

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/266406928>

IT-related Gender issues: A literature review and initial local investigation

Article

CITATIONS

0

READS

8

4 authors, including:



[Andy Bytheway](#)

University of the Western Cape

48 PUBLICATIONS 263 CITATIONS

SEE PROFILE



[Melius Weideman](#)

Cape Peninsula University of Technology

40 PUBLICATIONS 52 CITATIONS

SEE PROFILE



[Sibongiseni Tunzelana](#)

Cape Peninsula University of Technology

3 PUBLICATIONS 5 CITATIONS

SEE PROFILE

IT-related Gender issues: A literature review and initial local investigation

Andy Bytheway

Thoko Speelman

Faculty of Economic and Management Sciences, University of the Western Cape

Melius Weideman

Sibongiseni Tunzelana

Faculty of Business Informatics, Cape Technikon

*A working paper from the “ICT in Higher Education” research project
Based at the University of the Western Cape, South Africa,
and funded by the Carnegie Corporation of New York*

Abstract

An examination of the literature reveals only limited research into the connections between gender and the use of information technology (IT) in organisations. Despite a wide literature on both subjects taken separately, there is little that explores the combination of gender and information technology. The literature that does touch upon this combination is limited in scope, or it fails to develop adequate typologies of gender and technology, leading to generalisations that are not helpful in dealing with problems. However, there is evidence that attention is beginning to focus on the use of IT by women's organisations, the role of women in the IT industry, and the different attitudes of men and women in the routine use of information technology in the workplace and at home. Evidence of activity in women's organisations and NGOs to promote the use of information technology as an empowerment opportunity for women is not well supported by evidence that this empowerment is happening.

Interviews with a small number of women working with (or in) IT in the Cape Town region suggest that gender issues in the work place are not particularly strongly related to the use of IT – rather they are issues that might arise in any work situation. Those women interviewed clearly believed that they were competent in the use of IT (and at least one of them was an expert in certain aspects of IT) and there is no evidence that special training needs to be provided to women wishing to learn about IT. But there is evidence that mentorship and gender education is needed to ensure equality of opportunity and promotion.

Keywords

Gender; Culture; Developing countries; Education; Human resource management; IS Management; IT employment; IT use; South Africa

Contents

Abstract	1
Keywords	1
Contents	i
Introduction	1
History	1
The Information management competencies sub-project	1
This working paper	1
The literature	3
Emergence and impact of technologies in the workplace	3
Observations on general gender issues	3
The rise of feminism and the feminist movement	4
IT in women's organisations and occupations	4
Women in the workplace	5
Choosing whom to hire – an interesting study of recruitment criteria	5
Giving the right impression – how to behave and get promoted	6
Beyond the call of duty – citizenship in the workplace	6
Achieving better organisational performance	7
Gender and technology	7
Young peoples' attitudes to IT	7
The nature of education	8
An international survey	8
A German survey	8
So, what about attitudes within IT?	9
Two views of Africa	10
Models for the analysis of IT-related gender issues	11
A theoretical model	13
Interviews	15
Overview of the results	15
Limitations of the interviews	15
Conclusion	16
References	17
Appendix 1: Literature search	19
E-text repositories	19
Online initiatives	19
Organizational resources	19
Appendix 2: Analysis of literature content	21
Appendix 3: Interview questions	24
Appendix 4: Analysis of interview content	25

Introduction

The UWC “ICT in Higher Education” research project is a partnership between the University of the Western Cape and a number of other tertiary institutions in South Africa. It has been made possible with funding from the Carnegie Corporation of New York.

History

In 2000, the Carnegie Corporation invited proposals from South African tertiary institutions, requiring only that they were based on a partnership between “historically disadvantaged” and “historically advantaged” institutions. The topic was left more or less open, according to local perceptions of need.

UWC, in partnership with Cape Technikon, Peninsula Technikon, University of Cape Town and Stellenbosch University submitted a proposal concerned with **Information and communications technologies in Higher Education**, now generally referred to as the “**HictE**” project.

After comments from the Carnegie review panel, and appropriate adjustments to the proposal and the project plan, the proposal was accepted and was launched in July 2002.

The project plan embraces three sub-projects:

- ICT competencies in the workplace
- ICT in the management of tertiary education
- ICT in the delivery of tertiary education

These projects are developing new applications of information and communications technology in higher education, new postgraduate programmes and learning resources for the information age, and new ideas and systems for the management of the learning process. The combination of these three sub-projects can be seen as:

An investigation of tertiary education for the information age, supported and managed by the beneficial use of information and communications technologies.

The Information management competencies sub-project

This sub-project is investigating the competencies that individuals and organisations need in order to deliver the full value of their information systems and technology investments.

There is a long history of difficulty in delivering value reliably. Senior managers’ concern has grown as the mystique of computing has eroded and as end-user computing and other modes of working have encroached on the work of the traditional IT Department. The IT specialists no longer “call all the shots”. Recent thinking reinforces the view that we will not succeed with technical skills alone; a wider set of *organisational competencies*, as well as appropriate *personal skills*, are needed to deliver real value [Peppard et al, 2000].

This sub-project is therefore directed at an examination of the wider set of competencies that all those working in business will need (and those working in public administration, and in communities), if they are to adopt and adapt to new ways of working. It is not confined to IT specialists, indeed it is more focused on those who are *not* IT specialists but who have the need or the opportunity to adopt the use of new technologies in their work.

This working paper

This working paper is the first deliverable in the sub-project. It was agreed at the start that, in order to develop a new framework with which to understand those who might be marginalised by reason of gender (or for other reasons), a working paper would be developed that reviewed gender issues in the workplace with a special regard to any related information technology issues.

The project plan (available at <http://www.uwvc.ac.za/ems/is/hicte>) indicates that the working paper should be based on a review of the literature. Happily, it has also been possible to gather some evidence from the workplace. A small number of women working in IT-related jobs have been interviewed and a first impression gained of the issues that are evident in the Cape Town region.

The working paper starts with a review of the literature, followed by an analysis and commentary on the interview results. Concluding comments and notes for others engaged with the HictE project are included by way of summary.

The literature

The search for relevant articles and sources to inform this working paper was based, naturally, on keywords related to gender and information technology. A wide range of sources was invoked, as well as the usual web search engines and bibliographic databases (see Appendix 1, where the sources accessed are tabulated).

The general result was disappointing, in the sense that there seems to be very little literature that takes the two themes together and works with them carefully and with outcomes. On the other hand, this is evidence that the decision to research these topics in the HictE project was an appropriate one. No doubt further literature will become apparent, and the reader is urged to contact the research team (see the cover sheet for email addresses) should there be further literature that is germane to the discussion. Here the literature is presented under the following headings:

- Emergence and impact of technologies in the workplace
- Observations on general gender issues
- Women in the workplace
- Gender and technology
- Models for the analysis of IT-related gender issues

Emergence and impact of technologies in the workplace

There is little argument about the impact of technology on the workplace. There are different views about the nature of the benefits of IT (as seen in organisational performance) but whilst this is being debated we might note it is now fifteen years since the seminal paper by Peter Drucker that – for very many people – marked the turning point. It was Drucker that first argued the real consequences of IT in the workplace in his discussion of the information society and the knowledge worker [Drucker, 1988]. We do not need to linger in a critical appraisal of his argument – there is now copious literature that deals with the very significant effects of IT that are evident in every day life at work (and at home).

What is not at all clear is the way in which *gender* has affected the evolution of current attitudes to information technology in the workplace. In the very early history of the business there seems to have been equanimity about gender in IT employment¹. Even 100 years later, as the real information technology industry began to grow, it seemed to many to be a domain of equal opportunity. This was a new era, and as we moved into the 1960s and 1970s (at least, in Europe and North America) it seemed that the IT industry would not be hampered by any unreasonable gender bias.

Clearly, as we shall see, this was not to be the case.

Observations on general gender issues

At first sight there seems to be more popular literature on gender issues than there is studied academic literature. For example, popular books such as “Men are from Mars, Women are from Venus” Gray [1992] and “You just don’t understand” Tannen [1990] have become well known and are sometimes quoted [see for example Colwill & Townsend, 1999]. There is some consistency in the “traditional” gender values identified in these books. For example:

The Male ...

- seeks power, competency, efficiency and achievement
- communicates on a "need to know basis" with answers not questions

¹ We could mark the early history of information technology by noting that Ada, Countess of Lovelace, worked with Charles Babbage in the middle 19th century as the world’s first “computer programmer”. No gender bias in the early history of the IT business?

- lacks a will to explore the issues
- disagrees and focuses on things rather than people
- is averse to mistakes

The Female ...

- seeks communications and relationships with a common purpose
- communicates to be understood, with questions
- disapproves rather than disagrees
- focuses on people

[based on Gray 1992, and Tannen 1990, as quoted in Colwill & Townsend, 1999].

While there might be no immediately available proof that these gender traits are really true, these assertions at least give us the starting point for a discussion about what *might* be true. We must turn to the academic literature to investigate the serious research that has been done. It is useful to start with a brief look at the literature on the feminist movement, where there has been some adoption of IT.

The rise of feminism and the feminist movement

The rise of feminism could be said to parallel the emergence of the IT industry – it embraces roughly the same time period. If it is true that women have become *under-represented* in the IT industry in that time, from an equitable start in the mid-20th century, then it does not reflect well on the efforts of the feminist movement. But, as we shall see, this is a very complex area with very many factors and forces at work.

We do not need to explore the whole of the vast literature on feminism but it is interesting to note that, as it has evolved, the feminist movement has been globalising in parallel with the general globalisation trend, and it has adopted information technology in order to further its aims. Gelb [2002] details the internationalisation of feminist NGOs and the way they are "capturing" international organisations. Gelb's work reveals that the EU provides the strongest evidence of change; Japan has been to some extent influenced by the feminist movement, but the USA has failed to get involved in this internationalisation to the same extent and shows fewer signs of change. Perhaps the very different "starting positions" of these three regions need to be fully understood. After all, women in Japan and in many parts of Europe have been famously disadvantaged in comparison with women in the United States.

IT in women's organisations and occupations

The Pacific Rim has been particularly involved in the IT industry and is a major supplier of IT components. It is therefore not surprising that a review of the activities of women's organisations in the region shows that they use IT [Cabrera-Balleza, undated]. This review identifies certain benefits that arise from the introduction of IT in the NGO context. It provides:

- access to news information and research sources (e.g. NGO databases);
- improvement of personal knowledge and skills;
- participation in global activities (many facets);
- access to funding.

From this it is evident that the *communications* capability of information technology is the key factor here – email and the World Wide Web is what enables all of the above and the review affirms that email is one of the most valuable services of the IT-enabled organisation.

Barriers and problems were also identified:

- a lack of political and economic stability in certain parts of the region
- lack of national policies for the use of IT
- the cost of internet access - US\$50 per month is not affordable in the poorer regions
- a simple lack of skills
- the use of language – English is only the second or third language for many in the region
- the quality of information on the web - 70% is said to be pornography

Cabrera-Balleza proposes actions to address some of these problems, but it is interesting to note that few of them are gender-specific. With the exception of pornography, which is likely to be specifically offensive to many women, all the other observations would be equally applicable to a male-oriented organisation.

Another report [Dickinson, 2002] reveals that women in Tanzania are now on the Internet and gaining benefits. Economical, wireless-based Internet cafes in Tanzania are proving useful to women, many of whom are in small businesses (or helping people in business with no internet access) and some of whom are students.

Previous research at UWC has examined the benefits and problems in applying ICT to tourism-related micro-enterprises in the Cape Town region, mostly one-woman micro-enterprises [UWC Department of Information Systems, 2000]. In this case the limitations that apply to disadvantaged people, working in an industry dominated by large (some multi-national) organisations, became very clear. Access to capital, training in the use of IT and an understanding of the competitive context for their businesses were all issues that emerged as this UWC study progressed. It is clear from this work that IT alone is not helpful. There are several preconditions that will apply before benefits are achieved.

The general picture is that there are isolated examples of information technology benefiting women, but there are no striking gender differences apparent. Most of what is written would apply equally to men, should they find themselves in a similar situation. Perhaps the real question is: what differences might there be in the *response* of men and women in these situations?

Women in the workplace

When we look at the situation of women in the *workplace* (usually assumed in the literature to be a male-dominated workplace) the gender differences are more evident. Three examples – chosen for their novel view of the employment situation – let us see expert views of *recruitment* issues, *behavioural* issues and *commitment* to the job. This work does not necessarily focus on gender, but the examples help us to see some well researched academic work that exemplifies the approaches that we might choose to take in our own research project. Another example where gender creeps in, but is not the main feature, is also included.

Choosing whom to hire – an interesting study of recruitment criteria

Recruitment of staff might seem a simple matter on the surface but it is much more complex than it appears. Segalla, Sauquet & Turati [2001] undertook an interesting investigation of recruitment in Europe and manage to make some sense of the complexities.

By asking European managers to indicate how they would choose recruits, the analysis shows that there are significant variations in how French, Spanish, German, Italian and British managers would choose recruits, but *not* in any sense concerned with gender. They provide an interesting research design that could well be replicated locally in South Africa in order to elicit a better understanding of gender issues in recruitment. What Segalla *et al* show, very successfully, is that there are different approaches to recruitment and that different communities will use different criteria in selection.

One approach is *symbolic*: Will this candidate contribute to our image?. Another approach is *functional*: Will this candidate be able to do the job? Whilst we might consider these two approaches to be obvious, the interesting feature of this work is that there are *significant* national variations in the balance of symbolic and functional considerations, and that the detail within each (questions of language ability, schooling, internationalism and so on) also varies from one European country to another.

We are not in Europe but there are messages here for our multi-cultural society. As noted, the research design adopted by Segalla *et al* will be helpful if we need to do something similar in different local recruitment situations.

Giving the right impression – how to behave and get promoted

People at work want to give the right impression, especially to those who might influence their promotional prospects – line managers and others with influence. In the academic literature, one school of thought terms this *impression management*.

Impression management has an existing literature. Singh & Vinnicombe [2001] provide an overview that includes many additional references. Briefly, impression management strategies are said to include at least these three:

- **Upward influence and ingratiation strategies** (crucial for women, according to some authors)
- **Self focused strategies** (self-presentation and non-verbal behaviour)
- **Organisational citizenship strategies** (doing work that is additional to the normal tasks of the job)

Previous work by these authors has found that men and women see commitment differently: men see *task delivery* (highly visible) and women see *quality and involvement* (less visible) – at last we are beginning to see real evidence of gender differences. Singh & Vinnicombe investigated the proposition that men and women have different impression management strategies to promote what they see as high commitment to their work, and to improve their prospects for promotion.

By working with senior managers of both genders, Singh & Vinnicombe established that a higher proportion of women use impression management strategies than men (but we are talking about senior women here – the same might not be true at other levels). Previous work in the United States has not highlighted gender differences in this way. Further, the study has established that women believe that men use impression management more than they (women) do. If this seems to be a somewhat unexpected outcome, then this confirms that the approach taken by Singh & Vinnicombe may be replicable in the South African context and might reveal interesting aspects of the way that our diverse population differs in self-promotion and impression management.

Two quotations from the final section of this paper are revealing:

For highly committed women managers, reading what goes on as far as recognition and promotion in their organisation is concerned, and managing the impression which they give of their commitment may enable them to overcome some of the residual gender stereotyping in performance judgements. This may be achieved both through the visible demonstration of desired behaviours resulting in enhanced real performance and hence reputation (the desired image), and through increased self-esteem and consistency with the actual self-image as a highly committed, high performing manager.

[Singh & Vinnicombe, 2001]

The question of real or apparent commitment emerges, and is soon picked up again:

Managers should recognise that women who may be just as committed, competent and ambitious as men often do not feel as comfortable in using impression management tactics to enhance the visibility of their commitment. They may wait to be noticed, delivering quality performance, quietly putting themselves out, volunteering and acting as good organisational citizens, whilst others push themselves forward. In a busy work environment, the manager may need to make efforts to ensure that such commitment is recognised and rewarded, tapping this potential managerial resource for the organisation, through developing and releasing the leadership potential of such committed women. When coupled with high performance and high commitment, impression management is a tool which women and men can take up and use to their own and their organisation's advantage.

[Singh & Vinnicombe, 2001]

Beyond the call of duty – citizenship in the workplace

Kidder [2002] provides us with another interesting view of behaviour in the workplace, picking up on the idea of commitment and citizenship evident in the quotation from Singh & Vinnicombe above. Commitment to one's job, as indicated by activities *beyond* the normal work commitment, is referred to as

organisational citizenship behaviour (OCB). Kidder undertook a quantitative analysis of gender in nursing and engineering – two employments chosen for their strong gender connotations. Kidder examines gender at the level of biological gender, gender orientation, and gender typing (through the chosen occupation). Hence, he covers not only actual gender, but also gender preference and the nature of women in “men’s work” and men in “women’s work”.

Organisational citizenship behaviours explain work behaviour that is discretionary and not linked to the occupational reward system. Kidder quotes extensively from the existing literature [for example, Podsakoff & MacKenzie, 1997], arguing from it that OCBs are beneficial to organisational performance but noting that no prior work in this area looked at *gender* in OCBs although previous work indicates the persistence of gender stereotypes, and therefore that gender is very important to understand. In order to unpack the concept of organisational citizenship behaviour he invokes the concepts of *altruism* (helping – suggested by empirical research to be a female trait) and *civic virtue* (which inclines to voicing ideas and issues sometimes destructively – suggested by other research to be a male trait). He hypothesises that

- Being female will be positively related to the performance of OCB *altruism*
- Being male will be positively related to the performance of OCB *civic virtue*

Responses from 251 nurses and 195 engineers allow Kidder to conclude that gender is an influence on organisational citizenship behaviour, especially in “gendered” occupations, and his findings support prior work about gender traits.

Achieving better organisational performance

The evidence in the literature is that OCBs improve organisational performance. Of course we hope that this will also be true for those organisations working on new information systems. Kobelsky [2001] analyses IT investment and business performance and argues that labour practices (business processes?) have to be upgraded with worker skills in order to achieve the real benefits. A combination of “participatory practices” and “high use of IT” brings the benefits. This paper presents typologies for both, but his findings show that the former is changing only marginally and “paradise” (quoting Drucker) will be a little longer arriving than we had hoped.

In this regard, he then highlights the problems when a significant portion of the workforce is female. Many workers in factories are young women with a three-five year work horizon before they start their families (he argues). The persistence of physical manufacturing activities works against the adoption of new practices based on new IT. (But is he being fair to the female employees?)

Gender and technology

Mayfield has asserted that “IT is an industry without women” [Mayfield, 2001, cited in Woszczynski & Myers, 2002]. This sweeping generalisation is clearly not true, but the fact that women form a minority in the IT industry is recurrently evident in reported research despite the early presumptions about equality of opportunity in the IT industry.

Young peoples’ attitudes to IT

Teo & Lim [1996] undertook a gender study of students’ attitudes to personal computers, in Singapore. 41% of the respondents were female, revealing even at this level (higher education) that a majority of interested persons are male. They found through quantitative analysis that:

- ease of use of PCs is more problematic for women
- complexity is a factor separate from ease of use
- women do not see PCs fitting into their job as easily as men
- women derive image and status from use of PCs
- men are more willing to voluntarily take up the use of PCs

Teo & Lim derived the factors for their questionnaire design from the prior literature. Theirs is not an intensive piece of research work, but the detail is interesting and supports the argument that “IT” is no

longer just about the technology – the need for strategic thinking about information (rather than just thinking about the technology) favours women. This is an interesting outcome that we can pick up and develop later in this paper.

The nature of education

A review of technical education in the USA has revealed a bias away from technical subjects in women's choices in post-secondary education [Woszczynski & Myers, 2002]. In one survey quoted it was found that *no women at all* chose to study maths, and at the Massachusetts Institute of Technology in 1995, women computer science majors made up the *smallest* number in any undergraduate degree offered.

Woszczynski & Myers point out that previous studies have suggested making classrooms and learning resources more friendly to women, but they believe that a competitive culture and lack of professorial interest works against women in technical studies. They propose that mentors are one way of redressing the difficulty and equalising conditions for women. They refer to Expectancy/Valency theory [from Vroom, 1964]. This theory concerns the relationship between the individual and the work environment: *valency* is the individual's cognition about value of choice, *expectancy* is the expectation of success of choice. They propose research based on analysis of mentor involvement and same- and different-sex mentors, but the work (as reported at this stage) remains to be completed.

An international survey

A much more broad ranging study was undertaken by Hafkin & Taggart [2001]. It looked at different factors affecting women in IT, on an international basis. They summarise the current situation (women users are few and not representative) and list obstacles to access (education, language, cost, social norms).

Their study found that women are a minority of Internet users (but with variations from country to country) and tend to use IT at work for *production* or for *communication*, some in their own businesses. They also find that few women work in the IT Sector (doing IT work) and that few women produce Web content. However, the study finds that there is economic and political empowerment through IT for women and for some there is a real advantage. Africa is highlighted as an area of special concern because African women have the lowest levels in the world of participation in technical education, at all levels.

Hafkin & Taggart provide many references and endnotes, but they fail to address the variety and nature of work that accompanies IT (see "attitudes within IT", below) and seems to take too simplistic a view of the work that might be done by women, that might benefit from the application of IT. However, they provide plenty of evidence that there is a problem.

A German survey

Germany, being a relatively rich and progressive country in recent times, has been able to address a problem when they saw one. One report of an initiative to reduce the gender digital divide in Germany [Kompetenzzentrum 2000] makes interesting reading and includes comments comparing experiences with other European countries.

It reveals that there was a rising awareness of gender issues in technology even in 1978, and argues that they have only finally been addressed (by the Kompetenzzentrum) in the year 2000. Historical difficulties with improvement initiatives are noted. They explain that an earlier initiative launched in 1978 assisted 1200 young women with training and education; the prospects for the candidates looked good at the start but were not fulfilled. Hence we learn something about the dynamics of change in this particular context. The new initiative is reported positively. There is far more demand for courses than places, and – even more promisingly – willing cooperation from employers. Hopefully these fresh prospects will be fulfilled unlike those in 1978. The study found a severe shortage of IT skills and highlights the shift from demand for purely technical skills to implementation, team management and problem solving skills. This reinforces the idea that the profile of demand for "IT" skills is changing, and that with a wider spectrum of employment activities the prospects for women with softer skills might be improving.

The educational position of women in Germany seems to have improved significantly. In 1995 (for the first time in history) more women entered German universities than men. But, attitudes in business still

mitigate against women in their careers, and there is evidence that our earlier judgement that things are getting worse for women in IT (in the long term) are confirmed:

When computing was a new discipline the sector was more open to women than it is today, when both computing and information technology are clearly defined as male domains"

[Kompetenzzentrum 2000]

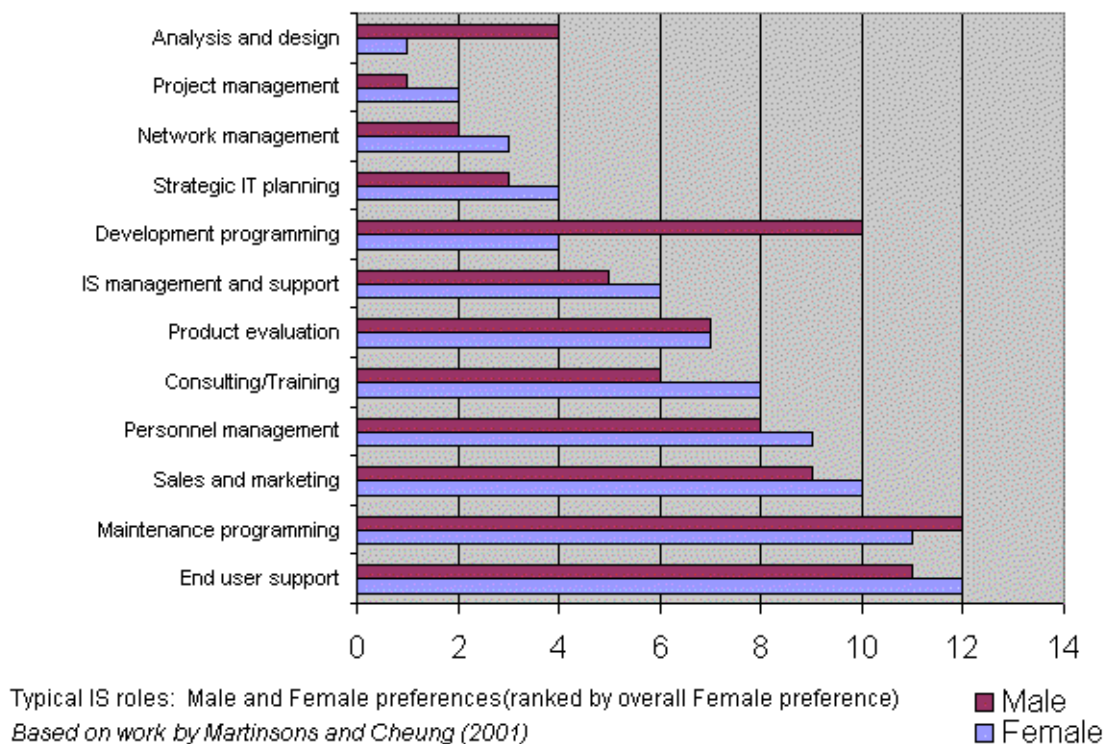
The report has some very specific comments about gender differences, and the extraordinary logic that is sometimes applied to establishing the differences:

The information technology skills required in traditionally female areas of work such as the secretarial and paramedical sectors are often devalued. It is claimed that women 'just use the computer' but 'they don't do the technology'. For men, it seems to be extremely important for 'male' technical skills to be clearly differentiated from 'female' skills, however small the real difference may be. Research on the transformation of the French printing industry found that the distinction between skilled male work and unskilled female work was based merely on a cable connecting the men's keyboards to the central computer - a mechanical addition that made no practical difference to the work, but was of crucial importance to salaries and working conditions.

[Kompetenzzentrum 2000]

So, what about attitudes within IT?

Martinsons & Cheung [2001] undertook a much more specific study of gender differences, within IT. The chart below is developed from their results and shows the *preferences* of respondents for different work roles within the IT function – systems development, project management and so on – by gender. The results of the survey are ranked by *female* preferences, to make the differences more obvious. *Least preferred* female roles are at the top, *most preferred* female roles at the bottom.



There is a striking preference amongst the men for analysis, design and development programming; surprisingly perhaps, maintenance programming is liked by women, as is end user support and some of the soft functions like education, sales and consulting. This would bear further investigation, as the taxonomy of roles is not particularly well developed and there may be striking differences between cultures, as well

as between genders. The investigation could also be extended or adapted for people working in non-IT roles but who are dependent on IT. But, to be fair to Martinsons and Cheung, this result is just one taken from a much broader investigation of the impact of changes (in IT itself) on IT personnel. It is a pity that although they feature gender early in their introduction there is very little about it in the analysis, apart from the results presented above.

Two views of Africa

Two sources were found that provide a specifically African view of gender issues in IT – one from the IDRC and one from the University of Cape Town.

The IDRC has published a collection of papers [IDRC, 2000] from different experts, originally presented at a conference entitled "African Women and Economic Development: Investing in Our Future", held from 28 April to 1 May 1998 in Addis Ababa, Ethiopia, and hosted by the United Nations Economic Commission for Africa.

The papers are replete with references to meetings, conferences and organisations seemingly intended to address the problems and the opportunities, but it is difficult to find practical evidence about what works and what does not. Policies are the focus here, not practices.

The third of these papers, "Getting gender into African ICT Policy: a strategic view" (by Gillian M Marcelle) is of great potential interest but on reading it is found to be thin on logic and argument. It offers a "model of ICT" but does not apply it in any way, which is disappointing. The chapter includes short comments on ICT policy activities in developed countries and asserts that African policies are not co-ordinated: Africa is a consumer not a supplier of IT, and that makes for obvious differences in comparison with developed countries. A more interesting comment notes the differences between anglophone and francophone countries – this is a point that reminds us to be careful of cultural diversity.

The early analysis concludes that very little has been achieved in practice, and it offers strategies to do something about it – to incorporate gender into ICT policy and to focus public policy intervention. With an eye to South Africa, "SANGONeT" and "Women's Net" are quoted as good examples, and the CSIR is mentioned as having a working group². Some of the recommendations are:

- Allocate ICT development resources to women
- Provide and improve telecommunications infrastructure
- Build technological capability
- Facilitate and encourage involvement of women in technological innovation
- Create culturally resonant content
- Design and deliver appropriate training mechanisms
- Increase effective demand for ICT products and services

We should note the "technology push" that is evident in these recommendations. It is surprising, on reflection, that there is no suggestion here to research the *lifestyle* and *activities* of women, and to map technology potential to the possibility of real benefits for women through an understanding of their lifestyle and activities.

The technology bias continues in the recommendations to stakeholders (governments, NGOs and so on), although amongst the calls for additional infrastructure and technical expertise there is a plea for consultation, monitoring and evaluation, affirmative action and a recognition of the specific needs of women (but they are not investigated or enumerated).

Perhaps the one message that comes from this lengthy report is that the situation really is complex, and that simple actions will not meet the needs that are evident. However, without establishing and building

² But a search of their respective web sites produced little evidence of progress – the people working on these specific initiatives need to be invited to discuss how some kind of co-operation might be helpful to them and to us.

on a full understanding of the typical lifestyles of African women, and without mapping ICT opportunities to those lifestyles, this kind of analysis is not really going to get us anywhere in practical terms.

The UCT report is more interesting [van der Merwe & Stander, 2002]. A substantial number of responses were received to a web questionnaire, and the report starts with the observation that only 20% of IT workers in SA are female. About half are married, one third single, the rest presumably divorced or living in different circumstances. 80% of respondents were white and 60% were from the IT industry. 83% were in permanent employment and had an average of 9 years' experience. 73% report that they have experienced discrimination (higher with contract staff)

This study reveals the importance (to women) of flexible timekeeping, equal pay and work-from-home opportunities; reduced hours are not so important as flexibility because of perceptions of exploitation of part time workers. It also reveals the importance of mentoring. Although few respondents have mentors, oddly they find they end up doing it themselves (for others).

85% feel there is gender bias in the IT industry and 74% believe that bias arises from the possibility of maternity commitments. There is wide agreement that women are under-represented in IT, especially at senior levels. Family support for careers is seen as important, and the view is that male colleagues do not make the same sacrifices for career advancement – the "Old Boy's network" does it for them. But there is evidence that there may be the beginning of an "Old Girl's network" ...

In summarising areas of concern, the five highest are:

- Time (72%)
- Management style of superiors (60%)
- Different roles for women (62%)
- Professional-personal trade-offs (61%)
- Sexism (59%)

There is a general view that having technical skills is important, but it is not an implicit problem for women. There is no reason why they should not be just as technically competent as a man, and they believe that they are so.

Models for the analysis of IT-related gender issues

The literature reviewed here is largely devoid of the causal and conceptual models that are commonly used to understand and research management and business phenomena. Apart from one passing reference to Maslow's hierarchy [Maslow, 1970], there were no frameworks or conceptual models offered in any of the papers. The more earnest research papers tended to be quantitative rather than qualitative, which always tends to a sparse result when compared with qualitative research involving interpretation and analysis of case studies and in-depth interviews. Given the relative difficulty in assembling this collection of literature, it seems unlikely that any such models will emerge³.

One of the most promising items found was from the Association for Progressive Communications web site ("APC" – a women's networking support programme), which includes a limited number of resources. One of these is a paper entitled "Gender and information and communication technology: Towards an analytical framework" [APC, undated]. This paper argues that we have lost democratic control over technology and its use, and over communications. There are increasing inequalities of access and a failure of education to bring women the required competencies to harness the benefits of technology.

Strong stuff, but this is a short paper that really only tabulates some wide-ranging feminist perspectives on women and ICT, along the following lines:

- "Hidden from history" (women are largely omitted from the historical record)

³ But at the time of writing delivery is awaited of a recommended "standard" textbook that was not available locally – this remains to be received and reviewed.

- “Women in technology” (women have been excluded - now shifting to inclusion but there are still salary differences)
- “Technology based on women's values” (humanism, pacifism, nurturance and spiritual development – rather than what we have now – some examples would be useful but none are given)
- “Technology and the division of labour” (male dominance of technology in work)
- “Gender and technology socially defined” (no redefinition offered – so let's redefine them now!)
- “Technology as culture” (technology meanings are not given, they are "made")
- “Democratising knowledge and technology” (arguing for re-interpretation of northern values in the south, and in developing countries)
- “Subsistence perspective” (seeking ecologically sensitive, traditional, women- and people-based knowledge systems)
- “From experiences of daily life” (women want to be involved in decision making, so that IT is used in a gender sensitive and practical way?)
- “Gender in communications” (argues that women are badly represented and the stereotypes must be challenged)
- “Feminist communications” (put women in control and recognise the diversity of womankind)

This is an interesting tabulation, but it is not a framework and as it stands it is not the sort of model that would assist us in furthering research of information technology related gender issues without some further conceptualisation. However, it gives us a starting point and analysis of the concepts explicit or implicit in the text allows us to derive a model of our own. This is done in the next section of the paper, and the model is then developed to incorporate some of the other important features of the reviewed literature.

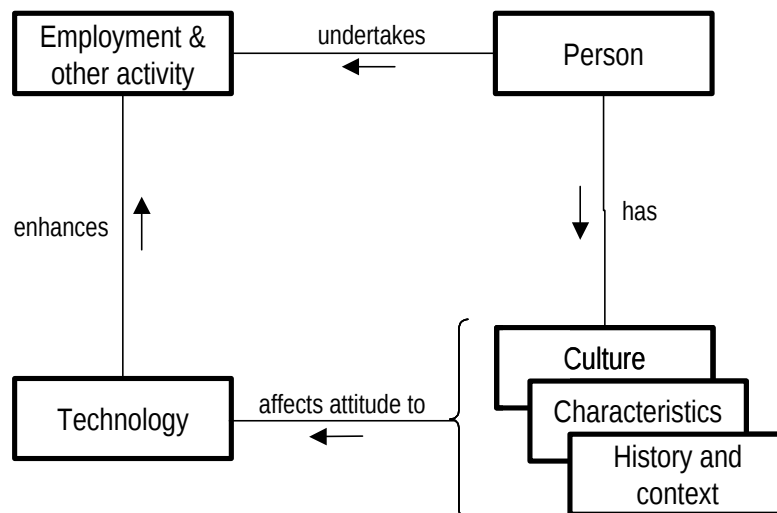
A theoretical model

As noted in the review of the literature (above), the APC paper talks of a framework but fails to provide a usable framework for further research and analysis. However, it does provide some interesting evidence. It makes clear, repeated reference to *technology*, and hints strongly that *women* have *characteristics* that affect their *employment activity*. The way in which they might be affected depends not only on their characteristics, but also on their *history and context*, and their *culture*.

This may seem like a sweeping simplification of the content of a short but interesting paper, but it is presented here as a generalisation of the much more detailed content of the paper. It allows us to put forward a conceptual model that relates these things graphically, based on the italicised words in the summary above:

A framework for the analysis of gender issues in the adoption and use of information technology

Loosely based on work by the APC Women's Networking Support Programme
(See APC(undated) in the bibliography)



Here we have a tentative model that allows us to debate and agree the possible causes and effects that need to be researched.

What is interesting in the APC paper, as well as in most of the other literature, is a complete *absence* of any detailed consideration of the *kinds* of technology that are at hand, and that are impacting on the lives and work of women. This is astonishing in view of the very wide variety of technology that is available and that is in use. The occasional reference to email, or to the World Wide Web, is no substitute for a proper analysis of the dramatically different technologies that are evident, and the dramatically different uses to which they are put. It is not sensible to couple a comment about young female factory workers (and their short term expectations of employment ahead of child rearing) with a comment about a senior female manager (and her use of decision support software). This tendency to ignore the variety of technology and the variety of applications in women's work (and in their lives generally) is dangerous and must be addressed before we can draw useful conclusions.

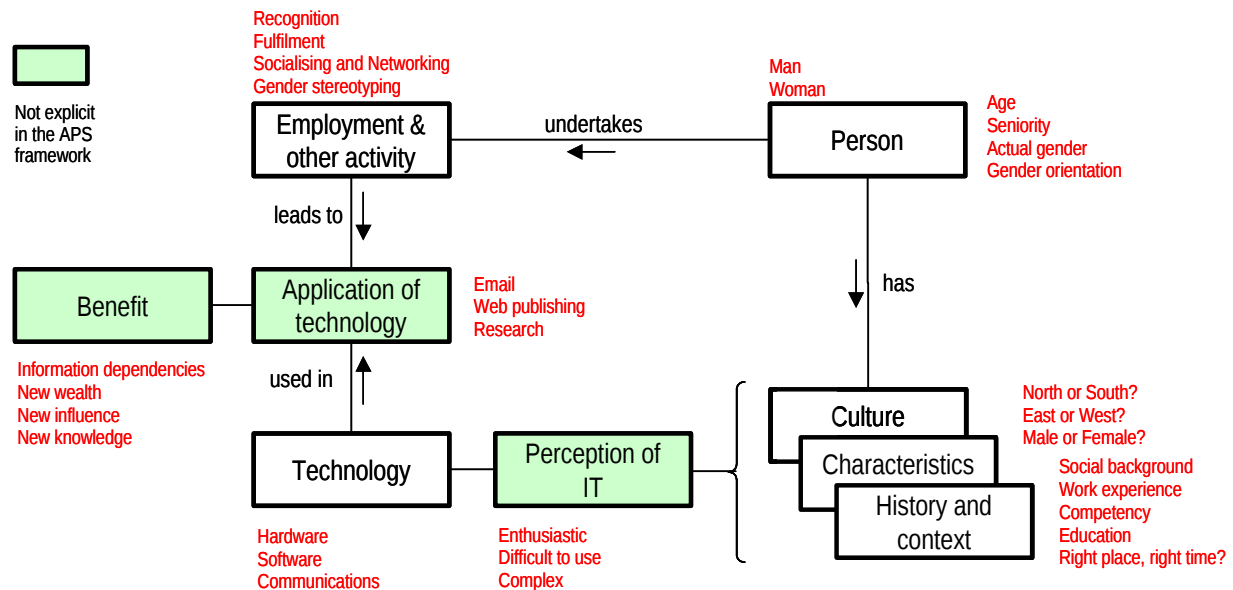
We can extend the model to account for this, by introducing additional concepts: the *application* of technology, the *perceptions* of technology held by the women who are using it or who are expected to use it, and the *benefits* that the technology might have (or can be demonstrated to have). Each of these

concepts is evident in the other literature and therefore needs to be incorporated if we are to have a reasonably complete view. (See the additional elements of the model, shaded).

We can also extend the model to accommodate some of the other concepts evident in the literature. Because we have chosen to generalise the concepts at hand, some of what the rest of the literature gives us is detailed examples (or “instantiations”) of the generalised concepts. These have been added to the model as annotations to each of its main features. (See the annotations against each box).

A framework for the analysis of gender issues in the adoption and use of information technology

Loosely based on work by the APC Women's Networking Support Programme
(See APC(undated) in the bibliography)



(Note that in Appendix 2 there is a tabulation of the nine domains in this model, and an explanation of which literature items contributed to them.)

At this point in time, the model will not be further developed – it must be reviewed and validated. The achievement of this initial model is a sufficient conclusion to the literature review presented here, and it gives us the framework we were seeking to analyse the substance of the interviews that were undertaken in the second part of the study.

Interviews

At the time of writing structured interviews had been undertaken and reported with six women, each of them working in the IT field or being involved in the use of IT. These interviews took place ahead of the literature review, but the responses to questions can be mapped to the model that is emerging. The questions asked are tabulated (and mapped to the emerging model) in Appendix 3.

Overview of the results

It is clear from the variety of answers that different opinions prevail in some areas of concern, but on some matters there was general agreement.

- There is gender bias in the workplace, but it is not necessarily associated with the development or use of information technology. The gender-related problems that were reported might occur in any working environment.
- Women may be as technically competent as men, or more competent, but it does not assure them of recognition or promotion.
- The women interviewed all used information extensively in their work and affirmed that they are dependent on information technology for their work performance.
- The women interviewed all use a variety of technologies but principally at the level of the “Office Suite” and the Internet. There are no apparent problems in learning and using these facilities – all subjects expressed confidence in their abilities.
- There was no general wish to “keep up” with the latest technologies, although one subject (being a specialist in security systems) needed to keep up with international developments.
- Mentorship and support mechanisms are needed to address problems arising from gender bias in the work place.
- Success stories should be noted and promoted in order to encourage women in the workplace, and to inform men about what women can do and how equality might be achieved.
- There is evidence that “impression management” (as discussed in the literature review) is used by the subjects in order to defend or maintain their position and to present themselves in the best possible way.

Limitations of the interviews

- There was no enquiry about the use of IT outside the workplace.
- The subjects were all relatively well educated or very well educated, and are not representative of currently disadvantaged or marginalised people.
- The number of subjects is not adequate to be able to draw final conclusions.
- The information about the history and context of the subjects – which is likely to be a key factor in determining success in the workplace – is rather limited and needs to be augmented.

Conclusion

This is the first working paper in what is intended to become a series concerned with information management and the competencies that are required in the workplace to achieve it. It has been shown that in one potentially important area – that of gender – there is little prior work that deals effectively with the combination of gender issues and information technology issues. However, there is evidence that attention is turning to these two things in order to ascertain whether there are problems or opportunities that can be addressed by a better understanding of the interaction between them. Some specific concluding comments are as follows:

- **Research design:** The review of the literature has provided a number of ideas for research design, and it provides a number of general ideas about gender management that can be further analysed in the specific domain of information management.
- **Need for a typology of IT activities:** The lack of any taxonomy or typology for information related activities was surprising. Only one item addressed this obviously important issue directly, although others admitted that the range of IT-related activities in business is extending to embrace strategy and change management, as well as technology implementation. At the first level, there is the difference between those who *develop* IT and IT systems, and those who *use* them.
- **Need for a typology of IT:** Much literature refers to “IT” without any real explanation about what it is seen to be. The very wide range of different technologies and the very wide range of activities to which it is put both need to be understood. Gender response to different technologies and different applications could vary widely and it is naïve to assume that IT is in any sense homogeneous. It is not.
- **No frameworks for gender management:** In the same way, the lack of any widely deployed models for gender management, were both surprising outcomes. In management research into information systems and information technology issues, it is common to develop models of cause and effect in order that phenomena can be better understood and better managed. This is evidently not the case in the literature that has been identified, and therefore further work in this area may be justified and may be of wide interest.

At least one of the experts quoted here (Dr Val Singh of the Cranfield School of Management) has affirmed in recent correspondence that there is a great deal of interest in the effects of IT in the workplace upon women, and this avenue of enquiry will be kept open in order that research opportunities might be better understood and taken up, as may be appropriate. However, we are learning that it is not just about the “IT” – there is a range of activities from pure technology to pure business strategy – from the hard to the soft. We might anticipate that gender related issues will differ markedly from one end of this range to the other. We really must learn to distinguish between “IT”, “IS” and “IM”: information technology, information systems, and information management. They are not at all the same thing.

References

- APC (undated): 'Gender and information and communication technology: Towards an analytical framework', World Wide Web, URL: <http://www.apcwomen.org/resources/research/analytical-framework.html>, Date visited: 2002/11/20
- Cabrera-Balleza V (undated): 'ICT and Gender issues in Asia and the Pacific', World Wide Web, URL: http://www.isiswomen.org/onsite/ict_gender.htm, Date visited: 2002/11/20
- Colwill J & Townsend J (1999): 'Women, leadership and information technology', *Journal of Management Development*, Vol 18, No 3, p207-216
- Dickinson D (2002): 'Tanzanian women get online bug', BBC News, November, URL: <http://news.bbc.co.uk/1/hi/technology/2487821.stm>, Date visited: 2002/11/28
- Drucker P (1988): 'The coming of the new organisation', *Harvard Business Review*, Vol 66, Jan/Feb, No 1, p45-63
- Gelb J (2002): 'Feminism, NGOs and the impact of the new transnationalisms', University of California International and Area Studies Digital Collection, URL: <http://repositories.cdlib.org/ucispubs/editedvolumes/1/9>, Date visited: 2002/11/20
- Gray J (1992): 'Men are from Mars, Women are from Venus', Harper Collins, New York
- Hafkin N & Taggart (2001): 'Gender, Information Technology and developing countries: An analytical study', United States Agency for International Development, June
- IDRC (2000): 'Gender and the information revolution in Africa', IDRC, URL: <http://www.idrc.ca/books/focus/903>, Date visited: 2002/11/18
- Kidder D L (2002): 'The influence of gender on the performance of organisational citizenship behaviours', *Journal of Management*, Vol 28, No 5, p629-648
- Kobelsky K (2001): 'Paradise delayed: The impacts of IT on performance and workers', *Proceedings ICIS 2001*, December
- Kompetenzzentrum (2000): 'Reducing the gender digital divide in skills and employment in Germany', Bielefeld Competence Centre, December, URL: <http://www.kompetenzz.de>, Date visited: 2003/01/01
- Martinsons M G & Cheung C (2001): 'The impact of emerging practices on IS specialists: perceptions, attitudes and role changes in Hong Kong', *Information and Management*, No 38, p167-183
- Maslow A H (1970): 'Motivation and Personality', Harper & Row, New York, (2nd Edition)
- Mayfield K (2001): 'IT: The industry without women', Lycos Worldwide, URL: <http://www.wired.com/news/women>, Date visited: 2001/12/05
- Peppard J, Lambert R & Edwards C (2000): 'Whose job is it anyway? Organisational information competencies for value creation', *Information Systems Journal*, No 10, p291-322.
- Podsakoff P M & MacKenzie S B (1997): 'Impact of organisational citizenship behavior on organisational performance: A review and suggestions for future research', *Human Performance*, No 10, p133-151
- Segalla M, Sauquet A & Turati C (2001): 'Symbolic vs Functional Recruitment: Cultural Influences on Employee Recruitment Policy', *European Management Journal*, Vol 19, No 1, p32-43
- Singh V & Vinnicombe S (2001): 'Impression management, commitment and gender: Managing others' good opinions', *European Management Journal*, Vol 19, No 2, p183-194
- Tannen D (1990): 'You just don't understand', Random House, Sydney
- Teo S H T & Lim K G V (1996): 'Factors affecting personal computer usage: the gender gap', *Women in Management Review*, Vol 11, No 8, p18-26
- UWC Department of Information Systems (2000): 'Peri-urban township tourism and e-commerce', Department of Information Systems, University of the Western Cape, URL: <http://www.uwc.ac.za/ems/is/somditti/Report.pdf>, Date visited: 2003/01/07

- van der Merwe N & Stander A (2002): 'Women in IT: A South African perspective', Department of Information Systems, University of Cape Town, URL: <http://itwoman.co.za/Reportw.htm>, Date visited: 2002/11/18
- Woszczynski A B & Myers M E (2002): 'IT: The last boys'club?', Eighth Americas Conference on Information Systems, p2157-2162

Appendix 1: Literature search

A large number of Internet searches were done to retrieve academic works on the topic of this report. As well as open searches on the well-known web search engines, the following categories of specific information stores were visited: E-text repositories, Online initiatives and Organizational resources.

A summary of these information sources is given below.

E-text repositories

University of California e-repository - <http://repositories.cdlib.org/escholarship/>
Australian repository of free online books - <http://www.e-book.com.au/freebooks.htm>
Library of the Sciences and Medicine - <http://highwire.stanford.edu/lists/freeart.dtl>
The National Academies Press - <http://www.nap.edu/index.html>
Proceedings of the National Academy of Sciences of the USA - <http://www.pnas.org/>
The Online Books Page - <http://www.digital.library.upenn.edu/books/>
ARL Office of Scholarly Communication - <http://www.arl.org/scomm/edir/index.html>

Online initiatives

ARL Digital Initiatives Database - <http://www.arl.org/did/>
Coalition for Networked Information - <http://www.cni.org/>
Digital Library of MIT Theses - <http://theses.mit.edu>
National Library of Medicine - <http://www.internet2.edu/>
BioMed Central - <http://www.biomedcentral.com>
Danish directory of Topics - <http://ipg.dtv.dk/>
Heriot-Watt University Subject Launchpad - <http://www.hw.ac.uk/libWWW/irn/pinakes/pinakes.html>
The Spire Project - <http://cn.net.au/>

Organizational resources

California Digital Library - <http://www.cdlib.org/>
Danmarks Elektroniske Forskningsbibliotek - <http://www.deff.dk/?lang=eng>
Deutsche Zentralbibliothek fur Medizin - <http://www.zbmed.de/>
Die Deutsche Bibliothek - http://deposit.ddb.de/netzpub/web_online-hochschulschriften.htm
The National Finnish Electronic Library - <http://www.lib.helsinki.fi/finelib/english/index.html>
GrayLit Network – Science Portal of Technical Reports - <http://www.osti.gov/graylit/>
Infotrieve - <http://www.infotrieve.com/aboutus.asp>
Los Alamos National Research Library - <http://lib-www.lanl.gov/lww/welcome.html>
Open Archives Initiative - <http://www.openarchives.org/>
Stanford Graduate School of Business Research Papers - <http://gobi.stanford.edu/ResearchPapers/>
Australian Academic and Research Library Network - <http://www.latrobe.edu.au/arlin/>
FIZ Karlsruhe - http://www.fiz-karlsruhe.de/products/pro_serv.html
University of London – Virtual Research Environment Project - <http://www.external.ull.ac.uk/elpt/vre.asp>
Information on Finnish Science and Technology - http://www.research.fi/index_en.html

Appendix 2: Analysis of literature content

The first table summarises the contribution of each of the literature items to the conceptual model that was *derived from the APC framework* (see the text of the working paper). The second table adds three additional domains (or concepts), based on the additional evidence in the literature items that were *not* reflected in the APC paper.

Domain (from APC)	Source(s)	Comment
Person	All sources	Clearly, all sources were focused to some extent or another on the person, and the differences between the genders. There was little evidence of taxonomies or typologies that would categorise people into different types, leading one to wonder whether other characteristics than gender tend to predominate?
Employment and other activities	Drucker Segalla, Sauquet & Turati Singh & Vinnicombe Kidder	Drucker got the new thinking about work and the workplace started, and he is credited with coining the phrase “the knowledge worker”. There is very little literature that <i>directly</i> addresses the questions of gender <i>and</i> IT in the workplace, however there is plenty that generalises about the workplace. We have been very selective here – there may be merit in investigating the literature more extensively.
Personal characteristics	Colwill & Townsend Tannen Gray Singh & Vinnicombe Kidder Podsakoff & MacKenzie	There is copious literature on gender traits and general gender management issues in organisations. Little of it focuses on issues of IT and gender.
History and context	Gelb Cabrera-Balleza	Emergence of the feminist movement, and use of IT to further its aims. Evidence that womankind is not well represented in the history of information technology (with a very small number of exceptions).

Domain (from APC)	Source(s)	Comment
Use of IT by women in the workplace	Cabrera-Balleza Dickinson Mayfield Woszczynski & Myers Hafkin & Taggart Kompetenzzentrum UCT UWC Department of Information Systems	Very thin. Where there is reference to actual use, there is little detail. What does it mean to say that women use IT for emails? What are they doing with email? What aspect of their life activities is being enhanced by email? There is not enough evidence to argue that this domain is understood (based on the APC report). None of the reported work undertook to meticulously examine the barriers to use of IT by women. Survey instruments seem to be lightweight, analysis is rather statistical and not necessarily convincing, and no theories are evident that would be useful to women and to managers who are trying to deal with these problems. The negative attitude adopted in the literature needs to be turned into a more positive analysis of the benefits of use, and the steps that need to be taken at the practical level to deal with problems.
Culture	Teo & Lim Kompetenzzentrum Martinsons & Cheung van der Merwe & Stander	The sources listed here touch on culture, but other sources dealing more specifically with gender issues and personal characteristics might be included. However, there is no evidence of widely accepted and broadly based tools or models that help us to understand culture. Just a passing reference to Hofstede (widely cited, but concerned with gender as a <i>national</i> trait rather than a personal trait).
Information technology (IT)	Drucker Cabrera-Balleza Dickinson UWC Department of Information Systems Mayfield Teo & Lim Woszczynski & Myers Martinsons & Cheung Hafkin & Taggart Kompetenzzentrum van der Merwe & Stander APC Peppard Lambert & Edwards	Most sources make some reference to IT, but there is again a surprising unwillingness to develop taxonomies or typologies that would categorise technology and make research more useful. To simply reference "PCs" is not acceptable – personal computers are themselves a combination of technologies and have vastly different uses.

This second table identifies the source of *additional* domains (or concepts) that were ***not evident in the APC paper***. It is interesting that each of these additional concepts is critically important to a proper understanding of the problems (and the opportunities), but the existing literature that has been found barely scrapes the surface and leaves much work to be done.

Domain (not in APC)	Source(s)	Comment
Application of technology	Drucker Cabrera-Balleza Dickinson UWC Department of Information Systems Martinsons & Cheung van der Merwe & Stander Peppard Lambert & Edwards	Without a proper understanding of how the technology is being applied, and to what aspect of a person's work or other activity it is being applied, it is not possible to understand the benefits (or the disbenefits)
Benefits of technology	Cabrera-Balleza UWC Department of Information Systems Hafkin & Taggart Peppard Lambert & Edwards	There is only weak reference to the need to understand benefits, probably arising from the failure of researchers to try and understand the nature of women's activities, and the potential benefits of the application of IT.
Perceptions of technology	Teo & Lim Cabrera-Balleza Woszczynski & Myers Martinsons & Cheung Hafkin & Taggart Kompetenzzentrum IDRC van der Merwe & Stander	The literature hints strongly that there are different perceptions of what technology is and how it might help, but the nature of these perceptions is not widely examined. Teo & Lim come closest, but fail to unpack the myriad of "technologies" that comprise a personal computer, and they do not reference the myriad of tasks to which PCs are applied.

Appendix 3: Interview questions

1. Please tell me more about yourself.
 - a. How old are you?
 - b. Gender?
 - c. What is your occupation?
2. Can you explain briefly your experience in IT/IS/IM/Gender?
3. Do you use information in your workplace?
4. Do you have enough knowledge that provides information management competencies in your occupation?
5. Which systems do you use that support you in doing your work efficiently and effectively?
6. Do you feel comfortable about the use of technology in your workplace?
7. How do you rely on technology in your daily tasks?
8. What do you think are the factors influencing your fulfilment or not being fulfilled in your work place?
9. Does your company recognize your value?
 - a. Do you think the value added by female ICT role-players is being recognized?
 - b. What do you think are the factors influencing the level of recognition of females in the ICT workplace?
10. Can you think of any negative incident(s) involving you directly, which you consider as having been influenced by gender bias?
 - a. Please explain why you feel this way.
 - b. What do you think needs to be done to remove any form of gender-based bias in IT/ IS / IM?
11. What is your perception of the current situation with regards to policies that are in place about women and other marginalized groups, in the workplace (IT/ IS / IM)?
12. Kathleen Melymuka (2000) was quoted in Computerworld as stating that: Some women say there are no real gender problems in the workplace, especially in IT/ IS / IM. What is your view on this statement?
13. Women are underrepresented amongst the senior workplace manager in IT/IS/IM.
 - a. What is your opinion in this statement?
 - b. What do you think are the factors influencing that?
14. What is the one thing that you can do to ensure that women do benefit equally with men in IT/ IS / IM or any field of employment? In other words – what do you see as being a possible solution to marginalization in the workplace?

Appendix 4: Analysis of interview content

The table below summarises the results of the interviews for the six subjects – “U” through “Z” – according to the model developed from the literature review. Note that the questions were developed prior to the literature review, and therefore in the left column the numbers of the questions that informed each of the nine domains of interest are indicated.

Domain	Subjects					
	U	V	W	X	Y	Z
Person (1a, b)	Female - 56	Female - 38	Female - 28	Female - 32	Female - 45	Female - 32
Work and the workplace (8, 9, 10, 11)	Head of Department – passionate about work and seeks recognition for work successes – believes recognition is there but has to be worked for. Has certain techniques to ensure she is seen – believes that appropriate policies exist but women do not always invoke them	Academic - also seeks to deliver value and receive recognition but feels it is not offered – also suffers sexual harassment that is not taken seriously by men – also believes that appropriate policies exist but are not used	IT analyst – wants to work with people and to have useful things to do in order to create things that did not previously exist – felt appreciated in previous job – what seemed to be a race issue turned out in fact to be a gender issue – feels given menial tasks to do – also notes “window dressing” when people are hired for the wrong reasons – trust is needed between races and genders	Senior Manager – seeks recognition and feels male colleagues are getting preferential treatment – a lack of females in the top ranks – has been passed by in a specific appointment where a man had no qualifications (she does have them) but got the job for reasons of “leadership” – the best person must be appointed	Managing Director – enjoys community projects and is frustrated at the lack of access – believes female contribution is recognised – suffers racial and gender bias and feels being a single mother is a factor – there needs to be a distinction between human rights and women's rights, and the government should be doing more about it	IT services Director – enjoys working with young people and seeks cohesion – believes in computer literacy for young people – wants to be recognised for intellect – concerned about rape and sexism on campus – not aware of any policies that exist to ensure equity in gender

Domain	Subjects					
	U	V	W	X	Y	Z
Personal characteristics (2)	Masters – doing PhD	Honours – particular interest in gender issues	MCSE – Technical background	Doctoral qualification – Security specialist very involved in additional outreach activities (research, industry committees)	Self taught PC skills – concerned about gender and has done something about it by starting a gender unit	Academically qualified
History and context (1c)	Progressed through career and academic level over the years			10 year career in IT specialising in security		Academic history but “converted” to management of IT services but with no IT qualifications
Culture (9, 10, 14)	“If you break your career, it’s hard to get back on track” – believes success (for a woman) comes from hard work and learning how loud you can “blow your trumpet” – to overcome gender bias need to be good, be a team player but not to lose femininity	Feels male domination and believes women are better, but not recognised – need to recruit more women into management and sensitise people about gender – use “she” as well as “he” in teaching and writing	Too soon to tell in new job – generally people need to change their biased attitudes	Feels that promotion for women comes from other factors than hard work and competency alone – wants to see women’s success stories and “market” women’s success	Works in an all-female organisation – people need to be educated about gender	Feels a lack of mentorship, which would be helpful – cultural and gender differences need to be defined and understood. Male culture needs to draw back and people need to be sensitised
Information technology (5)	Uses a very wide range of IT – office functions plus internet – very comfortable with IT	Office functions plus internet – not completely comfortable with IT	Refers to the outsourcing of IT but affirms the need to take appropriate decisions about IT acquisition – comfortable with IT	Feels a need (as a leading edge specialist) to keep in contact internationally in order to understand the field – comfortable with IT	Comfortable with IT	Uses a very wide range of IT – office functions plus internet and web-based learning tools – comfortable with IT

Domain	Subjects					
	U	V	W	X	Y	Z
Application of technology (3, 7)	Uses information all the time – information is now second only to people – totally reliant on IT, especially email	Yes, uses information	Yes uses information all the time and reliant on the IT that enables it.	Yes, uses information and highly reliant on the IT that enables it – not just PC but cell phone – not concerned to have the latest IT, rather to have IT that works	Yes uses information all the time and appreciates technology (even the alarm clock) – surprised at the existence of the digital divide.	Yes uses information all the time and totally reliant on laptop – does not use paper any more
Benefits of technology (4)	Confident and affirms reliance on available information	Room to learn more implying more benefits to be found yet	A cautious “yes”	Yes, confident in own abilities	Yes, feels competent but feels a need to develop in order to assist other women	Yes, confident and a fast learner – no problems
Perceptions of technology (6, 12, 13)	Enjoys using technology and has a passion for it – including working with students and seeing people becoming empowered with IT competencies - convinced that there are real gender problems however – women are under-represented and they are not always supported by their own gender – mentorship is one answer	Does not agree that there are no gender problems in IT, but admits some people think like that – women are under-represented – the pool is too small – policies need to be operationalised	There are a lot of gender problems – women are under-represented because of perceptions of low availability – a wide range of actions needed (training for women, “advertise” the value of women, get into schools and encourage girls to take up technical subjects)	There are wide problems (presumably in IT as well) – women are under-represented – mentorship is needed together with proper performance appraisal systems	Women are not always aware of the problems, for example with sexual harassment – but they know they have to work harder to get recognition – women are under-represented because they are seen as illogical and because of role gender typing (nursing, etc) – women must help themselves	There are problems – women are under-represented – perhaps it goes back to school education and the socialisation of women – more women should be employed, women's culture should be upheld and women should help women.