The Globalization Of Gender In IT
A Challenge For The 21st Century

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Abstract: This paper seeks to extend our understanding of the impact of occupational culture on gender relations in selected countries (USA, UK, and The Netherlands). The perspective adopted takes account of the gender dimension of national cultures. The evidence shows that gender segregation and under-representation seem to exist in both feminine and masculine national cultures suggesting that some elements of computing occupational culture transcend national boundaries

1. INTRODUCTION

The low representation of women in the field of computing has received increasing attention lately. In general, there is a consensus that the occupational culture of the computing environment has been a constraint for women's recruitment, retention, and promotion in computing work. In this paper, we carry out a cross-national study on this issue. We compare the level of gender representation and segregation in computing work across various countries by reviewing the most recent statistics in this area. We then discuss the potential influence of the national culture and the occupational culture on gender representation and segregation in computing work.

2. THE CULTURE OF COMPUTING

Trice [1] defined 'occupational cultures' as collectives that consist of ideologies and cultural forms. Occupational cultures structure social relations, encourage ethnocentrism, and are dysfunctional as well as

functional [2]. As Wright puts it: "...viewing computer work through the lenses of occupational culture suggests a way to unify seemingly disparate factors (about women's absence from this occupation) into a cohesive whole" [2, p.81].

In many occupations, the pattern of gender segregation has been established through an historical sedimentation of role allocation, as in the female-dominated clerical sector and the male dominated engineering sector. Computing, which came into existence during World War II, is potentially less bound by tradition, and therefore a gender-neutral occupation offering opportunities for both men and women to progress.

Contrary to this general assumption however, the values and norms of engineering have been found to be prominent in computing and, therefore despite its newness, there has been evidence of gender segregation and ghettoization in this sector.

According to Trice, subordinate occupational cultures take on the ideologies and cultural forms of their dominant culture. The computing culture took on the occupational culture of electrical engineering, which has a style of calculation and a pattern of working that is predominantly mathematical and structured in nature. Turkle [3] argues that men are more comfortable with a 'hard' computing style that emphasises mathematical calculation, while women are more comfortable with the culture of simulation, working through interfaces that permit a 'soft' flexible style, allowing for an experimental, a non-sequential, and a non-hierarchical approach. The culture of calculation corresponds to the hard programming style that emphasises a mathematical-driven structure with rigorous guidelines and procedures. By contrast, the culture of simulation adopts the soft programming style that allows for interaction, flexibility, trial and error and experimentation. Wright [4] finds that in computing workplaces both of these cultures could be evident, although the culture of simulation is more evident among female users. Groups of computer professionals are characterised by the culture of calculation and are male-dominated.

Other accounts that develop an image of masculinity in computing [2, 5, 6, 7] describe four 'forces' that make for discrimination and pressure for women in industries like computing. First, women with traditional feminine work styles, seeking consensus and team effort, are seen as less confident and capable than men; while those women who emulate masculine behaviour are seen as aggressive and are rejected by men for not conforming to feminine stereotypes. Second, employees tend to cluster with others like themselves. Tierney [8] reports networking advantages for 'the lads' in the computing sector. Hemenway's [7] third force is the reproduction of 'mental roles' of success in the image of senior males. The potential of female candidates may be devalued through such comparison. Fourth, male

behaviours (such as 'harmless' joking, 'laddish' conversation, and discussion of male interests) are stressful and over time can erode women's self-confidence and ability to present themselves successfully.

In the same vein, Henwood [6] argues that the reasons for women's exclusion from the IT industry is primarily due to the masculine culture of technology and the pattern of sex-segregation practices in this sector. An explanation of this trend has been advanced by McIllwee and Robinson [9, who feel that the 'masculine culture' of the profession discourages women from entering it because it requires aggressive displays of technical self-confidence and hands-on ability for success. Women are particularly affected by the obsession with technology and hands-on activities, because the gender socialisation experienced by most women yields little experience in 'tinkering' with electronics. Even when they acquire the necessary skills, women do not seem to be as comfortable or as obsessed as males.

Computing appears to carry 'progenetic' engineering and masculine characteristics. Even though other computing styles have been identified (e.g. the soft style of simulation), the engineering - masculine culture seems to be predominant in organisations where computing work is primary [2].

3.   THE INFLUENCE OF NATIONAL CULTURE

There has been little attention paid to the potential influence of national culture and practices on gender integration or segregation in the labour force. In this section, we examine the influence of national culture on gendered patterns in computing work. National culture may develop sets of common assumptions and values about work and organisational patterns that are shared by its members. An important implication is that national culture, as well as occupational culture may exert influence on the values, styles, and career orientation of computing staff in different countries.

National cultures are comprised of beliefs and values that normally unconsciously govern people's perceptions and behaviour. Hofstede [10] found that some societies are characterised by masculine features and others by feminine features. According to Hofstede:

> "Masculinity pertains to societies in which social gender roles are clearly distinct (i.e. men are supposed to be assertive, tough, and focused on material success whereas women are supposed to be more modest, tender and concerned with the quality of life); femininity pertains to societies in which social gender roles overlap (i.e. both men and women are supposed to be modest, tender, and concerned with the quality of life)" [11, p.82].

In our examination of national differences in computing culture, we explore similarities and differences regarding the representation of women in computing science education across masculine and feminine countries, and whether gender representation in IT and gender segregation differ from country to country.

The UK, Netherlands, and USA were chosen for our study due to their masculine and feminine culture. The Netherlands ranked low (14) on Hofstede's masculinity index, while UK and the US scored higher (66 and 62 respectively). Therefore, the two latter countries, UK and US have clearly been identified as masculine and the Netherlands has been identified as feminine.

4. WOMEN IN COMPUTING EDUCATION

Table 1 outlines the representation of women in maths and computer science degrees at different periods of time. UNESCO statistics adopted by Wright [12] were used to compile this information for the Netherlands and USA. The Social Europe Supplement 3/93 was used for the UK figures. Even though UNESCO and the Social Europe Supplement statistics do not correspond to the same time periods they do provide an indication of the trends in these countries.

Table 1: Cross National Comparison of Women's Representation of Graduates in Mathematics and Computer Science, 1975, 1985, 1990

Country	1975	1985	1990
	% Women	%Women	% Women
US	32.3	39.4	36.4
UK	25 (1970)	23 (1980)	13 (1989)
Netherlands	9.9	14.0	12.9

The UK has experienced the steepest and longest lasting decline of women taking computer science qualifications. More recent statistics report that in 1995 women's participation in undergraduate courses with computer science as a major dropped to 11.9% [13].

They do suggest, however, that boys and girls in masculine as well as feminine countries do not study the same subjects. Suggesting student take-up is not linked as we thought it might be to national culture.

5.   WOMEN'S REPRESENTATION IN COMPUTING

There has been an increase in the number of women entering IT occupations since the 1970s. However, women are under-represented in this industry in all member states of the European Union and other countries. In the early 1990s no member state of the European Union had a percentage above 30% and in most cases it was nearer 20% [14, S3p.93]. International comparisons reveal a widespread tendency for the proportion of the female IT workforce to rise until the mid 1980s and then fall [2].

Table 2: Trends in female shares of IT occupations

	1970S	1980S	1990S
UNITED STATES (1) System Analysts Programmers	15% (1970) 23% (1970)	23% (1980) 31 % (1980)	32% (1990) 41 % (1990)
UNITED KINGDOM (2) Analysts/ Programmers		21 % (1984)	16.45% (1994)
THE NETHERLANDS (3) System Analysts Programmers	5% (1979) 8% (1979)	10 % (1989) 15% (1989)	8.9% (1993) 13% (1993)

Sources: 1) Frenkel [15], 1990; 2) Social Europe S3/93; Labour Force Statistics 1994 [16]; 3) Social Europe S3/93; Tijdens [17], 1994

There has been some progress in the degree of representation of women in IT in the last three decades. The Netherlands has had the lowest representation of women in IT. More recent statistics [18] report that in the US, women account for 37% of IT professionals which, although higher than the representation of women in any European country, is 7% below the national average of women in the total workforce of the country. The UK presents a gloomy picture with the shares of women declining not only in specific specialities such as analysts/programmers (Table 2), but also overall. Seven out of ten lower status computing jobs (e.g. data entry clerks, help-desk etc) were held by women [5, 19]. Compared to the Dutch experience, the UK reports a higher representation of women but also the longest-lasting decline, evident in the 1980s and throughout the 1990s.

6.   ANALYSIS

It is useful to compare the proportion of women receiving degrees in computing-related disciplines to the proportion of women actually employed in IT occupations. For the UK and the Netherlands these show a parallel trend. The increasing and then declining participation of women in computing education is replicated in the IT labour force. One explanation is that the low representation of women in IT reflects the decreasing number of

female students who graduate with a computer science degree. Alternatively, the image of computing as technical and male-dominated, the perception that computing work is a field for anti-social individuals, and socialisation steers women away from maths and prevents the majority of females from pursuing computing as a career [5, 13].

US data show that women are increasing their share of employment in computing professions, while student enrolments decline. This suggests that declining numbers of female computer scientists do not alone explain declines in women's employment in computer science. Panteli et al [20] have argued that the diverse nature of IT occupations result in opportunities for women to enter the industry from a wide range of backgrounds. The diversification of specialties and skills in this industry offers prospects not only for computing qualifications but also for those with business-like qualifications [22] or post-graduate IT degrees. One study shows that 47% of all new entrants to computing work in the US were from other occupations within their employing organisations [23].

Factors other than education have exerted an influence on the representation of women. Gender segregation is prevalent in this industry. IT has absorbed the patriarchal power structure of the traditional engineering industries [24] despite increasing numbers of women. Women remain far from the most valuable and crucial occupations in the sector. Environmental factors, such as the emergence of the women's movement, growing technical education, initiatives from governments and computing organisations, and the implementation of equal opportunities in employment have not brought a change in the occupational status of women in high-tech industries [25].

Studies of gender-based patterns of employment and work experience in IT in the UK and the Netherlands show highly sex-segregated, competing workforces. In the UK, the presence of women declines on moving up the hierarchy [20]. Women are not only under-represented at the supervisory and managerial level but also in the higher ranks of the technical track.

A Dutch study [28] shows similar findings: women predominantly occupy the lower job categories, with the managerial, technical, and designing jobs are occupied by men and the processing and administrative jobs are occupied women.

7.   DISCUSSION AND CONCLUSION

Overall, women are under-represented and disadvantaged in high-status IT jobs in all of the selected countries. The data reflects the predominance of male culture in computing across different occupational specialties. A closer

look shows that despite their increased representation, women do not have equal access to the different levels of occupational hierarchies.

High-tech, once considered the 'great equaliser,' does not give adequate berth for women's occupational development nor does it produce an integrated work force and equality of opportunities [25]. The image of computing can override national values. In both feminine and masculine societies, women are not only under-represented but also experience similar barriers to their retention and career development in the field [26].

These characteristics have been identified in various countries and elements of the computing occupational culture transcend national boundaries. Our findings support the findings of Gerpott, Domsch and Kettler [27], who stated that in high-tech companies the sense of technological excellence overrides other considerations, and engineers across national boundaries are more likely to share the culture of other engineers than their fellow countrymen, "...because scientific methods and standards are generally valid independently of country boundaries" [27, p.456].

In the case of IT, offshore programming and globalisation contribute to the spread of the occupational methods and standards across the globe. Various reports suggest that multinational IT organisations have transferred their North American culture to other parts of the world [8, 28, 29].

Multinational IT organisations have a responsibility and are in a better position to innovate in the way they do business and exert an influence with regard to the gender-patterns of work in various countries. This could lead to more innovative ways of reorganising IS workplaces, developing career orientation programs, and retaining and promoting those people who might have been neglected. Furthermore, IT organisations should formulate strategy that is comprehensive enough to incorporate considerations of a diverse workforce.

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