A REVIEW INTO AUSTRALIAN FEMALES ENTERING THE ICT AND DIGITAL GAMING PROFESSION

Literature Review

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Abstract

“49 percent of all digital gamers in the United Kingdom are female.” (Lewis, 2013)

This is an alarming statistic for the hypermasculine and sexist world that has dominated the industry on a global scale for the better part of 40 years. The idea that these females will move from playing their games into a professional IT career is still a dream or at least a whole generation away from becoming an equalised industry, given the current status of participation rates in education and cultural differences within the IT sector.

In May 2013, it was estimated that, of the 15.5 million people aged 15-64 years in Australia, 2.9 million, or 19%, were enrolled in formal study. The ABS reported recently that 1.2% females enrolled in an IT approved course but on the contrary there were 5.2 % males. [1]

Through empirical data and research it has been proven that females can compete and excel in creating games and programming the next biggest thing on the app market, for example. With male domination in executive roles within IT, the need for a cultural gender change in psyche globally and the exclusive cultural nature of the ICT industry, how are females going to fit into the ICT or gaming industries in the distant future? Factors such as the decline in student numbers for ICT courses, the long hours of a working day in the industry and gender choices of careers, are all valid reasons for gender inequality within the Information and Technology industry.

Literature Review

Female participation in the Information Technology workforce in Australia and globally is low. There is a dramatic gender and pay gap which outlines that for decades females have been under- represented and discriminated against in the IT sector, not only in the workplace but also in the education sector. The prospects for women in IT have ranged from extreme pessimistic to extreme optimistic views on how to engage women in IT and make it an equalised industry. The fact of the matter is that nothing has really changed over the periods in which computers and professional IT employment have come into everyday society. It has been noted that the statistic of about 20% of females have entered the IT workforce and 20% roughly have always enrolled in IT based courses for a period spanning three decades in this country. On the one hand we have a society and government trying to always rectify this gender inequality and on the other hand the male dominance over technology and competitive pressures in the IT sector will ensure that the most prestigious jobs will remain in the hands of the male, even as technology and employment are transformed for the newer economy. An example of newer technology is the advent of robotics and how they are represented and configured for today's society as well as the ever changing landscape for the gaming industry in which participation rates are ever increasing and leaning towards the female side of things.

The ongoing under-representation of women in IT employment and sometimes declining representation of women in IT are a true indicator of cultural differences. In a study conducted by the Australian Bureau of Statistics the labour force surveys showed that female participation in professional IT employment has not changed since the 1980's and has remained at around the 20% level. As a contrast to this fact, women in the general population of the workforce have increased steadily over the same period from around 40% to approximately 50%. It also noted here that females in advanced economies throughout the world are experiencing the same phenomena, which is an under-representation in professional IT labour force.

The meaning of Professional IT employment can be clearly defined as ‘the technically skilled work broadly associated with the design, configuration and deployment in the application of information systems.’ (Whitehouse, 2006) This includes job roles such as systems managers, systems designers, software designers, application and analyst programmers, systems programmers, computer systems auditors and other computing professionals not elsewhere classified or further defined.

The culture of working in IT has always been an issue that cannot be ignored. IT professionals will be expected to work 40 to 48 hours per week on average. Contractors within the private sector sometimes work 60 to 70 hours per week. Long hours required in this profession make participation in the workforce problematic if a work-family balance is to be achieved. Less than 10% of computing professionals work less than 35 hours per week and access to part time working arrangements are very limited in both the public and private sectors. The proportion of women in professional computing occupations is higher in the public sector at 28% compared to the private sector where there is a 23% intake. This could be explained by the highly level of flexibility available in the public sector, however employment in the public sector typically attracts a lower salary than in the public sector. Women who pursue IT careers in the public sector have been shown to have increase opportunities for career advancement and have more access to higher paid roles than their counterparts within the public sector.

There are also other factors that need to be considered such as career expectations and experiences. There are issues that just do not go away such as feminist debates over gender and technology. Historically speaking there is a perspective that could explain how technology has become linked with masculinity and that woman’s positioning in the IT industry is one aspect of this broader relationship. In the view of this examination, the engagement of women in IT is significant to how the world we live in is designed and for whom it is designed for. (Wajcman, 2009) An examination in experiences of women at different stages of an IT career, gender differences in tertiary students’ career expectations and the experience of women returning to work after having a family or career break are all valid reasons for IT not attracting

the female kind. Anti-discrimination tribunals and interviews with professional IT workers in Australia have shown that there is influence on perceptions of discrimination in male-dominated IT work. Female migrants are comparatively well represented in IT in Australia, suggesting that levels of direct discrimination in recruitment are lower for migrant women with IT skills. Although migrant women are still disadvantaged due to the comparative lack of family support in Australian labour markets leaving them to make 'stark choices' between career and family. Overall the situation in other parts of the world is not really that different in terms of empirical data and surveys which suggest something around the 20% mark for women in IT employment.

It is more than clear that the IT industry has low female participation, a figure of approximately 20% is repeatedly recorded in academic literature through research, articles, journals and statistics. Cultural beliefs have been shown to contribute to the under-representation of females in the IT industry. Three theories of relevance have been discussed over the last 10 years, they are: Essentialist Theory; Social Construction theory; and Individual Differences Theory of Information Technology and Gender (IDTGIT).

Essentialist theory

Essentialist theory discusses the idea that men and women have different natures. (Wajcman, 1991) (Adya, 2008) proposed how Essentialist theory has had a profound effect on woman's participation rates in the IT workplace. Through psychological and biological behavior women bring different perspectives in the IT arena. Different perspectives included women's IT response and use compared to men. (Venkatesh & Morris, 2000).

Social construction theory

Drawn from sociology, social construction theory proposes that human actions are the product of the culture in which people are born and raised (Berger & Luckmann, 1966). Most studies into gender and IT with a theoretical underpinning have used social construction theory (Trauth, 2002; Trauth et al., 2004). In their examination of learning organisations, Nielsen et al. (2000) concluded that male values negatively impacted on the IT educational attainment of female students. (Alvesson & Billing, 1997) demonstrated how

the structure and practice of modern organisations were shaped by gender, while (Adya & Kaiser, 2005) found that the primary influence on girls choosing to enter the IT workforce was their fathers. Empirical evidence for the social construction theory in gender and IT research has usually utilised interpretivist methods (Trauth & Quesenberry, 2007), such as the Australian study by (Nielsen et al., 2000). As societal messages are not received and addressed identically by all women (Trauth & Quesenberry, 2007), social construction theory has been challenged for not accommodating individual differences (Trauth, 2002). Inadvertently, research that draws upon social construction theory has resulted in contradictory findings (Trauth et al., 2009), including different national contexts (Weil & Rosen, 1995).

Individual Differences Theory of Information Technology and Gender (IDTGIT)

Trauth summarised the IDTGIT as a focus on the attention of the differences within genders rather than between them (Trauth & Quesenberry, 2007). The idtgit extends the theory of social construction by recognising that individual differences in combination with socio-cultural influences define the participation of men and women in IT (Trauth, 2006; Trauth & Quesenberry, 2007). The IDTGIT is better able to justify the contradictory evidence ometimes found in gender and culture studies that use essentialist or social construction theories (Trauth et al., 2009). As an example of an IDTGIT study, although (Ash et al., 2009) found differences in occupational personalities between enders, they also found within-gender differences. Both types affected IT career preferences. In another study conducted (Trauth et al, 2008) the data analysis showed that the themes of parenting family and economics which reinforced the IT decision making processes, were experienced differently by women in different countries. The findings also uncovered how individual women experience different regional environmental influences and have individual responses to them.

Several studies that collected Australian data have been influenced by the IDTGIT, including (Trauth et al., 2003), (Trauth et al., 2008) and (Mackrell et al., 2009). Empirical studies supported by the IDTGIT were typically left up to interpretation and collected data through interview, participant observation

and/or analysis of documents associated with the participants (Trauth et al., 2004; 2008a; Adya, 2008).

Australia has all the attributes and incentives to be a strong performer in the global IT economy. However, in spite of the well-publicised demand for these skills, the high salaries paid to qualified IT workers and high youth unemployment, IT work remains unattractive to the majority of young Australians. There is less demand for IT university places than for other professional degrees including law, medicine, and teaching. The IT skills shortage is a complex problem raising questions about such issues as mployee turnover and burnout and the role of government in supporting IT education, as well as the difficulty of defining what constitutes professional-level IT work.

It is a complex issue that has not been addressed and perhaps it never will be addressed. In 2001, there was debate over the future of IT Professionals in Australia and the skills shortages in this area. However this did little to address the problems and skills shortage continue to exist. A review of the Australian jobsearch website tells me that over 1500 jobs nationwide have been advertised to " IT Professionals".

The issue that Australian women are not represented in great numbers in IT Professional roles may be attributed to education systems. Australian secondary school students, university students studying IT, and female IT professionals suggests that cultural factors influence both the decision by women to enter the IT industry and the success of female IT professionals.

The high percentage (about 40% of all female students) from Asian backgrounds studying IT degrees in Australia supports the argument that different ethnic groups view IT education differently. Even taking into account these overseas students, their participation is not in proportion to the composition of the overall Australian population of just over 23.4 million. The majority of Australia's population is Caucasian, primarily Anglo-Celtic, and only 4.8% of them are from Asia, a figure expected to rise to 7.5% by 2041. For countries with similar diverse populations, cultural factors such as those identified previously, may be increasingly significant.

Analysis of the data demonstrates that women's participation in professional IT education and employment has actually declined over the past two decades, contrary to female participation in the Australian work force at large which has shown a marked increase. Female students in Australian secondary schools today lack interest in going on to study toward IT degrees in universities, and the number of female IT graduates continues to be low, varying from 14% to 20% of all university IT degree programs. This decline is even more surprising considering the rise in female participation in the traditionally male-dominated professions of engineering, law, medicine and science.

Factors identified by Australian secondary school students recur among female first-year university students, including: the perception of lower female competence and the so-called difficult side of IT as a male domain; lack of female role models; different social influences among Asian and non-Asian students; and a poor understanding of career prospects in the IT industry. Confusion over IT as a career may be surprising, but many students (male and female alike) enter the IT degree in Australia because they did not achieve a score high enough to get them into their preferred areas of study. Approximately 48% of male students and 52% of female students do not go on to their second year of the degree. These figures are explained not only by a high failure rate but also because many students use their success in their first year of an undergraduate IT degree as a vehicle for changing preferences to their area of study.

A survey was conducted in a compulsory first semester subject within an IT degree. The subject was designed to introduce students to the software tools, operating systems and programming environments used within the degree. It showed that female students considered themselves or perceived to be less competent than their male counterparts, although their academic results did not show that they were any different to the males in the class. It is their own perceptions that lead to their own demise in IT undergraduate programs (von Hellens & Nielsen, 2001).

Another survey conducted in Perth with first year students entering university suggested that career choices have a significant impact on female expectations within the Science and IT industries. Within the literature on occupational choice, reference is frequently made to the importance of school experience in shaping career expectations and career choice decisions (Whitley, 1997). This literature suggests that performance and interest in particular subjects can give rise to particular choices, as can the influence of teachers, parents and career guidance officers.

The literature also highlights correlations among technical expertise (such as computer interest), gender beliefs, and school environment, with single-sex schools seen as providing a more supportive base for participation in non-traditional occupations. When compared with other female students, female Science and Technology students were, for example, significantly more likely to have attended a government or co-educational school, they reported a higher self-assessed performance in physical sciences and mathematics, and had been actively encouraged to enroll into their current course of study by their father (or primary male guardian). It appears that factors unrelated to earnings expectations are important in informing the occupational preferences of young women. In particular, it appears that there are relationships between educational context and mentoring from a male guardian that have an effect on career choice.

In addition to collecting background information on high school years the survey also asked respondents to rate the importance of a range of factors thought to have influenced their choice of course. The survey shows that the factors that most influenced female Science and Technology students in selecting their course of study were good career opportunities, employability and future earning potential. While these items were also rated highly by the other groups, several significant differences between female Science and Technology students and females in other courses were evident. For example, relative to females in other courses, female Science and Technology students appear to have placed more weight on aspects such as good career opportunities, future earnings potential, career/teacher advice, and course prestige when choosing their course of study. The availability of

scholarships and other financial support as well as school-based work experience programs also appear to have been a stronger influence for these students, suggesting that such policies may be helping to redress the gender imbalance in such 'non-traditional' courses.

The top four characteristics as rated by the female Science and Technology students were interesting work, good career opportunities, exciting work, and future earning potential. Again there were significant differences between the groups studied. Relative to females in other courses, female Science and Technology students rated the importance of graduate starting salary, future earning potential, opportunities for promotion/advancement, opportunities for travel, and opportunities for creativity and originality significantly higher. They (female S&T students) placed significantly less emphasis on flexibility, ability to take periods out of the workforce, community respect for the occupation, working to help others, working closely with others, and responsibility in the job. Perhaps importantly there was no significant difference between female Science and Technology students and females in other courses in the importance they attached to the ability to combine work and family commitments.

While female Science and Technology students thus appear to place less emphasis on the potential flexibility of their labour market arrangements, it is unclear from this survey whether this reflects a working knowledge of the types of labour market arrangements they might wish to access in later life. The retention rate of women in some sectors of the Science and Technology (for example, IT and engineering) is notoriously low (Bentley, 2003; Roberts and Ayre, 2002). This suggests that, for some women at least, earlier expectations of workforce participation have not been met. For other women, however, it may be the case that a relative lack of flexibility has been taken into account and is not of concern.

When compared with their male Science and Technology counterparts, female Science and Technology students also attached significantly more weight to the people factors (such as helping others, working with people, contributing to society) and significantly less weight to starting salary and earnings

potential. Both groups (male and female Science and Technology students) rated career opportunities, job security, opportunities for promotion and job responsibility as equally important. This suggests that while earnings and employment outcomes provide important motivations for choosing Science and Technology as a potential career, female Science and Technology students appear to have their expectations tempered by gender norms relating to women's caring roles within family units.

Of the Science and Technology female students who do plan to have children, around 64 percent envisaged taking a significant career break of between one and five years. Fewer than fifteen percent saw themselves returning to work before their youngest child was one year old (a slightly lower percentage than among other female students). In contrast, 90 percent of the male Science and Technology students imagined being back at work before their youngest child was one (the corresponding figure for other male students was less than 80 percent). Just over one quarter (26 percent) of the Science and Technology female students imagined themselves in a couple partnership where both parents work full-time (this was, however, a higher percentage than among other female students). The most commonly imagined arrangement (by all groups) was one where the father works full-time and the mother works part-time.

Based on the data presented here it seems fair to conclude that the vast majority of young professional women in Australia, at least initially, expect to become the primary care giver should they have children. They similarly expect to have lengthy periods of time out of the workforce. Whether these women see themselves making this decision by 'choice' or because of prevailing ideologies and social norms surrounding motherhood is something that cannot be determined from these data. From a human capital perspective these results lend, at best, partial support to the argument that women who plan on having children and taking time out of the labour market are likely to self-select into less responsible jobs where earnings growth is flatter and where the penalty for career entry and exit are lower.

Amongst female Science and Technology students the important or significant career drivers appear to be future earnings and job responsibility whilst family factors such as children and work and family are insignificant predictors. This is somewhat surprising given that more than 90 percent of female S&T students anticipate having children and more than 64 percent of them anticipate being out of the workforce for a significant period of time, returning when the youngest child is aged between one and five years.

From a human capital perspective, it seems that family care expectations (expectations or plans that are distinct from those held by male Science and Technology students) are not being built into the career goals and xpectations of these female Science and Technology students. It would, therefore, be erroneous to assume that just because young women and men share similar career expectations they will similarly respond to the shared cultural and institutional environment within Science and Technology, especially around work and family issues. Female S&T students will enter the industry pursuing similar goals as their male counterparts (earnings growth, responsibility, promotion, interesting and challenging work) and will struggle to remain attached if the jobs are unable to simultaneously deliver on these requirements and the flexibility requirements that would enable family care. Failure to meet their needs will not only contribute to ongoing costly retention problems and resultant skill shortages, it will also further exacerbate the current fertility crisis in Australia with women in this industry modifying their fertility plans.

The gaming industry and culture is another arena full of male dominated atmospheres and landscapes that cannot be ignored. Nonetheless, there is a slightly painted picture on the wall through smart phone technology that is trending right now, mobile gamers are pre-dominantly female.

Females make up half the population, and represent 47% of the digital game player market in Australia, yet women do not have comparative input and influence into the creation of digital games. Women are underrepresented in the digital games industry all over the world. In Australia, women's level of contribution to game development is much lower than the USA, Canada, and the United Kingdom.

In much the same way watching broadcast television became a daily activity in the 20th century, with children racing home from school to watch cartoons, digital games have become an increasingly popular pastime in many Australian households during the twenty-first century.

Compared to the film or television industries, the Australian digital games industry is still in its infancy. Nonetheless, it is emerging as one of the fastest growing entertainment sectors, and is now more than double the size of the local movie box-office, with sales reaching an all-time high in 2008 to $1.96 billion, to a creditable 1.18 billion at the end of 2012 (Dinham, 2013). Despite this growth and factors such as the Global Financial Crisis, the ABS reported that during 2006-2007, there were 1431 employees in the gaming industry in Australia, but only 154 were female – 10.5%. In 2012, those figures changed dramatically, with the number of digital game employees dropping to 581 of which 51 were female. In contrast within the same report, women represented in the film and television industry within Australia was 39% and 46.7% respectively. Also, the report outlined that women in the ICT industry made up 20% of the workforce.

According to an independent study undertaken in Queensland less than 10% of women actually work in technical roles developing digital games (Geneve et al., 2009). In comparison, figures released in the USA (Gourdin, 2009) indicate that women represented around 16%. In Canada the digital game development female workforce is 16% (Nordicity, 2013), Norway it is 33%(Ministry of Culture, 2008) and in Japan it is believed to be around 40% (Barnett, 2010).

First hand experiences as an undergraduate student enrolled in the Bachelor of Science – Information Technology at the University of Technology, Sydney, did nothing of a sort to assist in personal motivation. The number of female classmates declined significantly, between the first year in 2006 and the final year in 2008, from around 19 women out of 189 students, to being the only female student in three out of four final year programming subjects. Re-enrolling in 2010 within the new game development degree, there were even less females enrolled than in regular IT subjects. There was only one female in the iPhone Game Programming subject and only two females in the Game Design subject that semester.

In 2012, the Australian Bureau of Statistics, conducted the census, which showed that even though the number of people employed in the industry had declined by almost 60% (57% down in males and 67% down in females) since the previous census in 2007, the actual number of game studios increased by 85%. This was the result of the people who, after they had been laid off from the larger AAA studios during the Global Financial Crisis, opened their smaller independent studios. The more recent independent studios are now focused on the changing player demographics, which have been driving the development of these newer business models. Other contributing factors include the ease of online publishing stores such as Steam, and for mobile apps on Apple's AppStore and Google's Android Market in comparison to developing console games which require expensive licences (ACMI, 2008).

When it comes to using computers and playing digital games, both girls and boys can be equally skilled. More than likely however, more boys will play games than girls. In various studies done, Agosto 2004 notes that both sexes of preschool children demonstrate a similar interest in computer games. However as girls mature, their interest in games and the amount of time they spend playing, declines (Verbick, 2002). Electronic arts, EA, one the world's largest digital games companies own research that shows that 40% of teenage girls played video games compared to 90% of teenage boys and most girls lost interest in games within a year (Waters, 2006). It has been widely suggested that this is due to a lack of games available that appeal to girls.

Most games are designed and specifically marketed towards boys (Chaika, 1996; Verbick, 2002; Agosto, 2004; Adya & Kaiser, 2005). The game industry itself is partly to blame for gender gap in games for girls, however, there are several factors that come into play such as market driven decisions and social aspects (Chaika, 1996).

Most people could be forgiven for thinking that digital games are the realm of the teenage boy. In current times though, women over the age of 18 represent a significantly greater proportion (31%) of the game player market in Australia, than boys who are under 18 (19%). Over the past nine years, the proportion of females who play games has steadily increased from38% in 2005 to 47% in 2011, largely due to casual mobile and online games. It is predicted that this number will surpass males in 2014 (Bond University, 2012).

An overwhelming majority of computer games include male characters, speed, action, violence, defeating opponents, and repetition, which most girls find boring. Boys prefer to play alone, whereas girls would much rather play games that enable them to engage and communicate collaboratively rather than in competition (Gorriz & Medina, 2000).

Men tend to be more exploratory and risk-taking learners, so they are more likely to dive into games by banging all the command buttons until they figure them out. Women tend to want to know how it all works before they put their hands on the controls. However, most of the manuals and game consoles are designed for exploratory/risk-taking learners. Game developers need to ensure that the way tutorials, manuals and consoles are designed, they need to be aimed at both sexes if they want to target both markets (Pratt, 2007). Girls on the other hand, in general, choose games that have narratives that focus on human relationships, have strong female characters, use real life settings and do not contain violence (Denner et al, 2005).

Come 2012, digital games are still considered a “boys club”, according to a study conducted by a digital game research firm, Electronic Entertainment Design and Research, which looked at 669 games with protagonists and

noted only 24 female protagonists. This is consistent with various research studies that claim that avatars women are expected to play are still usually male. Underrepresenting and misrepresenting females in computer games can cause undesired consequences such as implying to girls that boys are the adventure seekers, while girls stand on the sidelines and are totally absent from the action. Girls are looking for experiences and boys are looking for bragging rights…the problem is videogame designers being mostly male, can't seem to figure out what girls want in a videogame…so they cater to boys because its more fun. Videogame companies are very good at figuring out that marketing should be aimed at boys much more than girls because it makes them rich. Ofcoarse they don't want to mess with a winning formula. (Herz, 1997)

Researchers and industry experts may claim to know what girls like to play, however it needs to be asked whether game developers should continue creating games that are built upon the stereotypes of what girls supposedly want. Instead, they should concentrate on making games, which embrace gender-neutral roles, since the production of girl –specific games has not led to any inceases in the number of women employed within the digital games industry (Denner, Bean & Werner, 2005). Regardless of which direction game companies take, in order to engage and sustain the female interest, the industry needs to pay more attention to creating software that focuses more the human, social and cultural aspects, rather than focus on technical advances such as speed, power and better graphics.

Whilst Graner-Ray (2003, pg.148) claimed 10 years ago that things have been going well with male-centric teams and that titles are selling well, with the industry out-grossing the film industry, most would agree. Nonetheless if it were not for the fact that the game industry is growing at a tremendous rate yet its market is not. In 2013, some game company CEO's recognise now that they need more game developers since approximately 50% of their customers are women and the over-18 demographic is the fastest growing.

According to EA's David Gardner, the videogames industry continues to fail women by not producing suitable content. If EA cracked the problem, the company could add a billion dollars to its sales (Waters, 2006).

Conclusion

In response to declining enrolment of women in computer science several items of agenda have been garnered to get girls more involved in IT, create games, gain technology skills and boost student performance in computer classes, which in these cases usually translates into increased awareness and interest in this area and subsequently increases enrolments at University level. Through action research, several after-school workshops and conferences were developed for self-selected middle and high school girls.

Each of the initiatives were to teach a mixture of introductory computer science, game design, human computer interaction, usability, computer graphics and artificial intelligence. To give girls a better understanding of the industry, they also invited successful women from both IT and the games industry to give talks. Although not definitive, upon completion of these workshops, positive feedback was received from most of the girls and their parents. This was especially so with regard to self-efficacy and the use of computers, with one of the girls commenting that they liked that the workshops were '*girls-only'* because there were no boys there who knew everything about computers and made girls feel dumb.

There is a definite gender imbalance in the IT and digital games industry, which can be attributed to less women seeking positions because of real or perceived barriers to entry. This is further impacted by the pipeline issue of young women choosing not to enrol in IT degrees at University.

However it is very clear that career choices have been made years beforehand in middle and early years of high school. This is simply understood to be a cultural and social influence problem that steers girls away from Information Technology and as a direct result also has similar impact on the gaming industry (Taylor, 2014).

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