THE EXTENT TO WHICH INFORMATION COMMUNICATION TECHNOLOGY CAREERS FULFIL THE CAREER IDEALS OF GIRLS.

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ABSTRACT

The aim of this research is to make a contribution to knowledge in relation to women as a minority group in the Information Communication and Technology (ICT) industry. The research presented in this paper represents a minor component of a much larger research project conducted under the auspices of Women in IT Tasmania (WIITT) and supported by funding from the Intelligent Island. The focus of the current research is on Year Nine students throughout Tasmania. It will involve a detailed examination of the results in relation to the perceptions of Year Nine girls and boys in relation to the career characteristics of their ideal careers and their views of careers in ICT. The objective is to identify areas that need to be specifically promoted to girls to attract them to careers in ICT. In addition existing research has shown that parents and relatives have a considerable influence on girls when they are making a career choice. This can mean that if the information girls obtain from this advice is inaccurate or out of date, then many could reject a career in ICT as a viable career option. Accordingly a secondary objective is to consider the means by which such information can be most effectively distributed.

Key word Gender differences, perceptions of IT careers, IS career.

INTRODUCTION

Historically, worldwide, women have been a minority in the Information Communication and Technology (ICT) labour force. Even though a chronic shortage of skilled information systems (IS) personnel has plagued the ICT industry, women have continued to represent a largely untapped human resource. Despite increased opportunities for employment and the changing nature of employment in the ICT industry, typically the extent of the involvement of women has remained constant at around 20%.

The research presented in this paper is based on the findings of the recent Women in IT Tasmania (WIITT) report (Young 2002). The objective of this report was to determine the 'buying behaviours' of girls associated with ICT careers. The WIITT project was founded on the premise that a gap existed in the body of existing knowledge in relation to the under representation of women in ICT careers. That is, the bulk of previous research had been conducted in larger population centres while the situation in regional areas has been largely ignored. To address this deficiency in knowledge the WIITT project was located in Tasmania, the small island state of Australia. This setting for the project was seen as a perfect opportunity to take a large sample of the identified population across a broad range of rural and suburban regions.

One of the main findings from the WIITT research showed that only five percent of the Tasmanian Year Nine students surveyed intended to establish careers in the ICT industry. Further, of those who indicated this intention, boys out numbered girls by four to one. This result highlights a real need for action to promote ICT careers to girls in smaller population areas.

In addition the WIITT research found that when choosing a career, girls more so than boys, sought the advice of their parents and relatives. This result confirms the findings from earlier research that showed parents exert considerable influence on girls when career decisions are made (Multimedia Victoria, 2001). However if these people, when acting as advisors are unaware, ill informed or hold out of date views of the nature of ICT careers, then many girls may reject careers in the industry based on misinformation. Previous research in the area has been found this often to be the case (Multimedia Victoria 2001).

Potentially this could mean that now obsolete features of the industry such as a heavy emphasis on technology still persist to preclude a larger number of young women from entering the industry. The reality is that in the modern business environment the nature of ICT has broadened with a need now for personnel capable of providing business, people and creative skills. This implies that many of the historical negative barriers that portray the industry as solitary, male dominated and 'nerdy' are no longer appropriate. From this background of the findings of the WIITT report it became apparent that to encourage more young women to take up careers in the industry there is a need for information that accurately portrays ICT careers in a positive light.

BACKGROUND

For more than a decade the problem of women as a minority group in the ICT industry has attracted the interest of researchers and a considerable body of knowledge has been assembled (Frenkel 1990; Spertus 1991; Igbaria and Baroudi 1995; Camp 1997; Teague 1998; The ACM Committee on Women in Computing 1998; Gurer 1999; Meares and Sargent 1999; Information Industries Bureau 2000; Newmarch, Taylor-Steele

et al.. 2000; Ahuja 2002). However, the situation is a complex one (Queensland Government, 1998) that so far has defied any workable solution.

The existing research can be broadly divided into being based in either an industry or an education perspective. The industry perspective has encompassed women already working in the industry (Frenkel 1990; Swanson and Wise 1996; Selby 1997; Teague 1998; Nielsen, Von Hellens *et al.*. 2000; Nielson, *et al*. 2000; von Hellens, Pringle *et al*. 2000; von Hellens, *et al*. 2001; Ahuja 2002), women lecturing in computing or IT in universities (Frenkel 1990; Levenson 1990; Selby 1997; O'Leary 1999; Cuny and Aspray 2000; Pringle, Nielsen *et al*. 2000; Trauth, *et al*. 2000; Multimedia Victoria 2001) as well as women teaching IT courses in the TAFE post compulsory education system (Delaney and Dyson 1998; Multimedia Victoria 2001).

The educational aspect of the research has focussed on girls as students in the school education system (Chan, Stafford *et al*. 1998; Nielson, *et al*. 2000; Moon 2001), young women enrolled in TAFE IT training (Newmarch, 2000; Information Industries Training Board, 2001) or studying IT related courses at university (Levenson 1990; Bana and Hassoun 1997; Margolis and Fisher 1997; Selby, Young *et al*. 1997; Cuny and Aspray 2000; Newmarch, Taylor-Steele *et al*. 2000; Nielson, *et al*. 2000; Jewell and Maltby 2001; Staehr, Martin *et al*. 2001).

Much of the existing education research has been focussed on the secondary school level of education as this has been identified where the initial barrier that precludes many girls from ICT careers is established (Chan, Stafford *et al*. 1998; Nielson, *et al*. 2000; Moon 2001). This has given rise to the notion of the 'shrinking pipeline' (Camp, 1997). What this implies is that a large proportion of girls discontinue studies in computing subjects at this point of their education. In addition, as young women move through tertiary education and beyond, the proportion that remain involved in ICT continues to decline.

From the education stream of research three major themes can be identified as having a negative impact on the perceptions of girls in relation to ICT. These are girls lack of confidence, the impact of the teaching and learning environment and the lack of accurate ICT career information.

Girls lack of confidence

The dominance of boys in relation to access and usage of computers in the school system has long been recognised (Margolis and Fisher 1997; Selby, Young *et al*. 1997; Newmarch, Taylor-Steele *et al*. 2000). Potentially, partially due to the dominance of boys, girls have been found to be less confident in their computing abilities. In addition, it has been determined that many teachers react differently to girls in ICT classes. This has often precluded them from demonstrating their capabilities in a positive light and so has served to perpetuate the lack of confidence on the part of girls (Chan, Stafford *et al*. 1998). As a result, the issue has been a recurring theme to an extent it has been described as a 'ghost that haunts our subject' (Margolis and Fisher 1997:4).

The impact of the teaching and learning environment

There is considerable evidence in the literature to suggest that the content and delivery of ICT in the secondary school system has been a major disincentive to interest girls to continue studies in the subject (Selby 1997; Newmarch, Taylor-Steele *et al*. 2000). In particular the teaching and learning environment has been found to be non-conducive to encourage the participation of girls (Selby, 1997). While generally students have reported ICT be a boring subject (Teague 1998; Bowes, Cowley *et al*. 2001; Multimedia Victoria 2001), a recent study conducted in the Tasmanian state education system found twice as many girls than boys perceived IT courses to be boring (Bowes, Cowley *et al*. 2001). In part this has been attributed to the fact that because many courses focus on gaining familiarity with software packages, it has communicated an incorrect message to girls that ICT involved secretarial careers (Chan, Stafford *et al*. 1998; Moon 2001; Newmarch, Taylor-Steele *et al*. 2000).

In addition, it has been concluded that many teachers appointed to deliver ICT courses have little or no knowledge or skills in the subject (Bowes, Cowley *et al*. 2001; Centre for International Economic Report, 2001).

The lack of accurate ICT information

A lack of understanding of what careers in ICT entail has been identified as a considerable influence contributing to the imbalance of women in the industry (Selby, Young *et al*. 1997; Teague 1998; Newmarch, Taylor-Steele *et al*. 2000; Nielsen, von Hellens *et al*. 2000; Moon 2001). This implies that outdated, negative images of the ICT industry have continued to be influential deterrents. The representation of ICT as a male

dominated, highly technical, solitary field and the domain of 'geeks' and 'nerds' has been effective in precluding women in larger numbers from careers in the industry.
The reality is that in the modern business environment there is a wide range of ICT activities and roles to which women are eminently suited (Queensland Government 1998). Further, the mix of skills required is ever changing to support the continuous developments in the industry (IT&T Skills Hub 2000). In the current ICT business arena, while a focus on technology remains, it no longer represents a dominant activity. Equally, there is also now a need for personnel with people, business and creative expertise (Swanson and Wise 1996; Juliff 1998).
A number of approaches have been recommended to achieve the widespread and effective distribution of ICT career information to girls. These include workshops, job shadowing, mentoring (Chan, Stafford *et al*. 1998), industry visits, attachments or summer internships (Newmarch, Taylor-Steele *et al*. 2000). In addition, it has been proposed that an effective way to overcome the lack of ICT career information could involve setting up links between schools, tertiary institutions, the ICT industry, government agencies and professional organisations (Selby, Young *et al*. 1997; von Hellens, *et al*. 2001). Generally, however, these approaches focus on girls and young women and do not take into account the substantial influence that parents and friends can exert when career decisions are made. This implies that to promote the uptake of ICT careers among young women, up-to-date career information is not only made available but distributed to a wide audience.

RESEARCH OBJECTIVE

From the perspective of the lack of understanding on the part of women in relation to modern day ICT careers, the aim of this paper is to determine the types of career characteristics that need to be promoted to attract larger numbers of them to careers in the industry. A secondary objective is to recommend the means by which the distribution of such information can be most effectively achieved.

ASSUMPTIONS

The research reported in this paper is based on the assumption that if girls lack understanding of what modern day ICT careers entail, they will be unable to recognise any associations between this form of career and what they see as important for their ideal career. At the same time if outdated myths are not identified and dispelled, they will persist as influential in precluding many young women from careers in ICT.

RESEARCH SCOPE

This research draws on the findings from the WIITT report and examines in further detail the results from two questions contained in the questionnaire administered within that research. For the purposes of this paper the scope of the research is limited to Year Nine students attending secondary schools throughout Tasmania. Based on a five point Likert scale the first question asked participants to indicate the extent to which they agreed or disagreed that sixteen career characteristics represented their ideal career. The second question repeated this approach but in this instance in relation to careers in ICT. The aim of this approach was to 'tease' out the issues of special importance to girls in order to demonstrate the extent to which ICT careers can achieve their ideal career goals. These career characteristics were drawn from existing allied research (Selby 1997; Multimedia Victoria 2001; SWIFT 2001). The application of these previously established characteristics provides a basis to identify particular aspects that need to be promoted while at the same time to provide feedback of areas where special attention needs to be made to redress incorrect information.

METHOD

The aim of this section is to establish the sample population and the approach to data collection used in this research. The process of data collection provides details of the pilot test and the administration of the main questionnaire.

Sample

The research presented in this paper is based on a sampling of Year Nine students enrolled in schools throughout Tasmania. The sampling encompassed district high schools, high schools, Catholic and non-Catholic independent schools. These represented single sex schools and co-educational schools. Enrolment in Information Processing (the term used for computer studies at this level in the Tasmanian education system) as a subject at was not a prerequisite for taking part in the research.

Three reasons support the primary focus of this research on this level of education group. Firstly, in the Tasmanian education system it is at this point in their education when students are able to choose the non-core subjects they wish to study. This implies an ability to make a decisive choice to enrol in ICT related courses. Secondly, Year Nine is also the stage where it has been found that peer pressure is exerted on girls and as a consequence many drop out of ICT as a subject (Frenkel 1990). Thirdly, it has been widely acknowledged that the process of making a career choice commences around Year Nine in the education system (Moon 2001).

Data Collection

The research was based on a cross sectional sampling and involved the distribution of questionnaires to the schools that agreed to participate in the study. The questionnaire developed and administered within this project was based on instruments applied in earlier research that shared a similar focus to the present study (Selby 1997; Multimedia Victoria 2001; SWIFT 2001). These instruments had been used in research conducted in New Zealand, Australia and Canada. Consequently the WIITT survey incorporated previously tested and validated instruments that had been applied in a range of countries.

Pilot survey

Prior to the administration of the main questionnaire, the instrument was subjected to a pilot round of sampling. The aim of this process was to ensure that the language and content of the survey were appropriate for Tasmanian Year Nine students. It was based on a forum conducted with forty-eight students attending a Department of Education school located in a North Hobart suburb. Both boys and girls completed an individual paper based brain storming activity of the key aspects proposed in the draft survey. On the basis of this pilot round no changes were necessary to the questionnaire and accordingly it was deemed as appropriate for application in the main survey.

Main survey

The potential sample size of the research was governed by the ability to gain support for the project from individual schools, parental consent and the willingness of students to participate. Following approvals from the relevant governing educational bodies a letter outlining the proposed research and an invitation to participate was mailed to sixty-four secondary schools throughout Tasmania. A draft survey was included with this correspondence. This contact was subsequently followed up by telephone. As a result twenty-six schools agreed to participate.

RESULTS

This section reports the results obtained in the more comprehensive WIITT research that relate to the specific focus of this paper. The reporting of these results will be preceded by some demographic results to establish a profile of the schools and students who took part in the research. The main section of the results will report the outcomes from the statistical analyses conducted from three perspectives of the career characteristics with respect to ideal careers and then those associated with careers in ICT. These will involve a series of comparisons based on sixteen given career characteristics. Within these initially the views of boys and girls in relation to their ideal careers will be examined. This process will then be repeated with respect to careers in ICT. The final comparison will solely focus on girls and the extent any match or mismatch their views between their ideal career and careers in ICT.

Demographic results

Twenty of the twenty-six schools that originally agreed to support the research returned questionnaires. Although reminder letters were sent to the outstanding schools no further responses were forthcoming. In the context of the sampling it was not feasible to attempt to calculate the actual response rate. To do this would have necessitated obtaining figures related to parental dissent and student absences on the day the questionnaire was administered or the number of students unwilling to participate in the survey. The quantification of this information would have placed an added burden on the schools concerned and so may have proved counter productive to enlist their support for the study.

Table 1 provides a summary of the school type attended and gender distributions of the 1634 Tasmanian Year Nine students who participated in this research. As shown, slightly more girls (53%) than boys (47%) completed questionnaires. Overall nearly two thirds of the responses were received from high schools. A further 22% of responses came from non-Catholic Independent colleges, 9% of students attended Catholic

colleges while 4% came from district high schools. In high schools a larger proportion of girls (39%) than boys (27%) contributed data to the research. By gender the distribution was the reverse in non-Catholic independent colleges and Catholic colleges with slightly more boys that girls taking part in the survey. Boys and girls were equally represented in the district high schools that took part in this research.

TABLE 1
Breakdown of Year Nine responses by school type and gender

	District High School	Non-Catholic Independent High School	College	Catholic College	Total
	%	%	%	%	%
Female	1.7	38.9	9.5	3.2	53.3
Male	1.7	26.8	12.6	5.4	46.5
	3.4	65.7	22.1	8.6	100
n=1634					

Main results

In this section of the results from two questions applied in the WIITT questionnaire are reported. These will consider the outcome following a statistical analysis from the three defined perspectives. That is, it will include an examination of the responses obtained from girls and boys to the given 16 careers characteristics with respect their 'ideal' careers and then in relation to careers in ICT. The final perspective of results will reconsider these two career forms focussing solely on girls.

The perceptions of career characteristics for ideal careers from a gender perspective

The first result reported in this section is the outcome when girls and boys were asked to indicate the extent of agreement or disagreement with the sixteen proposed features to describe their ideal careers. Table 2 shows the results when independent sample *t*-tests were applied to the data. This revealed little agreement between what girls and boys regard as important in their ideal careers. The variation mean differences were found to be statistically non significant in only four of the sixteen proposed characteristics. These were interesting challenges, travel, flexible hours and job security. For interesting challenges, the mean scores of 4.13 and 4.08 were shown to be non significant (t1483=. 348, p>.05). This was also true for travel (t1483=. 460, p>.05), flexible hours (t1479=. 828, p>.05) and job security (t1460=. 373, p>.05).

The *t*-tests revealed that the differences in the mean scores for the remaining twelve characteristics were statistically significant. This result serves to highlight the extent to which girls and boys place different emphasis on issues that constitute their ideal careers. Girls are more inclined to want to be involved in interesting work and working with people. The extent of the standard deviation for these two career characteristics (.79 and .84) supports that generally there was considerable consensus among girls on these issues.

More girls than boys strongly agreed that creativity, responsibility, socially useful work and independence were characteristics they perceived as important in describing their ideal careers. Boy participants indicated that a high salary, job security, high status, a cool image and the opportunity for self-employment were preferred characteristics in their ideal careers. On the basis of gender, the differences in the mean scores significant in relation to working alone and working from home. Within these results the responses from girl respondents tended more towards strongly disagreeing that these were features seen as desirable for their ideal careers.

TABLE 2
Mean differences 'ideal' careers of Year Nine girls and boys

	Girls			Boys					
							Levene test		*t*
	n=	*Mean*	*SD*	*n=*	*Mean*	*SD*	*F*	*Sig.*	*Sig.*
Interesting work	810	4.52	.79	684	4.27	1.00	56.367	.000*	.000*
Working with people	814	4.21	.84	693	3.94	1.14	27.327	.000*	.000*
Interesting challenges	804	4.13	1.07	681	4.08	1.08	3.335	.068	.348
Creativity	796	3.99	1.12	674	3.76	1.25	32.719	.000*	.000*
Responsibility	801	3.97	1.05	678	3.83	1.22	35.721	.000*	.020*
High salary	803	3.96	1.10	685	4.13	1.03	.148	.700	.002*
Socially useful work	799	3.92	1.06	672	3.68	1.22	44.834	.000*	.000*
Travel	803	3.89	1.23	682	3.84	1.24	.166	.684	.460
Flexible hours	805	3.80	1.21	676	3.82	1.23	1.453	.228	.828
Independence	792	3.68	1.19	670	3.50	1.33	30.301	.000*	.005*
Job security	794	3.56	1.24	668	3.62	1.30	1.357	.244	.373
High status	786	3.51	1.20	672	3.73	1.21	1.803	.180	.001*
Cool Image	798	2.83	1.40	677	3.24	1.41	.122	.727	.000*
Self-employment	791	2.70	1.26	678	3.06	1.40	19.965	.000*	.000*
Working alone	791	2.23	1.21	676	2.51	1.37	37.020	.000*	.000*
Working from home	789	2.20	1.19	671	2.55	1.38	57.878	.000*	.000*

*∂ = <.05 1=strongly disagree 5=strongly agree

The perceptions of career characteristics for ICT careers from a gender perspective

Table 3 reports the results when the same career characteristics were used to assess the extent to which girls and boys agreed or disagreed with these as features of ICT careers. The results highlight that there is considerable alignment in how girls and boys perceive ICT careers. Based on Levene tests and subsequent appropriate *t*-tests, on the basis of gender the differences were found to be not statistically significant for twelve of the sixteen career characteristics. Regardless of gender the participants tended to strongly agree that interesting work, interesting challenges, high salary, working with people, creativity, socially useful work, flexible hours, high status, working alone, travel, working from home and self employment were features of ICT careers.

There were four career characteristics in relation to ICT careers where there were significant differences between the mean score results. Within these while girls more strongly agreed that careers in the industry involved responsibility (t-3.405=.001, p<.05) independence (t-3.4.861=.000, p<.05) and job security (t-2.592=.012, p<.05) more so than boys they disagreed that ICT careers involved a cool image (t-5.627=.000, p<.05).

TABLE 3
MEAN DIFFERENCES ICT CAREERS OF YEAR NINE GIRLS AND BOYS

	Girls			Boys					
							Levene test		*t*
	n=	*Mean*	*SD*	*n=*	*Mean*	*SD*	*F*	*Sig.*	*Sig.*
Responsibility	784	3.79	1.13	670	3.58	1.27	30.702	.000*	.001*
Interesting work	786	3.77	1.29	679	3.99	1.26	5.569	.018*	.22
Interesting challenges	777	3.77	1.14	675	3.75	1.25	11.349	.001*	.751
Independence	776	3.71	1.15	666	3.39	1.28	26.804	.000*	.000*
High salary	782	3.67	1.12	671	3.75	1.22	3.753	.053	.183
Working with people	793	3.62	1.20	686	3.52	1.33	18.243	.000*	.121
Job security	785	3.57	1.13	667	3.41	1.29	30.460	.000*	.012*
Creativity	782	3.54	1.26	673	3.44	1.36	12.601	.000*	.127
Socially useful work	784	3.48	1.22	663	3.56	1.25	.002	.966	.181
Flexible hours	780	3.37	1.21	674	3.43	1.30	4.800	.029*	.401
High status	774	3.29	1.22	666	3.42	1.26	.456	.499	.052
Working alone	781	3.20	1.32	670	3.08	1.37	1.365	.243	.099
Travel	780	3.10	1.37	676	3.16	1.42	1.983	.159	.06
Working from home	769	3.06	1.30	668	3.09	1.38	3.758	.053	.687
Self-employment	778	3.00	1.28	667	3.12	1.35	5.370	.021*	.088
Cool Image	780	2.59	1.29	666	2.98	1.36	2.830	.093	.000*

*∂ = <.05 1=strongly disagree 5=strongly agree

A comparison of the perceptions of girls between ideal careers and ICT careers

To determine the extent of match between the view of girls in relation to their ideal careers and careers in ICT, paired *t*-tests were conducted on the sixteen career characteristics. Because the analysis involved paired results in some areas the numbers will vary to those presented in the two earlier tables. The reason for this is that missing data may have precluded some cases being included in the test. The results are provided in Table 4. This shows that in only two career characteristics, independence (t-.157=.876, p>.05) and job security (t-.076=.939, p>.05), the differences in the mean scores proved to be statistically non significant. This implies that girls tend agreed to the same extent that these are characteristics of both their ideal careers and careers in ICT.

Statistically significant differences were found between the mean results for ideal careers and ICT careers for the remaining fourteen career characteristics. A comparison of the mean scores shows that girls that were more inclined to perceive interesting work, working with people, interesting challenges, creativity, responsibility, high salary, socially useful work, travel, flexible hours, high status and a cool image as components of their ideal careers than features of careers in ICT. In addition, as shown by the mean results, girls associated self-employment, working alone and working from home with ICT careers of least importance in their 'ideal' careers.

TABLE 4
A comparison of the results from girls between ideal and ICT careers

		Ideal career		ICT career			
	n=	*Mean*	*SD*	*Mean*	*SD*	*t*	*Sig*
Interesting work	781	4.51	.79	3.78	1.20	14.412	.000*
Working with people	789	4.20	.85	3.62	1.21	11.729	.000*
Interesting challenges	771	4.14	1.02	3.77	1.14	7.123	.000*
Creativity	769	3.99	1.12	3.54	1.27	8.148	.000*
Responsibility	770	3.98	1.03	3.79	1.12	4.240	.000*
High salary	770	3.96	1.10	3.67	1.12	6.108	.000*
Socially useful work	770	3.94	1.05	3.47	1.21	8.880	.000*
Travel	775	3.90	1.23	3.09	1.37	13.155	.000*
Flexible hours	772	3.80	1.21	3.37	1.21	8.111	.000*
Independence	764	3.70	1.18	3.71	1.15	.157	.876
Job security	769	3.57	1.24	3.56	1.12	.076	.939
High status	753	3.52	1.20	3.29	1.21	4.443	.000*
Cool image	767	2.83	1.40	2.58	1.28	4.620	.000*
Self employment	767	2.71	1.26	3.00	1.28	-5.413	.000*
Working alone	765	2.22	1.21	3.19	1.32	-16.416	.000*
Working at home	754	2.21	1.16	3.06	1.30	-15.372	.000*

*∂ = <.05 1=strongly disagree 5=strongly agree

DISCUSSION AND CONCLUSIONS

This research has determined that while girls have different ideas to boys as to what they want in their ideal careers, these students shared highly similar views in their perceptions of ICT careers. In addition when the results between ideal careers and ICT careers of the girl students were compared, then this demonstrated that generally they failed to recognise the extent to which a career in ICT could fulfil their career goals.

With respect to their ideal careers girls placed different values than boys on a majority of the career characteristics applied in this research. This outcome has provided the basis to determine the features that need to be promoted to attract the interest of girls towards careers in the ICT industry. Girls most highly valued interesting work, working with people and interesting challenges so accordingly the message needs to be conveyed that these are integral components of careers in the modern ICT business arena. The primary focus on these three features as representative of ICT careers could also provide the means to diffuse the common view of the industry as a highly technological and solitary field. As such this could reduce the dominance of technology and social isolation as key barriers preventing many women from embarking on careers in the ICT field.

While working alone, working from home and self-employment are options within the industry, the research has shown these were not highly regarded as components in the ideal careers of girls. Possibly because of the importance girls placed on working with people, working alone and working from home were the least desired features of the their ideal careers. The implications are that the notion of ICT as a solitary career could still persist to dissuade girls from considering careers in ICT as a viable choice. In addition while traditionally self-employment has represented a large aspect of ICT careers, the research has shown that girls were clearly not attracted to this form of employment. The results for these career characteristics supports that any promotional ICT career information needs to address the potential negative effects of these aspects of the industry on the career choice of girls. This implies that while these need to be acknowledged as features of ICT careers, an emphasis must made that engagement in these forms of career involvement is optional and up to individual choice.

The results from perceptions of careers in ICT on the basis of gender showed that generally girls and boys held similar views. However there were four exceptions. Girls, more so than boys believed that ICT careers involved responsibility, independence and job security whereas boys supported that this form of career presented a cool image.

The comparison of the responses from girls between ideal careers and careers in ICT showed a considerable mismatch. From the results only two career characteristics, independence and job security, were similarly regarded in both their ideal careers and careers in ICT. However, these were only low priorities as features of their ideal careers. As a result of this comparison the scope of the issues that need to be promoted to more fully inform girls about careers in ICT have been determined. Clearly girls need to be made aware that much of the work performed by ICT professionals is interesting and challenging and involves working with people. What is important also is that all aspects need to be addressed even though girls do not necessarily perceive some of them to be ideal in their future careers.

A secondary objective of this research was to consider the means by which information about ICT careers can be distributed. While a number approaches have been proposed in the literature what is important is that such information should reach a wide audience and not just target secondary school girls. This is essential to ensure that when girls call on parents and friends for career advice, those offering this support are aware the scope and diversity modern day ICT careers have to offer.

A natural follow on from the WIITT research would be to use Tasmania as a test case. An initial aim could be to distribute true to life information about the roles and activities women undertake in the course of their employment as ICT professionals to the widest possible audience. This could take the form of a weekly diary appearing as a newspaper column that details the day to day work of women currently engaged in ICT careers. Ideally this will provide an opportunity to emphasise the extent to which they interact with people, the challenges they face and the interesting nature of their work. A potential benefit of this approach is that because of their participation in the WIITT research, many Tasmanian secondary school girls will have a heightened awareness of ICT careers. On this basis they will be more inclined to read this information and discuss it with their parents and friends. A second stage initiative could be for a professional organisation, such as WIITT or the Australian Computer Society (ACS), to arrange a series of visits by women ICT professionals to schools especially during careers expos. The measurement of the effectiveness of these approaches could then form the basis for future research into the buying behaviours of girls in relation to careers in ICT.

REFERENCES

Ahuja, M. K. (2002). Women in the information technology profession: a literature review, synthesis and research agenda. **European Journal of Information Systems** 11: 20-23.

American Association of University Women (2000). Tech-Savvy: Educating Girls in the New Computer Age. URL: http://www.aauw.org/2000/techsavvybd.html Accessed November 14, 2000

Bana, S. and S. Hassoun (1997). Improving the Graduate School Environment for Women in Computer Science. URL: http://www.cs.washington.edu/homes/soha/GH/list.html Accessed May 18, 2002.

Bowes, J., T. Cowley, Price, K. (2001). **Tasmanian Student Readiness for the IT Industry**. Hobart, TASITE.

Camp, T. (1997). The Incredible Shrinking Pipeline. **Communications of the ACM** 40(10): 103-110.

Centre for International Economics. (2001) Breaking the Skills Barrier-Demonstrating the benefits of investment in ICT higher education in Australia. **Centre for International Economics**. Sydney.

Chan, V., K. Stafford, Klawe, M, Chen, G. (1998). Gender Differences in Vancouver Secondary Students' Interests Related to Information Technology Careers. URL: http://taz.cs.ubc.ca/SWIFT Accessed February 14th, 2002.

Cuny, J. Aspray, W. (2000). Recruitment and Retention of Women Graduates Students in Computer Science and Engineering. Washington, **Computer Research Association**.

Delaney, Dyson, B.C. (1998). **Women: Creating the Connection**, Strategic Planning and Research Division, Office of Training and Further Education.

Foster, J. J. (2002). **Data Analysis using SPSS for Windows**. Sage Publications. London

Frenkel, K. A. (1990). Women and Computing. **Communications of the ACM** 33(11): 34-46.

Gurer, D. (1999). Testimony to the Committee on Workforce Needs in Information Technology. URL: http://www.acm.org/women/work-shortage.shtml Accessed September 14, 2000.

Ho, R. (2002**). Handbook of Univariate and Multivariate Data Analysis & Interpretation: SPSS Approach**. Central Queensland University Publishing Unit. Queensland.

Igbaria, M. Baroudi, J.J. (1995). The Impact of Job Performance Evaluations on Career Advancement Prospects: An Examination of Gender Differences in the IS Workplace. **MISQ** 19(1 March): 107-125.

Information Industries Bureau (2000). **Queensland ICT Industry Profile 1999/2000**, Queensland Government Innovation and Information Economy

Jewell, H. Maltby, J.R. (2001). Female Involvement in Information Technology Degrees: Perception, Expectation and Enrolment. **Proceedings of the tenth Australasian Conference on Information Systems**, Southern Cross University.

Juliff, P. L. (1998). IT Skills Essence of Any Future Success. **The Australian**: 44.

Levenson, N. G. (1990). **Educational Pipeline Issues for Women**.

Lundy, S. K. (1999). **21st Century Women**. Address to FITT Luncheon, July 14.

Margolis, J. Fisher, A. (1997). **Geek Mythology and Attracting Undergraduate Women to Computer Science**.URL: http://www.cs.cmu.edu/~gendergap/papers/wepan97.html. Accessed November 9, 2000.

Meares, C. A. Sargent, J.J.F. (1999). **The Digital Workforce: Building Infotech Skills at the Speed of Innovation,** US Department of Commerce.
Moon, S. (2001**). Set for Life**. Canberra, University of Canberra.
Multimedia Victoria (2001). **Reality Bytes - An in-depth analysis of attitudes about technology and career skills**. Melbourne, Victorian State Government.
Newmarch, E. Taylor-Steele, S. Cumpston, K. (2000). **Women in IT - What are the Barriers?**, Department of Education Training and Youth Affairs.
Nielsen, S. von Hellens, L. Wong, S. (2001). The Male IT Domain: You've Got to Be In It To WinIT. **Proceedings twelth Australasian Conference on Information Systems**, Coffs Harbour.
Nielsen, S. von Hellens, L. Wong, S.. (2000). The Women in Information Technology Project: Uncovering the Pride and Prejudices. **Proceedings of the sixth Australian Women in Computing Workshop**, Brisbane.
Nielson, S., von Hellens, L. Wong, S. (2000). The Game of Social Constructs: We're Going to WinIT. **Proceedings of the International Conference on Information Systems**, Brisbane.
O'Leary, D. (1999). Accessibility to Computer Science: A Reflection for Faculty Members. URL: http://www.cs.umd.edu/~oleary/faculty.whole.html. Accessed April 6, 2002.
Pringle, R., S. Nielsen, et al.. (2000). Net Gains - Success Strategies of Professional Women in IT. **Proceedings of the 7th International Conference of Women, Work and Computerization**, IFIP TC9 WG9.1, British Columbia.
Queensland Government (1998). **IT&T Skills in the Smart State**. URL: http://www.iib.qld.gov.au/skills/IT&T20Skills%20paper/IT&T%20Skills/
index.html. Accessed February 13, 2002.
Roepke, R. P. Agarwal, R. Ferratt, W. (2000). Aligning the IT Human Resource with Business Vision: The Leadership Initiative at 3M. **MISQ** (Forthcoming).
Selby, L.Young, A. Fisher, D. (1997). Increasing the Participation of Women in Tertiary Level Computing Courses: What Works and Why. **Proceedings of ASCILITE97**, Perth.
Selby, L. M. (1997). **A Critical Analysis of Factors Affecting the Participation of Women in Tertiary Level Computer Science and Information Systems Courses**. Science and Mathematics Education Centre. Perth, Curtin University of Technology.
Spertus, E. (1991). **Why are there so few Female Computer Scientists?,** MIT.
Staehr, L., M. Martin, et al.. (2001). Computer Attitudes and Computing Career Perceptions of First Year Computing Students.**Informing Science**(June): 502-509.
Swanson, G. and P. Wise (1996). **Digital Futures: Women's Employment in the Multimedia Industry**. Brisbane, Australian Key Centre for Cultural and Media Policy, Griffith University.
SWIFT (2001). SWIFT Career Choice Report. British Columbia, University of British Columbia. URL: http://www.taz.cs.ubc.ca/swift/. Accessed January 31, 2002.
Tasmanian Department of State Development (2000). Industry Audits: Information Technology, **Communications and Advanced Technology**. URL: http://www.dsd.tas.gov.au/inaud2.htm. Accessed January 31, 2002.
Teague, J. (1998). Recruiting computing professionals - Expanding the recruitment base. Working paper 198/3. Deakin University.
The ACM Committee on Women in Computing (1998). Computer Gender Gap Prompts Major Study by **ACM**.
URL: http://www.acm.org/announcements/acmwnsf.html. Accessed November 9, 2000.
Trauth, E. Nielson, S. von Hellens, L. (2000). Explaining the IT Gender Gap: Australian Stories. **Proceedings of the tenth Australasian Conference on Information Systems**, Brisbane.
von Hellens, L. Nielson, S. Trauth, E. (2001). Breaking and Entering the Male Domain. Women in the IT Industry. **Proceedings ACM SIC CPR**, San Diego.
von Hellens, L. A. Pringle, R. Greenhill, A. Nielson, S. (2000). People, business and IT skills: The perspective of women in the IT industry**. Proceedings ACM SIGCPR**, Chicago.
Young, J. (2002). Increasing the participation of women in information, communication technology careers. Women in IT Tasmania. Available on line at http://WWW.acs.org.au/tas/wiitt/**Wit_Report**_V4.pdf.

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