Reproducing gender inequality: Segregation and career paths in information technology jobs in Australia

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ABSTRACT

This paper draws on recent survey data to examine horizontal and vertical segregation within information systems employment in Australia, and seeks to illuminate the ways in which gender inequality is reinforced and/or reshaped at organisational level in this rapidly evolving area. Our analysis shows patterns of horizontal segregation across job categories that suggest some limitations to the use of simple dichotomies such as 'hard' versus 'soft' technologies to explain the occupational distribution of women, while also identifying patterns of vertical segregation consistent with the situation in the broader labour market. The organisational case studies highlight both cultural and structural barriers that tend to reinforce gender inequalities in information technology work.

Introduction

Numerous studies have drawn attention to the limited (and in some cases declining) representation of women in information technology (IT) tertiary courses and professional jobs (see, for example, Greenfield *et al*., 2002; Margolis and Fisher 2002; Panteli *et al*., 1999; Webster 1996). The broad pattern across the information and communications technology (ICT) sector as a whole, both within countries and on a global scale, is for women to be concentrated in the more routine jobs (for example, data entry or telemarketing), while men predominate in the engineering and design of information systems.

While this situation is clearly contrary to earlier hopes of a new industry less imbued with traditional distinctions between 'men's' and 'women's' work, it comes as little surprise to most feminist and labour studies analysts. Assumptions about the 'indeterminate gender' of computers run counter to understandings of the masculinity of science and technology (see, for example, Wajcman 1991), exemplified in male domination of 'pure' computing (Grundy 1994) and 'hacker' culture (Turkle 1984; Wright 1994). Moreover, predictions of the emergence of 'information age' firms with more flexible forms of work organisation, and operating in the context of well established equal employment opportunity practices (see Deakin 1984; Fountain 2000) contrast with the potential for work pressures in highly competitive environments to reinforce gender inequalities in career opportunities.

Our first goal in this paper is to provide a more comprehensive overview than has been available to date of the distribution and earnings of men and women involved with the design and maintenance of information systems in Australia. While our focus is thus considerably narrower than the ICT sector as a whole, the task is still complicated by a wide range of detailed job descriptions, inconsistencies in nomenclature across firms and ongoing change in the scope and content of particular occupational roles. We draw on a survey of large IT firms to examine patterns of horizontal and vertical segregation in this field, and assess the utility of distinctions between 'hard and soft', 'creative and routine/support', and 'solitary and socially engaged' job roles in explaining the gender differences evident in the data.

Our second goal is to elaborate some of the ways the gender differences we identify are reproduced at organisational level. Following Acker's (1991: 162-3) recognition that 'organizations are one arena in which widely disseminated cultural images of gender are invented and reproduced', we use information from organisational case studies to examine the ways gender stereotypes are reinforced and challenged, and structural barriers to women's career progression maintained, in different IT occupational roles and organisational settings.

The gendered distribution of information technology jobs: an Australian overview

Data for this section of the paper were collected in a commissioned survey of large IT firms conducted by Classified Salary Information services (CSi) in November-December 2003. CSi regularly surveys Australian Information Industry Association (AIIA) members for detailed information on salaries and remuneration packages, using a comprehensive and regularly updated list of occupational roles and position descriptions in the IT sector (although it has not previously included a gender breakdown). We requested information on the employment distribution and salaries of men and women in 106 roles directly related to the development, configuration and maintenance of information systems (excluding senior executives, non-technical sales and marketing staff, finance/ administration and human resource management staff). CSi contacted 108 companies with employees in our selected roles, and responses were received from 77 (a response rate of 71 percent). Annual turnover within Australia in these organisations ranged from $2 million to over $5,000 million, and together they employed over 63,000 staff. Specific information was collected on 12,706 employees working in the designated occupational roles, although not all of these jobs were sufficiently prevalent to provide statistically reliable information. The sample includes regular full-time employees and long-term contractors, but excludes part-time, short-term contract, casual and expatriate staff. It cannot be taken as representative of IT employment or computing professionals as a whole: as well as excluding some types of employees (in particular short-term contract staff who may be very highly paid), it does not include organisations in which IT was not a primary function, and is predominantly comprised of large, high-turnover organisations. However, the data do provide a relatively comprehensive picture of regular employment in large IT companies in Australia, with an important advantage being the level of occupational detail available within these specialised firms (detail far superior to the occupational categories in the Australian Standard Classification of Occupations). To set our data in context, we note that the Australian Bureau of Statistics (ABS) estimate that there were 107,686 information and communications technology (ICT) employees working in ICT specialised businesses in Australia in 2003, 34 percent of whom were female (ABS 2004: 11). As these statistics include a wider range of occupations than those included in our survey data (including administrators), the proportion of women in our sample is likely to be lower.

Overall female share of the jobs included in our survey was only 22 percent. but the distribution across the different occupational roles varied considerably. In close to one-third of the roles, female share was 10 percent or lower (less than half the survey average); but in around one-fifth of the jobs, women made up 40 percent or more of employees (from around twice to four times the survey average). The occupations with 10 percent or lower female share included a few highly paid senior positions, but the majority of employees in this group of occupations were in 'support engineer' roles primarily involving installation and repair of computer systems. Entry and higher level pay rates in these jobs tended to be lower than those in programming, and a number of the position descriptions either did not specify the need for tertiary qualifications or indicated the value of TAFE or industry training.

While a low level of female representation in support engineer roles is consistent with perceptions of these types of jobs as 'hands on' technical and stereotypically masculine, many of the occupations in which female share was 40 percent and over were also technical support roles. As Table 1 shows, women's representation was high in jobs providing technical support for software development projects, and although a familiar decline with increases in career level and pay was evident, women's representation at management level in this area was still high in comparison with the survey average. Women were also well represented in lower career level (and team leader) jobs in Technical Support Centres, which provide technical assistance to customers via telephone or email. Specialised support analyst jobs in these centres typically require computer science or engineering degrees, and at the top of the career ladder they are relatively well paid. However, the decline in female share with steps up the career ladder is particularly marked, although less so for 'operational analysts' (poorly paid jobs not requiring formal qualifications) and 'team leaders' (also comparatively poorly paid for the career level, perhaps indicating the undervaluation of team management responsibilities in this context).

TABLE 1
Technical support roles, female share and relative pay for full-time employees in large IT organisations, 2003

Occupational roles	***Career level***	***% Female***	***Average pay relative to programmer***[1]	***F/M pay ratio***[2]	***N (employees)***
Software Project Support					
Technical writing					
Technical writer[3]	3	82	113	.94	22
Senior technical writer[3]	4	41	146	.92	17
Testing and quality management					
Test analyst	2	47	105	1.07	66
Senior test analyst	3	41	127	.95	78
Quality manager[3]	5	32	172	.92	28
Technical Support Centre					
Operational analyst-basic support	2	40	79	H.89	67
Senior operational analyst-basic support	2	30	84	.96	273
Assoc technical analyst-specialised support	2	41	108	1.00	51
Technical analyst-specialised support	3	26	143	.97	356
Snr technical analyst-specialised support	4	14	172	.96	169
Principal technical analyst-specialised support	5	10	206	.92	167
Technical support centre team leader	4	40	130	.81	35
Technical support centre manager[3]	6	19	239	.87	27
Total sample (106 roles)		22		.95	12,706

1. Mean Nominal Base Salary (NBS) for the job role 'Programmer' = 100. NBS includes taxable base salary and any Salary Sacrifice Superannuation amounts made by the employee. The survey also provided figures for Total Remuneration Cost (TRC), defined as the total cost of all salary and benefit items, total variable pay and any fringe benefit tax liability, but excluding overtime and shift/standby allowance. Using NBS values produces conservative estimates – for example the average pay of a Technical support centre manager based on TRC values is 279% of a Programmer's average TRC.
2. Based on mean Nominal Base Salary (NBS) scores for men and women.
3. Small cell sizes for this occupation mean the results should be interpreted with caution.
Source of data: CSi Study of Gender Based Pay Rates and Demographics in the ICT Industry, Australia 2003

What these data suggest is a division *within* technical support roles, with 'hands on engineering' jobs remaining strongly male dominated, and remote technical support, software testing and documentation more open to women. This division has some resonance with a 'hard/soft' distinction among technical tasks, but only partially, as remote technical support work and software testing cannot unproblematically be classified as 'soft', or linked with associated notions that sustain ideologies of masculinity of engineering and technology (see Cockburn 1985: 196-7). Cockburn's study also reminds us, however, that encroachments on horizontal segregation may be accompanied by a reinforcement of vertical segregation, and Table 1 underlines the strength of vertical segregation in technical support centre work.

Another potential dimension of gender difference is between 'technically creative' (design and innovation) and 'technical support' roles, with women deemed more likely to be represented in the latter. Two groups of occupational roles are used to illustrate the more creative end of the spectrum: one involving software research and development; the other incorporating the professional services staff who develop links with clients and shape products to customers' needs. This also allows comparison of job categories with quite different levels of customer liaison and social interaction, another dimension on which gender divisions are predicted.

Initially, it can be observed that although female share in both these groups of jobs is lower than in many of the technical support roles included in Table 1, it is considerably higher than in the support engineer type roles discussed previously; thus there is no clear confirmation of gendered distribution along a purely creative/support continuum. Table 2 shows that women's representation in basic programming jobs is higher than the survey average, and that this is maintained in the more advanced career levels of Analyst Programmer and Systems Analyst (see also Baroudi and Igbaria 1995; Beirne *et al.*, 1998). Our figures do show, however, that women are less likely to progress to Senior Programmer (the highest paid of the four software development jobs) or be rewarded as highly as men if they do. In a similar pattern to that shown for Support Centre Managers in Table 1, women's representation is relatively high in Project Leader jobs, but this drops off dramatically with further steps up the career ladder and pay increments, and the gender pay gap is widest at the senior management level.

TABLE 2
Software development roles, female share and relative pay for full-time employees in large IT organisations, 2003

Occupational roles	***Career level***	***% Female***	***Average pay relative to programmer***[1]	***F/M pay ratio***[2]	***N (employees)***
Software developers					
Programmer	2	29	100	.97	345
Analyst programmer	3	27	143	.97	909
Senior programmer	3	22	158	.92	778
Systems programmer	4	28	139	.92	224
Software project managers					
Project leader	4	32	145	.94	523
Software project manager	5	22	190	.94	166
Senior software project manager	6	15	249	.88	79
Total sample (106 roles)		22		.95	12,706

1. Mean Nominal Base Salary (NBS) for the job role 'Programmer' = 100. (For further details on the NBS measure see notes to Table 1).
2. Based on mean Nominal Base Salary (NBS) scores for men and women.
Source of data: CSi Study of Gender Based Pay Rates and Demographics in the ICT Industry, Australia 2003

Table 3 focuses on jobs that combine customer liaison and technical tasks, specifically the pre-sales support staff and consultants who design and adapt computer systems for individual clients. These are the types of jobs often depicted as 'hybrid', with the expectation that the combination of technical and communication skills would be particularly attractive to women (see Woodfield 2002). (They are also jobs that could be located more towards the 'soft' end of a hard/soft continuum.) The figures in Table 3 do indicate that women's representation at the lower ends of these career ladders is higher than the survey average, but it is not markedly higher than for programmers – thus raising some questions over expectations that women would be more prevalent in hybrid or customer oriented, as opposed to more isolated and purely technical, IT jobs. Again, there is a marked decline in female share with steps up to the very well paid jobs at the top of these career ladders.

TABLE 3
Customer interface/ technical design roles, female share and relative pay for full-time employees in large IT organisations, 2003

Occupational roles	*Career level*	*% Female*	*Average pay relative to programmer*[1]	*F/M pay ratio*[2]	*N (employees)*
Pre-sales Support Specialists					
Assoc Pre-Sales Support Specialist[3]	2	32	130	1.01	28
Pre-Sales Support Specialist	3	12	176	.85	126
Senior Pre-Sales Support Specialist	4	8	217	.97	258
Principal Pre-Sales Support Specialist	5	10	254	.99	86
Pre-Sales Support Manager[3]	6	18	301	.73	17
Consultants					
Associate Consultant	2	31	105	.98	346
Consultant	3	31	150	.89	1135
Senior Consultant	4	19	203	.90	594
Principal Consultant	5	23	214	.91	449
Total sample (106 roles)		22		.95	12,706

1. Mean Nominal Base Salary (NBS) for the job role 'Programmer' = 100. (For further details on the NBS measure see notes to Table 1).
2. Based on mean Nominal Base Salary (NBS) scores for men and women.
3. Small cell sizes for this occupation mean the results should be interpreted with caution.
Source of data: CSi Study of Gender Based Pay Rates and Demographics in the ICT Industry, Australia 2003

The analysis thus far suggests that horizontal patterns of segregation in these occupational groupings cannot simply be explained in terms of hard/soft, or indeed creative/routine or socially isolated/engaged divisions. Rather the picture appears to be one in which these distinctions overlap and are overlaid with a strong pattern of vertical segregation. The following section of the paper narrows the focus to the organisational level processes that impede the progress of women in the jobs represented in Tables 2 and 3 – that is, software development and customer interface/technical design roles. Our analysis is concerned with the extent, and means of reinforcement, of a masculine culture around these jobs, as well as the structural barriers that impinge on women's advancement.

The reproduction of gender inequality: case study evidence

The evidence in this section of the paper is drawn from eight organisational case studies conducted in 2003-4. The organisations were from both the public and private sectors. The private sector organisations were sometimes smaller and IT was their core business, whereas in the public sector organisations, IT was only one aspect of the organisations' activities. IT professionals were employed in a range of occupations, and some commonalities were evident. Table 4 provides information on sector, industry, number of employees and types of computing roles, as well as the labels we use to identify them in the following analysis. We note that the jobs titles are those used within the organisation and that information about the job tasks would indicate that similar roles have different names, and different roles have similar names, in the various organisations. This uncertainty is one of the ongoing difficulties of research in this field (see Panteli *et al.*, 1999).

TABLE 4
Overview of case study organisations

Case	Sector, industry	Workplace size[1] (employees)	Computing roles
A	Public, education	5081 (263)	Helpdesk support, workstation support, network service, database manager, IT trainer, website manager, customer service, IT security, infrastructure manager, software developer/programmer, system administrator, server administrator, database admin.
B	Private, software	1131	Consultant, support analyst, software developer, internal IT consultant
C	Private, software	266	Technical analyst, programmer, tester, business analyst, developer, consultant
D	Public, education	2832 (156)	Helpdesk support, IT infrastructure, system administrator, web developer, database administrator, on-line communications officer, programmer
E	Private, software	42	Professional services consultant, software architect, programmer, technical consultant, analyst programmer, project manager
F	Public, govt admin	6518 (142)	IT support, user tester, IT logistics, computer systems officer, web, desktop systems
G	Private telco service	25	Developer, database administrator, system analyst, web designer, IT security, network administrator
H	Public, govt admin.	4612 (206)	Applications developer, lead analyst, systems analyst, applications tester, tech support, project manager, web co-ord., enterprise systems officer, network services officer, database admin, project manager

1. In organisations where IT was not the main business, number of computing staff are included in parenthesis. This figure for Case D is an estimate.

Information from these organisations was gathered from senior managers, human resource managers and computing professionals themselves, using interviews and focus groups conducted according to semi-structured interview schedules. These covered a broad range of issues including qualifications and skills, recruitment, training and careers, work organisation, pay, working time and flexibility, work/family, work regulation and organisational culture. The semi-structured format meant that the sessions were essentially discussions where respondents reflected on recent experience and interacted with each other and the interviewers. The sequence of questions, apart from initial introductory questions, was not crucial and most topics could be pursued as they arose. The number of interviews conducted in each case ranged from two to seven, and depended primarily on the complexity of the organisation.

Software development roles

While software development roles varied somewhat among our case study organisations, two relatively consistent themes emerged in terms of gendered divisions within this group of jobs. The first was an essentialist notion of the suitability of women for 'analyst' tasks, but at the same time a widespread recognition that men were the primary candidates for the main development and 'software architect' roles. The second was the idea that the time-intensive 'lived culture' around advances in computing tended to keep women at the lower end of the career ladder. These themes were evident in the responses of managers and employees, albeit with some variation between organisations.

The role of 'analyst' (analyst programmers and systems analysts) was seen not only as increasingly important in the industry, but also a job at which women would excel:

> I think the importance in the analyst role will grow...Twenty years ago the IT industry was full of men, and they decided that they knew best and people would get what they would give them, [but] that world has changed. The end-user is much more sophisticated now, so being able to interpret what they need [and translate that] into delivering a product [is very important]. So the role of analyst, which I believe women are much better at, is a strong role…I think [it] is a natural job for a woman, for a technical woman… [because] women think like at this level [indicating breadth] about a wide scope of things, where men sort of think like that [indicating a linear thought process] (female manager, E: 5, 16-17).

At the same time, however, this manager (among others) noted that the key software 'development' roles, the 'really kind of pointy-end roles', still attract more men – and often men who tend to fit the stereotype of socially inept technical wizards: 'these guys, our development guys … don't have a lot of client skill' (female manager, E: 17). In such environments, 'power', 'aggression' and 'wanting to dominate' were often seen as important aspects of the workplace culture (female manager D: 6; female manager F: 5).

In some organisations (particularly the small organisations immediately dependent on innovation for financial viability), it appeared that perpetuation of this type of culture around the development jobs was – at least informally – woven into recruitment and work organisation practices. For example considerable work was put into maintaining a particular (masculine) culture around the development team at Case G, 'because the environment they operate in together is very important, and to upset that environment is really costly ' (male manager, G: 9-10). New members of the team were carefully selected to fit the existing 'technological orthodoxy', and an important part of attracting new talent was to provide an environment 'where they're going to fit in, where they're going to feel valued, where there's an alpha geek that they…want to learn from (male manager, G: 16). Within this workplace, the development team were the leaders: 'they know everything, they're arguing about stuff, and they're really opinionated and they just live it' (male manager, G: 14, 15). Their status meant they were accorded a high level of flexibility and autonomy over their work, 'I let them do what they want to do [and they] get paid a lot' (male manager, G: 9, 20).

Amongst employees, there was a widespread recognition of competition among male staff in keeping technologically 'up-to-the-minute', and the level of time commitment required to keep competitive in such an environment – particularly for those who could not, or preferred not, to 'live' IT. Although a relatively small number of our male respondents were currently living the complete 'geek lifestyle' where their non-work time was spend on all-night computer sessions and LAN (local area network) parties that maintained their cutting-edge skills and knowledge, it was a facet of the culture in a few cases. At Case G, for example, the development team all had 'LAN at home, with eight computers on it, and that's all they do' (male manager, G: 15). Women sometimes referred to their earlier experiences with this culture: 'I didn't have kids then, and … my whole life was like a lot of the people are in IT ... it's like you eat, drink and sleep it' (female IT worker, A: 9). Another told us: 'When I first started in IT I got really into it, and now I'm still into certain aspects of it, but I'm not going to attend a LAN party when I could be out doing something else' (female IT worker, A: 8). More generally, it was seen as difficult for women to maintain the time commitment necessary to keep up-to-date: 'for women, if you want to build up your technical expertise … [you can], but it does take time and a reasonable amount of dedication and commitment …While you can [be] dedicated … nine to five, it's the after hours that you have difficulty with' (female manager, F: 3).

These pressures at least partly explained the tendency of some women to stay in programming roles. Programming was depicted as one of the 'easiest' paths for women in computing:

> because it's more of a discipline that doesn't require people to do a lot of hands on hacking or experimentation….[In comparison] sys admin…fits with people who are doing a lot more of the tinkering with operating systems …[so it's] a bit more difficult to compete with the men [in those areas]. (female manager, A: 3)

Overall, this interview data highlights some of the ways a masculine culture tends to be reinforced around the higher-level development jobs, through perceived associations between technical brilliance and a masculine hacker-style culture, the intensity of the lived IT experience and difficulties of keeping at the 'leading edge'. Although essentialist assumptions about the suitability of women for analyst roles were also evident, a clear distinction seemed to exist between these types of jobs and the leading development jobs in some organisations, and the less challenging role of basic level programming appeared a safe haven for those less engaged with IT culture.

Customer interface/technical design roles

As in our investigation of software development roles, examination of jobs combining customer liaison and technical design also uncovered some tension between an essentialist view of women as highly suited to such roles and barriers to advancement at the organisational level. The jobs under analysis in this section of the paper are consistent with the concept of 'hybrid' – terminology utilised in debates over the changing needs of the IT industry and a perceived need to rely less on technical wizardry and more on the actual needs of end-users (see, for example, Woodfield 2002). The combination of technical with business/communications skills exemplifies the notion of 'hybrid', and such jobs have been depicted as more likely to be attractive to women than socially isolating purely technical roles. If true, this is significant as pre-sales and consultancy jobs are relatively well remunerated at the higher career levels (see Table 3, which also shows, however, that women in our survey were considerably less likely than men to progress up these career ladders).

There was some evidence in our case studies that organisations were seeking a 'hybrid' style of worker, at least for some roles. At Case B, for example, Business-IT dual degree graduates were seen as desirable recruits – so much so that the organisation sponsored the program at the local university. The Human Resource manager noted that staff for the organisation's Consulting Group 'generally come out of a business IT type degree, have some technical skills … some functional as well…so that the mix is good…[and] there are more women…[These graduates are] well rounded [with good] communication skills' (female manager, B: 3, 4, 6). Employees were aware of this orientation and the demand for business and communication skills: 'communication skills are definitely what they're looking for…communication skills and customer focus' (female IT worker, B: 11)

Nevertheless, it was clear (particularly in the private sector organisations) that consultancy roles involved intense work pressures and were not suitable for those with family commitments. In one organisation there was a clear division between 'research and development' and 'professional services' jobs, with consulting in the latter grouping. One of our female respondents noted that:

> if you're married…with small children, then [consulting] is the last place you'd want to be because…you are working for a customer who's paying for your time…If there's an urgent problem, you've got to fix it and fix it now; and it's expected that you don't leave until it's fixed. (female IT worker, C: 14)

Where overseas travel was part of consultancy work (as in Case C), there was a clear tendency for women to move into the development job stream: 'on some [consultancy] teams it's very heavily male dominated, but a lot of that's because of the travel that's required… A lot of the ladies have children, and they try and go into the [development] area where they don't need to travel' (female IT workers, C: 11). This tendency was not limited to Case C, or to moves into software development roles. The HR manager at Case B spoke of her shock when a highly competent (female) consultant sought to transfer to the internal IT section of the organisation when she planned to start a family: '[her decision] sort of blew me away because she's one of *the*…top, most highly regarded performers in consulting' (female manager, B: 18).

These observations illustrate the pressures that run counter to the idea that women will find niches in relatively highly paid technical jobs in the IT sector, and the reasons why some might be more inclined to pursue careers in 'development' rather than 'consulting' sections of organisations, or alternatively to take up programming or routine support jobs rather than pursue careers. The product testing area in Case C, for example, was highly feminised – a situation a senior (male)

staff member explained in the following terms: 'I think there's a few who are … married. Happy just to do [testing work], not ambitious … It's a … bit of a dead end job. I mean for someone who's on the career move you don't stay in testing very long' (male manager, C: 5).

Conclusion

The analysis presented in this paper has highlighted difficulties in explaining the horizontal distribution of women in information systems jobs on the basis of simple (often essentialist) dichotomies that suggest women will be located primarily in 'soft' technical areas, particularly those involving customer liaison and communications skills, or in 'routine support' rather than 'design' roles. While there is some evidence for these general expectations, reality is far more complex, and one of the most striking patterns evident in the data is the level of vertical segregation (which of course is not peculiar to IT employment). The case study material illustrates some of the pressures that impede career advancement for women in these jobs, and although some are peculiar to IT (a competitiveness around up-to-the-minute skills honed through 'living' IT, and assumptions about men's mastery of technical skills), others reflect work organisation arrangements that make certain types of higher level jobs incompatible with family or other commitments. This not only reinforces vertical segregation, it also appears to generate horizontal shifts that help explain women's relatively high presence in programming and technical support roles.

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References

Acker, Joan. 1991, 'Hierarchies, jobs, bodies: a theory of gendered organisations', in Lober and Farrell (eds) *The Social Construction of Gender*, Sage Publications, Newbury Park.

ABS. 2004. *Information and Communication Technology 2002-3*, Cat No 8126.0

Baroudi, J. & Igbaria, M. 1995, 'An examinations of gender effects on career success of information systems employees', *Journal of Management Information Systems*, vol. 11, no. 3, pp. 181-201.

Beirne, M., H. Ramsay and A. Panteli. 1998. 'Developments in computing work: control and contradiction in the software labour process', in P. Thompson and C. Warhurst (eds) *Workplaces of the Future*, Macmillan, Houndmills.

Cockburn, Cynthia. 1985, *Machinery of Dominance: Women, Men and Technical Know-How*, Pluto Press, London.

Deakin, Rose. 1984, *Women and Computing: the Golden Opportunity*, Macmillan, Basingstoke, UK.

Fountain, J. E. 2000, 'Constructing the information society: women, information technology, and design', *Technology in Society*, vol. 22, pp. 45-62.

Greenfield, S., Peters, J., Lane N., Rees, T. & Samuels, G. 2002, *Set Fair: A report on Women in Science, Engineering and Technology to the Secretary of State for Trade and Industry*, Department for Trade and Industry, London.

Grundy, F. 1994, 'Women in the computing workplace: some impressions' in A. Adam. J. Emms, E. Green & J. Owen (eds), *Women, Work and Computerisation*, Elsevier, Amsterdam.

Margolis, Jane & Fisher, Allan. 2002, *Unlocking the Clubhouse*, MIT Press, Cambridge, USA.

Panteli, N, Stack J, Atkinson M & Ramsay H. 1999, 'The status of women in the UK IT industry: an empirical study', *European Journal of Information System*, vol. 8,pp. 170-82.

Turkle, Sherry. 1984, *The Second Self: Computers and the Human Spirit*, Simon and Schuster, New York.

Wajcman, Judy. 1991 *Feminism Confronts Technology*, The Pennsylvania State University Press, University Park, Pennsylvania.

Webster, Juliet. 1996, *Shaping Women's Work: Gender, Employment and Information Technology*, Longman, London.

Woodfield, Ruth. 2000, *Women Work and Computing*. Cambridge University Press, Cambridge.

Wright, Rosemary. 1996, 'The occupational masculinity of computing', in C. Chang (ed.) *Masculinities in Organisations*, Sage Publications, Thousand Oaks.