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ICT and Gender Issues in the Higher Education of Entrepreneurs

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ABSTRACT

Rapid technological innovations are currently occurring in higher education with differential effects on academics, students and ICT. This article, through literature review and author experiences, highlights the potential misperceptions of gender and related learning styles resulting from increased adoption of ICT in higher education. The authors emphasise the need for a collaborative approach between educators, learners, and the people and organisations that drive technological innovation, which contrasts the competitive forces that now abound. The authors also acknowledge the implied positions in dialogues about gender. One response is to initiate understanding at the strategic level and utilise the advances in ICT technologies that enhance connectedness in the educational experience. To improve the education of entrepreneurial managers and leaders, future policies must address the effects and accessibility of online education to meet employer and global technological requirements with equitable outcomes.

Keywords: *Education, Entrepreneur, Equity, Gender, ICT, Innovation, Management*

ICT IN HIGHER EDUCATION

Computer usage has become an integral part of the higher education system and this is a reflection of increases not only of information and communication technology (ICT) diffusion (Cortada, 2008) within the global workforce, but also overall technology awareness, acceptance and application in the community (Zhang & Maruping, 2008). From the factory floor to the highest levels of management, and through the burgeoning e-entrepreneurship sector, workers require an awareness of the applications of IT and accordingly it has become imperative that we, as educators, play a part to transfer these skills to our students. For educators today, age, gender, background, experience, and level of education can rarely be cited as excuses for not knowing how to manage ICT. We simply have to get on with the task of skilling people for their roles as contemporary entrepreneurs, managers and leaders. The challenges we confront are linked with the foundational differences between individuals.

The objective of this theoretical article is two-fold. First, by incorporating information

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from the literature and author experiences as higher education academics, to explore the subtle equity issues that can occur when using online technology in the education and professional development of female and male learners. The second objective of this article is to raise awareness and generate debate of the potential differences in online interaction amongst the genders so that universities can make policies and implement practices that do not limit learning opportunities on the basis of gender. To foster the next generation of competent entrepreneurs and managers, it is imperative that educators have a good understanding of the effects of ICT on learning. In this article the authors have drawn upon management and education literature and focused on one component of the task environment: the customers in the form of university students (see Figure 1). This has been combined with the impact of the technological environment; part of the general environment (see Robbins & Coulter, 2009; Waddell, Devine, Jones, & George, 2008) on the collection and dissemination of information amongst the academics and students.

Figure 1 presents some of the internal and external environmental constraints faced by the higher education sector. Online teaching offers a number of advantages, such as, cost-effectiveness, if managed carefully, flexibility for educators and learners, instantaneous communication and access to a myriad of web resources (Whip & Lorentz, 2009; Steinbronn & Merideth, 2008; Bach, Haynes & Smith, 2007; Hudson, Hudson, & Steel, 2006). Universities are, accordingly, attempting to ensure that their students, regardless of their chosen field, graduate with basic online technological skills. Nevertheless, in the light of increased enrolments during tighter economic times (Gill & Marcus, 2009) and the increasingly diverse generation of students, it is important not to make assumptions about computer skills and, rather, to improve equity awareness in relation to the technology. Universities must strive for equality of academic and student usage and application of information and communication technology (ICT). For the purpose of this article we have defined ICT as the range of information technology tools, such as discussion threads, blogs, wikis, Twitter and email that assist communication through digital media. Please note that the words 'equality' and 'equity'; and 'IT' and 'ICT' have been used interchangeably in this article.

Within the external environment there is direct pressure from the task environment upon the successful operation of a university, which is in addition to the impact of the other general environmental factors. The quality of higher education depends on achieving a balance of these factors (Srikanthan & Dalrymple, 2007). In the task environment, employers, as occasional strategic allies of universities, are demanding that the graduates joining their organisation have a good working knowledge of the ICT that is a component of the general environment. An increasing number of universities are thus initiating policies around expanding ICT applications in their courses (Rossi 2007; Tsai & Beverton, 2007). This is the result of the interplay noted between task and general environments, and is recognition of the generational shift that has occurred amongst university students that has been noticed by employers. The shift has encouraged commentators, such as Prensky (2001) and Buckingham (2006) to label the new generation as 'digital natives', and 'millennials' respectively. Nevertheless, one should still recognise that some people come later to technological awareness and proficiency, and are known as 'digital immigrants' (Prensky, 2001). The students can now "choose when, where, how, with whom, and for how long they engage in learning exercises" (Simpson 2001, p. 4). Regardless, the ubiquity of technology and the expectation that it will be used in business and personal life compels educators and education administrators to wrestle with new online applications.

For universities to be truly successful in their efforts to exchange knowledge with enterprises globally and practice "lifelong learning" (Hicks, Reid, & George, 2001; Keogh, 2001; Selwyn, Gorard, & Williams, 2001) it is essential that efforts are made to reduce the

Figure 1. Higher education internal and external environmental influences

Internal environment					
	University Council (Vice chancellor)	**Employees (Academics)**	**Employees (Administrators)**	**Culture**	**Owners (public, private or semi-(private)**
	-Good governance -Arbiter of policy -Financial viability -Good reputation helping to attract more students and expert academics	-Delivering current information -Being empathetic and understanding of students' personal issues that may impact their learning -Treating all students equal -Providing timely and constructive feedback to students -Working collaboratively with colleagues - Undertaking topical & practical research & apply it in teaching -Working collaboratively with colleagues - Community & academic service	-Smooth running of technical and administrative jobs (eg., IT facilities, library, fees) -Liaison with academics and students	-Interaction between the top management & academics -Interaction between the academics & students (current and future) -Experience of students with academics & administrators -Past connecting with the present & future directions of the University	-Reputation -Making a profit
External environment = task environment + general environment					
	Competitors	**Customers (students, the community, and employers - current and potential).**	**Suppliers (publishers, software producers)**	**Strategic allies (employer, off-shore partnerships)**	**Regulators (Federal government, industry guidelines)**
	-Fair competition -Non-deceptive promotions	-Timely service -Competitive fees -Timely and comprehensive information -Timely and constructive Feedback -Equitable access to resources & information across on- & Off-campus students	-Providing current information and access to learning resources, including the legal framework around copyright - Least feasible waiting time for books and other study material - Remaining competitive and profitable	-Partnerships to maximise market opportunities -Easy transfer & usage of skills	-Compliance to laws and guidelines -Participation in compliance audits -Ensuring quality education across disciplines -Providing constructive feedback
	Economic	**Technological**	**Social-cultural**	**Political-legal**	**International**
	-Exchange rate impacts on international student number enrolment or total income -Global financial crisis impact on international student numbers	-Knowledge management -IT usage and facilities for staff & students	-Tolerant of diverse backgrounds -Resources (food, clothes) for different cultures	-Stable & safe country for local, national and overseas students & visiting academics	-Good reputation globally amongst prospective employees and employers

"digital divide" (Keogh, 2001; Selwyn et al., 2001; Bon, 2007). The potential divide can result from inequalities of access to technology "in terms of age, socio-economic status, race, gender" (Selwyn et al., 2001, p. 260) or living in remote/rural areas, having a disability, or English not being the mother tongue (Keogh, 2001, p. 223). Creed, Zutshi, Fujimoto and Parris (2007) assert that sensitivity to diversity ought to be a key outcome of management education experiences for both students and teachers irrespective of online or face-to-face delivery. The digital divide, whether defined by physical technology or perceived identity

variations around gender or other factors, is still a real division needing respectful treatment by educators. The complexity of day-to-day administration of management education courses in the midst of new technologies can lead to outcomes lacking equity sensitivity on the part of various educators and students. This is a significant part of the digital divide. The next section of the article reminds the reader of the different learning styles amongst individuals. This is followed by a discussion of potential differences of ICT usage amongst genders, and the implications for the education of managers and entrepreneurs. The article concludes with some pragmatic future directions for policy influencers.

Influences on Learning Styles

Learning styles are not attributes set in concrete. Learning styles merely "offer descriptions of the different ways in which people acquire knowledge, think, and learn" (Nachmias & Shany, 2002, p. 316). The ways that individuals learn differ according to age, gender and general personality determined by upbringing and cultural influences. As individuals, we modify learning according to the situation. In relation to learning styles, there are significant bodies of research into left brain – right brain variations (Vernon, 1984; Nowak, 2003), masculine – feminine counterpoints (Heilbrun, 1965; Rychlak & Legerski, 1967), and quantitative – qualitative distinctions (Conway & Christiansen, 2005; Schneider & Roberts, 2004), in information processing and learning (Creed, 2006).

People learn in different ways and information technology, despite its increasing flexibility, tends to pre-determine the ways that data is fragmented, reorganized, disseminated and interpreted according to the dominant patterns of the time. For example, the development of punched card readers enabled development of examination systems within higher education (Kistermann, 2005). This suited some people's learning styles but not others. In the contemporary environment, there are discussion threads, social software, Twitter and an emerging suite of multimedia and communication applications, such as web conferencing software and online role play games. The latter, for example, clearly have more experiential potential than punched card readers and, nonetheless, still constitute a technological delivery approach which suits some learners but not others, thus, the digital divide argument persists.

The ways that we respond to individuals in the online environment can significantly affect the quality of our experiences as teachers and learners. It has been argued that our learning style has a direct effect on our teaching style (Ballard & Clanchy, 1991). There are a number of questionnaires, such as, Vision, Auditory, and Kinesthetic (VAK) Learning Style (Slack & Norwich, 2007), the Dunn and Dunn Model of Learning-Style Preferences (Kavale & LeFever, 2007), Creative Learning Systems (2008), and NSCU (2008) that can assist educators to identify their learning styles. Once teachers identify their own learning style preferences, the next step is to recognize if and how their learning styles impact on teaching styles. One of the moderators of learning and teaching styles is personality difference. The well-researched Big Five Personality Traits (Srivastava, 2006) reveal that individuals exhibit different degrees of Extraversion (sometimes called Surgency), Agreeableness, Conscientiousness, Neuroticism (sometimes reversed and called Emotional Stability), and Openness to Experience (sometimes called Intellect or Intellect/Imagination). The increased anonymity of the online environment generates a risk that fundamental personality difference can be subjugated behind the technological veil (Ward & Tracey, 2004; Brunet & Schmidt, 2007). Students in an online discussion thread, for instance, unless the educator makes a concerted effort to discern psychological dimensions of online communications, risk having their personal differences overlooked in the course of the semester.

Additionally, the growth of role play games and online discussion forums has expanded the opportunities for people to participate in social and educational experiences without having to be immediately labelled according to their

individual differences (e.g., Flanagan, 1999). In the authors' experience as tertiary academics involved in face-to-face and online teaching environments, quite shy and introverted people can easily project an extraverted tone in emails and discussion threads. It seems the relative anonymity of being online and not face-to-face is conducive to forgetting social niceties. There are anecdotes of university lecturers being surprised at the vehemence of some online postings by students who they perceived to be shy and reluctant to share their thoughts in the face-to-face environment (Lujan, 2008). Similar misrepresentations of real personality traits can occur online; the agreeable can appear disagreeable, the closed can appear open, the conscientious can appear lazy. The relative transience of identity online makes misunderstandings of people and their learning styles quite possible. Teaching styles online, therefore, must factor in these contingencies. The next section discusses whether gender differences, in particular, translate to genuine differences in the equity experiences of students and academic staff in the online context.

Masculine-Feminine Technology Counterpoints

As highlighted in the first section, gender is among the many attributes that can influence an individual's learning style (Zutshi & Creed, 2007a). This section considers the aspects of real or perceived gender differences in context with information technology. For example, the terms, 'computer' and 'video games' have developed around a stereotype more readily associated with males. As digital technology usage is becoming a norm within the higher education sector, and games inevitably encroach, the historical bias can persist and one could, on occasion, claim that computer-oriented curricula align more readily with interests linked to masculinity, such as competition, mechanics, mathematics and logic (Lee, 2004).

The earliest conceptions of a computerized world were of centralization and disconnection. The sentiments were predominantly masculine. The vision of machines controlled by software built on logic drove the mass perception. Since mechanics and reason, and assertive control were stereotypically seen to be the domain of males, the computer became aligned with them. Oldenziel (1999) proposes that this masculinisation of the engineering profession, especially, throughout the period when technological developments were transforming the industrial landscape belied the emergence of discrimination and general isolation of females from the developing computer technologies. There have been changes in perception and demography of university courses since last century but the remnant gender predisposition relating to technology in industry and education still warrants acknowledgement (Elnaggar, 2007).

There are stereotypes relating to femininity and the affinity for connectedness in the same way that masculinity has been previously aligned with centralization and disconnectedness. Entrepreneurship and education literature is replete with studies of gender differentials at work (Gupta, Turban, Wasti, & Sikdat, 2009; Holmquist & Carter, 2009) and in learning. For example, Weber and Custer (2005) remind that females generally prefer a collaborative approach incorporated into curriculum design (see also Chapman, 2000; McIntosh, 1983; Rosser, 1985). It is thus possible that technological situations that serve to enhance a collaborative approach will appeal to the feminine nature as opposed to the masculine. On the one side of the debate, Brynin, Raban and Soffer (2006, p. 7) comment that "the long-standing male predominance in the use of technologies … is associated with extensive job segregation by gender". On the other side, Katz and Amichai-Hamburger (2008) observe differentials in competitiveness between males and females when the online and face to face contexts were compared in relation to negotiation. Katz and Amichai-Hamburger (2008, p. 527) assert that, in the online environment, "males and females are driven by totally different incentives". There is, accordingly, a need to approach an understanding of these differences while avoiding stereotypical views of gender differences.

It is the battle to break away from gender stereotypes that has raised the ire of much feminist literature and this archetypal battle continues through the new technological media (Lohan, 2000). Lee (2006, p. 195), for instance, maintains the view that, in the past, generally, "females… are found to be unenthusiastic about studying technologies and computing and perceive that computing sciences are only for white males. In addition, new media for children learners are found to foster masculine values such as competition" (see also Gansmo, Lagesen & Sørensen, 2003; Sørensen, 2003; Spilker & Sørensen, 2000; Varma, 2002). The reality today is different and sometimes by choice, sometimes by necessity, the ICT tools for entrepreneurship and the education that underpins professional development are embraced by all genders. The remnants of gender perception differences still return, however, through the biases and behaviours of individuals in the midst of the new ICT (Lagesen, 2008; MellstrÖm, 2004; Bruni, Gherardi & Poggio, 2004).

In online educational environments, it remains in the hands of the teacher as facilitator to create an environment conducive to cultural change in the online classroom and encourage greater participation of female students through engagement with collaborative, communicative, connected technologies (e.g., Lieberman, 1996; Yazici, 2004; Loi & Dillon, 2006). Since new communication technologies are tending to bring people together who otherwise may never have met, there are new challenges to consider. People, through machines, are talking to each other, applying communication in ever-richer and more socially interconnected ways, and taking the skill of multi-tasking to a new level. This seems, from the authors' perspective, generally better aligned with common (stereotypical) notions of femininity, as communicative and relational. The flipside appears in the argument that females can perceive technology as being too masculine in its applications (Brunner & Bennet, 1997). Another dilemma rests in the contrasting learning styles of males and females in this new, more connected technological environment. How do we maximise the benefits of increasing connectedness, a feminine aspect, in entrepreneurship education against the backdrop of the more masculine feature of overt control that can be a feature of ICT (MellstrÖm, 2004)?

The ability in the online environment for people to obscure some or all of their gender identities adds some complexity (Flanagan, 1999). Some advantages of concealing gender in online interactions are to avoid first impression biases relating to appearance, skills and abilities, and to avoid conscious or subconscious discrimination (Palomares, 2004). In short, one can more confidently reveal intimate details without the normal face-to-face cues that might otherwise serve to inhibit open communication. The disadvantages of people not knowing gender differences online are in the reaction to revelation of any deception. For instance, what if a male represents himself as female online and a subsequent meeting becomes necessary? Obviously, in role plays and games and other creative endeavours, altering representations of individual differences can be liberating (Carpenter, 2009). But when there is an interface between the role play and tasks that subsequently need to be carried out in the real world, when face-to-face meetings and negotiations must take place, any deceptions or altered perceptions about each other could lead to problems with trust, respect and, ultimately, performance (Herring & Martinson, 2004). The burgeoning world of role play gaming is creating new stages for some repeating performances of the gender challenge.

In education, writers such as Loi and Dillon (2006) refer to digital technology facilitating adaptive environments as creative spaces. This intuitive approach is far removed from the first ideas of how computers might impact on education. Devices to store and transmit information promised to provide efficiencies in education. Universities previously invested heavily in computer technology for largely utilitarian reasons. The Internet and increasing levels of connectivity and bandwidth are, however, changing the landscape. Debates about the effectiveness of new technologies in

education are now tending to outweigh those of pure efficiency. Dillon (2006) goes further to explore the pedagogy of connection which he sees as essential in e-enhanced education environments. Educators need to be cognizant of the difference and even design distinct pedagogy around the theme of connectedness (Zutshi & Creed, 2007b). The emergence of widespread, mobile, interconnected networks of computers and communication technologies portends a new learning environment that strongly supports the pedagogy of connectedness (Downes, 2006). Just how this will play out in the context of gender and labelling needs further exploration.

The question is hence raised: Are males and females the same when it comes to learning? The answer emerges from within the broader context of individual differences. It may be that, as a general disposition, the masculine amongst us are more inclined to view computer usage as a game, for entertainment and personal satisfaction (Willoughby, 2008). Females, on the other hand, may be inclined to use the computer as a tool for achieving life goals. This can include, for instance, personal improvement, connection to others for the purpose of finding the solution to problems, communication and keeping in touch with family and friends, and advancing the prospects of their families. Recent studies flag a possible qualitative difference in task performance by females engaged with computer technology (Imhof, Vollmeyer & Beierlein, 2007; Arning & Ziefle, 2009). The reasons for seeking education services contribute to and are affected by certain learning styles which have gender differentials as one of the underlying bases. Educators and administrators need to be mindful of these subtleties as well as the stereotypes. Equity in the online environment requires careful observation and attention.

GENDER ARCHETYPES

Research has shown that women are less likely to access technology due to their greater family commitments (see Ndubisi, 2005; Kramarae, 2003; Selwyn et al., 2001). A study conducted by Vergidis and Panagiotakopoulos (2003) on students' dropping-out of Open University found that females dominated this trend primarily citing "unexpected situations" or "lack of sufficient time". Other studies have shown that different learning styles of males and females also affect the extent of on-line contribution made by females (Barrett & Lally, 1999, p. 52). However, the authors contend that the increasingly complex relational, or connectedness, aspects of communication technology, in particular, may attune more favourably in future with common feminine characteristics. This was recently observed by the authors when teaching a first year management unit to an off campus student cohort. The overall number of messages posted by the females outnumbered those of the males. Furthermore, a majority of the messages posted were about sharing the learning experiences and personal study tips. Generally, the overall length of the online posts by females was longer than of the males, with the latter messages focused on a specific query.

Researchers such as Rozendaal, Minneart and Boekaerts (2003) claim that an individual's learning and information processing occurs at two levels: surface and deep. These two levels of learning are noticed to differ among males and females with "males being more superficial" learners than females (Rozendaal et al., 2003, p. 276). With exceptions, males were shown to 'give up' after an incorrect response and were more extrinsically motivated than females (Rozendaal et al., 2003). Guiller and Durndell (2006) found that messages posted by female students were more positive and supportive than their male counterparts. This aligns with the feminine concept of connectedness and the relational imperatives implied, in contrast with the competitive and disconnected masculine stereotype. A study conducted by Roy, Taylor and Chi (2003) to identify the methods applied in searching for information on- and off-line found that males tend to employ more rapid search and sorting methods. Also females "had a tendency to open and browse the entire linked

documents without going through a preliminary scanning step" (Roy et al., 2003, p. 249). Studies conducted by Barrett and Lally (1999) and Huang (2002) found that males posted more messages online, with their average message being longer than that of females (see also Guiller & Durndell, 2006). This contradicts the authors' experiences and illustrates the variability inherent in gender differential studies.

A cross-cultural study conducted by Gunawardena et al. (2001, p. 113) quoting their respondents comments reported that females were less likely to respond to messages that depicted "competitive [rather than] democratic" posts. Males, on the other hand were less likely to respond to a message if the question asked was long or had a "touchy feely" element to it, aspects most often associated with females posting messages. Another study found that females reported less experience, confidence and interest in their computing skills compared with males (Lynn, Raphael, & Olefsky, 2003). These aspects have been attributed to the different purposes for which males and females use their computer, with females viewing computers as a tool rather than an object of "tinkering, play, programming, or systems design" (Lynn et al., 2003, p. 144; see also Czubaj, 2004; Bostock & Wu, 2005).

From the perspective of equity, the issue of gender is significant. Universities and academics alike need to take steps to ensure equity when creating learning opportunities. This is especially noteworthy if we believe that learning approaches differ amongst genders and, as a generalisation (with plenty of possible exceptions), male preferences are more attuned to computer technology in a pedagogical environment. Crotty (1998) highlights the dichotomous and political nature of this issue. Sources of individual and group identity differences, including gender, are deconstructed by considering the privilege of one side of a dichotomy over the other. Altman (2005) makes a divergent observation about the labelling of Aboriginal art, specifically, Western Desert art, being a catalyst for more widespread acceptance of other regional art styles as fine art. This example steps laterally into a point about learning differences based on marked and unmarked categories. It seems artists suffer similar issues of cultural marking and stereotyping as do learners. Where some art categories are more main stream, so are some learner categories (on variables of gender, culture and other labels). This could be a compelling revelation for any educator who discovers they may have been unconsciously facilitating success for certain marked categories of learners, for example, those who are female and good at writing versus those who are male and good at computer game playing. McCann (1995) highlights the need generally for people to acknowledge positions that are implied in texts and conversations about differences. Important issues to consider are the world view of any statements made in the learning situation, the context in which learning occurs, the beneficiaries of the context, and the barriers, if any, to the improvement of teaching and learning.

Other studies, however, have not found gender to be a differentiating factor when looking at the uptake of e-learning techniques (Nachmias & Shany, 2002). As opposed to the traditional view of females perceived to be disadvantaged when completing online courses, a study conducted by Price (2006) found that women excel in online courses compared with their male peers and generally do not have any lesser access to Internet. This is consistent with emerging studies of the female tendency to relate to the connectedness and enhanced communicative ability provided by online networks (Chen & Tsai, 2007). This follows from an earlier study conducted of students undertaking online courses for the Connecticut Distance Learning Consortium which found more positive than negative responses in relation to their overall experiences (Sullivan, 2001). Female students preferred online courses primarily due to the flexibility being offered by this medium so that they could balance their family and full time work. In the view of students from both genders, technology assists shy and quiet types to share their views with their peers as compared with a face-to-face scenario. This is consistent with

the benefits of socialization as a core human activity, and one quite prominently expressed as a feminine characteristic and as generally experienced by the authors.

An opposing view comes from Cooper (2006) in support of Oldenziel (1999) who purports an insidious masculine bias within computing hardware and software design. Cooper (2006) goes on to suggest a fundamental redesign of computer packages is required at the early school level as an antidote to the inherent masculinity that has found its way into technology applications. The socialization process is ubiquitous and potentially problematic for the different genders depending on the way the software is utilized and explained by teachers. As a concluding point one could assume that there is a slowly decreasing gap between genders when it comes to the educational uses of technology, but there remain subtle differences in application and purpose which need to be considered at the level of administration, teaching and learning (Imhof, Vollmeyer, & Beierlein, 2007). A concise summary of the themes discussed in this section is provided in Figure 2 and extended to indicate potential policy implications for higher education.

The modern global imperative for innovation is relevant, but collaboration can boost productivity and cannot be overlooked from a higher education perspective. The design of online education brings possible gender biases into play; therefore, ongoing awareness training of key managers and educators is part of the solution and may affect performance outcomes in certain higher education courses. At the design level, ICT applications must match with overall objectives. Most courses will require a balance of control and connection in the way learning tools and assessment methods are used. The strengths and weaknesses of learners have to be accommodated at key points. This means course evaluations should allow for usage differentials. Ultimately, changes to software applications and network performance will play out in accessibility differences, which also require close attention by policy influencers.

The debate can be about the extent to which technology impacts on gender differences as opposed to how much gender impacts on the uses of technology. Flanagan (1999) observes that there is a requirement to allow and share multiple perspectives when using information technology tools in an attempt to avoid gender bias. The pragmatic view is that the uptake of the technology is not diminishing and we should be sure that any maleficent undertones in this situation do not create residual equity problems. As online educators, this issue needs elevation in our consciousness from the design of pedagogy through to teaching practice, and necessarily flows into investment decisions about technology infrastructure.

Closing the Gap

Online technology with its various versions within the education sector is here to stay. The landscape of global enterprises and the inexorable changes that organisations of all kinds are asking their managers and staff to observe means education providers have to respond (Kelly, 2009). Equitable interaction with online technology and comfort with its usage has become a timely issue as current and future generations of our learners face deeper immersion in ICT. For example, Conroy (2008) announced the implementation of a "Digital Education Revolution aimed at making sustainable and meaningful change to teaching and learning in Australian schools". This follows on the heels of other countries, such as Britain (Glover et al., 2005, p. 155; see also Pittard, 2004) where the government pressed its schools to implement interactive whiteboards.

Educators or designers of educational material for online courses must be aware of the archetypal differences in learning preferences between individuals, nonetheless, always being careful to avoid stereotyping. In practice, online discussion mediums can be used to accommodate differences by facilitators encouraging all groups of students, whether they are introvert or extrovert, to contribute equitably. In terms of equity of access, academics also need to ensure

Figure 2. Usage of ICT for females versus males

Theme	Female	Male	Policy implications
Online communication approach	Females generally prefer collaborative tasks as part of curriculum (Weber & Custer, 2005).	Online and computer-based media applications are observed to draw from competitiveness and other traditionally masculine values (Gansmo, Lagesen & Sørensen, 2003; Sørensen, 2003; Spilker & Sørensen, 2000; Varma, 2002).	Competitiveness can drive innovation, but collaboration can drive productivity. Consider the gender differentials in design mandates for online education.
Perception about technology	Females often perceive masculine characteristics designed into computer applications (Brunner & Bennet, 1997).	The inherent masculine bias in engineered technologies, including computers, has been linked to embedded gender-based job segregation (Brynin, Raban & Soffer, 2006, p.7)	Educate key managers and educators about the inherent biases in ICT job designs. This may affect performance outcomes in certain higher education courses.
Computer usage	Computers can be used as tools for achieving personal goals and this is usually preferred by females when applying the technology (Imhof, Vollmeyer & Beierlein, 2007).	Computers can also be used for games and entertainment and that is how males often apply the technology (Willoughby, 2008).	Educational purpose and outcomes can often diverge. Ensure the applications are consistent with the overall objectives.
Connection versus control	Connectedness is an aspect of computer usage that is associated with feminine characteristics (Zutshi & Creed, 2007a).	Overt control is an aspect of computer usage that is associated with masculine characteristics (MellstrÖm, 2004).	Some higher education courses require careful control, some need greater connectedness. Most require a balance of the two.
Searching preferences / skills	Thoroughness and attention to detail when reading online messages tends to reflect a feminine mindset (Roy et al, 2003).	Scanning and pattern recognition tend to be favoured above word-for-word reading by males (Roy et al, 2003).	Assessment policy should consider the strengths and weaknesses of learner sub-groups.
Length of the online messages	Females tend to post shorter online discussion messages (Guiller & Durndell, 2006), although anecdotal evidence sometimes contradicts this.	Males generally tend to post longer and more frequent online discussion messages than females (Barrett & Lally, 1999; and Huang, 2002; see also (Guiller & Durndell, 2006).	Evaluation of online courses should consider the implications of response length and allow for usage differentials.

that all material posted on learning management systems is easily accessible and downloadable for students (across national and international borders; metropolitan and regional areas) with appropriate bandwidth and connectivity speeds (Obayelu & Ogunlade, 2006). Academics need to be conscious of the ramifications of applying ICT in teaching and learning situations from the perspective of gender equity, and also ensure that their preferences of ICT and comfort with its usage are not inequitably reflected and reinforced in their students.

Before labelling one group as being a more dominant and comfortable user of various forms of ICT, it is necessary to contemplate two significant differences. First, that the computer can be applied as a 'tool' to accomplish some purpose, and alternately as a way to satisfy hardware curiosity. Second, that there is a difference between extent of use (for example, 2 hours) versus reason for use (such as, playing games versus using the computer to do the assigned task) and comfort with usage. If we only track the number of hours to show that one gender benefits more from computer usage, it is not a transparent and true picture. The latter does not indicate how comfortable one is with computers.

Understanding and subsequently addressing different learning styles has implications for educators and, more importantly, administrators if a university wants to remain competitive in the global education market. Some practical manifestations of the implications are to incorporate a collaborative approach into curriculum design, and to design distinct pedagogy around the theme of connectedness. This would align with technological trends and cater to inequities felt especially by many females in a technological environment. However, individual differences persist and it is recommended to make a genuine effort to enhance student learning experience, keeping in mind individual limitations of technology awareness. Further, we should be aware that the choice of technology and emerging advances in technologies that enhance connectedness seem the most promising for closing the gender divide, despite the immediate equity challenges highlighted in this article.

How Do Gender Issues Manifest for Managers and Entrepreneurs?

To this point, we have been discussing the interplay between gender, learning and teaching styles within the higher education sector. This is only one section of a complex equation and we need to keep in perspective the realities and practicalities of the real world. We need to contemplate where our current students will be working in the future—for themselves as entrepreneurs or working for someone else in their role as intrapreneurs. Intrapreneurs, whilst generally working for large bureaucratic organizational structures, often display many entrepreneurial attributes (Fitzsimmons, Douglas, Antoncic, & Hisrich, 2005; Macrae, 1982). This leads us back to the concept of entrepreneurship.

There are numerous ways to interpret and define an entrepreneur. For this article entrepreneurs are defined as those individuals who work independently and commonly have attributes such as opportunity identification, vision, financial risk, leadership, and management skills (see Veira, 2008; Kearins et al., 2004; Waddell et al., 2008; Zutshi et al., 2006; Sexton & Bowman-Upton, 1990). Massie (1987, pp. 222-223) points out key traits psychologists have identified as entrepreneurial, including, the need for achievement, an internal locus of control, and a tolerance of ambiguity (see also McShane & Von Glinow, 2005; Sexton & Bowman-Upton, 1990). Let's focus on one of the attributes: opportunity identification, which will allow an entrepreneur to either replicate, reengineer or create new products or services to fill a gap in the market. When the latter is undertaken using technology we can call these individuals e-entrepreneurs. In this mix of e-entrepreneur and innovation let's throw in the ingredient of gender.

The Global Entrepreneurship Monitor survey report on women and entrepreneurship, with more than 10,740 respondents from

35 countries in 2005, found that within high-income countries both genders can be equally successful as entrepreneurs (The Globe and Mail, 2006; see also Moules, 2005 for similar conclusions). The survey also found that the genders use similar entrepreneurial strategies: "seeking opportunities, taking risks, mingling with other entrepreneurs, and sharpening their business skills", nevertheless, males were twice as likely to start a new business (Veira, 2008; The Globe and Mail, 2006; see also Wojcik, 2003; Envick & Langford, 1998). Similar deductions about entrepreneurial traits were reached by Forman (1994) whilst reporting the findings of another survey. Forman (1994), nevertheless, did recognise that males and females employ different approaches to the completion of business transactions (see also Veira, 2008). Another survey of 562 male and female entrepreneurs in New York City found that both the genders experienced similar barriers when trying to secure finance when establishing their company (De Lisser, 1999). Statistics, however, indicate that more cases of bankruptcy are linked with males than females and this could be attributed to the different intentions of starting a business. Males generally have the inclination to expand their business in a short span of time as compared to females who wish to find a way of "earning a living" in the longer term (Veira, 2008, p. 96). This may be linked to differences in the extent of risk taking between the genders with males linked to higher percentages of risk taking as compared to females (Sexton & Bowman-Upton, 1990).

In *Female Advantage*, Helgesen (1990) comments on the role played by information technology and sees that it has assisted with communication and accordingly some successes. "Technology mandates direct communication. Computer technology is giving… [communication]… power and strength, rather than the other way around" (Forman, 1994, p. 1D). "The Internet economy is thriving and great ideas are being funded left and right. As a woman CEO networked into this community, and coming from a background of watching trends, I can easily see the potential for women entrepreneurs ("Research study provides insights to gender differences in entrepreneurs," 2000). These comments reflect the current experiences of the authors when teaching students with females now able to take a lead in the entrepreneur world thanks to the developments in ICT and hence transforming themselves into e-entrepreneurs. This brings us to the conclusion that, despite the difficulties of balancing gender inequities, there is cause for some optimism in the future of ICT developments and associated teaching and learning designs.

CONCLUSION AND FUTURE DIRECTIONS

This theoretical article is not based upon primary data; therefore, the next step of the research will involve focus groups to explore the extent and type of online usage amongst different genders in teaching and learning environments. It is vital that any focus groups have equal proportions of genders representing local, international, metropolitan, and regional student combinations. We need to acknowledge that the differences, including gender, are here to stay. The differences range from subtle to obvious in various circumstances. It is premature to claim that one can completely reconcile the different learning styles of males and females within the online environment. University administrators and government policy makers, nevertheless, can broaden awareness and increase the understanding of different learning styles. Future policies must ensure a balance between practical and theoretical knowledge of ICT amongst higher education customers (primarily our students) whilst addressing equity issues of user accessibility, employer and global technological requirements.

Academics need to share their experiences with one another as well as with top management. This will inform the strategic level policy makers of the realistic challenges being experienced by the academics. Of course, in this equation we cannot and should not overlook the learners. They are the future entrepreneurs,

academics, administrators and policy-makers, and are also responsible for ensuring the sustainability of the higher education sector. It is the dollars from their fees (either directly or via the various governments' funding schemes) that ultimately pay for university operations, academic salaries and other resources. If this balance can be achieved, learners in a technological environment will experience enhancements in skills, knowledge, and an improved sense of connectedness. The professional development of all students, including entrepreneurs, depends upon getting the mix right from policy through to implementation levels.

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