International Journal of Gender, Science and Technology

http://genderandset.open.ac.uk

In association with the Internet Interdisciplinary Institute, Open University of Catalonia

Special Issue: Editorial

Juliet Webster, Cecilia Castaño and Rachel Palmén

A seemingly vast number of publications on women and ICTs begin with a lament on the stubbornness of women's low and declining presence in the professional areas of technological creation. This editorial, and this Special Issue, are no exception. The problem persists, and despite numerous and strenuous efforts in many quarters, there has been no change for the better. Also striking is the similarity that seems to exist between the situation of women in ICT in different countries: the downward trend seems to be as widespread as it is apparently inexorable.

This Special Issue arises from our attempt to formulate an analytical framework which we hope will contribute to a better understanding of the processes by which women come to be under-represented, particularly in different contexts. It seems to us that, in addition to our feminist understandings of the gender-technology relation, we also need to analyse better – at an empirical level - the precise ways in which women's and men's different life events are implicated in their technological engagement over time. For us, this necessitates some attention to the ways in which gender orders (Connell, 1995) and other social arrangements, influence these life events and so create particular socio-cultural contexts for women's and men's relationship to technological creation, production and use.

This, then, is fundamentally a dynamic and a comparative approach: we want to provide for an analysis of the role that different social contexts play in the shaping of the gender-technology relationship. In our experience, this has seldom been done. Debates about the gender-technology relation rarely problematise the specific social arrangements within which both evolve, seeming instead to locate their analysis in a generalised, ideal-type society, which closely resembles the Anglo-Saxon version[1]. But is the gender-technology relation the same everywhere? And, despite the apparent similarities in the patterns of women's engagement with technologies in different countries, are the same issues at work in shaping this engagement? If not, are the possible points of intervention different, depending on social context?

Our preoccupation with a comparative analysis of the gender dynamics of ICT studies and careers arises from a collaborative study we have been pursuing, in which we have been examining women's ICT careers in the north and south of Europe - the UK and Spain. Despite their geographical proximity and shared membership of the European Union, these are nevertheless two vastly different societies in terms of their social cultures, institutional arrangements, corporate structures, gender orders and gender relations. We want to be able to analyse the role of these differences, and ultimately to widen our international focus considerably to include other countries in our analysis.

To develop this framework, we hosted an international conference in November 2010, the aims of which were to explore different empirical evidence bases concerning the dynamics of women's engagement in ICT studies and careers over the life-course, and to relate these patterns to the different social contexts within which women's lives are lived.[2] The papers in the conference, some of which have been revised for this Special Issue, focussed on women's participation in ICT at different life stages. Thus, they provided their own discrete analyses, but when taken in combination, they also allowed us to explore the case for some kind of 'cumulative disadvantage' which affects women in ICT fields. As women move through their careers and lives, processes of discrimination, disadvantage, and, crucially, their personal responses to their situation, reinforce one another and give combined impetus to their attrition from these fields (Merton, 1973; Xie and Shauman, 2003; Hutchinson, 2008).

The Special Issue starts with Castaño and Webster's paper, which sets out our proposals for a life-course approach to the analysis of women's under-representation in ICT. This approach, we argue, helps us to identify the main factors affecting women's ICT engagement at different life stages, addresses their lives beyond study and work, recognises women's agency in making their way through their ICT careers, and facilitates cross-national analysis by taking context into account.

The empirical papers begin with Sáinz's discussion of the orientations of Spanish secondary school students to computing studies. One of the key issues to come out of her paper is that there are no clear-cut differences between girls' and boys' perceptions of the utility of computing education, but girls' perceptions of their computing competence act as deterrents to their pursuit of ICT studies. So too do the structural constraints of Spanish secondary education; students have to choose a single advanced level (Bachillerato) subject 'track' (science and

technology, or arts, or humanities and social sciences) and cannot mix subjects from different tracks or move between them. Unimaginative ICT teaching at secondary level in Spain, as elsewhere, does not help to motivate girls. Palmén's contribution shows how, despite, the continued under-representation of girls in ICT secondary level studies in the UK, educational policy-making has become increasingly preoccupied with the under-performance of boys, in all subjects, and has become progressively geared to using ICT in education to address this problem.

Müller's paper considers the delivery of technical education at tertiary level. His analysis focuses on higher education in Spain, in particular the tensions between the requirements of the Bologna process – generic competencies, continuous assessment, stronger staff-student interaction, collaborative learning activities - and the entrenched masculine culture of the computing curriculum and pedagogy, a closed body of theoretical knowledge transmitted through traditional teaching methods, and supported by values of hardship and individualism. Because of this culture, the 'millennials generation' (Howe and Strauss, 2000) - already intensive and accomplished ICT users of both sexes - show scant interest in engineering or technology education and professions.

We might imagine that, because of their socio-political differences over recent decades, Sweden and Spain would be worlds apart in terms of their gender cultures in ICT. Despite their different educational and overall political traditions, however, Salminen-Karlsson shows that in Sweden, as in Spain and elsewhere, computing departments are a large part of the problem. She identifies profound difficulties for feminist researchers and practitioners in finding a common language and vision with computer scientists that would enable them both to bring about cultural change or curriculum reform in computing education.

Despite this obdurate masculine culture, girls and women are taking science, engineering and technology (SET) degrees in increasing numbers in many countries, including the UK. Yet, as Kirkup's paper shows, vocational education and training (VET), which has traditionally been focussed on skilled non-professional occupations, remains profoundly gender unequal in ICT. This is still an under-researched area, and it is not yet clear what factors are at work. At the very least it seems reasonable to point to the intersection of gender and social class as an important influence on participation in VET, and to conclude that long-established gender divisions are significant here, as elsewhere in ICT. From the point of view of women's access to this field over the life course, it seems that this is a potential transition point between education and the ICT labour market which is largely closed to women.

If computing education and training are somewhat entrenched, the ICT labour market is changing rapidly. Valenduc's paper, which draws on evidence from several EU countries and beyond, identifies a growing diversity of entry points into ICT occupations which raise a question-mark over what an ICT 'pipeline', if we accept such a concept, actually looks like nowadays. As research by the OECD (2007) has demonstrated, ICT occupations are increasingly diverse, and Valenduc shows that growing numbers of professionals enter the field without having undertaken computing studies. Women, in particular, are very likely to enter this work through non-technical routes - from practitioner fields or from other business or administrative careers, for example (men's routes in appear to

be more conventional). The final full paper by González and Vergés reveals the factors involved in the decisions that women with established careers make in moving internationally: their patterns of mobility differ markedly from men's and are, as we might expect, fundamentally connected to their role in the domestic sphere.

What, then, is to be done to improve the participation of women in ICT studies and professional areas of work? Three papers in this Special Issue are concerned with concrete interventions and their effectiveness. In their Perspectives paper, Glover and Evans argue forcefully that there are significant limitations with approaches that rely on the business case for diversity in ICT. Glover and Evans advocate the implementation of coherent systems and robust evaluation to ensure that interventions achieve their potential. Discussing interventions in the US in her Perspectives paper, Cohoon identifies some of the key factors which contribute to their success or failure: sustained leadership, resources, and embedded initiatives that do not rely on a sole practitioner. Herman's case study paper deals with an initiative in the UK aimed specifically at women returners to SET. This initiative had very positive feedback from its participants, and was apparently very effective in increasing the personal confidence and employability of the women involved. But Herman raises the important issue of how success is measured. Much evaluation tends to operate with 'hard' numerical outcome measures, yet 'soft' measures such as those capturing qualitative or cultural changes are arguably just as valid, and indeed may be much more important in contributing to long-term, sustained social change, particularly in relation to gender.

In reflecting on how best to analyse gender differences in participation, identify key problem areas, and formulate practical responses, the conference participants returned to the basic issue of what we mean by the 'life-course'. Part of our critique of approaches such as the 'leaky pipeline' model concerns their failure to recognise the non-linear patterns of women's lives in particular. Women seem to enter ICT work through diverse routes, and once in the labour market, they have very diverse patterns of engagement. The conception of an ideal-type linear career pathway analytically excludes many women (and increasingly men) in ICT work. But if women's careers do not unfold in a simple series of life stages, how can we best understand them? Are metaphors of spirals, or 'snakes and ladders', more appropriate to describe their patterns of labour market entry, exit, re-entry, partial engagement and continuing learning? Perhaps we should conceptualise the life-course as a network of nodes and links intersecting at different stages, to show the relational nature of ICT education and employment. This is an issue we hope to open for debate via this Special Issue.

While we wanted to privilege the notion of the life-course of ICT professionals, and particularly women professionals, our attention was also drawn to the novel notion of the life-course of an ICT career. As Valenduc argues in his paper, and discussed in an interview during the conference, ICT careers are also undergoing transitions, not least in the way they are entered, sustained and left. It was suggested that there may be an analytical case for considering women's and men's life-courses in parallel with ICT career life-courses to find the intersection points and by the same token, the points of divergence. (The interview with Valenduc can be seen in full at http://www.youtube.com/watch?v=_lFlzDylksY.)

This raises the issue of the difference between women and gender in our frameworks, our analysis and our debates. This conference was concerned primarily with women's under-representation in ICT studies and careers. However, it was clear from the outset of our discussions (and this is well-understood already) that analysis of women's careers makes little sense without recognition of the role of gender relations, gender cultures, and of course, of men. Two of the papers in this volume also highlight the declining engagement of boys and men in ICT studies. Men are not necessarily beneficiaries of the entrenched masculine culture of computing, and they too seem to be rejecting this culture. How, then, will this culture be perpetuated in the longer term?

A further aspect of the changing nature of ICT work is its increasing reliance on 'hybrid skills', a mixture of technical skills and social skills. Are women the potential beneficiaries of such a development? The shift towards hybrid skills could be a double-edged sword: both offering opportunities, and also closing doors for women by essentialising and making invisible their capabilities (see also Woodfield, 2002). Women may be valued and needed by employers for their assumed social skills, but they can also be locked into roles in which 'soft skills' predominate, and in which their technical skills go unused. Much, of course, depends on the ways in which different skill sets are valued and rewarded, and this too may be linked to broader differences in gender orders and knowledge systems between countries and cultures. One of the most intriguing questions we are left with is: does this body of research and debate point to significant and enduring national differences in the gender relations of ICT education and employment, or is there, in the final analysis, an overriding, dominant culture of ICT which flattens cultural differences and creates increasing convergence between the trajectories of women in ICT professions? We hope this Special Issue will open up this question for much wider debate.

ENDNOTES

[1] The body of empirical work on the global gender relations of ICT production and consumption (for example, Mitter and Rowbotham 1995; D'Mello 2005) provides a marked exception to this point.

[2] You can find details of the conference and download the speakers' presentations here: http://gender-ict.net/wordpress/?page_id=151. You can watch videos of all the presentations here: http://gender-ict.net/wordpress/?p=329

REFERENCES

Connell, R. W. (1995) *Masculinities*, Polity Press, Cambridge.

D'Mello, M. (2005) 'Gendered Selves and Identities of Information Technology Professionals in Global Software Organizations in India', *Information Technology for Development*, Vol.12, No.2, p.131-158.

Howe, N. and Strauss, W. (2000) *Millennials Rising: The Next Great Generation*, New York, Vintage Books.

Hutchinson, E. D. (2008) *Dimensions of Human Behavior: the Changing Life Course*, Sage, Los Angeles.

Merton, R. K. (1973) *The Sociology of Science: theoretical and empirical investigations*, The University of Chicago Press, Chicago and London.

Mitter, S. and Rowbotham, S. (1995) *Women Encounter Technology: Changing Patterns of Employment in the Third World*, Routledge, London.

OECD (2007) *ICTs and Gender*, OECD Digital Economy Papers, No. 129, Paris, OECD.

Woodfield, R. (2002) 'Woman and information systems development: not just a pretty (inter)face?', *Information Technology & People,* Vol.15, No.2,p.119 – 138**.**

Xie, Y. and Shauman, K. (2003) *Women in Science: Career Processes and Outcomes*, Harvard University Press, London.