The lack of participation by females in Information and Communication Technology (ICT) careers is of growing concern. It is puzzling why girls are not attracted to such careers. ICTs can be flexible, dynamic, exciting and challenging while accommodating a range of skills and expertise. Commonly held perceptions of ICT professionals and what is involved in ICT careers are perhaps unappealing to young women, but they are not typical and indicative of the reality of ICT professionals and careers. ICT professionals can be creative, or technical, or both. It is a unique career choice as it provides a range of opportunities for all and is embedded in almost everything we do now and will do into the future.

The Girls and ICTs Project commenced in 2003 with the aim of increasing the participation of girls in ICTs across Queensland. Events were organised to engage girls, parents, teachers and guidance officers, and bridges were built between existing local networks, including local industry groups. Attendees at these events could meet female ICT mentors and role models, as well as participate in hands-on activities and workshops. These events have been successful over the past three years, with the 2005 event, held at Griffith University, attracting 1,500 south-east Queensland girls in Years 7–10.

The lack of participation by females in Information and Communication Technology education and work is an ongoing issue. In Queensland, the participation level for females in ICT subjects and courses in secondary, vocational and higher education is significantly lower than that of males. Subject choice influences opportunities in the paid workforce; therefore the participation of women in ICT careers is also far lower than that of males. In Queensland, only 20% (at most) of ICT students and employees are female, with
the IT first preferences for tertiary admission down 22% for 2004 enrolments².

This problem is also recognised nationally and could have a significant impact on the Australian ICT industry in the near future. An article published late last year in the highly regarded weekly IT section of *The Australian* newspaper, stated that tertiary enrolments were 'plummeting' in IT and that this would lead to a shortage of graduates in three years' time³. In response to this, the IT Dean of a Brisbane university made plans to meet with industry leaders "to see what kind of campaign we can come up with for the longer term"².

A concerted ongoing effort is also visibly being made by academics at other local universities, including a range of practical activities such as university students mentoring secondary school students, and industry professionals mentoring first-year university IT students and hands-on workshops showing the range of applications for technology. Such commitment was confirmed at the 2006 annual *IT Can Take You Anywhere* day. Griffith University’s School of ICT at Nathan campus hosted the July 21 day of excitement for girls in Years 7 – 10 from all over southeast Queensland. The number of girls attending in 2005 far surpassed previous years’ events, with our original hopes of attracting 750 girls being far exceeded, bursting our capacity at 1,500. Girls were enticed with hands-on workshops such as dance studio, robots, cryptography, PDAs; with workshops run by the volunteers from the Australian Federal Police, IBM, Suncorp Metway, and DNA Evidence to name a few. Much research has also been done within this local context to understand the barriers for females entering and working in the ICT industry¹².

In 2004 a study by the University of Melbourne’s Centre for the Study of Higher Education (Australia) commissioned by the Federal Education Minister, suggested that women in engineering and information technology should be retained as a recognised equity group in the higher education equity system, whereas women in general have been removed as a equity group. As the grouping currently stands, there needs to be 40% female participation in engineering and information technology for them to no longer be regarded as a group that is disadvantaged⁴.

Despite these efforts, the number of females entering and participating in ICT is still declining. This article presents some discussions as to why secondary school girls are still not attracted to a career in ICT. It focuses on a Queensland project that is aiming to change the perceptions about ICT and demystify the skills and attributes needed to be successful in this dynamic, exciting industry.

**Girls and ICTs project**

A commonly held perception of school children is that to work in ICT, you need to be geeky and nerdy, have few social skills and like working alone. This profile is particularly unappealing to young girls and, of course, this is not the usual profile of an ICT professional. We know that to be a successful ICT professional, you need to be a good communicator, a team player and have a range of skills.

With State Government funding, the Association of Women Educators and Education Queensland started the *Girls and ICTs* project in July 2003 in Queensland. The aim of the project was to increase the participation of girls in ICTs across the State by running events to engage girls, parents, teachers and guidance officers and by building bridges among existing local networks including local industry groups. The participating groups included the Department of Education and Training, other government departments, Technical and Further Education (TAFE) and local universities, Queensland Society for Technology in Education (QSITE), Girls Into Doing Great Information Technology Society (GiDGITS), Women in Technology (WiT), and individual participants from the local ICT industry. Most importantly, local and some not so local (up to 100 kilometres away) secondary schools were very supportive of their female students and teachers attending the events held as part of the project.

The project began by establishing local *Girls and ICTs* action committees in eight locations throughout Queensland: Cairns, Townsville, Mt Isa, Gold Coast, Toowoomba, Ipswich, Sunshine Coast and Brisbane. The committees were then responsible for organising...
two events in their local community; one for female students in Years 8, 9 and 10 and one for parents, teachers and guidance officers. The Girls and ICTs events aimed to promote the use and study of ICTs by girls, and build on existing successful Girls and ICTs initiatives such as local school girl computer clubs Techno G, GIDGITS and GoGurl.

In 2005, after running separate successful events for girls and ICT each year, GIDGITS and WIT combined efforts to run this year's huge IT Can Take You Anywhere event. In each year the event is run, organisers collect feedback from the girls attending. This feedback is then analysed and used to help us improve events the following year based on the feedback, and understand the underlying issues discouraging girls from believing that IT is a valid career option. The results presented here are based on feedback we collected in 2003 and 2004.

Participants
The participants in the study were attendees at the two Brisbane Girls and ICTs events. Current secondary school students were one group of focus, with teachers/guidance counsellors/parents being the other. The attendees at the teacher event were invited to complete a questionnaire on arrival at the event. At each student event, the girls in attendance (up to 100 in each location) answered a survey before the role models and industry representatives spoke to the group, and they were asked follow-up questions at the conclusion of the events. The reasoning behind having the students complete two sets of questions was to enable a snapshot of their perceptions about ICTs before the event, and then to see if their perceptions had been altered after (and as a result of) the event.

Discussion

The Culture of the ICT Industry
The lack of female participation in ICTs is often referred to as a social or 'cultural' problem, a problem that has been socially constructed, so therefore offers hope that we can deconstruct it. The authors used the data collected from the events to try to understand the reasons behind the lack of participation of females in ICTs, particularly why girls are not participating in ICT studies at school, and why they are not going on to university studies in this area. The view taken is that culture consists of shared and meaningful symbols, including myths, ideology, cultural artefacts and values, which is shaped by its surrounding society, history and the specific contingency factors impinging on it.

Looking at cultural symbols (symbols are words, gestures, pictures or objects that carry a particular meaning which is only recognised by those who share the culture), there were a number of common symbolic artefacts related to ICTs that were evident amongst the responses. One symbolic artefact is the use of the term 'geek' when talking about the ICT industry. One of the participating teachers referred to the way, "[girls] see IT as a 'geek' industry". This symbolic artefact, which is often used in a negative context, tends to deter students from engaging in activities that would have them labelled as such.

Acronyms are one symbol that might help us to understand the cultural influences. Within the education system as well as the ICT industry, the use of acronyms abounds. Students, teachers and parents need to navigate through the endless array of acronyms in the education system. However, the ICT industry, like many other professions, is well known for areas of specialisation where context dependent acronyms are very common. "Information technology is the technical construct of the knowledge economy. Students will need basic skills in information technology to transact business and to work in the future".

In an educational context, society relies significantly upon teachers to convey discipline-based knowledge to the students. This knowledge includes explanations of acronyms used in an everyday context as well as other more specialist terminology in specific subject areas including Mathematics and IPT. Acronyms form a part of occupation and discipline specific jargon; however, 80 percent of the teachers surveyed said that they had trouble keeping pace with changes in ICT jargon and technology. It would be difficult to teach a student current information, if the teacher has been unable to keep abreast of
technology and its associated terminology. This was suggested by teachers who felt that "not enough teachers use IT regularly. It's a bit like the piano" and "[there are] not enough qualified staff to access for advice/help".

Other verbal symbols that were seen in association with learning ICTs in an educational environment included a belief that boys see computers as toys. One teacher commented on why it is difficult to attract girls to ICTs – "[they have] different thought processes, eg. boys like to play computer games thus become accustomed to this". There was also evidence that female students see computers as tools. When asked about what they primarily used their computer for, 86% said school work and other students commented: "making things" and "designing things". Far fewer students (42%) said that they used their computer for playing games. If computers are portrayed as something serious and not as something enjoyable, it might explain the reluctance of students to be involved in ICTs. However, 57% of the students said that they enjoyed learning about and using computers. Other students responded that comments from the students mentioned that the reason that they enjoyed working with computers was that they enjoyed the process of learning, such as, "the chance to learn different things and it could challenge you".

In terms of formal structures, strategies, policies and management processes, authority, power structure, training and education are all integrally linked. All schools must comply, to a certain level, with the educational policies of the government body, Education Queensland. The way in which the curriculum is developed and delivered can affect the way in which the subject is viewed. The basic curriculum and its delivery are decided at a high level in the authority structure and it is then enacted by the teaching staff. Changes to this basic curriculum take time and because of the dynamic nature of the ICT industry, these changes may not occur fast enough. This is emphasised in comments by a teacher when asked about the ICT curriculum: "[the] Year 11 and 12 curriculum doesn't change quickly enough to reflect industry changes...". The lack of financial and physical resources also can affect the delivery of the ICT curriculum and how ICTs are negatively perceived by teachers and students. Funding is supplied to public schools by the government and these funds are supplemented to differing degrees by the parents at the individual school. Governing bodies decide how much money is available to be spent by each school, but the departmental heads and principals then decide how this money is to be used to the best advantage within their school department. Overwhelmingly, 85% of the teachers responded that their departmental budget did not allow the purchase of adequate resources to deliver the curriculum. These resources, however, do not include only computer hardware and software, they also include personnel and buildings. In most secondary schools, students move between classes approximately every 40 minutes throughout their school day in order to be taught different subjects. To enable this, timetabling of subjects where teachers, rooms and students are co-ordinated, is very important.

Both teachers and students acknowledged that there is a problem with the offering of ICT subjects in secondary school prior to Year 11 and 12. When students were asked if there was any reason that they were not currently studying an ICT subject, many students responded that "our school does not offer IT" and "I can't study it until next year". Teachers similarly responded that "we are delivering by integration to the majority of students but most classes do not have enough access" and about the lack of ICT subjects in the early years of secondary school, "there is no lead-in subject for IPT in the junior school". Many teachers also commented that the ICT subjects were already outdated and others wanted to see the ICT curriculum made more practical and more relevant to the ICT workplace. The recognition of the need and importance of early ICT education, along with the provision of physical, human and temporal resources to the schools and teachers by their funding sources could address some of these issues.

Individuals bring their own experience, personality and legacy to a situation and these help to shape a person's motives, assumptions and expectations. Motives are something that induces a person to act in
a certain manner or to achieve a desired goal. Individual students have their own motives in relation to whether they intend to enrol in ICT study. The students were asked about their career intentions and the influences on career choices. Fifty-six percent of surveyed students said that they already knew what career they would like to pursue when they finished their schooling and 54% said that they intended to undertake tertiary education.

When asked what influences their ideal career, several students commented that it is based on personal interests and “doing what I enjoy”. Some factors that may influence student motivations include enjoyment of the area, career aspirations, friends and peers and role models. There were vast differences in opinions as to whether the student enjoyed ICTs. Many students studying an ICT subject stated that they enjoyed ICTs; however, other students found the subject “boring” and “repetitive”. When the students were asked about influencing factors in choosing ideal careers, the top five responses included interesting work, working with other people, high salary/wage, challenging work and creativity. These factors included recognition of social, remuneration and lifestyle aspects of these future careers.

Assumptions and expectations relate to the individual actor’s belief of what is real in their world and their anticipation of perceived future events in their reality. Friends and family play a significant role in influencing the students' assumptions and expectations in relation to subject choices and career decisions. Students were quizzed about what things influenced their career decisions. The top responses in descending order were mother, teacher, father, friends and family members. Mothers also scored higher than fathers in perceived computer literacy with students reporting that 49% of their mothers were very or moderately computer literate compared to only 37% of fathers reportedly being very or moderately computer literate. It was also interesting to note, the students stated that guidance officers had very little influence on their career plans with 70% of students saying that they have not sought career or subject assistance from guidance officers. Moreover, when the students were asked if anyone discouraged them from studying ICTs, the singular answer was “friends”.

Role models are one of the powerful factors influencing the assumptions about ICTs and the career expectations of high school students. These people can be parents and family members, friends, as well as identities within the relevant industry. There were two common responses from the students when they were asked if they could name a male and female that they saw as an ICT role model. One overwhelming type of response for both male and female ICT role models was either “No” or “-”. The other response was “dad” or “uncle” for a male role model, but mothers were not mentioned at all as a female role model. The few responses to the female role model question included a teacher, aunt and friends. Similarly, only 35% of the teachers were able to name a male or female ICT role model. Of the teacher responses there was primarily one main theme for the female role models – fellow teaching staff. The teacher responses to the male ICT role models included a media figure and Bill Gates. Finally, only 10% of teachers agreed that they were mentors for their students.

Conclusion

Although a much discussed topic, the participation of females in ICT is not increasing, in fact it is actually decreasing. It is puzzling why girls are not attracted to a career in ICT when it can be flexible, dynamic, exciting and interesting. It accommodates a range of skills and expertise, and it is often challenging. ICT professionals can be creative, or technical, or both. It is a unique career choice as it provides a range of opportunities for all as it is embedded in almost everything we do and will do into the future.

This Girls and ICTs project has grown substantially over the past three years. Starting out with $1*Star funding in 2003 with an average of 80 people at each event, we have now reached our peak with 1,500 participants in 2005. There have been many lessons learnt along the way and it is now in the calendar as a definite annual event. Links have now also been made with other states to run complementary events in 2006, with Go Gurl running in Perth in March and Melbourne in October.

The aim of the project has always been to inform
students (primary and secondary), teachers, guidance counsellors and parents about the ICT industry. We invite role models in the ICT industry to share their experiences as ICT professionals in a friendly environment where questions and discussion is encouraged. An important aspect of the events and thus the project is to enable the students to raise their awareness about the range of careers in IT and across other industries so they can then make an informed choice about their future career. Providing information on the reality of ICT and where to get more information about careers and the industry is of utmost importance.

Resulting from the many events held and the diversity of events in 2003, a kit was compiled based on ‘best practice’ experience from hosting the events. Input from all committees was sought at a two-day conference, which was held in Brisbane at the completion of the events. Their success and their failures were evaluated and synthesised and compiled as a ‘how to’ guide. The conference was attended by representatives from each committee and provided a great opportunity to look holistically at the project and to discuss future initiatives. An outcome of the two-day conference was an event resource kit to support these and other local networks in organising future Girls and ICTs events. The conference and construction of the kit enabled all committee members to share hints, tips and general advice for the running of future Girls and ICT events. This information has proved helpful due to the diversity of the events held in 2003. The events ranged from early morning events with buffet breakfasts, to light lunch events and evening cocktail parties. Some event locations were rather isolated, while others were in the inner city; some events were held in the town’s community hall, with others in schools, universities and local businesses. The kit is available on the AWE website at:

www.awe.asn.au/girlsicts/

to help the program continue and expand in subsequent years. Further information about the project can be found at:


or contact Colleen Stieler.

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