARY

There are an estimated 6 billion chickens in the world, that's one chicken per person. The need for segregation of poultry based on sex is driven by sex-related differences in growth rate, market, age, management practices, and nutritional requirements.

Each day, global poultry industry staff would ideally like to determine the sex of >150 million newly hatched birds. Currently, this can be done only manually at the hatchery, which is a virtually impossible undertaking.

It is becoming more difficult each year to conduct manual sexing, as this skill is disappearing from the workforce, is becoming unaffordable to the industry, and is encumbered by such negatives as repetitive motion disorder¹.

Automated gender sorting of eggs prior to hatching could resolve many, if not all, of these problems. Successful application of Ultraviolet Resonance Raman (UVR) spectroscopy to determine the gender of birds has been tested. This approach is based on the fact that genome size is larger in male birds as compared to females.

In chickens, the difference relative to the respective DNA content amounts to about 2%. This difference should be detectable by means of UVR spectroscopy since other sample components such as carbohydrates or lipids contribute negligible Raman signals in the deep UV region. After extraction of the DNA-rich cell material by pressing the thawed feathers from tip to base, no further extensive sample preparation is required².

This research and innovation has major applications for the poultry industry, in particular the egg industry which does not require male chickens. A way to determine the sex of a chicken embryo before it hatches should also save money and improve animal welfare³ by reducing unnecessary cost of raising unwanted chicken such as food, water and vaccinations.



LEADING RESEARCH GROUPS

Adnan Menderes Universities Veteriner Fakultesi, Zootekni
CSIRO Livestock Industries' Australian Animal Health Laboratory (AAHL)
Molecular Profiling Laboratory, Massachusetts General Hospital Center for
Cancer Research and Harvard Medical School, Charlestown, MA 02129

KEY DISCIPLINES

Genetics, Molecular Biology, Animal Health, Agriculture

TARGET INDUSTRIES / MARKETS

Poultry industry, Egg industry, Food, Farming

NEW PRODUCTS/SERVICES

Genetic sex testing equipment, Farming equipment and methods, Food production methods

REFERENCES

1 Tran HT, Ferrell W, Butt TR. An estrogen sensor for poultry gender sorting. J Anim Sci. 2010 Jan 15, LifeSensors Inc. 271 Great Valley Parkway, Malvern, Pennsylvania 19355.

2 http://www.daserste.de/wwiewissen/Gendering_per_Laserscan.pdf

3 Economist, Feb 9th 2010, <http://www.economist.com/node/15491505>

FROM IDEAS to MARKETS: the GENDER FACTOR - Drilling



MORE EFFICIENT DRILLING in SPACE based on female wasp's drilling mechanism for laying eggs in wood with a minimum of power and least destruction to samples.

SUMMARY

"Apollo astronauts wielded rotary drills to penetrate beneath lunar terrain, but the close-packed regolith proved extremely resistant...ExoMars is one of several planetary missions incorporating a drill. One of the most difficult engineering challenges in extra-terrestrial exploration is gaining access to sub-surface samples and data." ¹

Low gravity encountered on Mars or on the Moon and the low mass of the probes, landers and rovers that carry drilling devices limit classical drilling techniques. Novel boring solutions optimised in mass and power consumption are thus needed for space applications and it is in the humble wood wasp, which drills holes into trees in order to lay its eggs, that the European Space Agency has identified a solution.

Their analysis showed the wood wasp's egg-laying 'ovipositor' to be divided into two elements, one side possessing cutting teeth and the other side equipped with pockets to remove the resulting debris. Applying this lesson in natural engineering, led to development of a double-drill bit able to penetrate metres underground using a few watts of power, providing more competitive performance compared to static penetration.²

The goal is to stimulate research for space applications in general as well as taking advantage of potential 'spin-in' for space from other technologies originally intended for other domains.



LEADING RESEARCH GROUPS

<http://www.surrey.ac.uk/ssc/>

<http://www.isae.fr/en/>

http://www.esa.int/gsp/ACT/bio/bio_op.htm

KEY DISCIPLINES

Space Research, Space Engineering, Mechanical Engineering, Soil Mechanics, Structural Biology, Sensors

TARGET INDUSTRIES/MARKETS

Space Applications, High Performance Machines, Robotics Exploration

NEW PRODUCTS/SERVICES

Drilling technology

REFERENCES

¹ Thibault Gouache, Yan Gao, Yves Gourinat, Piere Coste, Wood wasp inspired planetary and Earth drill. In: Biomimetics, Learning from Nature, InTech - Open Access Publisher, Rijeka, Croatia, 2010, pp. 467-486. <http://oatao.univ-toulouse.fr/> Eprints ID: 44

² http://www.esa.int/esaMI/Technology/SEM737NEG5G_0.html

FROM IDEAS to MARKETS: the GENDER FACTOR - Chemical Risk



IMPROVING CONSUMER PRODUCTS containing chemicals that disrupt female and male hormone systems and cause harmful effects.

SUMMARY

Endocrine Disrupting Chemicals (EDCs) represent a broad class of molecules such as organochlorinated pesticides and industrial chemicals, plastics and plasticizers, fuels, and many other chemicals that are present in the environment or are in widespread use. They can interfere with synthesis, secretion, transport, metabolism, binding action, or elimination of natural blood-borne hormones that are present in the body and are responsible for homeostasis, reproduction, and developmental process. A spectrum of disorders throughout life, some of which are sexually dimorphic, can be related to endocrine disruption. Male sexual differentiation is androgen-dependent (and potentially estrogen-dependent), whereas female differentiation occurs largely independently of estrogens and androgens. Therefore, it is expected that different disorders are seen in males and females as a result of EDC effects that overall mimic estrogens and/or antagonize androgens.^{1,2}

Bisphenol A (BPA) is one of many man-made chemicals classified as endocrine disruptors. It is widely used in consumer products such as reusable water bottles, food can linings, water pipes and dental sealants. There is: “a very strong suspicion in the scientific community that this chemical has harmful effects on humans.” There is also environmental risk where plastic manufacturing and incineration creates air and water pollution and exposes workers to toxic chemicals.³

Studies have examined people from the general population and found associations between low levels of hormone-altering compounds and infertility and other reproductive problems, cardiovascular disease, neurodevelopmental effects, obesity, abnormal bone health, cancer and other diseases. The overall cost to society is enormous, and it continues to rise. Academic, regulatory and industry scientists must work together to identify and replace such chemicals that are ubiquitous in everyday consumer products. Reducing and eventually eliminating these exposures is absolutely needed to protect human health.⁴



LEADING RESEARCH GROUPS

Tufts University's Department of Developmental and Regenerative Biology
Center for Risk Science and Public Health at The George Washington University
JRC, Institute of Health and Consumer Protection

KEY DISCIPLINES

Materials Science, Chemistry, Engineering, Environment

TARGET INDUSTRIES/MARKETS

Chemical, Plastics, Packaging, Fuel, Agriculture

NEW PRODUCTS/SERVICES

Packaging, Cleaning, Food containers, Dental products, Pipe and container linings

REFERENCES

1. Evanthia Diamanti-Kandarakis, Jean-Pierre Bourguignon, Linda C. Giudice, et al. Endocrine-Disrupting Chemicals: An Endocrine Society Scientific Statement, *Endocrine Reviews* June 1, 2009 vol. 30 no. 4 293-342
2. <http://www.mst.dk/English/About+the+Danish+EPA/News/20120328pregnant.htm>
3. <http://www.environmentalhealthnews.org/ehs/news/2012/opinion-endocrine-disruptors-low-level-effects>
4. BISPHENOL A SHOULD BE PHASED OUT FROM CONSUMER PRODUCTS, <http://www.beuc.org/custom/2011-00248-01-E.pdf>

FROM IDEAS to MARKETS: the GENDER FACTOR - Radiation



IMPROVING DIAGNOSTIC RADIOLOGY through more accurate dosimetry models based on detailed physiological information for women and men, as well as children.

SUMMARY

Many of the current radiation dosimetry models do not fully or accurately reflect available radiobiological or physiological information, either because the models are outdated or because they were based on selective or uncritical use of data or inadequate model structures. For example, most current estimates of bone marrow radiation dose are obtained from two-dimensional images acquired from seven skeletal sites in a 44-year-old adult male during the late 1960s. The medical community is sounding the alarm about the potential for harm from excessive radiation exposure.

“According to the National Council on Radiation Protection and Measurements, the average annual radiation exposure in the United States increased about 75 percent between 1982 and 2006. During that time, the proportion of exposure due to medical interventions rose from 15 percent to 48 percent. Worldwide figures for 2000–2007 indicate that 3.6 billion medical procedures with ionizing radiation (3.1 billion diagnostic radiologic, 0.5 billion dental, and 37 million nuclear medicine examinations) are performed annually. Worldwide, the average annual per-capita effective dose from medicine (about 0.6 mSv of the total 3.0 mSv received from all sources) has approximately doubled in the past 10–15 years.”¹

In 1997, the German Federal Office for Radiation Protection reported 136 million X-ray examinations and 4 million nuclear medicine diagnostic tests, resulting in a mean effective dose of 2.15 mSv per person per year.² A total of about 41.5 million medical and dental x-ray examinations are now conducted each year in the UK (0.70 examination per head of population) resulting in an annual per caput effective dose of 330 μ Sv.³



LEADING RESEARCH GROUPS

European Association of National Metrology Institutes

KEY DISCIPLINES

Metrology, Radiation Physics, Medical diagnostics, Radiation risk

TARGET INDUSTRIES/MARKETS

Radiologic medical diagnostics and interventions

NEW PRODUCTS/SERVICES

X-ray and other radiation interventions, Protective equipment and measures

REFERENCES

1. <http://radiology.rsna.org/content/253/2/520.full>
2. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC381057/>
3. http://www.medicalphysicist.co.uk/nrpb_w4.pdf, 2001

FROM IDEAS to MARKETS: the GENDER FACTOR - Wildlife Control



IMPROVING WILDLIFE DISEASE CONTROL by taking into account different roles and impact in how males and females respond to and affect spread of infection.

SUMMARY

There is a great deal of interest in wildlife disease surveillance in Europe, and a lot of scholarly information from different disciplines has been contributed to this issue. A significant proportion of results and experience is not reported in peer reviewed journals, however. Moreover, efforts to coordinate the activities in this field are just beginning to develop. There is little agreement on what the best methods are.

Management through population reduction has been used in an attempt to control badger bovine TB, CSF in wild boars and fox rabies. Different methods were employed to kill badgers, wild boars and foxes, either at the den (burrow gassing) or by shooting or trapping (or even poisoning). However, a trial to reduce an animal population will be sooner or later balanced by reproduction or immigration. "Lessons and expertise deduced from previous experience are beneficial for the community on a whole since at the stage where we are, good descriptions and clear portrayal of facts are needed. We can certainly speculate and try to build hypotheses, models and theory about emerging infections and parasites, but factual information (properly sampled) is what is really desired."¹

Wildlife managers traditionally establish differential hunting regulations based on sex, but their goals have focused mainly on sustainable wildlife management and not disease control. Important economic trade-offs emerge from a sex-based management approach when disease control becomes an additional objective. Males and females influence demographic change differently. Sexual dimorphism can be used to manage wildlife disease because physical, physiological, genetic, and behavioural differences may lead to different levels of disease transmission and susceptibility between the sexes. Differentially harvesting males and females affects levels of disease prevalence, and the make up of both the current stock and future harvests – and, apart from disease control is also important because males and females of many species are valued differently.²



LEADING RESEARCH GROUPS

Department of Agricultural Economics, Agriculture Hall, Michigan State University
Ecole Nationale Veterinaire Lione (ENVL), Unité Pathologie infectieuse, Marcy l'Etoile

KEY DISCIPLINES

Public Health, Field Biology, Behavioural Ecology, Environment, Population Biology,
Microbiology, Epidemiology, Animal Health

TARGET INDUSTRIES/MARKETS

Wildlife Management, Agriculture, Veterinary services, Coordinating agencies

NEW PRODUCTS/SERVICES

Multidisciplinary training, Policy initiatives, Models

REFERENCES

1. M. Artoris, WILDLIFE INFECTIOUS DISEASE CONTROL IN EUROPE, *J. Mt. Ecol.*, 7 (Suppl.): 89-97
2. Eli P. Fenichel, Richard D. Horan, and Christopher A. Wolf, The Role of Sexual Dimorphism in the Economics of Wildlife Disease Management

FROM IDEAS to MARKETS: the GENDER FACTOR - Seeds



IMPROVING MAIZE HYBRID SEED PRODUCTION by exploiting the plant's own mechanism for producing male organs, to create plants that could save huge effort spent by commercial farmers on detasseling hybrid crops.

SUMMARY

The world produces around 850 million tonnes of maize seed per year.¹ "It is essential to change the architecture of plants to minimize how much land we need to produce food and fuels... If you can find a natural mutation or mechanism that gives you what you need, you are much better off than using transgenic techniques that could be difficult to get approval for...When maize loses the ability to produce brassinosteroids, it becomes a dwarf." The unexpected finding produced is that..."The plants without the naturally occurring steroids could not make male organs -- they had kernels where the tassels should be."²

In corn, the tassel is the male and silk on the ear is the female. In a commercial cornfield, only one hybrid is planted and pollen falls from the tassel on the silk, which promotes kernel and ear development. Seed companies create new corn hybrids by planting more than one variety in a field. Tassels are removed from one hybrid, but left on another to promote cross-pollination. The idea is to take the best traits from one type of corn and combine them with the best traits of another.³

A mutation resulting in the lack of brassinosteroids could be a cost-saving discovery for the seed industry. Hybrid seed producers must painstakingly remove the male pollen-producing tassels from each plant so that they do not pollinate themselves...maize plants that produce only female organs would eliminate the detasseling step.

Such discoveries could also help address market barriers and opportunities for farmers in drought-affected regions, e.g. Kenya, where reliance on maize is very high and where internal and external, local and certified seed markets compete, and better policies are needed for promoting high quality local seed production.⁴



LEADING RESEARCH GROUPS

Departments of Horticulture and Landscape Architecture and Botany and Plant Pathology, Purdue University, West Lafayette, <http://www.purdue.edu/>
RIKEN Advanced Science Institute, Wako-shi, Saitama 351-0198, Japan
ESRC STEPES Centre, UK

KEY DISCIPLINES

Genetics, Agriculture, Horticulture, Plant pathology, Biochemistry, Biophysics

TARGET INDUSTRIES/MARKETS

Food industry, Hybrid seed production, Agricultural machinery, Land management, Agricultural policy

NEW PRODUCTS/SERVICES

Locally-focused hybrid seed production and distribution, Plants for better land/water management, Harvesting systems, Food supply security

REFERENCES

1. http://www.geohive.com/charts/ag_maize.aspx
2. Thomas Hartwig, George S. Chuck, Shozo Fujioka, Antje Klempien, Renate Weizbauer, Devi Prasad V. Potluri, Sunghwa Choe, Gurmukh S. Johal, Burkhard Schulz. Brassinosteroid Control of Sex Determination in Maize. Proceedings of the National Academy of Sciences, 2011
3. http://wcfcourier.com/business/local/detasseling-vital-for-crop-development-summer-employment/article_7ca1b2d2-9211-11df-8878-001cc4c03286.html?mode=image
4. Environmental Change and Maize Innovation in Kenya. Exploring Pathways in and out of Maize, October 2009, The ESRC STEPES centre.

FROM IDEAS to MARKETS: the GENDER FACTOR - Biofuels



IMPROVING BENEFITS OF BIOFUELS

to reduce exclusion of women from agriculture and improve social and environmental benefits of second generation technologies through the added value of by-products.

SUMMARY

“In Africa, where two-thirds of farmers are women, the potential of biofuels as a low or lower-carbon alternative fuel, with applications at the household energy, community and village level, to a national resource or export commodity, has a critical gender dimension. The key question is: how will increased biofuel production affect women? It’s important to account for the complexities involved, and not rely on a simple, traditional commodity model but one that tracks the impacts on women through changing prices and demands for crops to be sold on local and international markets. Who gains and who loses as prices change, and as the value of specific crops and of land changes?”¹

“Mozambique has recently received numerous requests for land to produce biofuel feedstock, such as sugarcane for ethanol and jatropha for biodiesel. By 2009, requests exceeded 20 million hectares, which is equivalent to two thirds of total arable land in the country and four times the land currently cultivated. Not all requests are considered credible, however, with many of them merely attempting to obtain land use rights in a country where the state formally owns all land. Nevertheless, a recent rapid appraisal of biofuels investors identified 15 ongoing projects seeking to plant a total 500,000 hectares. The analysis of Mozambique through the gender lens is important because biofuels expansion implies rapid growth in cash/export crop production, where men tend to predominate. Food crop production, where women provide the majority of labor, will be indirectly affected via resource competition and exchange rate effects, which are likely to make imported foods relatively more attractive. This leads to higher food prices. Moreover, a shortage of skilled female labor implies that wages for these workers increase substantially.”²

Another aspects to consider is second-generation biofuels, using recycled waste oils or cellulose containing plant residues such as rice husks, wheat straw or wood chips, which may have fewer negative environmental and social impacts than the first generation biofuels, such as sugar cane, and palm oil, etc. The socio- economic and gender dimensions of second-generation biofuels requires attention as they become commercially available.³



LEADING RESEARCH GROUPS

Department of Economics, University of Copenhagen

Gender and Development Group, World Bank

United Nations University’s World Institute for Development Economics Research

KEY DISCIPLINES

Economics, Development, Social Science, Behavioural Science, Environment, Energy

TARGET INDUSTRIES/MARKETS

Development, Innovation, Energy, Policy

NEW PRODUCTS/SERVICES

New fuel production methods, Better cash crop production, Skills training

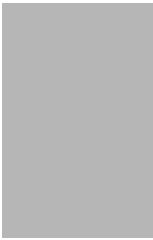
REFERENCES

1. <http://blogs.worldbank.org/climatechange/biofuels-threat-or-opportunity-wome>

2. Channing Arndt, Rui Benefica, James Thurlow, Gender Implications of Biofuels Expansion in Africa: The Case of Mozambique, World Bank

3. Valerie Nelson and Yianna Lambrou, Scoping the Gender Issues in Liquid Biofuel Value Chains, university of Greenwich

FROM IDEAS to MARKETS: the GENDER FACTOR - Cooking Stove



IMPROVING BIOFUEL COOKING STOVES to reduce health risks to women from bad indoor air pollution and to improve fuel consumption thus protecting the environment.

SUMMARY

“Half of the world’s population, and up to 95 percent in poor countries, rely on solid fuels, including biomass fuels (e.g. wood, dung, agricultural residues) and coal, to meet their energy needs. The World Health Organization lists “indoor air pollution (IAP) from primitive household cooking fires as the leading environmental cause of death in the world (women and girls, mostly),” stating that “it contributes to nearly 2.0 million deaths annually,” about as many deaths as malaria and tuberculosis combined. It is conventional wisdom that it is possible to reduce exposure to indoor air pollution, improve health outcomes, and decrease greenhouse gas emissions in the rural areas of developing countries through the adoption of improved cooking stoves. This belief is largely supported by observational field studies and engineering or laboratory experiments.

A randomized control trial conducted in rural Orissa, India (one of the poorest places in India), on the benefits of a commonly used improved stove that laboratory tests showed to reduce indoor air pollution and require less fuel has contradicted these assumptions. Tracking household behaviour for up to four years after they received the stove the study found no evidence of improvements in lung functioning or health and no change in fuel consumption (and presumably greenhouse gas emissions). The difference between the laboratory and field findings appear to result from households’ revealed low valuation of the stoves. Households failed to use the stoves regularly or appropriately, did not make the necessary investments to maintain them properly, and usage rates ultimately declined further over time.

Testing environmental and health technologies in real-world settings where household behaviour may temper impacts, and to test them over a long enough horizon to understand how this behavioural effect evolves over time, is critical. Organisations such as the Global Alliance for Clean Cookstoves (GACC), has called for 100 million homes to adopt clean and efficient stoves and fuels by 2020. Rigorous evidence on the efficacy on health and fuel use of recommended technologies is needed”,¹ as well as an appreciation what we mean when we talk about the ‘household’ and its impact. Is the role of the women within recognised fully?²



LEADING RESEARCH GROUPS

Centre for International Development, Harvard University
Haas School of Business, University of California
Università “Ca’ Foscari” di Venezia, Italy, Dept. of Economics

KEY DISCIPLINES

Economics, Development, Social Science, Behavioural Science, Environment, Energy

TARGET INDUSTRIES/MARKETS

Development, Innovation

NEW PRODUCTS/SERVICES

Improved stoves, Fuel

REFERENCES

1. Rema Hanna, Esther Duflo, Michael Greenstone, UP IN SMOKE: THE INFLUENCE OF HOUSEHOLD BEHAVIOUR ON THE LONG-RUN IMPACT OF IMPROVED COOKING STOVES, CID Working Paper No. 241 April 2012
2. Vijay Laxmi, Jyoti Parikh, Shyam Karmakar and Pramod Dabruse, Household energy, women’s hardship and health impacts in rural Rajasthan, India: need for sustainable energy solutions, Energy for Sustainable Development I Volume VII No. 11 March 2003

FROM IDEAS to MARKETS: the GENDER FACTOR - Textiles



IMPROVING PROTECTIVE TEXTILES to take into account differences between skin properties of women and men and the nature of expected protection.

SUMMARY

The skin exerts a number of essential protective functions ensuring homeostasis of the whole body. It acts as a barrier to the external world, providing thermoregulation and antimicrobial defence. Textiles, in particular clothing, interact with skin functions in a dynamic pattern. Mechanical properties like roughness of fabric surface are responsible for non-specific skin reactions like wool intolerance. Thermoregulation, which is mediated by local blood flow and evaporation of sweat, is an important subject for textile-skin interactions. There are age-, gender- and activity-related differences in thermoregulation of skin that should be considered for the development of specifically designed fabrics. Antimicrobial textiles may interfere with non-specific defence mechanisms like antimicrobial peptides of skin or the resident microflora. Antibacterial compounds like silver, copper and triclosan have been used in conjunction with textile material. Macromolecules with antimicrobial activity like chitosan have been incorporated into textiles. Interaction of textiles with the specific immune system of skin may lead to allergic contact dermatitis. Electronic textiles and other smart textiles offer new areas of usage in health care and risk management but bear their own risks for allergies.¹

Medical textiles are one of the most dynamically expanding sectors in the technical textile market. Above average growth rates are a result of increases in consumption in developing countries in the Asian and Western markets. A forecast suggests that the world market for medical textiles will increase at a rate of 4.5% per annum in volume from 2005 to 2010 to reach 2.4 million tons with a value of \$8.2 billion by 2010. Additionally, technical textiles will grow at 3.8% per annum to reach 23.8 million tons with a value of \$126 billion dollars in the same time frame.

Disposable and reusable textile products are two popular but competing materials employed in health care and other fields requiring personal protection against biological and chemical hazards.² For example, Kimberly-Clark has introduced its first line of gender specific adult absorbent underwear. The new male and female designs are tailored to fit the unique body shapes of both sexes offering superior fit and protection.



LEADING RESEARCH GROUPS

Department of Dermatology, Hospital Dresden-Friedrichstadt, Academic Teaching Hospital of the Technical University of Dresden, Germany

Division of Textiles and Clothing One Shields Avenue, University of California, Davis, CA, US

KEY DISCIPLINES

Materials, Textile Engineering, Environment, Toxicology, Fashion, Chemical Engineering

TARGET INDUSTRIES/MARKETS

Medical environment, Hazard protection, Waste management

NEW PRODUCTS/SERVICES

Protective clothing, Functional textiles, Technical textiles, Disposable and reusable products

REFERENCES

1. Wollina U, Abdel-Naser MB, Verma S., Skin physiology and textiles - consideration of basic interactions, *Curr Probl Dermatol.* 2006;33:1-16
2. Health Protective Textiles: Bridging the Disposable/Reusable Divide A National Science Foundation – Materials Use: Science, Engineering, and Society Study, University of California, Berkeley

FROM IDEAS to MARKETS: the GENDER FACTOR - Packaging



PACKAGING for MORE EFFECTIVE application of prescription medicines helping patients to take medicine as recommended by the manufacturer or the doctor.

SUMMARY

In the context of health, “proper patient compliance with taking the right dose of the right medication at the right time for the prescribed duration of the treatment is very important... Carefully designed packaging can make a significant contribution to patient compliance with respect to, for example: 1) Ease of identification; 2) Clarity of instructions; 3) Visible evidence of medication taken. Through elements such as printing, colour-coding and the format of the package itself, package designers can incorporate features that serve to improve patient compliance.”^{1,2}

“In the US the number of patients needing support to stay compliant or adhere to medication instructions is around 150 Million, and for Europe the relative figure would be in excess of 220 million people, 50% of whom are estimated to give up their treatment within one year, while they are supposed to stay on the prescribed treatment. It has been estimated that every day 10% of those who are engaged with their therapy forget to take their medicine.”³

“Clyk is a refillable electronic tablet dispenser with an LCD display...specifically designed to help women comply with a new oral contraceptive within a unique flexible extended intake regimen, to provide a woman with reliable contraception and the option to personally plan her period. The dispenser guides the woman through her cycle and the 4 day tablet free interval.”⁴



LEADING RESEARCH GROUPS

<http://www.hcpc-europe.net>

<http://abcproject.eu/index.php>

KEY DISCIPLINES

Packaging Design, Psychology, Manufacturing, Pharmacology

TARGET INDUSTRIES/MARKETS

Pharmaceutical industry, Packaging industry, Patient organisations, Health insurance, Health professionals organisations, Policy makers

NEW PRODUCTS/SERVICES

Packaging, dispensers, education for healthcare professionals, education for patients

REFERENCES

1. http://www.hcpc-europe.net/cms/front_content.php?idcat=3
2. <http://abcproject.eu/img/Brussels%20presentation%20FINAL.pdf>
3. http://www.hcpc-europe.net/cms/front_content.php?idcat=200
4. http://www.hcpc-europe.net/cms/front_content.php?idcat=205

FROM IDEAS to MARKETS: the GENDER FACTOR - Safety



SOFT ARMOUR PROTECTION SOLUTIONS that are flexible and strong and can be specifically adapted to suit women's and men's bodies.

SUMMARY

In the early 1970s, DuPont commercialised aramid fibre, under the trade name Kevlar. Long aramid molecules were dissolved and then spun into fibres that were stretched as they solidified. This process oriented the long molecules along the length of the fibre, greatly increasing the finished fibre's tensile strength. Originally developed to replace steel in the reinforcement belts of car and truck tires, aramid proved useful as well for bulletproof vests.¹

"More recently, systems have been developed to provide the highest level of ballistic penetration resistance and blunt trauma protection for concealable protection vest. Specialized laminate materials typically found in hard armour ballistic panels have been adapted into flexible soft armour solutions for individual protection. Law enforcement officers benefit from increased safety and protection against ballistic penetration as well as the devastating effects of blunt trauma impact"².

"The concept of a 'curvy' bulletproof vest was adopted for women, that would fit perfectly to the female body curves offering maximum comfort possible, with functionality and key structural features. The female vest combines the highest ballistic protection, low blunt trauma effect, positive flotation, UV and moisture resistance and high comfort. The vest has already been chosen by Belgium, France and Finland Police officers to protect them in their everyday duty life."³

The number of women serving in the police is rising. In Scotland's eight police forces it has reached a record high. New figures show that female officers now account for 26.8 per cent of the police workforce. The findings reveal a huge rise in women entering the force since 1998, when just 15.3 per cent of officers were female. Two of the eight chief positions on Scotland's police forces are now held by women. And 32 per cent of new recruits each year to the Scottish Police College at Tulliallan in Kincardine, Fife, are female - a level which has been achieved for the past five years."⁴



LEADING RESEARCH GROUPS

Army Research Laboratory (ARL, US)

<http://www2.dupont.com/personal-protection/en-us/dpt/article/ballistics-lab.html>

http://www.pro-systems-ballistic-protection.com/engl/company_profile.html

KEY DISCIPLINES

Physics, Materials Science, Chemistry, Polymer Chemistry, Composite Materials

TARGET INDUSTRIES/MARKETS

Personal protection, Police, Army, Materials, Laboratory methods

NEW PRODUCTS/SERVICES

Personal protection gear for women and for men, Mechanical testing, Optical testing

REFERENCES

1. <http://www.compositesworld.com/articles/new-options-in-personal-ballistic-protection>

2. <http://www.turtleskin.com/Body-Armor/Body-Armor-Soft-Panel.aspx>

3. <http://www.army-technology.com/contractors/personal/elmon-co/presselmon-female-curvy-bulletproof-vest.html>

4. <http://www.dailyrecord.co.uk/news/scottish-news/2011/03/06/record-high-as-number-of-women-police-officer-hits-27-of-workforce-86908-22970532/>

FROM IDEAS to MARKETS: the GENDER FACTOR - Gaming



ON-LINE GAMING SOFTWARE for RESEARCH with thousands of users, women (30%) and men contributing solutions for faster and more effective exploration and manipulation of protein structure.

SUMMARY

“The online game Foldit, developed by teams led by Zoran Popovic, director of the Centre for Game Science and biochemist David Baker, both at the University of Washington in Seattle, allows players to manipulate structures involved in the folding of proteins on their home computers in search of the best-scoring (lowest-energy) configurations.”¹ The latest effort involved an enzyme that catalyses one of a family of dedicated reactions used regularly in synthetic chemistry, called Diels-Alder reactions. Members of this huge family of reactions are used throughout industry to synthesise everything from drugs to pesticides, but enzymes that catalyse Diels-Alder reactions have been elusive and FoldIT users can help.

Foldit turns protein-folding into a game and awards points based on the internal energy of the 3-D protein structure, dictated by the laws of physics. The game was part of an experiment to see if gamers could pick up where supercomputer logic fails. Gamers can take risky moves and can consider the future, which are things computers can't do.²

In one problem, 57,000 players have taken the challenge to contribute to scientific research of solving a problem that scientists couldn't solve for over 10 years. It's a new kind of collective intelligence, as opposed to individual intelligence. FoldIT top five solo players didn't study biochemistry after high school and most of the players are not scientists. 30% of Foldit players are women, and some are among the highest-scoring Foldit players.

The project has progressed from volunteers donating their computers' spare processing power for protein-structure research, to actively being engaged in predicting protein structures, and now to designing new proteins. The game has 240,000 registered players.



LEADING RESEARCH GROUPS

Centre for Game Science, University of Washington

KEY DISCIPLINES

Chemistry, Biochemistry, Physiology, Medicine, Molecular Biology, Structural Biology

TARGET INDUSTRIES/MARKETS

Chemical industry, Pharmaceutical industry, On-line gaming,

NEW PRODUCTS/SERVICES

Enzyme design, Designing new proteins, Gaming software for research, Open innovation platforms

REFERENCES

1 Jessica Marshall, (2012, Victory for crowd sourced biomolecule design, <http://www.nature.com/news/victory-for-crowdsourced-biomolecule-design-1.9872>

2 Cooper, S. et al. Predicting protein structures with a multiplayer online game. Nature 466, 756–760 (2010)

FROM IDEAS to MARKETS: the GENDER FACTOR - Voice Response



IMPROVING VOICE RECOGNITION SYSTEMS to reduce the higher level of errors when responding to women's voices compared to men's, as well as improving accuracy on tasks.

SUMMARY

Interactive voice response (IVR) systems are one of the most mature applications of automatic speech recognition (ASR) today and are widely deployed for customer care and service applications. ASR research is currently moving from mere "speech-to-text" (STT) systems towards "rich transcription" (RT) systems, which annotate recognized text with non-verbal information such as speaker identity, emotional state. In IVR systems, this approach is already being used to identify dialogues involving angry customers, which can then be analysed with the goal of automatically identifying problematic dialogues. Also, the first adaptive dialogues are now appearing, particularly in systems exposed to inhomogeneous user groups. These can adapt a degree of automation, order of presentation, waiting queue music, or other properties to properties of the caller such as age or gender. As an example, it would be possible to offer different advertisements to women and men in the waiting queue.

In non-personalised services, speaker classification will be based on the caller's speech data. While classifier performance is only one factor influencing the utility of the above approach in an IVR system, it is certainly a major factor.¹ In the case of speaker-independent voice recognition it is well known that the performance of recognizers for female speakers is almost always worse than for male speakers. The common solution is to have separate male and female acoustic-phonetic models. There is a significantly higher rate of transcription error in women compared to men when using commercial voice recognition applications.²

There are other types of error issues with IVRs: research has shown that speech recognition software produces eight times as many errors as conventional dictation transcription in breast imaging reports. Major errors included word omission, word substitution, nonsense phrases, and punctuation errors, among others. Errors varied by report type. Breast MRI reports were most prone to them, with 35 percent of speech recognition versions having a major error, 13 percent of interventional procedures, and 15 percent of mammography reports (the dictation equivalents had error rates of 7 percent, 4 percent and 0 percent, respectively).³



LEADING RESEARCH GROUPS

INRS Telecommunication, France

Machine Intelligence Laboratory, University of Cambridge

KEY DISCIPLINES

Acoustics, Phonetics, Language, Computing, Databases, Software Development, Modelling

TARGET INDUSTRIES/MARKETS

Telecommunication, Health, Customer services, Call Centres

NEW PRODUCTS/SERVICES

Voice response tools, Communication support tools, Transcription tools

REFERENCES

1. Florian Metzger, Jitendra Ajmera, Roman Englert, Udo Bub et al, Transferring unsatisfied customers to an agent, and other purposes. COMPARISON OF FOUR APPROACHES TO AGE AND GENDER RECOGNITION FOR TELEPHONE APPLICATIONS, , ICASSP 2007
2. Rivarol Vergin , Azarshid Farhat , Douglas O'Shaughnessy, Robust Gender-Dependent Acoustic-Phonetic Modelling In Continuous Speech Recognition Based On A New Automatic Male/Female Classification, in Fourth International Conference on Spoken Language Processing, 1996, <http://www.asel.udel.edu/icslp/cdrom/vol2/816/a816.pdf>
3. Sarah Basma, 2011, Speech Recognition Brings Breast Imaging Report Errors, American Journal of Roentgenology.

FROM IDEAS to MARKETS: the GENDER FACTOR - Communication



TRANSLINGUAL COMMUNICATION can support intercultural exchanges in an increasingly globalized world by including knowledge how women and men use English language.

SUMMARY

“Comparing the language of men and women in a large, heterogeneous sample of written and spoken text reveals small but consistent gender differences in language use. For the women who contributed 8,353 text files to the study, the English language was more likely to be used for discussing people and what they were doing, as well as communicating internal processes to others, including doubts. Thoughts, emotions, senses, other peoples, negations, and verbs in present and past tense figured high on the list of words that women used more than men. For the men who contributed 5,970 files, language was more likely to serve as a repository of labels for external events, objects, and processes...Contrary to popular stereotypes, men and women were indistinguishable in their references to sexuality, anger, time, their use of first-person plural, the number of words and question marks employed, and the insertion of qualifiers in the form of exclusion words (e.g., but, although).”¹

“Along with the growing need for intercultural and translingual communication in an increasingly globalized world, machine translation (MT) becomes more and more important both in assisting language professionals in their daily work and in helping non-professionals understand and create texts in foreign languages...if you regard these [MT] as communication aids or translation tools rather than as a substitute for a human translator, you will find that their value is often vastly underestimated.”²



LEADING RESEARCH GROUPS

Lingenio GmbH, Heidelberg, <http://www.lingenio.de/>
Department of Social and Behavioural Sciences, Arizona State University,
<https://webapp4.asu.edu/directory/person/1094007>

KEY DISCIPLINES

Linguistics, Discourse Analysis, Machine Translation, Computational Linguistics

TARGET INDUSTRIES/MARKETS

Machine Translation, ICTs, Printing, Publishing, Social Networking, Forensics

NEW PRODUCTS/SERVICES

Translation tools, Communication support tools, Discourse analysis tools, Text forensics

REFERENCES

1 Matthew L. Newman, Carla J. Groom, Lori D. Handelman and James W. Pennebaker (2008). Gender Differences in Language Use: An Analysis of 14,000 Text Samples, *Discourse Processes*, 45:211–236,
<http://homepage.psy.utexas.edu/homepage/faculty/pennebaker/reprints/NewmanSexDif2007.pdf>

2 Anke Frank, Christiane Hoffmann, Maria Strobel, Lingenio GmbH, Heidelberg (2004). Gender Issues in Machine Translation, <http://www.adlantech.de/Publikationen/GIST.pdf>

FROM IDEAS to MARKETS: the GENDER FACTOR - Vehicles



MAKING ACCURATE FEMALE CRASH DUMMIES to better assess the risk and potential injuries that women experience when in a car accident.

SUMMARY

The calculable costs of motor-vehicle crashes are wage and productivity losses, medical expenses, administrative expenses, motor vehicle damage, and employers' uninsured costs. In the US, the costs of all these items for each death (not each fatal crash), injury (not each injury crash), and property damage crash were estimated in 2010 to be: Death \$1,410,000, Nonfatal Disabling Injury \$70,200, Property Damage Crash (including non-disabling injuries) \$8,900.¹

From data on past crashes, researchers found that the odds of serious injury for female drivers wearing seat belts were 47 percent higher than those of men in a comparable accident. Women, having smaller bones and lower bone density, are at greater risk than men of suffering injury or death in crashes. Their less muscular necks make them more vulnerable to whiplash. In general, smaller people cannot tolerate crash forces as well as can full-sized men.²

At present, there are no specific female crash dummies. General Motors use 200 dummies, about 35 are considered female, which are defined as such by changing height and weight, making wider hips than for a male of comparable size, and using chest-jackets simulating breasts. Vehicle crashes causing 'whiplash injuries', is a worldwide problem. In Sweden, such injuries account for ~70% of all injuries leading to disability due to vehicle crashes. It is well established that the whiplash injury risk is higher for females than for males, even in similar crash conditions. These studies concluded that the female injury risk was 1.5 to 3 times higher than the male injury risk. The different anthropometry and mass distribution between women and men may influence the interaction of the upper body with the seatback/head restraint and thus increases the injury risk. For example, the deflection of the seat frame, seatback padding and springs may depend on the mass and/or the centre of mass of the upper body with respect to the lever about the seatback hinge..³



LEADING RESEARCH GROUPS

Humanetics (Germany, USA)

Chalmers University, SAFER Centre, Sweden

University and ETH Zurich, Switzerland

AGU Zurich, Switzerland

Swedish National Road and Transport Research Institute VTI, Sweden

KEY DISCIPLINES

Scaling anthropometry, Sensor systems, Computational modelling

TARGET INDUSTRIES/MARKETS

Road and Transport design, Automobile, Insurance

NEW PRODUCTS/SERVICES

Scaling methodologies, Car seat design, Test methods

REFERENCES

1. National Safety Council, 2012

http://www.nsc.org/news_resources/injury_and_death_statistics/Pages/EstimatingtheCostsofUnintentionalInjuries.aspx

2. Dipan Bose, Ph.D., Maria Segui-Gomez, ScD, MD, MPH and Jeff R. Crandall, PhD, 2011. Vulnerability of Female Drivers Involved in Motor Vehicle Crashes: An Analysis of US Population at Risk, Am J Public Health. 10.2105/AJPH.2011.300275

3. Fred Chang, Anna Carlsson et al, 2010. EvaRID: a dummy model representing females in rear end impacts, Whiplash 2010: Neck Pain in Car Crashes

FROM IDEAS to MARKETS: the GENDER FACTOR - Robotics



MAKING ROBOTS BETTER DESIGNED for interaction with human users by taking into account social and identity reinforcing knowledge.

SUMMARY

Research in human robot interaction (HRI) shows that men and women respond differently to 'male' and 'female' robots. For example they tend to rate the robot of the opposite sex as more credible, trustworthy, and engaging. The effect was much stronger between male subjects and the female robot. These results demonstrate the importance of considering robot and human gender in the design of HRI. "Much of what roboticists take for granted in their own gendered socialization and daily lives is reproduced and reified in the robots they design, and in their publications. In short, gender for them constitutes common-sense knowledge, or a cognitive style through which they experience the social world as a factual object. The practice of attributing gender to robots is also an application of this knowledge as a representation of their social world. How robot-makers gender their humanoids is a tangible manifestation of their tacit understanding of femininity in relation to masculinity, and vice versa."^{1,2}

Understanding HRI issues contributes to future development and acceptance of robotics technologies. Important opportunities for robotics are emerging in: Logistics; Medicine; Healthcare; Professional services and Domestic services. In addition to these sectors, the European Roadmap has also cited space and security (home protection, border security, etc.) as important areas of market opportunity. As an indication, in healthcare alone powered wheelchairs could reach a market volume of a little over \$1 billion by 2013 in the USA and Asia.^{3,4}



LEADING RESEARCH GROUPS

Personal Robots Group, MIT, Cambridge, MA, USA
The Hamlyn Centre, Imperial College, London

KEY DISCIPLINES

Computing, Human-Computer Interaction, Interface Design, Sensor Systems, Anthropology, Communication

TARGET INDUSTRIES/MARKETS

Health, Logistics, Medicine, Entertainment

NEW PRODUCTS/SERVICES

Robots for domestic use, Robots for caring tasks, Robotic surgery

REFERENCES

1. Siegel, M., Breazeal, C., Norton M.I., 2009. Persuasive Robotics: The influence of robot gender on human behavior. IEEE Intelligent Robots and Systems Conference, 2009
2. Jennifer Robertson, Gendering Humanoid Robots. Robo-sexism in Japan, 2010, Body and Society, Vol 16(2), pp 1-36, Sage
3. http://www.robotics.org/content-detail.cfm/Industrial-Robotics-Feature-Article/Roadmap-to-the-Future/content_id/1647
4. http://ec.europa.eu/information_society/activities/health/docs/studies/robotics_healthcare/robotics-final-report.pdf

FROM IDEAS to MARKETS: the GENDER FACTOR - Assistance



TECHNOLOGY SOLUTIONS to ASSIST with age related and other types of chronic disability that affect women and men's independence and physical mobility.

SUMMARY

A myriad of everyday technologies fail people with disabilities. Doorknobs, kitchen tools, or shirt buttons that do not produce a second thought for most people but can become obstacles for someone with arthritis. A lever door handle and a simple buttonhook device, although not useful to most people, can assist someone who finds it difficult to manipulate these devices.¹ Women and men may differ in the types of disability and in the nature of their need for assistive devices.

There is an increasing awareness of the need for person-centred planning in health and social care, supported by the move towards personalization in a number of health policy areas. The use of assistive technology potentially provides a level of flexibility and choice for individuals.²

The range of needs is highly diversified. They extend from 'intelligent' tablet dispensers, emergency biosensor technology in motor vehicles, motion sensor technology through telemonitoring, online consultations, or brain jogging and exercise games.²

Chronic conditions can account for 70 percent of total health expenditure in Europe. Understanding the different structures in acceptance motives of both women and men is particularly important in the development of assistive medical devices considered for diseases that, due to their prevalence, affect either men or women more frequently. With an increasing comprehension of factors forming the usage acceptance of medical technologies in men and women, developers, designers as well as marketing experts can profit in creating user adjusted technology and advertisements.³

Medical assistive devices may contribute to maintaining personal independence and mobility in everyday life, and in home environments could advantage several aspects of life quality, and provide better control of health status maintenance (e.g. monitoring of bodily functions).⁴



LEADING RESEARCH GROUPS

Swedish Institute of Assistive Technology

RWTH, Aachen University

Department Health Systems and Policy, School of Public Health, University of Medicine and Dentistry of New Jersey, US

KEY DISCIPLINES

Materials Science, Human-computer Interaction, Engineering, Mechanics

TARGET INDUSTRIES/MARKETS

Personal technologies, eHealth and medical technologies, Carer support systems

NEW PRODUCTS/SERVICES

Assistance systems, e-Health and health games, 'Intelligent' tablet dispensers, Emergency biosensor technology in motor vehicles and motion sensor technology, Telemonitoring, Online consultations, Brain jogging and exercise games

REFERENCES

1. The Future of Disability in America. Institute of Medicine (US) Committee on Disability in America; Field MJ, Jette AM, editors. Washington (DC): National Academies Press (US); 2007.

2. Age appropriate technology on the advance, Digital economy and structural change, Deutsche Bank Research, December 2009

3. http://www.humtec.rwth-aachen.de/files/small_but_significant_difference.pdf

4. Wiktorja Wilkowska, Sylvia Gaul, and Martina Ziefle, 2010, A Small but Significant Difference – The Role of Gender on Acceptance of Medical Assistive Technologies, in The Role of Gender on Acceptance of Medical Assistive Technologies, Springer Verlag 2010

This report presents a collection of diverse research and innovation topics where understanding of the differences between females and males at biological, social and environmental level contributes to the quality of results and outcomes. Research evidence shows that when the needs of women and men are fully considered throughout the research and innovation process, from ideas to applications, the gender dimension can open up new opportunities to create previously overlooked markets for science knowledge, from diagnostics, to medical interventions, to food production, to energy use, transport and household items.

