

# Open Research Online

---

The Open University's repository of research publications and other research outputs

## ICT Changes Everything! But Who Changes ICT?

### Book Section

How to cite:

Corneliussen, Hilde G.; Herman, Clem and Gajjala, Radhika (2018). ICT Changes Everything! But Who Changes ICT? In: Kreps, David; Ess, Charles; Louise, Leenen and Kai, Kimppa eds. This Changes Everything – ICT and Climate Change: What Can We Do? HCC13 2018. IFIP Advances in Information and Communication Technology, 537. Springer, Cham, pp. 250–257.

For guidance on citations see [FAQs](#).

© 2018 IFIP International Federation for Information Processing 2018

Version: Not Set

Link(s) to article on publisher's website:

[http://dx.doi.org/doi:10.1007/978-3-319-99605-9\\_18](http://dx.doi.org/doi:10.1007/978-3-319-99605-9_18)

---

Copyright and Moral Rights for the articles on this site are retained by the individual authors and/or other copyright owners. For more information on Open Research Online's data [policy](#) on reuse of materials please consult the policies page.

---

[oro.open.ac.uk](http://oro.open.ac.uk)

# ICT Changes Everything! But Who Changes ICT?

Hilde G. Corneliusen<sup>1</sup>(✉), Clem Herman<sup>2</sup>, and Radhika Gajjala<sup>3</sup>

<sup>1</sup> Western Norway Research Institute, Sogndal, Norway  
hgc@vestforsk.no

<sup>2</sup> Open University, Milton Keynes, UK

<sup>3</sup> Bowling Green State University, Bowling Green, OH, USA

**Abstract.** Information and communication technology (ICT) has a changing power and digitalization is gradually changing society in all aspects of life. Across the western world, men are in majority in the ICT industry, thus, the computer programs that change “everything” are most often made by men. Unless questioned, this male dominance can be perceived as a “norm” and becomes invisible. Against this background, this paper will provide three examples of how a feminist gaze can contribute to raise important questions and produce an awareness of how exclusion mechanisms have produce a highly homosocial tendency in design of ICT systems in the western world.

The three cases illustrate how a feminist gaze leading to feminist interventions can make a difference in various ways. The first author presents a case study of a pilot for involving programming in public education in secondary schools in Norway, where a complete lack of gender awareness makes this an offer for boys in most schools. Author two presents a case study comparing the situation in the IT business in the UK and India, finding challenges not only to the situation in the western world, but also to white western feminism. Author three discusses alternative ways of involving women in ICT work, through practices of feminist pedagogy, emphasizing hands-on work.

**Keywords:** Feminist theories · ICT competence · Feminist pedagogy  
Global perspectives

## 1 Introduction

ICT and digitalization envelop our everyday lives – in most societies worldwide, digital infrastructures shape basic everyday tasks in the household and at work. Digitalization has gradually changed society in all aspects of life, from our private life, including leisure activities [25], who we communicate with [12], which interest groups we associate with [24], to education [18] and working life. Online shopping, banking, public services etc., have transformed our work experiences as well as relationships between companies and their customers. Where previously a person responded to our wishes and requests, there might now be a computer program providing the options, guidance and help to make choices. This means that a lot of our everyday life activities are shaped by the design and infrastructure of the digital gadgets and software that

surround us. While the consumer base of ICTs globally is diverse and keeps increasing, those that work in the software industry and who shape the design and accessibility of these technologies are unrepresentative of the wider population. For instance, the gendered nature of the ICT labor force is a global concern. It is well known that women software developers are both marginalized and intimidated in Silicon Valley and other contexts [19] and that only 10% of Wikipedia editors are women. For instance, Wikipedia has about 24 million articles written collaboratively by volunteers globally, but 90% of these volunteers are men. Initiatives to increase women's participation in the editing of Wikipedia thus are themselves feminist interventions and can be found in diverse geographical location such as urban USA as well as in rural India. Thus, we ask the following question – ICT might change everything, but who changes ICT? The computer programs that change “everything” are – often quite literally – *man-made*, in an ICT industry where about 4 in 5 are men in many Western countries. The already low number of women in the ICT industry is even declining, according to Deloitte's predictions.<sup>1</sup>

In this paper, the three co-authors examine the under-representation of women in ICT from three distinct contexts. In doing so we each take up particular intersections as feminist researchers to explore how more women can be included in the ICT workforce internationally. We argue for a feminist approach to examining the issue of gender inclusion and diversity in ICT labor. In doing so we bring into conversation three distinctly different contexts – one from Norway, one from India and one from Mid-western USA. Each of these contexts has specific feminist histories and socio-economic conditions that lend themselves to unique situations of inclusion of women in the IT workforce. Thus theoretically, no single feminist theoretical frame/gaze can be applied unproblematically. The description of these three contexts will allow us to raise questions in relation to feminist solutions to the problems in each context. In one instance we see the issue of state feminism and an overall well-being in women's material condition (Norway) but there is a lack of attention to recruiting and retaining women in the IT workforce; in the second instance, a case study from India, the larger socio-economic and cultural contexts of women's empowerment are mixed – however the participation of women in the IT sector is much higher in this context than in the other two examples, challenging assumptions of universal explanations for ICT inclusion and exclusion. The third context discussed is a university general education classroom context in a Midwestern university in USA where a significant portion of the classroom population are technology users but have little understanding of the coding and infrastructural issues around the technologies they use. As some interviewees in this latter project noted – they could be seen as technology dependent but not technology savvy. The three case studies thus illustrate how a feminist gaze can help to reveal how a particular gendering of ICT might be reproduced in different cultural contexts that intersect with other diversities of socio-economic and technological access.

---

<sup>1</sup> <https://www2.deloitte.com/global/en/pages/technology-media-and-telecommunications/arti-cles/tmt-pred16-tech-women-in-it-jobs.html>.

## 2 5 Mill NOK per Year for a Gender-Blind Pilot for Programming in Secondary School

Norway is generally good at gender equality, scoring high on the World Economic Forum's Global Gender Gap Index. The unitary school has been important in Norway for at least two centuries, with an emphasis on providing all children and youth with the same educational opportunities in elementary school. And still we are not entirely successful in doing this.

The "Nordic Paradox" has been suggested as a description of a similar high degree of gender equality, combined with poor results when it comes to recruiting women to computing education and, consequently, the computing business [3, 7] found across the Nordic countries. While there are more women choosing computing fields associated with humanities, arts, and design, programming is worst off, reflected in the latest statistics for higher education, where women made up between 5 and 10% in applicants for programmes and courses in programming in higher education.<sup>2</sup>

If ICT is vital for society, competence about ICT is important, and, in particular, knowledge about controlling the technology that ends up controlling us by deciding our actions and choices. Thus, programming and creating the algorithms that control technology have appeared as increasingly important, and have also been at the centre for recent attention to how algorithms involve social bias and can cause social, economic and political harm [21]. In other words, the skill of programming has appeared as increasingly important to learn, quite contrary to what we believed in the 1990s, when the focus was on making computer applications easier to use, to eliminate any need for more advanced technical skills. But, simplification often also means less control, and less knowledge about the applications means less understanding of the choices that the technology makes for us. Or rather: the tech people, those who make the programs and thus also define the choices.

Recently, a growing choir of voices claim the importance of learning to code, or program, like Rushkoff, who suggests that it is a matter of Program or Be Programmed [23]. Even young children are invited to learn programming, in school and in after-school clubs. Making programming available for more people is not a new wish. Grace Murray Hopper, pioneer in developing programming languages, was concerned with making computers available for more people [17]. Women made up a considerable proportion of programmers in the US software industry in the 1950s and 1960s – up to 30% [13] – that is, in a period when gender inequality was expected in working life, there were more women in software and programming than in the top scoring "gender equal" countries in 2018. The historical facts around this negative development in the Western world have gradually been revealed since the 1980s, showing that the masculinization of ICT and programming in particular, is a historical and cultural construction, made by an increasing professionalization of both education and the profession. In this process, women seem to have lost the position they had formerly filled [13]: one where they felt welcome and appreciated, and where they even though they were a better fit than men. "It really amazed me that these men were programmers,

---

<sup>2</sup> Statistics from The Norwegian Universities and Colleges Admission Service, April 2018.

because I thought it was women's work!" said one of the women who worked as a programmer in the 1950s in the US [1]. In the process of gendering computing as a male field, a particular type of person was increasingly preferred, creating a circular logic that this type of person was the one needed for computing and gradually this increased the masculinization of the field [13].

Let us make a jump to 2016 and Norway. The masculinization of computing has been going on for decades, and the continually low proportion of women in computing has made it expected and thus invisible. When code club instructors and parents were interviewed in Norway, they illustrated how they were aware that there were less girls than boys. However, because this simply mirrors what people are used to finding in most computing contexts, they accepted it without questioning it [10]. It appeared as "natural" and not something that they could or should fix.

This is the cultural context of the national project introducing programming in secondary schools in Norway, as a pilot running between 2016 and 2019. The pilot material contains a "trial curriculum", not very detailed, and with nothing about gender or inclusion [11]. A survey of the 140 pilot schools spread across the country showed that a total of 18% girls participated the first year, however only 15% the second year of the pilot. More than five schools had failed to recruit girls at all! None of the schools had failed to recruit boys. And more than 100 single classes had no girls, only boys. Again, apart from single classes with one or two pupils, there were no larger groups of girls in classes without boys. The lack of an inclusion strategy in the pilot represents a sad example of how gendered structures tend to be reinforced when a gender-blind strategy is employed. Perhaps the "Nordic paradox" should not be considered a paradox at all in this particular case, as the low proportion of girls rather can be tied to the choice of introducing programming without any awareness of the strongly gendered patterns already recognized in this field.

Even though there is a general awareness in society about the low proportion of girls and women choosing a career in ICT, the pilot illustrates that this awareness does not automatically translate into activity or interventions to change the situation. This suggests that what is missing is not an awareness of the low proportion of girls and women, but rather awareness of how this is a result of social and cultural constructions. It is a result of choices that were made, and different choices could produce different results.

### **3 Gender Disrupted in a Global System of IT Work**

The Norwegian case is in stark contrast to the situation in our second case study. The feminist gaze is often criticized as being a white western perspective – while this is not a new argument it has found renewed voice as a result of the perceived narrow focus of the recent high profile women's marches and other new feminist movements [9]. Thus we should question first of all what we mean by feminist and how we can use that term in an inclusive way that incorporates the experiences of women of color and women from the global south more generally. While gender disparities and 'programming' cultures are no doubt reproducing male dominance within ICT especially as led by the major IT companies in Silicon Valley, and feminist critiques are important in addressing highly sexist and hostile cultures, such experiences are by no means a universal experience.

The poor participation rates of women in ICT are not reflected in a number of other countries in particular the so-called BRIC countries such as Brazil, Russia, India and China [26], where women are much more highly represented. As Charles and Bradley have noted “International variability is striking even if we consider only engineering, the most sex-segregated field. [...] If anything, these results suggest a tendency for fields to be more segregated in highly affluent societies” [8].

In a recent project comparing gender in ICT in India and the UK, some common assumptions made in the Western feminist research literature about technology and masculinity have been challenged. Figures show that women form more than 35% of entry level programmers and technical staff in IT in India [22]. Companies in India, keen to (a) retain talented and trained staff and (b) to be seen as ‘modern’ and cutting edge, consciously portray themselves to be women friendly, and offer policies and benefits that attract women – one example is free transportation to and from work (essential in some Indian cities where sexual harassment on public transport is common), plus generous maternity leave over and above any statutory entitlements (which have only become enshrined in law recently). This is understood by women and men alike who perceive working in IT as a highly desirable career, regardless of gender. All over Bangalore there are visible posters and billboards that show positive role models of women working in IT and even popular soap operas feature women software engineers. Thus working in IT is not considered gender incongruent as it has been characterized in the West. Nor is engineering considered a masculine area of study – figures for women in Indian Higher Education Institutions show much higher percentages of women in technical subject areas than elsewhere [20].

So gender, we could say, is disrupted in this global system of IT work. However, we may still need to question to what extent neo-colonial power structures and inequalities continue to be reproduced across multiple sites of IT work. In this case does ICT change everything, or continue to reinforce and shape existing global inequalities?

## **4 Making a Difference with Feminist Pedagogy in Rural Ohio (USA)**

Feminist pedagogy and hands-on work within digital environments can be one way to counteract the issues raised in the above two sections [2]. The final case study, provides a personal account of being an educator with the potential for using ICT as an agent of change.

In my classes I have developed assignments around Wikipedia editing, curating of social media and even the use of mobile phone texting apps like snapchat. These are comparatively “low” end tools and make the technology and any soft coding associated with them very accessible [6]. Students feel a sudden surge of empowerment in using such tools and develop a sense of ownership of the knowledge they create and share [5]. In working with undergraduate students in the NW Ohio, USA, I have found that young women and students of color and diverse backgrounds use the opportunity to turn the gaze back on to the mainstream narratives of technology as they insert

themselves into the narrative through Wikipedia editing assignments, curating of social media feeds using Instagram and twitter and in developing digital humanities oral history archiving projects collaboratively [4]. These assignments make technology user-friendly by demystifying the process of editing Wikipedia for instance. Exploration and discussion in such courses – following the assignments and during the process of doing the assignments – often pushes students towards a rethinking of their abilities.

In such exploration and thinking through of the use of digital tools in a hands-on manner is supported by basic underlying feminist pedagogy of doing and engaging and returns us to the last 20 years of work by cyberfeminist [16] and other critical pedagogues who learn from participatory frameworks developed by fan communities and others - “crowd sourcing” in their organic everyday in efforts to negotiate the use of these technologies [15]. This allows us to simultaneously gain a close involved understanding and a critical thoughtful distance in relation to multiple entry points into these environments. Women in these classes tend to be participants in such communities through their leisure activities and are excited to realize that they already come with technology skills that can further them in the business world or gain them entry into even the technology sector for employment.

Here the techniques of teaching serve to highlight the context of corporeality and subjectivity through pedagogic exercises that serve to highlight the technology in renewed and different ways from their assumed everyday leisure or work use. As the students engage these contexts through an engagement with the process of building, co-creating and living in online spaces, it is possible for them to understand the production of selves as within gendered and raced hierarchies through technospatial praxis. This problematizes their self perception as technologically savvy digital natives while also reveals to them different ways in which the design of the technologies are limited and in need for further development while thinking about access and inclusion in multi-dimensional ways.

## 5 Conclusion: The Feminist Gaze Changes Everything

This conference theme focuses on challenges caused by the Anthropocene. As we have illustrated here, we cannot ask such questions without also involving a perspective of gender, as well as other social categories that are producing social differences today, to ensure that we are aiming for a better future for everybody.

Understanding mechanisms producing exclusion from digital cultures is imperative for developing advice for local, national and international authorities, policymakers, and educators aiming to reduce excluding forces.

Strategies of inclusion are not simply mechanisms of exclusion reversed, as suggested by Faulkner and Lie:

“While the development of inclusion strategies should be informed about the nature of the exclusion processes that one tries to overcome, inclusion activities should not just be directed at curbing exclusion mechanisms. In addition, and this is very important, inclusion strategies need to have outspoken positive measures. To stop exclusion is not the same as achieving inclusion; in fact, too strong a focus on exclusion mechanisms may make inclusion seem impossible” [14].

The feminist gazes we have presented here include a reworking of embedded discourses of ICT production that are based on Western experiences of gendered exclusion but also a critical understanding of the potential for transnational globalised IT workers to address global challenges from the perspective of those most immediately affected. We propose an immersive feminist epistemological engagement with technology. We argue for the feminist gaze to open new ways of perception that are vital in preparing for the enormous disruptions that are to come with the acceleration of technological change including artificial intelligence, robotics and so on. We must educate the programmers and ICT workers of our future to adopt a critical and informed understanding of societal challenges, not just teach them “how to code”.

## References

1. Abbate, J.: *Recoding Gender. Women's Changing Participation in Computing*. MIT Press, Cambridge, London (2012)
2. Belenky, M.F., Clinchy, B.M., Goldberger, N.R., Tarule, J.M.: *Women's Ways of Knowing: The Development of Self, Voice, and Mind*. Basic Books, New York (1986)
3. Bergman, S., Rustad, L.M.: *The Nordic Region-A Step Closer to Gender Balance in Research? Joint Nordic Strategies and Measures to Promote Gender Balance Among Researchers in Academia*. Nordic Council of Ministers, Copenhagen (2013)
4. Bomberger, A.M.: Ranting about race: crushed eggshells in computer-mediated communication. *Comput. Compos.* **21**(2), 197–216 (2004)
5. Boyd, D.: *It's Complicated: The Social Lives of Networked Teens*. Yale University Press, New Haven (2014)
6. Bruns, A.: *From prosumer to produser: understanding user-led content creation* (2009)
7. Charles, M., Bradley, K.: A matter of degrees: female underrepresentation in computer science programs cross-nationally. In: Cohoon, J.M., Aspray, W. (eds.) *Women and Information Technology. Research on Underrepresentation*, pp. 183–203. MIT Press, Cambridge, London (2006)
8. Charles, M., Bradley, K.: Indulging our gendered selves? Sex segregation by field of study in 44 countries. *Am. J. Sociol.* **114**(4), 924–976 (2009)
9. Collins, P.H.: *Black Feminist Thought: Knowledge, Consciousness, and the Politics of Empowerment*. Routledge, New York (2002)
10. Corneliussen, H.G., Prøitz, L.: Kids Code in a rural village in Norway: could code clubs be a new arena for increasing girls' digital interest and competence? *Inf. Commun. Soc.* **19**(1) (2016). Special Issue: Understanding Global Digital Cultures
11. Corneliussen, H.G., Tveranger, F.: Programming in secondary schools in Norway – a wasted opportunity for inclusion. In: *Proceedings of Gender&IT 2018, Heilbronn, Germany, May 2018 (Gender&IT 2018)*, pp. 172–182. ACM, New York (2018)
12. Dralega, C.A., Mainsah, H.: Ethnic minority youth participation in the production and consumption of social media in Norway. *Vestlandsforskning-rapport nr. 4/2014* (2014)
13. Ensmenger, N.: Making programming masculine. In: Misa, T.J. (ed.) *Gender Codes: Why Women are Leaving Computing*, pp. 115–141. IEEE Computer Society and Wiley, Hoboken (2010)
14. Faulkner, W., Lie, M.: Gender in the information society: strategies of inclusion. *Gen. Technol. Dev.* **11**(2), 157–177 (2007)



15. Gajjala, R., Altman, M.: Producing cyber-selves through technospatial praxis: Studying through doing. In: Liamputtong, P. (ed.) *Health Research in Cyberspace*, pp. 67–84. Hauppauge, NY, Nova Publishers (2006)
16. Gajjala, R., Oh, Y.J.: Cyberfeminism 2.0: where have all the cyberfeminists gone? *Cyberfeminism* **2**, 1–9 (2012)
17. Güler, D.W.: Pioneering women in computer science. *Commun. ACM* **38**(1), 45–54 (1995)
18. Kortuem, G., Bandara, A., Smith, N., Richards, M., Petre, M.: Educating the Internet-of-Things generation. *Comput. Educ.* **46**(2), 53–61 (2013)
19. Massanari, A.: # Gamergate and the Fapping: How Reddit’s algorithm, governance, and culture support toxic technocultures. *New Media Soc.* **19**(3), 329–346 (2017)
20. Ministry of Human Resource Development: All India Survey on Higher Education (AISHE) 2014–2015, Ministry of Human Resource Development - Department of Higher Education (2016)
21. Pasquale, F.: *The Black Box Society: The Secret Algorithms that Control Money and Information*. Harvard University Press, Cambridge (2015)
22. Sondhi, G., Raghuram, P., Herman, C.: Skilled migration and IT sector: a gendered analysis. In: Rajan, S.I. (ed.) *India Migration Report, 2018*, New Delhi, India, Routledge (2018 forthcoming)
23. Rushkoff, D.: *Program or Be Programmed: Ten Commands for a Digital Age*, Soft Skull Press, Berkeley (2011)
24. Shirky, C.: *Here Comes Everybody: The Power of Organizing without Organizations*. Penguin Press, New York (2008)
25. Taylor, T.L.: Multiple pleasures: women and online gaming. *Convergence* **9**(1), 21–46 (2003)
26. World Bank: Labor force participation rate, female (2015). <http://data.worldbank.org/indicator/SL.TLF.CACT.FE.ZS/countries/1W?display=default>. Accessed 28 Jan 2017