LUND UNIVERSITY
School of Economics and Management

Master Programme in Economic Growth, Innovation and Spatial Dynamics

The Gender Digital Divide

Yanfei Zhao

yanfei.zhao.693@student.lu.se

Abstract: Gender not only pervades how people use the ICT, but also influences whether or not and how much they use them. This study, making use of the latest possible secondary data, studies the possible gender digital divide among users of ICT in both developed and developing countries. I move the study of gender digital divide from an early narrow perspective of ICT access and usage patterns among biologically identifiable men and women to a wider exploration of its statistical evidences, its important aspects, and its crossing through four Es. Fewer economic resources, lower levels of awareness, literacy and education, gendered ICT training and gendered ICT sector are identified as important contributes to gender digital divide which can supposedly be bridged through four Es: education in ICT competency, equality of ICT access, employment in ICT-related occupations and ICT–enabled jobs, and empowerment by ICT use.

Key words: gender; digital divide; ICT; segregation; feminism; technology

EKHR71
Master thesis, first year (15 credits ECTS)
June 2013
Supervisor: Jonas Ljungberg
Examiner: Anders Nilsson

ACKNOWLEDGEMENT

I want to express my gratitude to all those who made it possible for me to complete this thesis. My sincerest gratitude goes to Jonas Ljungberg, my supervisor. He reads this thesis and comments on it again and again, providing me with both revelation and encouragement. The completion of this research would never been possible without his patient and enlightening guidance. I'd like to thank all the teachers teaching the courses in the programs of Economic History in Lund University, from whom I've learned a lot and developed both interest and competence in researches of issues related with economic history. Living and studying in Lund has been and would be forever, a most memorable, joyful, and inspirational experience of my life. I love the clear blue sky, the cute architecture, and the kind, helpful friends I made in Lund. I'd also like to thank my parents for their unconditional love and support to me. In the end I have to say: I will always treasure my fond memory of the kind, energetic and intelligent Swedish people: Hugo, Lena, Hilda, Julius, Tim, Susanne, Eva, Monica, Gunn, Gunnel, Adam, Daniel and Gudrun.

CONTENTS

ABLES AND CHARTS

TABLES

CHARTS

CHAPTER ONE: INTRODUCTION

Background and Objectives

1.1 Background

The second half of the last century witnessed human kind conducting a massive task of making our huge store of knowledge and information more accessible (Bush, 1945). The task is not finished, but its current results have turned on irrevocable social, productive, political and cultural changes (Geldof & Unwin, 2005) made possible by Information and Communication Technology (ICT) in all forms and functions. In all these changes lies the question of getting accessed to the huge digital store of knowledge and information, and in particular, who gets advanced digitally by use of these new inventions and who is digitally marginalized in the Internet age.

As a contribution to this ongoing discussion, this study analyzes how women differ from men in their access to and use of ICT in the selected countries. First I make a literature review which shows that: gender segregation exists not only at home but also at work, and hence women tend to be segregated from men horizontally across occupations and vertically at positions; technology is not only cultured with strong masculinity but also gendered accordingly much to the disadvantages of women; dominating as it is, technology is shaped in turn by various gender factors; in all these mutual actions between technology, culture and gender, digital divide still occurs between genders in terms of the actual physical ICT possession, access to the Internet and the quantity and intensity of ICT use. Then I seek and present statistical evidences of gender digital divide not only about its magnitude across the world, but also about its frequency, location and patterns in use. Finding that the inequality in employment, income and education affecting female ICT use negatively, I go on to explore the important aspects of gender digital divide, namely, fewer economic resources; lower levels of awareness, literacy and education; gendered ICT education; and gendered ICT sector. Mapping the evolving changes in gender digital divide, I bring the study to an end by investigating crossing gender digital divide through four Es: education in ICT competency, equality of ICT access, employment in ICT-related occupations and ICT-enabled jobs, empowerment by ICT use.

1.2 Objectives

The objectives of this study are:

●To track statistical evidences of gender digital divide so as to answer the question of How great is gender digital divide?

●To explore important aspects of gender digital divide so as to answer the question of What are the barriers to ICT use for women?"

●To seek possible solutions to gender digital divide so as to answer the question of In what ways gender digital divide could be bridged?

CHAPTER TWO: LITERATURE

Work Segregation, Feminist Theories of Technology, Digital Divide

The following sets of literatures in feminism and media are most relevant and beneficial to the present study.

2.1 Work Segregation

Work segregation refers to the tendency of women and men to work in different sectors and occupations. An illustration from the labor market is such as one of the genders dominates a given professional category (De Meyer et al., 1999). Two types of work segregations could be distinguished.

2.1.1 Horizontal Segregation

Horizontal segregation refers to over/under presence of a certain group in occupations or sectors which is not ordered by any criterion (Bettio and Verashchagina, 2009). It is understood as the concentration of women and men in professions or sectors of economic activity. Horizontal segregation is believed to be a constant phenomenon in the labor market in all OECD countries (Rubery and Fagan, 1993). Being a nearly immutable and universal characteristic of contemporary socio-economic systems (Anker, 1998), horizontal segregation is anticipated to be staying on or to be even accentuated (Jonung, 1998). It also explains a part of the gender pay gap (Blau and Ferber, 1987). Abundant evidence shows that women enter scientific fields in higher numbers when men do not choose to enter these fields, and science, engineering and technology sectors as well as ICT have always been dominated by men in almost all European states (Thewlis et al, 2004).

2.1.2 Vertical Segregation

Vertical segregation refers to over/ under representation of a certain identifiable group in occupations or sectors at the top of an ordering based on such 'desirable' contributes as income, prestige, job stability, etc, independent from the sector of activity. Under-representation at the top of occupation-specific ladders, categorized into the heading of 'vertical segregation' in the past, is now more commonly expressed as 'hierarchical segregation'(Bettio and Verashchagina, 2009). In gender studies, vertical segregation is sometimes referred to by the "glass ceiling" indicating visible or invisible obstacles that result in a certain rarity of women in power and decision positions in organizations or enterprises. The concept of barriers preventing the ascension of women is completed by another one of "sticky floor", describing the forces holding women at the lowest levels in the organizational pyramid (Maron and Meulders, 2008). Vertical segregation is evidenced by many reports. Research conducted for an ITU (2012b) study in both developed and developing countries found classic cases of vertical gender segregation, with women on average accounted for 30 per cent of operations technicians, only 15 per cent of managers and a mere 11 per cent of strategy and planning professionals. The widening women's work in information and communication technology (Valenduc et al, 2004) reports that in ICT organizations across Europe there exists a flat structure with little hierarchy, inducing an informal working environment in which career ladders could be nonexistent. A lack of formal progression processes can make it especially hard for

women to achieve career advancement. This can be a hinder to women because they are more likely to advance where career paths are clear (Wickham et al, 2008).

In feminism, the terms of glass ceiling effect and sticky floor effect have been transplanted from economics. The glass ceiling is "the unseen, yet unreachable barrier that keeps minorities and women from rising to the upper rungs of the corporate ladder, regardless of their qualifications or achievements" (Federal Glass Ceiling Commission, 1995). Initially, the metaphor was used to describe barriers faced by working women but was quickly extended to refer to obstacles impeding the advancement of minority men, as well as women. Four distinctive characteristics of the glass ceiling inequality have been defined by Cotter, et al. (2001):

- *A glass ceiling inequality represents a gender or racial difference that is not explained by other job-relevant characteristics of the employee. (p.657)*
- *A glass ceiling inequality represents a gender or racial difference that is greater at higher levels of an outcome than at lower levels of an outcome. (p. 658)*
- *A gender or racial inequality represents a gender or racial inequality in the chances of advancement into higher levels, not merely the proportions of each gender or race currently at those higher levels. (p. 659)*
- *A glass ceiling inequality represents a gender or racial inequality that increases over the course of a career. (p. 661)*

By comparison, the term "sticky floor" is applied to describing a discriminatory employment pattern which keeps at the bottom of the job scale a certain group of people. Those who experience the "sticky floor" are often "pink collar workers," such as secretaries, nurses, or waitresses.

2.2 Feminist Theories of Technology

Feminist theories of technology conceptualize the link between gender and technology.

2.2.1 Technology as Culture

Defined in terms of male activities, technology is traditionally equaled with industrial machinery and military weapons, namely the tools of work and war, dwarfing other technologies used widely in daily life; initially, feminists try to prove that the biological sex difference does not necessarily result in the identification between technology and manliness, arguing that the taken-for-granted connection between men and machines comes mainly from the historical and cultural making of gender (Wajcman, 2009). Just as mainstream science and technology studies (STS) do, feminists believe that socio-technical relations exist not only in physical objects and institutions but also in symbols, language and identities (McNeil, 2007), asserting that science and technology (technoscience) are a notion of culture or 'material-semiotic practice'. In contemporary Western society, the hegemonic form of masculinity is still strongly associated with technical prowess and power (Wajcman, 1991). Although women's opportunities in the new knowledge economy increase, men continue to dominate technical

work. Women's employment in the information technology, electronics and communications (ITEC) sector has been much lower than their participation in the workforce generally, and it is declining in most industrialized countries (Wajcman, 2009). Labour market economists tend to contribute such sex segregation to differences in human capital, domestic responsibilities disproportionately given to women, and employment discrimination (Becker, 1991). In their opinion, to remedy the 'gender deficit', a combination of different socialization processes and equal opportunity policies need to be exercised.

2.2.2 Technology as Gendered

Because of the complexity of the relationship between women and technology, by the 1980s feminists efforts shift from exploring women's access to technology to examining the very processes by which technology is developed and used, as well as those by which gender is constituted (Wajcman, 2009). For radical feminism, women are fundamentally different from men. Their power, culture and pleasure are supposedly controlled and dominated systematically by men in the framework of patriarchal institutions. While radical feminists argue that gender power relations are embedded more deeply within technoscience, liberal feminism sees the problem in terms of male control of neutral technologies (Wajcman, 2009). When radical feminism focuses on women's bodies and sexuality, socialist feminism centers on the relationship between women's work and technology, arguing that, far from being an autonomous force, technology itself is crucially affected by the antagonistic class relations of production, and that women's exclusion from technology is a consequence of the male domination of skilled trades that develops during the Industrial Revolution (Bradley, 1989; Cockburn, 1983). The socialist feminist frameworks see masculinity as embedded in the machinery itself, highlighting the role of technology as a key source of male power (Cockburn, 1985).

2.2.3 Contemporary Approaches

If feminists of the 1980s are rather pessimistic about the prospects for women offered by the microelectronic revolution, feminist approaches from the 1990s till today, being centered on the mutual shaping of gender and technology and regarding technology as both a source and consequence of gender relations, are positive about the possibilities of ICT to empower women and transform gender relations (Green and Adam, 1999; Kemp and Squires, 1998). A social constructivist framework now is widely adopted by feminist STS scholars (Berg, 1996), conceiving of technology as both a source and consequence of gender relations (Wajcman, 2004). Moreover, the concept of gender itself is now understood as a performance or social achievement, constructed in interaction (Butler, 1990). Rather than conceiving of gender as fixed and existing independently of technology, the notion of performativity, or 'gender as doing', sees the construction of gender identities as shaped together with the technology in the making (Wajcman, 2009).

2.3 Digital Divide

The digital divide is "the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access ICT and to their use of the Internet for a

wide variety of activities" (OECD, 2001). Existing globally between developed and developing countries, or nationally within a country, the digital divide can show itself in different demographic characteristics of the population, such as age, gender and income, or in different locations, such as urban and rural (ITU, 2010). As study goes further, academic literature has commonly distinguished between first and second digital divide (Attewell, 2001). First digital divide refers to an actual physical gap between those who have ICT, such as computers, scanners and camcorders, as well as access to the Internet. For example, according to ITU (2011), the gender gap in the Internet use in 2010 is still quite high in some countries/regions, and the largest differences of women - men are found in Turkey (-20.2) and Azerbaijan (-17.9). Second digital divide describes the gap in the quantity, intensity，efficacy, pattern of ICT use, psychological attitudes (Adams et al., 2005), motivations and Internet skills (Min, 2010).

More specifically, the gender digital divide, which is assumed to be synonymous with and about women in this study, indicates the under-representation of women in the ICT-related fields (Fink and Kenny, 2003).

CHAPTER THREE: METHOD

Design and Data, Advantages and Disadvantages

3.1 Design and Data

In this study, ICT refers to the Internet and, by extension, the computer, but traditional mediums such as mobile phones, print media, radio and television are subsumed under this acronym, for they expand the reach of ICT initiatives and facilitate the spread of information. The gender digital divide in focus refers to inequalities of ICT in terms of access, actual usage, literacy, skills and employment, etc.

To fulfill the three objectives and answer the three questions as mentioned above, this study goes by four steps.

Step 1: Reviewing related literatures supporting the study of gender digital divide (presented in Chapter 2)
Step 2: Tracking statistical evidences of gender digital divide (presented in Chapter 4)
Step 3: Exploring important aspects of gender digital divide (presented in Chapter 5)
Step 4: Seeking possible solutions to gender digital divide (presented in Chapter 6)

For secondary analysis, I collect and examine statistical data mainly from the following fifteen sources: **intel,** an American multinational semiconductor chip maker corporation; **CNNIC,** the China Internet Network Information Center; **ITU,** a United Nations specialized agency for information and communication technologies; **Turk Stat,** the Turkish Statistical Institute; **ONS,** the Office for National Statistics of UK; **eMarketer,** based in London, covering digital marketing, media and commerce; **OECD,** the Organization for Economic Co-operation and Development, based in Paris; c**omScore**, based in Virginia, USA, measuring and studying what users of the Internet do as they navigate the digital world; **DESA,** the Department of Economic and Social Affairs, UN;

Internet World Stats, dealing with the collection, classification, analysis, interpretation, and presentation of masses of numerical data; **The World Bank,** a source of financial and technical assistance to developing countries around the world; **European Schoolnet**, the network of 30 European Ministries of Education based in Brussels; **UNCTAD,** the United Nations Conference on Trade and Development; **Catalyst,** the leading nonprofit membership organization expanding opportunities for women and business; **meraka,** an African advance institute for information and communication technology and **ACS**, the Australian Computer Society.

After collecting the data from the fifteen secondary sources listed above I make some necessary editing, examining them to discover any unrelated elements, rearranging them to make them more logical and combining some with some others to make them more convincing.

3.2 Advantages and Disadvantages

This empirical study is based on and supported by secondary data, the choice of which is made mainly due to two factors: the data availability/quality and the point view of developing/ developed countries.

This type of empirical study has both its advantages and disadvantages. According to Boslaugh (2007), in working with secondary data there are three advantages: the task economically convenient, the data widely available, and the data quality professional and accurate. Tow disadvantages could be cited: the data are not collected in the first place to answer my specific study questions; I am not involved in any of the planning and execution of the original data collection process, so I don't know exactly how it is done.

CHAPTER FOUR: STATISTICAL EVIDENCES OF GENDER DIGITAL DIVIDE

Magnitude of Gender Digital Divide, Frequency of ICT Use, Location of ICT Use, Patterns of ICT Use

An investigation seeking statistical evidences is not only indispensible to the exploration of the important aspects of gender digital divide, but also absolutely necessary if the adverse impact of the current trends of ICT access and ICT use on women worldwide could be dealt with and the potential of ICT could be enhanced to become an effective tool for women's advancement.

4.1 Magnitude of Gender Digital Divide

According to ITU (2013), in 2013 globally women are far more outnumbered by men in using the Internet: only 37% of all women are Internet users, compared with 41% of all men; in addition, the greater gender gap exists more widely in the developing world, "where 16% fewer women than men use the Internet, compared with only 2% fewer women than men in the developed world."

Table 1 below reveals the gender distribution of the Internet users in China from 1997 to 2012: in China the Internet is mostly dominated by men, especially from 1997 to 2004. The female-male difference, however, closes

down as the time continues, reaching the narrowest at -4.7 by the end of 2008 when it turns larger and larger again, climaxing at -11.8 by the end of 2011.

Table 1: Percentage of Women and Men Using the Internet in China

	1997.10.31	**1998.12.31**	**1999.12.31**	**2000.12.31**	**2001.12.31**	**2002.12.31**	**2003.12.31**	**2004.12.31**
Female	12.3%	14%	21%	30.4%	40.0%	40.7%	39.6%	39.4%
Male	87.7%	86%	79%	69.6%	60.0%	59.3%	60.4%	60.6%
Difference women - men	-75.4	-72	-58	-39.2	-20	-18.6	-20.8	-21.2
	2005.12.31	**2006.12.31**	**2007.12.31**	**2008.12.31**	**2009.12.31**	**2010.12.31**	**2011.12.31**	**2012.12.31**
Female	41.3%	41.7%	42.8%	47.5%	45.8%	44.2%	44.1%	44.2%
Male	58.7%	58.3%	57.2%	52.5%	54.2%	55.8%	55.9%	55.8%
Difference women - men	-17.4	-16.6	-14.4	-4.7	-8.4	-11.6	-11.8	-11.6

Calculated and Rearranged from CNNIC: Annually Statistical Survey Report on Internet Development in China

For the benefit of comparison, let's see data about the United States from eMarketer (2013): in 2013, 52.1 percent of the U.S. Internet population is women, while the percentage of men is 47.9. This means women in the United States are not only far more likely than women in China to have Internet access, but also more likely than their male peers in the United States to have Internet access.

Table 2 below indicates that only 8 percent of Indian women and 9 percent of Uganda women are online; in Egypt and Mexico, rates of female Internet access are much higher, 32 percent and 34 percent respectively. Mexican women enjoy significantly higher rates of access than other women in South Asia, Sub-Saharan Africa, Middle East and North Africa, while women's access levels in India and Uganda are roughly on par with regional levels. What is stupendous is the extremely wide gap existing between the regional lows and regional highs as seen in the last two lines, which indicates there is not only a big geographical digital divide but also an unbalanced social-economic development among developing countries.

Table 2: Female Internet Access rates by Focus Country and Region				
	India (South Asia)	Uganda (Sub-Saharan Africa)	Egypt (Middle East & North Africa)	Mexico (Latin America & the Caribbean)
Women's and girls' Internet penetration	8%	9%	32%	34%
Regional average	8%	9%	18%	36%
Regional low	3% (Afghanistan)	<1% (Sierra Leone)	4% (Iraq)	7% (Haiti)
Regional high	25% (Maldives)	40% (Seychelles)	45% (West Bank/Palestine)	82% (Antigua and Barbuda)
Rearranged from intel: Women and the Web, 2013, p. 23				

One direct cause of women being greatly outnumbered by men in ICT use may be that, in many developing countries, women make less money and hence have less access to education. Studies such as the one by Milek et al. (2011) have discovered that women are likely to earn less than men even when they are equal in work qualifications and experience. Lower income level often leads to less affordability to ICT access for women. Additionally, women's lower level of education would also result in an income imbalance between the genders.

In contrast, Table 3 below, showing the percentage of women and men aged 15 to 74 using the Internet in a descending manner, indicates that within a developed country/region, gender digital divide is much smaller, and that it differs only slightly between them. This is illustrated by the women-men differences, in the last column, of Japan (-3.7%), Israel (4.5%), EU 27 (-5.4), Switzerland (5.9%), Macao of China (6.1%), Hong Kong of China (6.2%), Singapore (8.1%) and Korea (Rep.) (8.4%).

Table 3: Gender Digital Divide: Percentage of Women and Men Aged 15 to 74 Using the Internet

Source: ITU World Telecommunication/ICT Indicators database

Country/ Region	Reference Year	Women	Men	Difference Women - Men
Japan	2009	83.8	87.5	-3.7
Israel	2009	64.2	68.7	-4.5
EU27	2010	68.5	74.0	-5.4
Switzerland	2010	86.0	91.9	-5.9
Macao, China	2009	53.7	59.9	-6.1
Hong Kong, China	2009	69.2	75.3	-6.2
Singapore	2009	63.3	71.4	-8.1
Korea (Rep.)	2009	78.5	86.9	-8.4
Selected and rearranged from ITU：Measuring the Information Society, 2011，p. 117				

4.2 Frequency of ICT Use

As part of the issues representing the intensity of ICT use, frequency of use represents a second, and more critical, digital divide that should be studied and bridged in order for women to share in the benefits of an information

society, for "the ability to access, adapt, and create new knowledge using new information and communication technology [ICT] is critical to social inclusion in today's era" (Warschauer, 2003a).

In the developed UK, Individuals' use of the Internet is gendered as is shown in Table 4 below. In 2008, almost three quarters of British men (73 per cent) use the Internet every day or almost every day, compared with two thirds of British women (66 per cent).

Table 4: Frequency of Use of the Internet by Recent Internet Users, by Sex, UK, 2006, 2007 & 2008 (Per cent)

	Every day or almost every day		
	2006	2007	2008
Women	54	63	66
Men	64	70	73
All	59	67	69
Women-men difference	-10	-7	-7

From ONS: Internet Access 2008, Households and Individuals, p. 5

In the mobile Internet use, gendered frequency is also present in UK. Table 5 below reveals a familiar pattern: males more frequently search online by the mobile Internet.

Table 5: Frequency of Using Mobile Search According to UK Internet Users, by Gender, 2010 (% of Respondents)

Source: Tamar, "2010 Search Attitudes Report," June 1, 2010

	Male	**Female**
Daily	10%	3%
Once a week	14%	6%
Once a month	6%	5%
Once every 3 months	3%	3%
Once every 6 months	4%	2%
Once a year	2%	4%
Never	56%	72%
Don't know	1%	1%
Do not have mobile phone	4%	4%

From eMarketer: UK Internet Users and Usage: Top 2010 Trends, November 2010, p. 14

This disproportionate share in mobile use could be understood by a few possible explanations. First, men adopt the ICT earlier than women, suggesting that this is yet another area in which they are to lead the trend. Second, men tend to be making more money than women, thus enabling them to purchase a costly Smartphone and pay for a monthly data plan. comScore MobiLens data in the U.S. and in the E.U. also indicate that the vast majority of mobile users whose mobile phone plans are at least partially paid for by their employer are male (comScore, 2010).

4.3 Location of ICT Use

Where the Internet is accessed is important because the accessing location is often associated with imbalances in access to physical infrastructure, such as computers and Internet, or even conventional communication infrastructure like fixed telephone lines. So another dimension of the gender divide study is from where women access and use ICT.

Across the world, the key categories of accessing locations are: "home, office, school, library, public, cyber café, gaming (Internet access in gaming establishment), kiosk, mobile, access points (wireless access via Wi-Fi & Bluetooth)" (eTForecasts, 2012). Table 6 below shows that except in the Slovak Republic, "at home" is the most common place for both women and men to use the Internet, leaving "at work" far behind in most of the countries in terms of access except in the Czech Republic, Greece, or Portugal. Data from the same source also indicate that in all countries except Brazil, Korea and the Netherlands, women are less likely to access the Internet from home than men. Gender differences in workplace access are both unfavorable and favorable to women: they are to the detriment of women in Austria, Korea, Luxembourg, the Netherlands and Norway, and to their benefit in Finland, Poland and the Slovak Republic.

Table 6: Places where Internet has been Used[1] by Women and Men[2], Selected Countries, 2005

Source: Eurostat, Newcronos database 2006, Statistics Canada, Australian Bureau of Statistics, and Brazilian Network Information Center.

	At home		**At work**		**At place of education [3]**		**At other people's house**	
	Women	Men	Women	Men	Women	Men	Women	Men
Netherlands	93.4	93.1	40.1	50.9	10.3	11.0	3.6	3.9
Denmark	92.7	93.3	47.7	48.7	14.9	13.7	..	..
Luxembourg	92.3	94.5	28.3	45.4	14.9	13.1	3.1	4.9
Iceland	87.5	91.5	52.3	56.1	19.7	20.0	11.5	15.5
Germany	86.1	89.0	27.7	34.0	12.9	14.6	6.3	10.0
Sweden	84.8	88.7	47.7	49.7	16.8	12.5	5.1	7.2
Norway	83.0	85.7	54.0	62.3	17.9	13.3	7.0	11.0
United Kingdom	83.0	83.2	44.9	48.3	17.5	14.1	21.0	26.9
Belgium	79.4	83.0	29.7	31.4	9.2	7.5	4.8	5.7
Finland	74.1	80.8	53.3	50.8	..	..	5.5	9.1
Austria	73.6	75.2	41.4	47.7	9.4	8.3	1.9	3.8
Italy	68.9	74.1	44.8	49.1	13.5	9.9	9.3	12.1
Ireland	66.8	71.1	44.4	47.2	10.9	9.7	6.3	9.2
Greece	**60.9**	**65.9**	**40.4**	**46.5**	**18.9**	**14.8**	**10.0**	**13.1**
Spain	**60.7**	**65.9**	**44.2**	**47.2**	**19.9**	**17.5**	**23.3**	**24.1**
Canada	60.3	61.5	25.2	27.4	11.3	12.0	..	..
Czech Republic	**59.9**	**62.9**	**43.2**	**43.8**	**23.2**	**19.7**	**6.5**	**7.0**
Portugal	**58.4**	**63.2**	**47.0**	**49.3**	**28.6**	**20.7**	**13.8**	**15.5**
Poland	56.5	59.5	34.2	29.3	28.1	28.7	15.4	18.9
Hungary	52.8	59.0	43.9	46.5	18.9	19.8	15.5	15.3

Australia	50.0	53.0	28.0	31.0	9.0	8.0	20.0	18.0
Brazil	46.5	37.6	31.2	21.7	17.1	25.5	18.7	16.6
Slovak Republic	**34.0**	**45.4**	**56.2**	**51.8**	**23.7**	**20.3**	**22.1**	**24.5**
1. Used in the last three months for EU countries, past 12 months for Australia and Canada.								
2. People aged 16 to 74 for EU countries, 10 and over for Brazil, and 18 and over for Australia and Canada.								
3. Technical and further education or Tertiary Institution for Australia, school for Canada and Brazil.								
Rearranged from OECD: Working Party on the Information Economy, ICT AND GENDER, p. 35								

Although accessing the Internet at educational establishments is less common compared with at work or at home, women in all the selected countries are generally more likely to access the Internet from these places than men (Brazil, Canada, Germany, Hungary, the Netherlands, Poland are an exception).

4.4 Patterns of ICT Use

Once accessed, women and men may have different usages online which lead to many studies of various gender-specific usage patterns with the focus on differences in how women and men use ICT (Bonfadelli, 2002). It is found, for instance, that: girls tend to exchange instant messaging and chat online by Internet, whereas boys would download games and music, conduct business and trading online, and create Web pages of their own (Lenhart, Rainie, & Lewis, 2001; Roberts and Foehr, 2004); women regard the Internet as an efficiency booster, keeping family plans and reading at magazine, health and retail sites for helpful information to aid their daily routines, while men like downloading software programs and use the Internet as a form of fun in spare time; (Janis, 2011); women like the Internet for the human connections it promotes, while men like it for the experiences it offers (PEW/INTERNET, 2005). Similar but more inclusive findings in this regard are made by Buchmuller, et al. (2011, p. 756):

- *Women used ICT more for emotional or organizational connectedness.*
- *Women were more concerned about interpersonal communication or care for others, while men used ICT in a more self-referential way.*
- *Men used ICT more for entertainment purposes throughout all generations.*
- *"Availability" and "asking for help" were critical and ambivalent issues for women, while men stated not having any problems being unavailable or out of reach for others.*
- *Women were generally concerned with more and diverse topics (e.g., privacy, friendship, partnership, children, family, housekeeping, care, traveling, health, wellness, fitness, emotions, beauty, and style) than men (professional life, entertainment, and health).*
- *Women's lives posed more challenges in coordinating different life spaces as well as mediating between their own and other people's needs.*

- *Women often regarded ICT from a perspective of daily purposefulness and anticipated less technical limits than men, while men were more qualified in more technical details and showed a higher degree of technical differentiation.*

Table 7 below ranks online categories in two columns, each being followed by the shares of both females' and males' total time online. The index value listed in a descending order for each column points out the relative degree by which females are more likely to stay at a certain category when compared to males. Indices above 100 indicate categories at which females spend more than their 'fair share' of time online. Conversely, indices under 100 imply categories at which females spend less than their 'fair share' of time online.

Table 7: Share of Time Spend Online: Females vs. Males

Worldwide Audience (15+ accessing from Work or Home), April 2010

Source: Media Metrix Worldwide

Site categories	Females	Males	Index	Site categories	Males	Females	Index
Social networking	16.3%	11.7%	**139**	Multimedia	6.3%	5.2%	**82**
Instant messengers	11.3%	10.4%	**108**	Search/Navigation	2.9%	2.8%	**96**
Email	7.7%	6.8%	**114**	Directories/Sources	2.4%	2.2%	**91**
Retail	2.9%	2.4%	**120**	Business/Finance	1.7%	1.5%	**89**
Online gaming	2.7%	2.2%	**124**	Auctions	1.6%	1.5%	**98**
Community	2.2%	1.8%	**123**	General news	1.1%	0.9%	**79**
Education	1.1%	0.8%	**140**	Banking	0.8%	0.7%	**97**
Photos	1.0%	0.8%	**125**				
Blogs	0.9%	0.8%	**120**				

From comScore: Women on the Web, How Women are Shaping the Internet, June, 2010, p. 7

Approaching the question from a related but slightly different point of view, Table 8 below offers the highest reach indices for women compared to men, revealing the categories in which the difference between male and female behavior is greatest. It's not terribly surprising that women over-index most heavily in the following categories: Fragrances/Cosmetics (210), E-cards (160), Flowers, Gifts and Greetings (158) and Pets (158).

Table 8: Top Indexing Categories: % Reach for Females vs. Males

Worldwide Audience (15+ accessing from Work or Home), April 2010

Source: Media Metrix Worldwide

Site categories	Females	Males	Index	Site categories	Males	Females	Index
Fragrance/ Cosmetics	6.6	3.1	210	Community-Food	17.7	12.2	145
E-cards	5.8	3.6	160	Family & Parenting	20.1	14.0	144
Flowers/Gifts/Greetings	6.7	4.3	158	Apparel	21.5	15.1	142
Pets	5.0	3.2	158	Retail-Food	5.9	4.2	141
Beauty/ Fashion/ Style	14.6	9.4	155	Pharmacy	2.1	1.6	136
Department Stores	10.6	7.1	149	Health-Information	22.8	17.4	132
Jewelry/ Luxury Goods	4.4	3.0	147	Kids	12.5	9.5	131
Coupons	5.0	3.5	145	Mall	6.6	5.0	131

From comScore: Women on the Web, How Women are Shaping the Internet, June, 2010, pp. 6 and 8

Table 9 below indicates that although social networking varies in its relative importance — reflective, perhaps, of overall cultural differences, no matter in what region they are across the world, women are consistently more social on the Internet than their regional, male counterparts. For the Internet and online knowledge networking provide open space for them to freely voice and share their opinions, stories, worries and experiences, which is also conducive to their empowerment (Jain, 2006). Studies by individual researchers arrive at the same conclusion that females are more social online: women are more likely to use emails to stay in touch with relatives (Boneva, Kraut, & Frohlich, 2001); girls aged 15-17 years old spend more time online than boys of the same ages and are more likely to use emails, instant messaging, and text messaging through mobile phones (Valkenburg, 2004). In using emails, forums, instant messages, getting health and spiritual information, and playing online interactive games, women can enlarge the scope of activities and participate in discussions previously beyond their capacity. Among college students, gender continues to be a significant predictor of types of Internet use. For instance, Fortson et al. (2007) confirms that male college students are more likely to use the Internet for recreation, whereas female college students tend to surf the Web for communicative and educational ends.

Table 9: Share of Time Spent on Social Networking, Email, and IM

Worldwide Audience (15+ accessing from Work or Home), March 2010

Source: Media Metrix Worldwide

	% of Total Minutes		% of Total Minutes for Females 18+		
Region	**Female 18+**	**Male 18+**	**Social networking**	**E-mail**	**Instant Messenger**
World-Wide	33%	27%	15%	8%	11%
Latin America	52%	45%	18%	10%	24%
Europe	37%	30%	19%	6%	12%
North America	30%	25%	13%	13%	4%
Asia Pacific	20%	17%	10%	4%	6%

Rearranged from comScore: Women on the Web, How Women are Shaping the Internet, June, 2010, p. 9

Twitter seems，however, to vary in its function for women versus men by context. In an April 2010 comScore survey (Table 10), consumers in US are investigated about how they use Twitter. Though the site has been proved pleasing to both genders, it is not surprising that men and women differ in Twitter uses. Men are far more likely to post their own Tweets than women. Meanwhile, a larger percentage of female Twitter users say they are more likely to use the service as a conversation medium and to follow celebrities (comScore, 2010).

Table 10: Consumer Usage of Twitter in the U.S.

Source: comScore Survey, April 2010

Q: For which have you used Twitter?	**male**	**female**
Reading tweets from users I follow	42%	38%
Posting my own tweets	38%	29%
'Retweeting' other users' tweets	20%	18%
Finding breaking news	23%	13%
Conversations with other users	16%	18%
Following celebrities	14%	18%
Following businesses to find sales/deals/special prices/promotions	12%	16%
Finding product reviews/opinions	17%	11%
Finding political news	15%	10%
Following my favorite sports teams	15%	8%
Asking for help/advice from other users	7%	3%
Other	35	8%
None of the above	11%	23%

From comScore: Women on the Web, How Women are Shaping the Internet 2010, p. 13

In short, as indicated by findings above, gender differences in specific uses of the Internet do clearly seem to exist, but they appear to result primarily from differences in Internet experience. Although this understanding agrees with the present findings, it is only tentative at best. In summary, results from above investigations show that women use the Internet primarily for interpersonal communication and educational assistance, whereas males use it often for purposes related to entertainment and leisure.

CHAPTER FIVE: IMPORTANT ASPECTS OF GENDER DIGITAL DIVIDE

Fewer Economic Resources, Lower Levels of Awareness
Literacy and Education, Gendered ICT Training, Gendered ICT Sector

Different socioeconomic and cultural variables determine the adoption and effective use of ICT, thus creating a digital divide or more specifically a gender digital divide, the focus of this study. Dimensions of gender digital divide have been explored by researchers and organizations. Walterova（2012) finds that apart from age, education and income, other major contributes to gender digital divide are: "geographical factors", "gender inequality", "lack of computers at home", "lack of computers available for the public from government/municipalities", lack

of basic ICT skills", and "permanent social isolation". (p. 349). ICRW (2010) lists four barriers hindering women's access to and use of technologies:

Exclusion from technology education and design — not only do men overwhelmingly constitute the users of diverse types of technologies worldwide, but they also dominate the innovation process as developers, creators, and designers; little free time — across developing countries, women bear a disproportionate burden of household and family responsibilities, such as cooking, cleaning, and fetching fuel or water, as well as child and elder care; social norms favoring men — throughout the world, technologies are often considered to be within the purview of men; financial and institutional constraints — women tend to lack the financial resources to use, rent, or purchase established and new technologies.(p. 7)

Warschauer (2003b) states that the determining variables could be divided into four groups, namely: physical — computers and connectivity; digital — content and language; human — literacy and education; and social — communities and institutions.

A two-group division developed by Bridges.org (2002) and used to assess the extent to which ICT is usefully available, not just physically present, encompasses a range of dimensions as follows:

●Physical Availability —Presence of ICT and connectivity around；

●Non-Physical Availability — Affordability to use；Capacity to use；Locally relevant content and language；Integration into daily routines；Socio-cultural inequality in gender, race, or other socio-cultural factors；Appropriateness to both local and personal needs and conditions；Trust in ICT in terms of privacy, security, or cybercrime；Legal environment for laws and regulations limiting ICT use；Local economics favorable to ICT use；Macroeconomics in terms of transparency, deregulation, investment, and labor issues; Political will to enable ICT use.

These variables and dimensions shed light on my choice of the most important aspects of gender digital divide to be explored as follows.

5.1 Fewer Economic Resources

Studies of 'digital inequalities' reveal that use of ICT reflects inequalities with regard to the access to economic, cultural, and social resources outside them (Hargittai, 2004).

Table 11 below offers information rearranged both on income levels in selected African countries and percentage of individuals using the Internet. In Côte d'Ivoire, only four per cent of the first three quartiles in terms of disposable income are users of the Internet. In comparison, for people earning in the top quartile, Internet use comes at fourteen per cent. What is discouraging is that, in almost all the selected countries, women are doubled

or more than doubled, by men in terms of the percentage using the Internet. As is indicated, in all of the selected African countries, there is both a clear link between income and Internet use and a clear gender divide, with women outnumbered twice by men in most of the selected countries in using the Internet.

Table 11: Percentage of Individuals Aged 16 and Older Using the Internet (%), by Income, in Selected African Countries, 2007/2008*

Source: Research ICT Africa (RIA)

Countries	**Lowest three disposable income quartiles**	**Top disposable income quartile**	**Men ****	**Women *****
Ethiopia	0	3	0.9	0.4
Uganda	1	7	3.7	1.1
Zambia #	1	13	5.6	1.7
Tanzania	1	4	1.9	2.3
Ghana	5	8	8.1	3.2
Côte d'Ivoire	4	14	8.1	4.0
Botswana	2	19	10.1	4.0
Benin	6	16	11.9	5.3
Senegal	9	14	14.4	6.7
Nigeria #	10	22	16.4	7.6
Namibia	4	25	11.2	7.2
South Africa	7	38	20.4	11.3
Kenya	9	32	21.1	11.5

Note: * Surveys were conducted between August 2007 and April 2008 (most countries having finished already in 2007).
† Not nationally representative, but extrapolation was adjusted to reflect the national level.
Source: Research ICT Africa (RIA).

Note: * Surveys were conducted between August 2007 and April 2008 (most countries having finished already in 2007).
** As a percentage of men aged 16 or older.
*** As a percentage of women aged 16 or older.
† Not nationally representative, but extrapolation was adjusted to reflect the national level.
Source: Research ICT Africa (RIA).

Note: * Surveys were conducted between August 2007 and April 2008 (most countries having finished already in 2007).
** As a percentage of men aged 16 or older.
*** As a percentage of women aged 16 or older.
# Not nationally representative, but extrapolation was adjusted to reflect the national level.

Combined from ITU: Measuring the Information Society, 2011, pp. 114 and 118

ICT uses have to be affordable if people are to benefit from them. As with other technological advancements, the possession of computer and Internet determines both how many people will be their user and how often they are used. Therefore it is important that any study of gender digital divide should not only consider and understand building of ICT infrastructure but also take into account the households with computer and Internet.

Table 12 below, showing the percentage of households with computer/Internet and the gender digital divide, offers two important revelations. On one hand, the percentage of households with computer and Internet is seen, on the whole, in a direct proportion to the percentage of women and men aged 15 to 74 using the Internet. On the other hand, surprisingly, the blackened relatively developed countries/regions, which are relatively high both in Gross National Income Per Capita and with high percentages of households with computer and Internet, also have an average gender digital divide of – 5.44 in terms of the percentage of women and men aged 15 to 74 using the Internet, as compared with an average gender digital divide of -6.69 for the other relatively less developed countries (as calculated from data of Difference Women – Men in Table 12). This surprising fact indicates that apart from fewer economic resources, there must be other contributes to the gender digital divide which are to be elaborated in details below.

Table 12: Percentage of Households with Computer/Internet and Gender Digital Divide

Source: ITU World Telecommunication/ICT Indicators database

Country/Region (Gross National Income Per Capita in 2010, PPP 2008 $)	Percentage of Households with Computer		Percentage of Households with Internet		Percentage of Women and Men Aged 15 to 74 Using the Internet	
	Reference Year		Reference Year		Difference Women - Men	Latest Available Year
	2008	2010	2008	2010		
Australia (38,692)	**74.9**	**81.1**	**66.6**	**74.1**	**-0.4**	**2009**
Brazil (10,607)	31.2	34.9	23.8	27.1	-0.5	2010
Uruguay (13,808)	35.4	52.8	20.8	33.3	-0.9	2009
Mauritius(13,344)	30.0	*33.4*	20.2	*24.6*	-3.1	2008
Costa Rica(10,870)	34.4	41.3	14.8	24.1	-3.5	2008
Iran (I.R.) (11,764)	*22.3*	*33.7*	*14.0*	*20.8*	-3.7	2009
Japan (34,692)	***85.9***	***88.5***	***79.8***	***85.4***	**-3.7**	**2009**
Mexico (13,971)	25.7	29.8	13.5	22.2	-4.2	2010
Belarus(12,926)	28.5	40.8	15.6	31.2	-4.3	2010
Chile (13,561)	40.0	*46.8*	*26.6*	*35.0*	-4.4	2009
Israel (27,831)	***71.0***	***77.0***	**61.8**	**69.0**	**-4.5**	**2009**
Egypt (5,889)	27.0	34.0	*19.9*	*31.2*	-5.2	2009
Qatar(79,426)	**71.0**	**89.6**	**63.0**	**84.0**	**-5.7**	**2010**
Switzerland (39,849)	***80.6***	***86.9***	***78.0***	***86.4***	**-5.9**	**2010**
Macao	**75.5**	**80.1**	**69.3**	**80.0**	**-6.1**	**2009**
Hong Kong	**74.6**	**77.3**	**70.9**	**75.7**	**-6.2**	**2009**
Peru (8,424)	18.0	22.7	8.8	12.3	-7.7	2008
Singapore (48,893)	**80.0**	**84.0**	***76.0***	***82.0***	**-8.1**	**2009**
Korea (Rep.) (29,518)	***80.9***	***81.8***	**94.3**	**96.8**	**-8.4**	**2009**
Russia (15,258)	43.0	50.0	29.0	42.1	-9.0	2009
Senegal (1,816)	*4.6*	*5.7*	*1.9*	*4.5*	-9.0	2009
Azerbaijan (8,747)	*14.6*	*21.5*	*13.9*	*35.3*	-17.9	2010
Turkey (13,359)	*32.0*	*44.2*	*25.4*	*41.6*	-20.2	2010

Note: Data in italics refer to ITU estimates

Combined from ITU: Measuring the Information Society, 2011, pp. 152 and 117 and UNDP: Human Development Report 2010, p. 143

5.2 Lower Levels of Awareness, Literacy and Education

Levels of awareness, literacy and education related with ICT are an important indicator in measuring the gender digital divide. Basic literacy and numeracy are required to read and compose simple messages, surf the Internet, and perform commands in software applications. As women account for nearly two-thirds of the world's illiterates, and one out of every two women in developing countries is illiterate, they are more likely than men to be in need of the basic literacy and computer skills which would enable them to benefit from the new opportunities provided by the new global communication network（P. Fraser-Abder and J.A. Mehta, 1995）.

5.2.1 Awareness

One has to be aware of the existence and benefit of ICT so as to use them. Results from an investigation of African citizens as shown in Table 13 below reveal a seemingly striking fact that a lot of people stay offline simply because they are not aware of the existence of the Internet and what it might bring to them. In Africa, on the whole more women than men are unaware of the Internet and its benefits. In Uganda, Zambia, Ghana, Côte d'Ivoire, Botswana, Benin, Senegal, Nigeria, Namibia, South Africa and Kenya, for example, on the whole, men know more about the Internet and consequently they are more likely to be users of the Internet. In Cameroon where there are as many women as (or more women than) men being aware of the Internet, the digital gender divide, in terms of the Internet use, remains slightly small. While being unaware could be impeding the Internet adoption, other factors, being poor and being illiterate, are likely to function as barriers, too.

Table 13: Knowing about the Internet and Using it: the Gender Divide, 2007/2008*

Source: Research ICT Africa (RIA)

Countries	**Individuals Aged 16 and Over Who Know What the Internet is (%)**		**Individuals Aged 16 and Over Who Use the Internet (%)**	
	Men **	**Women *****	**Men ****	**Women *****
Ethiopia	10.8	6.5	0.9	0.4
Mozambique	3.8	3.7	1.0	0.9
Uganda	9.4	3.5	3.7	1.1
Zambia #	49.2	39.6	5.6	1.7
Rwanda	6.4	7.0	1.8	2.1
Tanzania	9.9	8.0	1.9	2.3
Ghana	29.7	23.4	8.1	3.2
Burkina Faso	8.9	9.8	3.7	6.4
Côte d'Ivoire	19.3	13.4	8.1	4.0
Botswana	30.8	18.1	10.1	4.0
Benin	27.8	14.6	11.9	5.3
Senegal	56.5	35.8	14.4	6.7
Nigeria #	40.7	34.9	16.4	7.6
Namibia	30.4	24.2	11.2	7.2
South Africa	56.2	47.0	20.4	11.3
Kenya	39.9	27.8	21.1	11.5
Cameroon	34.5	44.6	13.1	12.8

Note: * Surveys were conducted between August 2007 and April 2008 (most countries having finished already in 2007).

** As a percentage of men aged 16 or older.

*** As a percentage of women aged 16 or older.

Not nationally representative, but extrapolation was adjusted to reflect the national level.

Rearranged from ITU: Measuring the Information Society, 2011, p. 118

Women in developing countries require more information on the potential of ICT for their individual advancement, a subject that should be increasingly and concertedly pushed forward among all women-related organizations. Women, especially in the developing world, must be made aware of ICT as a tool which can update and increase their access to life-long learning, new job and business opportunities, health information, political participation, and which can even create alternatives and solutions to difficult situations women might face, such as violence, harassment or discrimination.

5.2.2 Literacy

Literacy is "the ability to understand and employ printed information in daily activities, at home, at work, and in the community — to achieve ones' goals and to develop one's knowledge and potential," which is determined by reading literacy or prose literacy, namely functional command of common texts; scientific literacy or document literacy, namely identifying evidence, evaluating and communicating conclusions, the understanding and using data in contexts such as maps, tables, forms and charts; and quantitative literacy or mathematical literacy, namely manipulating numbers in circumstances that might be encountered in occupational or private life (OECD, 2000).

Low literacy levels can affect Internet use by causing frustration with the internet. Across the world, especially in developing countries in Africa, Asia, Middle East and Latin America / Caribbean, the gap between literacy levels by gender is extremely large, some as large as -34%, which is shown (Table 14) in a clear proportion to the corresponding low percentage of population in terms of Internet penetration.

Table 14: Statistics and Indicators on Women and Men Literacy (Left)

And % Population (Internet Penetration) (Far Right)

Country or area	Year	Youth (15-24) literacy rate				Adult (15+) literacy rate				NOTES: Internet Statistics were updated for June 30, 2012.
		Total	Women	Men	Women- men difference	Total	Women	Men	Women- men difference	
Guatemala	2010	87	89	85	-4	75	81	70	-11	16.2%
Ghana	2010	81	82	80	-2	67	73	61	-12	14.1%
Mauritania	2010	68	71	65	-6	58	65	51	-14	4.5%
Iraq	2010	83	85	81	-4	78	86	71	-15	7.1%
Solomon Islands	1999	85	90	80	-10	77	84	69	-15	5.9%
Burkina Faso	2007	39	47	33	-14	29	37	22	-15	3.0%
Cameroon	2007	83	89	77	-12	71	79	63	-16	5.0%
Egypt	2010	88	91	84	-7	72	80	64	-16	35.6%
Cambodia	2009	87	88	86	-2	74	83	66	-17	4.4%
Uganda	2010	87	90	85	-5	73	83	65	-18	13.0%
Sudan (pre-secession)	2010	87	90	84	-14	71	80	62	-18	19.0%
Côte d'Ivoire	2010	67	72	62	-10	56	65	47	-18	4.4%
Lao People's Democratic Republic	2005	84	89	79	-10	73	82	63	-19	9.0%
Zambia	2010	74	82	67	-15	71	81	62	-19	11.5%
Gambia	2010	67	72	62	-10	50	60	40	-20	10.9%
Democratic Republic of the Congo	2010	65	68	62	-6	67	77	57	-20	1.2%
Ethiopia	2007	55	63	47	-16	39	49	29	-20	1.1%
Eritrea	2010	89	92	87	-5	68	79	58	-21	6.2%
Chad	2010	47	53	41	-12	34	45	24	-21	1.9%
Guinea	2010	63	70	57	-13	41	52	30	-22	1.3%
Nigeria	2010	72	78	66	-12	61	72	50	-22	28.4%
Mali	2010	44	56	34	-22	31	43	20	-23	2.7%
Sierra Leone	2010	59	69	50	-19	42	54	31	-23	1.3%
Senegal	2009	65	74	56	-18	50	62	39	-23	17.5%
India	2006	81	88	74	-14	63	75	51	-24	11.4%
Morocco	2009	79	87	72	-15	56	69	44	-25	51.0%
Nepal	2010	83	88	78	-10	60	73	48	-25	9.0%
Angola	2010	73	80	66	-14	70	83	58	-25	14.8%
Benin	2010	55	66	45	-21	42	55	30	-25	3.5%
Bhutan	2005	74	80	68	-12	53	65	39	-26	21.0%
Central African Republic	2010	65	72	58	-14	56	69	43	-26	3.0%
Guinea-Bissau	2010	72	79	65	-14	54	68	41	-27	2.7%
Togo	2009	82	88	75	-13	57	71	44	-27	5.1%
Niger	2005	37	52	23	-29	29	43	15	-28	1.3%
Mozambique	2010	72	79	65	-14	56	71	43	-28	4.3%
Pakistan	2009	71	79	61	-18	55	69	40	-29	4.3%
Yemen	2010	85	96	74	-22	64	81	47	-34	14.9%

Rearranged and calculated from data by DESA, UN, December 2012

http://unstats.un.org/unsd/demographic/products/indwm/

Rearranged from data by Internet World Stats

http://www.internet worldstats.com/stats.htm

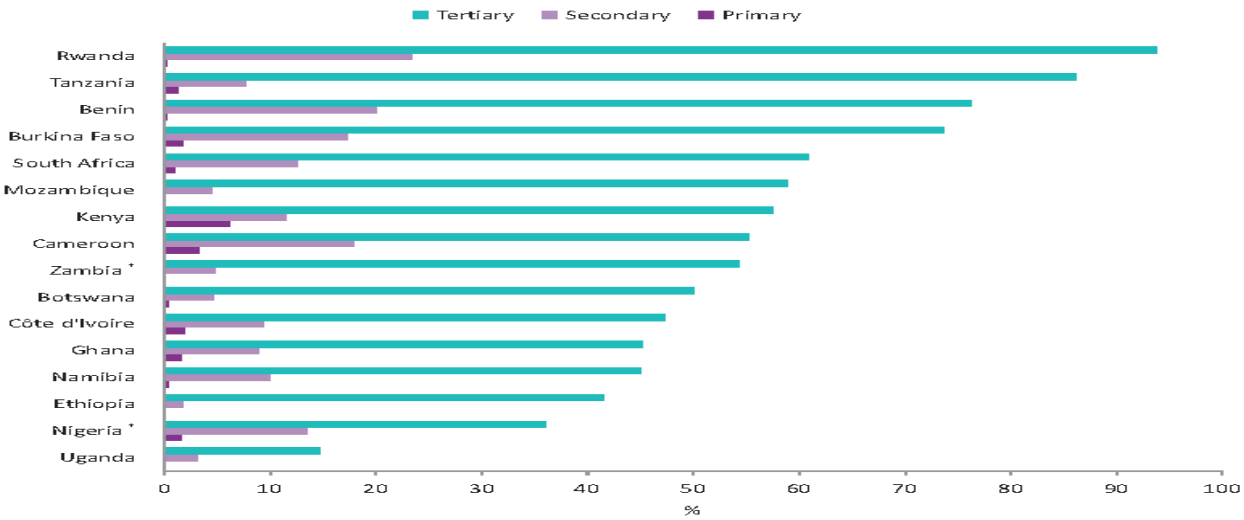
The causal link between literacy and ICT use can be evidenced even in the developed UK. According to the National Literacy Trust, low levels of internet penetration in the North East could result from literacy levels. In the North East, which has the lowest levels of internet use in the UK, at just 29%, there are one in six people struggling with literacy; and a US study has also found that people with low levels of literacy often have problems using websites. People with low levels of literacy feel "frustrated and exhausted" when it comes to using the internet according to the Nielsen Norman Group (BBC, 2010).

5.2.3 Education

Investigations of Internet use by level of education across the world indicate without exception that Internet is used much more among users with higher level of education, because a higher educational level generally leads to higher income and greater computer literacy which are important driving force of Internet use. Chart 1 below suggests that in the selected African countries, there is a direct correlation between level of education and level of Internet use. As is indicated, while few Africans with only a primary education are online in 2007/2008, the majority of those with a tertiary education are using the Internet. At the same time, even the more highly educated population differ considerably in Internet user penetration rates, with Rwanda standing at over 90 per cent and Uganda at less than 20 per cent.

Chart 1: Percentage of Individuals Aged 16 or Older Using the Internet, by Highest Educational Level Attained in Selected African Countries, 2007/2008

Source: Research ICT Africa (RIA)



Note: * Surveys were conducted between August 2007 and April 2008 (most countries having finished already in 2007).

† Not nationally representative, but extrapolation was adjusted to reflect the national level.

From ITU：Measuring the Information Society, 2011, p. 113

Many factors contribute to a female's level of education. Elnaggar (2008) finds that family support or its non-existence affects nearly all women's decisions. The family approval is vital in women's choice of education,

occupational field, workplace location, as well as working hour's length (Chatty, 2000). In her study on the obstacles to female formal educational attainment in Ghana, Amua-Sekyi (1998) finds that the value of reproductive and traditional duties of females are generally considered higher than the accomplishments such as education and career. Because societal ideas of female roles are more domestic or concerning marriage and raising children, girls are expected not to achieve much in formal education. Social class factors also influence the state of a female's level of education. High social class status of women may remove for them some of the barriers they face in getting a higher education. An example of this is that upper class women would pay for domestic labor by other women in order to pursue their own educational goals (King & Hill, 1993). This phenomenon could be found in many developed and developing countries.

There are also barriers which arise due to the ways in which institutions make their education programs available, for example: fixed hours; attendance requirement; lack of childcare facility. In the case of scientific and technical studies, further barriers experienced by women include: lack of female teachers, male orientation in courses, inflexible entry requirements, heavy attendance requirements, male oriented language (Evans & King, 1991).

Other barriers to girls' education can be health-related issues, situations of crisis and instability, no school close to home, poor quality environment, violence (physical and psychological), poor quality content, inadequate learning materials, biased or inappropriate content, poor quality learning processes, conflict and instability, inadequate legal framework in such areas as compulsory education, child labor and re-entry into school, lack of enforcement of existing laws and policies relating to corporal punishment and unlawful school fees, insufficient national budgetary allocations to primary and secondary education, isolation of education from existing national frameworks, lack of political will (UNICEF, 2002).

5.3 Gendered ICT Training

Worldwide, women are seriously under-represented in the training of computer science and computer engineering (CS/CE) and, thus, in the ICT workforce across the world. This is a grim situation for both the women whose potential remains unutilized and the societies which are dependent on women's contribution to ICT.

The gender differences in training trajectories originate early and become larger as young males and females continue their schooling. This can be illustrated by data from UNESCO/UIS database (The World bank, 2012) that "In 63 percent of countries (109 of 172), the fraction of women enrolled in general secondary education is higher than that of women enrolled in vocational secondary education (The World Bank, 2012, p. 115)" where ICT training is more likely to be offered. The causes of this difference may be found in varieties of studies of primary and secondary schools in which girls not only report less experience with computer programming (Barron, 2004) but also express less confidence in their computing and Internet skills (Bunz, 2005) and less interest in computers (Vale & Leder, 2004).

At the tertiary level, the gender differences enlarge further still, especially in disciplines comprising ICT which has a deeply ingrained masculine culture. A study by Lewis, S., et al. (2006) discovers that women account for less than 15 percent of enrolments in many ICT courses in Australia. Actually this inequality exists in most of the countries in the world. In Table 15 below is seen that women are overrepresented in education (84%) and health and welfare (82%), fairly presented in arts and humanities (55%), social sciences, business, and law (23%) and services (21%), underrepresented in science (13%), agriculture (3%) and extremely underrepresented in engineering, manufacturing and construction (0%). In short, with regard to gender segregation in field of study, it is with doubt, that in most countries, women dominate health and education studies and men dominate engineering and sciences.

Table 15: Gender Segregation in the Field of Study Across the World

Source: WDR 2012 team estimates based on data from UNESCO Institute for Statistics

Field of study	**Fraction of countries where the field of study is**			**Number of countries**
	Female dominated %	**Male dominated %**	**Neutral %**	
Education	84	6	10	97
Health and welfare	82	4	13	97
Arts and humanities	55	6	39	96
Social sciences, business and law	23	16	61	97
Services	21	59	21	87
Science	13	68	20	96
Agriculture	3	74	22	89
Engineering, manufacturing and construction	0	100	0	97

Rearranged from THE WORLD BANK: World Development Report 2012, Gender Equality and Development, p. 115

As matter of fact, more than a decade ago, countries of Western Europe already demonstrates a substantial gender gap in enrollments in computer science (CS) and greater computer anxiety among women than men (Durndell & Thomson, 1997). In the US, the percentage of women earning bachelor's degrees in computer science actually drops from 37 percent in 1984 to 25 percent in 2004 (Singh, Allen, Scheckler, & Darlington, 2007), and in 2005, men dramatically raised their share to 39,329 or 78% of bachelor's degrees in CS, whereas, women increased their proportion only marginally (11,235 or 22%) (National Science Board, 2008). This suggests that CS does not seem to be a popular major among female students in the USA.

A study, broadly representative of varying levels of ICT integration in both training institutions and wider society and conducted by Gras-Velazquez, et al. (2009), looks into why girls in France, Italy, Netherlands, Poland and United Kingdom are not attracted to ICT trainings and careers. The study arrives at the percentages of the female secondary school students who are interested in networking careers but despite their liking ICT would not continue to study it (Table 16). The table shows that only an average of 30.6 % of female students develops

interest in networking careers in the course of education. Then of the 30.6 low percent of interested female students, 46 percent would eventually drop out of ICT study.

Table 16: Women Drop-Out Rate for Tertiary ICT Studies and ICT Careers in Focus Countries, in 2009						
	France	Italy	Netherlands	Poland	United Kingdom	Average
% of students interested in networking careers	17	38	8	65	25	30.6
Drop-out rate – % students who despite liking ICT will not continue to study it	24	61	54	48	43	46
From European Schoolnet: WHITE PAPER, Women and ICT, Why are Girls Still Not Attracted to ICT Studies and Careers? JUNE 2009, p. 17 <http://newsroom.cisco.com/2009/ekits/Women_ICT_Whitepaper.pdf>						

The question arises: why are girls still not attracted to ICT studies and careers though they are benefiting varyingly greatly from ICT? Biological gender differences simply cannot account for the participation gap (Cohoon and Aspray, 2006). When looking at the female student's perspectives on ICT, Gras-Velazquez, et al. discover that the idea of men being better in this area has a profound effect. They conclude that in essence the more the students see ICT careers as being more of a men's preserve, the more other more positive perceptions of ICT (liking it, intending to study it, providing travel, etc.) are depressed, which can be eventually attributed to lack of support from role models, persistent stereotyped views that the sector is better suited to men, a lack of understanding about what ICT jobs entail, and in some cases, how easy or difficult they find the subject.

Many other researchers have also studied the causes of gender imbalance in the ICT training sector, and they invariably come to roughly the same conclusion that access to ICT training and its progression seems to be dependent on an array of external social and structural factors and certain internal individual differences and culture norms (Adya & Kaiser, 2005). Of the external social factors, the lack of role models seems most influential in the choices by female students. For the presence of role models can be de-mystifying some stereotyping images of nerdy computing majors and prevalent geek culture (National Academy of Sciences, 1997), while the lack of female role models in computing fields reinforce the gendered norms (Jepson & Perl, 2002) that women are passive, hold marginal positions, and have little power over technology, just as Steinke (1999) states: A masculine image of science is reinforced by the media whose images of women scientists not only stress the obstacles they face in a male-dominated profession and highlight the difficulties of balancing work and family responsibilities, but also present women scientists' domestic abilities and feminine qualities.

The notion of girls majoring in ICT mirrors varieties of intricate clichés which are part of the external social causes of the gender divide that — from school to university to work — gradually diminishes women's participation and advancement in the ICT sector. All the social factors are reinforced by an array of external structural factors, such as the teaching and teacher variables. Many school teachers, because of their insufficient training and unequal biased emphasis on male students, add to the gendering masculine domination in the fields of mathematics, sciences, and computing (Barker & Aspray, 2006). The male orientation of the computing field, the

aggressive classroom atmosphere and the different faculty treatments of male and female students work together to support an incoming male assumption while challenging his female peers (Seymour & Hewitt, 1997).

As for the internal individual differences and culture norm, the most astonishing difference between girls and boys is not in their achievement, but in their confidence in science, mathematics, and computing. Even when girls have similar exposure to courses and similar grades, they are less confident of their capability, feel less competent, and feel less interested in science, engineering, and ICT education (Seymour & Hewitt, 1997; Ogan, C. L., et al., 2005). The debilitating anxiety in the female students, resulting from students' underlying perceptions of the field and a loss of self-confidence, often leads girls to switch out of the computing field (Margolis & Fisher, 2002). In other words, masculine stereotypes of computer science and girls' inaccurate perceptions of their own abilities inhibit them from continuing in computer science courses (Beyer, R., and Haller, 2004), and they would talk about leaving the computing field mostly because of technical difficulties they face in the program (Varma, 2007). When dropping out of the ICT education, girls are finally made to believe that mathematics, sciences, and computing subjects are indeed for their male counterparts (Clewell & Braddock, 2000). In short, "the gendered differences in the socialization of computer-oriented knowledge and the gendered differences in performance and self-efficacy in mathematics and computing" (Varma, 2010) are two determining factors responsible for the underrepresentation of women in ICT training.

Nevertheless, ICT training at the tertiary level is a critical starting point for achieving a gender balance in the ICT sector because it represents a critical entry point for encouraging women to become more involved in ICT at higher levels, enabling them to participate in developing ICT applications and to shape ICT solutions according to female-specific experiences. As ICT continues to be a rapidly developing industry and sector, women should be supported in their quest to equally benefit from rewarding jobs such as software programmers or IT analysts. The society as a whole, parents, teachers, career guidance counselors and recruiters included, is responsible for involving more girls and women into the ICT training, and on the other hand the society has to make changes to its own mindsets by having more females trained in ICT.

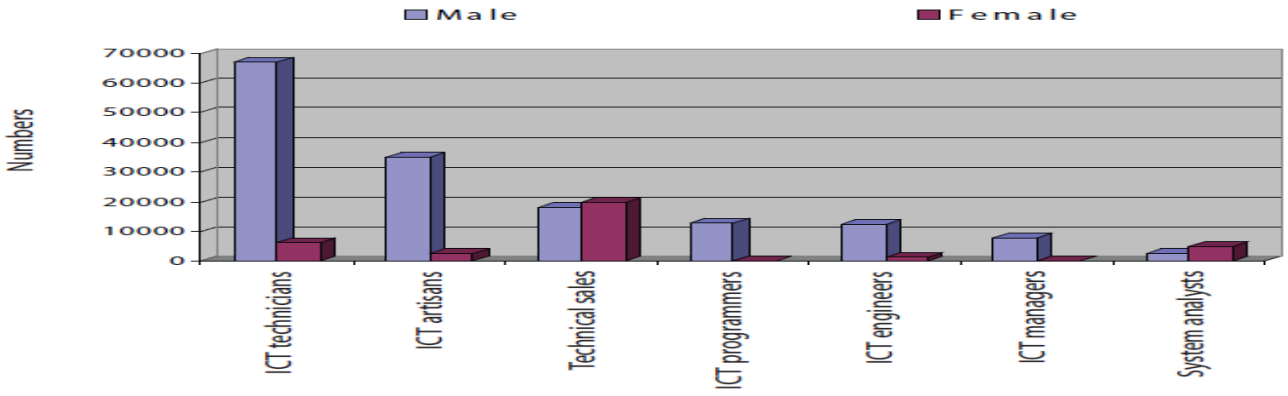
5.4 Gendered ICT Sector

Across the world, ICT sector is perceived in its narrowest sense to be dominated by male. Globally, women form less than one third of full time staff in telecommunications industry (ITU, 2004); in India, women take only 21% of all software professionals (Agarwal, R., 2004); in Europe, women account for only 6% of networking professionals (Raghuram, 2004); in South Africa, females make up approximately 20% of ICT workers (Sanders, 2005); in UK, women comprise only 20% of the ICT workforce (Griffiths and Moore, 2006); in USA, women stand for only 32.4% of the overall ICT workforce (US Bureau of Labor Statistics, 2005); finally in Switzerland, women constitutes a mere share of 14-25% of the ICT labor force (Kelan, 2007). The highest shares of females employed as ICT specialists in 2009 are in the United States (almost 25 per cent), being followed by Iceland, Finland and Hungary, each standing at around 20 per cent（ITU, 2012 b）.

In addition to the fact (as noted above) that women are in the minority in their engagement with ICTs, their engagement in ICT technical professions and on the higher management levels is similarly insignificant. In other words, gender segregation is being reproduced in ICT work fields, where men do most of the high-skilled, high value-added jobs, and women hold the low skilled, lower value-added positions. An investigation about females employed in call centers in Europe discovers that, contrary to notions about easy skill development and smooth career advancement, women's data-processing work is often "routinized, de-skilled, and devalued". It is extremely hard for women in these centers to "advance beyond team leader roles into more professional managerial positions." (ITU, 2012a)

According to a study of women in the Information and communication technology sector in South Africa by meraka, although 44.2% of female core ICT employees had HET (Higher Education and Training) qualifications in 2005, very few of them, in contrast with men, are employed working as ICT managers, engineers, programmers, technicians and artisans. Females take up the majority of ICT technical sales and systems analyst occupations, as shown in Chart 2 below.

Chart 2: Core ICT Workers by Gender, in South Africa, in 2005



From meraka: Women in the Information and Communication Technology Sector in South Africa, 2006, p. 42

The reason for this gendered distribution across positions within the ICT sector, as I understand, is an interactive mechanism between the cultural response to technology, positive for men and negative for women (Kraut R., 2006) on one hand and the gendering masculine stereotypes and women's underrepresentation in engineering on the other. These two factors actually feed into each other, as Phipps (2002) notes that "masculine images of engineering and engineers both proceed from and bring about the under-representation of women in the field." (p. 413) And the undervaluation of jobs which are done disproportionately by women could also be explained by the V's theory developed by Damian Grimshaw and Jill Rubery (2007): visibility — the compression of a range of skills into a single set and the correspondingly limited chances for career progression; valuation— the low value given to the skills involved; vocation — the way that complicated work is accounted for by women's "natural talents" rather than their skills; value - added — the comparatively low monetary value of the output; and

variance — the fact that women are overrepresented in part time jobs which confines them to a narrower range of sectors and occupations.

Many issues contribute to preventing women from advancing to management and executive positions within the ICT sector. Most of them result from misapprehensions that women do not possess leading competence and differ from usual male leaders in that their behavior would be damaging not only to themselves but also to the company (Booysen, L., 2000). Table 17 below shows, in descending order of importance, there are sixteen issues as identified by meraka (2006) keeping women from entering and advancing in the ICT sector.

Table 17: Variables and Barriers Influencing Women Succeeding in the ICT Sector			
From meraka (2006, p.45)			**By Author's Own Elaboration**
Ranking	**Issue**	**Mean**	**Grouping**
1	**Access to computers**	**2.465**	**Personal variable**
2	**Education**	**2.628**	**Personal variable**
3	**Lack of confidence**	**2.632**	**Personal variable**
4	**Old boys' network**	**2.874**	**Personal variable**
5	**Career development opportunities**	**2.898**	**Personal variable**
6	Working time constraints	3.086	Social barrier
7	Management style	3.111	Social barrier
8	Perception & stereotyping – general	3.170	Social barrier
9	Perception & stereotyping – ICT	3.176	Social barrier
10	Valuing women and tokenism	3.183	Social barrier
11	Cultural issues	3.208	Social barrier
12	Work-family conflict	3.305	Social barrier
13	Lack of influence to choose ICT as career	3.396	Social barrier
14	Salary inequity	3.541	Social barrier
15	Masculine nature of ICT	3.768	Social barrier
16	Lack of role models	4.194	Social barrier

In light of the external-internal grouping discussed in Section 5. 3 above, the sixteen issues keeping women from entering and advancing in the ICT sector can be divided into two categories, the first five listed in black can be regarded as internal variables because they are personal in nature, while others are regarded as external barriers for the sake of their being more social in nature. As is shown in the table, the social barriers are more significant (11 accounts) than the personal variables (5 accounts) in influencing women entering ICT industries and advancing in their course of career.

Many other researchers have also explored this gendered ICT sector. Phillips and Taylor (1986) found that male workers have their work defined as skilled, even when the content resembles women's work, which is instead defined as unskilled or semi-skilled. Furthermore, Cockburn analyzes how technology and technical skills are intertwined with the very construction of gender identities so that it is widely accepted that men are good with

technology while women are technically unskilled (Cockburn, 1985). As a result, a hierarchical gender structure is reproduced in the workplace where men's work holds higher status than women's, and invisible barriers are accordingly created by a process of excluding practices that effectively eliminate women as candidates for higher positions. That hierarchical gender structure and those invisible barriers function together so as to constrain women's progress toward employment equity, which extends from the glass ceiling at the largest corporations to the sticky floor of low-paying, low-mobility jobs at the poorest neighborhood (Berheide, 1992).

CHAPTER SIX: CROSSING GENDER DIGITAL DIVIDE THROUGH FOUR E'S

The Evolving Gender Digital Divide

The 1st E — Education in ICT Competency

The 2nd E — Equality of ICT Access

The 3rd E — Employment in ICT-Related Occupations and ICT-Enabled Jobs

The 4th E — Empowerment by ICT Use

Serving as a basic infrastructure of the 21st century, ICT，though far from equal to women, represents a significant opportunity for advancing gender equality and women empowerment when appropriately used, and benefits women in all spheres of life. Given the convergence with traditional media, ICT also functions for contesting pervasive gender stereotypes that go on tenaciously holding back progress for gender equality everywhere.

6.1 The Evolving Gender Digital Divide

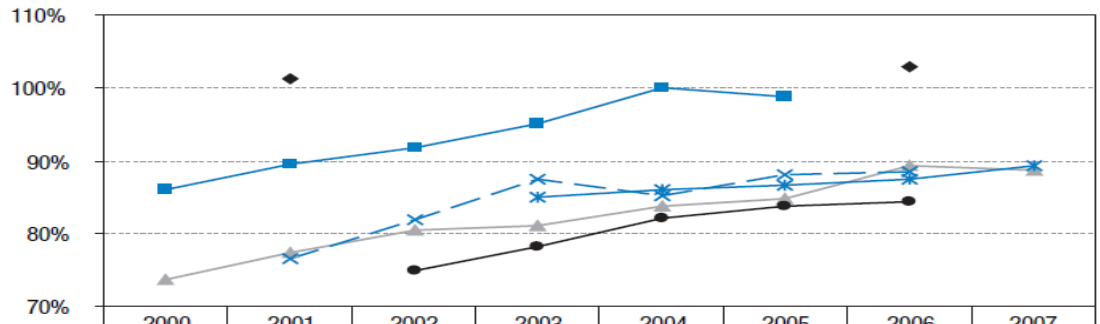
As time goes on, ICT continues to diffuse among women across the world and the gender digital gap becomes smaller, yet with varying speeds, depending on the country and the specific divide in question.

In many parts of the world, women have expanded their sphere of influence to the digital mainstream, for instance, accounting for almost half (44.2%) of China's Internet population as of December 2012. Even in countries where women represent a minority of the online population, they're closing in fast on the top spot. Presently, women represent 40% of Internet users in Seychelles, 31% higher than the regional average for Sub-Saharan Africa; 45% of Internet users in West Bank/Palestine, 29% higher than the regional average for Middle East & North Africa; and 82% of Internet users in Antigua and Barbuda, 46% higher than the regional average for Latin America & the Caribbean as illustrated by data in Table 2 above.

Chart 3 below shows, for most OECD countries, although males are still more likely to be Internet users than females (with a female to male user ratio of less than 100 per cent), the gender gap has been closing significantly since 2000, with the general trend being towards increasing female-to-male ratios among Internet users.

Chart 3: Gender Gap: Ratio of Female to Male Internet Users, OECD Countries, 2000–2007

Source: OECD, data collection for 2007 Scoreboard publication



	2000	2001	2002	2003	2004	2005	2006	2007
New Zealand		101%					103%	
Australia	86%	89%	92%	95%	100%	99%		
Korea	74%	77%	80%	81%	84%	85%	89%	89%
Japan		77%	82%	87%	85%	88%	89%	
EU15				85%	86%	87%	87%	89%
Switzerland			75%	78%	82%	84%	84%	

From UNCTAD: The Global Information Society: a Statistical View, 2008, p. 46 <http://unctad.org/en/docs/LCW190_en.pdf>

The positive change is once again confirmed by an OECD (2011) statistical profile which shows that although men are still more likely than women to use the Internet in most OECD countries, it is not the case for Ireland, New Zealand, Estonia, the United States and Canada, where in 2010 slightly more women use the Internet than men.

Apart from some cautious optimism in regards to the evolution of the gender digital divide for access, there are some delighting trends in women's experience of ICT-related education and employment. According to Eurostat, in the EU, 51% of almost 59 million persons employed in science and technology occupations in 2006 are female, and in Lithuania, the percentage reaches 72% of women (Meri, 2008). Another example is the software and services outsourcing industry in India, where a large number of women have entered this field. To some extent, the gender parity is being gradually achieved.

To accelerate the gender digital parity, mind-sets should be updated and actions taken. A nuanced understanding of the causes and the impacts of the multiple gender digital divide has substantial policy implications, because the imbalance is global, influential and ongoing and government policies and enhanced institutional arrangements are a strong guarantee of women's transition to the knowledge society. Exploring the multiplicity of ICT is a way out, for instance, the use of mobile phones can be an alternative route to getting connected. It is cheap and convenient. Promoting Internet access at public places is a short cut through which to diffuse ICT beyond ivory towers. Training and assisting can be a great helper, but they should take into account local information contents and women's personal needs.

To cross the gender digital divide, efforts are being made, and frameworks are being experimented with. As an illustration, "BIG" is "a three-phased process consisting of Buy-in, implementation, and Growth and reinforcement…used to analyze four critical areas of intervention — ICTs policy making, ICTs applications for promotion of women's economic empowerment, ICTs-enabled health and education services, and ICTs-mediated public life participation (Marcelle, 2004, p. 31)" ; "TECH NEEDS GIRLS" is an ITU campaign "that seeks, through extensive engagement with government and private sector stakeholders…to achieve greater empowerment, equality, education and employment for girls through greater access to opportunities in the world of information and communication technologies" (ITU, 2012a, n.pag.); "Four Es", standing for Education in ICT Competency, Equality of ICT Access, Employment in ICT-Related Occupations and ICT-Enabled Jobs and Empowerment by ICT Use, is adapted from "TECH NEEDS GIRLS" and adopted as a framework in which I explore how the gender digital divide can be bridged in this study.

6.2. The 1st E — Education in ICT Competency

Education in ICT Competency means ensuring that women receive the same ICT educational choices as boys, and acquiring timing and positive guidance towards skillful usages in ICT.

For ease of manipulation, the Education in ICT Competency could be demarcated on three levels, each of which covering a different group of skills, such as the ones summed up by Tandon, N. (2006, p.10):

- *Digital literacy:…ability of the user to establish an email account, communicate via email, navigate the Web, understand the basic etiquette of using the Web, download information, use of CD ROMs and other interactive materials, … use electronic forms of communication for distance education.*
- *Applied ICT skills: ability to use and apply generic ICT tools in workplace settings and to upgrade these skills in line with the requirements of business and industry.*
- *Professional ICT skills: …skills required to design and develop, implement and repair ICT tools (includes hardware and software manufacturing, electronic manufacturing, network operating systems, cabling, router programming).*

No matter on which level is the education of women in ICT competency carried out, it should always come before the other three Es, because case studies of women's successful use of e-commerce or e-education tools have confirmed the truth that some initial basic training must occur first (Tandon, N., 2006). To have a satisfactory result, not only the instruction must be in local language and preferably for women by women in peer-group applied workshop settings, but also the whole current education systems and infrastructure have to be restructured.

Instruction needs to be made more relevant; schools need to improve the quality of their execution, moving away from rote individualistic learning to hands-on, team-work and problem-solving teaching methods; schools need to ensure that students know about the continually evolving nature of the knowledge economy and that they need to

carry on improving their skill base once basic schooling is completed; more funds or subsidies need to be placed for technical training and incubation programs (ITU, 2012 b)(p. vii).

To address women's lacking in ICT education, in a joint effort of United Nations Development Fund for Women, the local national governments and the Achieving E-Quality in the IT Sector initiative and Cisco Systems, a training campaign has been going on to educate women in ICT skills in Egypt, Jordan, and Lebanon (ICRW, 2010). In India, Self-Employed Women's Association has been working with women from the informal sector since 1972 (Patil et al, 2009). It has set up Technology Information Centers in 11 districts of Gujarat of India providing basic computer training for these self-employed women, offering courses that enhance their abilities in using computers, radio, television, video, telephone, cell phone and satellite communication. In April 2011, ITU and ITU–D Sector Member, in partnership with the Telecentre.org Foundation, put into action the Telecentre Women: Digital Literacy Campaign. The movement aims at bringing life changes to at least one million vulnerable female groups in the third world. This joint project train digitally literate women to use ICT, leading them onto a life-changing path created by ICT. So far nearly 225, 000 working women have mastered practical ICT skills as a result of the free training programs (ITU, 2012c).

6.3 The 2nd E — Equality of ICT Access

Closely linked with socio-economic development, Equality of ICT Access requires that every girl and woman should have full and equal access to the information and opportunities provided by ICT (SPIDER, 2012). Bringing ICT right into the users' routine arenas of activity is especially important to women in poor households who usually cannot afford to use the public facilities.

By involving all walks of life in action, the marginalized women could be helped to meet this requirement of full and equal ICT access. Sponsored by the government and operated by rural women, the E-Seva Project which is going on in Andhra Pradesh, India, harnesses ICT into various Citizen-to-Citizen and Citizen-to-Government services for the rural population to help narrow the gender digital divide in access (Patil et al, 2009). Supported by the city government, the "Inter-city Marketing Network of Women Entrepreneurs" in Chennai, India, creates a communication network among community-based women organizations where telephones and cell phones are provided free of charge to help women reach new markets within the city (Gurumurthy, 2004). Corporation, organization and even private small business can play a part. For instance, mobile banking programs, such as M-PESA in Kenya, make it possible for more and more low-income women to process small financial and banking transactions more effectively and promoting their savings, which is especially beneficial to small women peddlers or retailers; the Dhan Foundation in India uses handheld devices and smart cards to facilitate microfinance projects to empower poor women (Jain, 2006) ; by enabling women to have access to information and communication across gender, national and cultural borders, the small street Internet cafés arouses new forms of political and social awareness in women. (Wheeler, 2007). Schools, too, have their part to play in providing poor girls with access to ICT. The use of computers in elementary and secondary schools is especially important

for girls in developing countries, because they are less likely to have access to computers outside of school, and they are less likely to ascend to higher level science and technology courses. The fact that primary school students can obtain typing and word-processing skills as quickly as secondary school students (Derbyshire, 2003) makes it critical for girls to have access to computer training at an early age. Lastly, even the proper domestic arrangements of space and time with home computers can be helpful with women's access to learning and personal development via the Internet (BURKE, 2001).

6.4 The 3rd E — Employment in ICT-Related Occupations and ICT-Enabled Jobs

ICT-related sector, as defined by ACS (2012) and OECD (2007), is divided into two categories, a narrow one and a broad one:

A narrow category covers ICT-related occupations which are held by such ICT specialists as ICT Managers; ICT Trainers; Management and Organization Analysts; ICT Sales Professionals; Graphic and Web Designers, and Illustrators; ICT Business and Systems Analysts; Multimedia Specialists and Web Developers; Software and Applications Programmers; Database and Systems Administrators, and ICT Security Specialists; Computer Network Professionals; ICT Support and Test Engineers; Telecommunications Engineering Professionals; Electronic Engineering Draftspersons and Technicians; ICT Support Technicians; Telecommunications Technical Specialists; Electronics Trades Workers; Telecommunications Trades Workers; ICT Sales Assistants; Other Information and Organization Professionals; ICT Professionals nfd (no further description)(ACS, 2012).

A broader category refers to ICT-enabled jobs which are done by such ICT users as professionals in the frontlines of media, teachers in classrooms, medical staff, or financial staff (OECD, 2007), and all other professionals who use ICT in their occupation.

As a coordinate, let's look at the female percentages of employment in both of the two categories. As of February 2012, in Australia, females account for 19.73% of those working under the narrow category of ICT-related occupations; while females doing the ICT-enabled jobs amount to a mere 1.77% of all the females working in the same industry sector. (ACS, 2012).

As time goes on, more and more women are expected to be engaged in both of the two ICT-related sectors due to such reasons as follows: the female talent pool adds to their diversity and creativity; ICT skills extend to broad spectrum of jobs; closing female-male employment gap is good for economic growth; gender diversity on company boards is good for business performance; over time, a nation's ICT competitiveness depends on whether and how it educates and utilizes female skills.

Across the world, mind-sets are improving, actions are taking place and positive results are emerging. The 2006 Catalyst Member Benchmarking Report shows that 91 % of participating member corporations from the Canadian

ICT sector design and conduct activities aimed at women in America and many also plan recruiting women in overseas operations. The report reveals that many influential ICT companies have made great progress in hiring and keeping skillful women in their workforces (Catalyst, 2006). A survey by Bayt.com (Bayt, 2009) of 9,923 job seekers across the Middle East shows that 72 percent of professionals think that telecommuting would be beneficial for both employees and employers. The major benefits for employees include increased time with family, reduced costs and time in commuting and flexibility in working hours. Benefits cited for employers are better employee motivation, staff loyalty, and higher productivity. Actually, marked by a pressing need for ICT talent and plagued by skill shortages, many corporations across the world have been responding with efforts to attract women, readily opening the door to underrepresented female groups. And this positive trend of increasing female engagement in ICT-related sectors are also benefitted to women in three ways, as discovered by Wheeler's (2007) ethnographic research: information access increased and professional skill developed, social networks and social capital expanded/maintained, and social and political awareness transformed.

6.5 The 4th E — Empowerment by ICT Use

Empowerment is viewed as an internal and self-guided process in which one develops a positive self-image, a self-confidence and a greater capacity to challenge one's oppression (Parmar, 2003). Defined through three layers, namely resources, agency and achievements (Kabeer, 2003), the empowering use of ICT benefit women mainly in two manners: socially and economically.

Socially, across the world, especially in developing countries, ICT helps with women's meaningful participation in society, making their opinions accessible to others, as is done through digital networks seen in feminist movements (Harcourt, 1999). For example, TiCBolivia, a locally established network in Bolivia, offers a computer skills development course to a core group of 100 female indigenous leaders, and their lobbying activities and decision-making practices benefit a lot from their newly-acquired ICT skills, such as email, Skype, blogging and writing wikis, the use of applications such as Word, Excel and Power Point, and Web development and maintenance (SPIDER, 2012). ICT-facilitated knowledge networking assists the process of women's empowerment by creating space for women to freely voice and share their stories, concerns and knowledge (Jain, 2006). In the case of network formation, Harcourt (2002) finds that women are building a strong network through the Internet where personal struggles, hopes and stories can be shared. In short, ICT has great potential for improving the social conditions that restrict women's agency and choice (Davis, 2005).

Economically women can be empowered through ICT use. Women's empowerment is determined by such factors as economic decision-making, economic efficacy and self-confidence; and access to economic resources, including assets, capacity, opportunity, environment (ICRW, 2010). All these factors can be positively influenced by proper use of ICT. By providing databases where women can find useful links, connections and resources and develop partnerships for their business, the Internet greatly aids women's entrepreneurship (Jain, 2006), making it possible for women entrepreneurs to get accessed onto worldwide e-business channels available 24 hours a day

far away from home in real-time (Brodman and Berazneva, 2007). As an e-commerce initiative promoting online a variety of custom-designed woolen clothing hand-knitted without the middleman, the Hipknit in Nepal enables poor women in Thaiba to work for a fair income and attain financial independence. The "Giving Visibility to Invisible Work" project launched by Les Pénélopes, a feminist organization in France, gives ICT support to migrant women in unorganized job segments (Global Knowledge Partnership, 2003). Similar assistance comes from "eHomemakers network" and "T-Center" in Malaysia which promotes online sales of home produced merchandise and help teleworkers to offer their services and employers to advertise online work opportunities respectively (The World Bank, 2012, p. 342). In Gujarat of India, Dairy Information System Kiosk, by organizing a databank of all milk cattle, provides women dairy producers with information about veterinary services and other useful knowledge of the dairy industry, assisting women producers achieve optimal productivity and profits (Gurumurthy, 2004).

The empowering use of ICT also contributes to the advancement of women in other aspects. ICT use is the most effective means to broaden women's participation in a number of positive aspects and advance their personalities and competence (Huyer & Tatjana, 2003). It builds upon existing information channels that women already have access to, including community information centers, radio broadcasts, television and other local forms of popular media, print and theatre. It transforms the traditional gender roles of those women who are limited in life skills by helping with their lifelong education (Kelkar and Nathan, 2002). It helps women overcome discrimination and inequality, and improves their well-being and participation in the decision-making which are determining factors in their own lives and for the future of their communities (Sharma 2003). It enables women to engage actively with planning and decision making at the household level, as well as institutional and societal levels (Gurumurthy, 2004). Even women's health can be improved by their use of ICT, as illustrated by Sisu Samarakshak, an ICT initiative going on in Andhra Pradesh of India, which provides illiterate communities with knowledge about health, hygiene and sanitation using audio and images (Patil et al, 2009).

Women's empowerment has thus gained a new concept: through the use of ICT, it becomes a process through which women gain power over men or as a process that enables women to gain access to decision-making processes and instances of power (Oxaal and Baden, 1997). And this leads us to conclude that " the Internet, if it does empower, does so through small windows of opportunity created by the technology and its users as they work in tandem or isolation to subvert norms and social orders (Wheeler, 2007)", but the core lies in the ability of a woman to control her own destiny.

CHAPTER SEVEN: CONCLUSION

Summary of the Study, Limitations and Future Directions

The objectives of this study of gender digital divide are to track its statistical evidences, to explore its important aspects and to seek its possible solutions. To the best of my knowledge, this study is the first to research on the

gender digital divide over time and in a global range of developed and developing countries, especially from a three-element perspective which gives us more information about its state, its decisive causes and its possibly effective solutions.

7.1 Summary of the Study

Fundamentally, the gender digital divide is about the gap between females and males in terms of their access to ICT and intensity of its use. While I caution once again that the lack of first-hand data and standardized supporting theories weakens the precision and rationality of all analysis and synthesis, this study suggests that the gender digital divide remains not only real internationally across the developing world where in 2013, 16% fewer women than men use the Internet, compared with only 2% fewer women than men in the developed world, but also intra-nationally in all focused countries where women differ varyingly from men in their frequency, location and usage of ICT application. The gender digital divides in China, the biggest developing country in the world, and the U.S., the biggest developed country in the world, are an interesting pair to look at. The gender digital divide in China, by percentage of women and men using the Internet, stands at -11.8 in favor of MEN by the end of 2011. In contrast, the gender digital divide in the U.S. stands at -4.9 in favor of WOMEN in 2013. This fact means possibly two things to us: China still has a long way to go to catch up with the developed countries in terms of balanced ICT diffusion by gender; the more developed a country is, the smaller the gender digital divide is. Another interesting finding in this regard is that gender digital divide varies far more greatly among developing countries than among developed countries as illustrated by data in Table 2 and Table 3 respectively.

The gender digital divide occurs at the intersection of socioeconomic, technological and linguistic differences. Picked out from the many dimensions of gender digital divide, including age, geographical factors, dual burden of career and home, I explore in details its four important aspects. They are: Fewer Economic Resources; Lower Levels of Awareness, Literacy and Education; Gendered ICT Training; and Gendered ICT Sector. Having fewer economic resources usually means having less education, fewer skills, poorer credit, and thus being less likely to invest in or to pay for ICT use. This is evidenced in the cited data by a clear link between income level and ICT use. Being unaware of the existence of the Internet and its possible benefits is found responsible for fewer women, especially those in Africa, staying offline. Lower literacy or education levels are seen contributing a lot to the imbalanced ICT use by gender not only in developing countries but also in developed countries. As for the training of ICT science and engineering, it is seriously gendered, too, in favor of men and boys. The trajectory starts early and becomes prominent as students continue their schooling. At the tertiary level, the situation turns worse still, especially in disciplines comprising masculine ICT subjects. An array of external social and structural factors and certain internal individual variables, such as lacking role models, less confidence in science, are found responsible for the underrepresentation of women in ICT training. Further on the study confirms work segregation, either horizontal or vertical, is obvious in the male-dominating ICT sector in which fewer women are working as specialists and still fewer working as managerial personnel or decisive figures. Identified keeping women from entering the ICT sector and advancing in it are many barriers which are inevitably related with concepts such as

technology as culture, technology as gendered and can be grouped under four categories: cultural, namely common patterns in role and status of women emerging across countries, despite widely different circumstances; attitudinal, namely perceived differences in male and female roles and capabilities; qualificatory, namely lack of maths/science/computing pre-requisites for entry to the ICT sector; situational, namely family commitments, lack of partner support, financial, living in rural/isolated areas.

Perceiving positive changes evolving in favor of women, I elaborate on crossing the gender digital divide by four Es: education of women in ICT competency, depending on situations, of digital literacy, applied ICT skills and professional ICT skills; equality of women ICT access, making sure females have full and equal access to ICT and its benefits; employment of women in ICT-related occupations and ICT–enabled jobs, increasing female engagement in ICT-related sectors to benefit both the industries, the society and the women employees; empowerment of women by ICT use, in terms of their resources, agency and achievements.

In the course of study I come to understand that there is no single antidote to bridge the gender digital divide. As Cukier (2007) suggests, however, barriers can be dismantled, if we adopt a multi-pronged approach to their dissolving. Success necessitates joint efforts from all stakeholders. While many societies have opened their doors wider to encourage women's share, intensity in ICT use, effective measures need to be strategic, integrated, sharply-focused, and evaluated. Governments and researchers have been tracking the involvement of women in ICT for years. The time to really take the matter seriously is the present moment as neither the ICT industry nor society as a whole can afford to lose the interest and potential talents of women any longer. Indeed, as an Ernst and Young (2009) study of women and the world economy reveals, where and when women are underrepresented, the society as a whole becomes the loser:

At a time when our global economy is facing its greatest challenge in decades, we have to capitalize on the contributions women can make. While many corporations and governments have for years been making efforts to tap the hidden potential of women – and many have launched laudable initiatives to do so – now is the time to accelerate those efforts. It's time to place renewed emphasis on women as a resource to move businesses and economies ahead. The learning that comes from crisis is a terrible thing to waste. (p.16)

7.2 Limitations and Future Directions

A number of safeguards are built into the design in order to minimize some of the potential weaknesses associated with empirical study. For instance, to enhance the logic of study, the three parts of evidences, aspects and suggestions are highlighted and elaborated. To make the elaboration convincing enough, lots of data are cited in tables and charts. Despite these safeguards however, the following limitations should be considered when reviewing the findings:

Bias: As in any study that uses empirical methods and secondary data, the findings could be subject to other interpretations. Reading fatigue: The 17 tables and 3 charts used in the study may be too many and too detailed thus both mentally exhausting and physically challenging for anyone reading the thesis and judging the study.

In addition to these limitations which should have been reduced to a minimum level, the future work of a similar topic needs to take into account more issues of gender digital divide such as culturally and linguistically appropriate contents online such as flaming which women may find alienating and men tolerate (Herring, 1994) and privacy and security problems such as harassment or cyber stalking directed at women because of their gender, as well as pornography whose victims are almost always women. Lastly, in future gendered-related study of ICT use, special methods of sex and gender analysis could be introduced and adopted, for instance: analyzing sex and gender, analyzing knowledge created through social divisions of labor, participatory research, rethinking female language and female ethical dimensions, and rethinking stereotypes.

References

ACS (2012). *2012 Australian ICT Statistical Compendium.* < http://www.acs.org.au/__data/assets/pdf_file/0014/13541/2012_Statcompendium_final_web.pdf>

Adams, N., Stubbs, V., & Woods, V. (2005). 'Psychological barriers to Internet usage among older adults in the UK'. *Medical Informatics and the Internet in Medicine*, 30(1), pp.3–17.

Adya, Monica, & Kaiser, Kate M. (2005). 'Early determinants of women in the IT workforce: A model of girls' career choices'. *Information Technology and People*, 18(3), pp.230–259.

Agarwal, R. (2004). *DIGITAL TECHNOLOGY AND WOMEN EMPOWERMENT: EMPLOYMENT DIMENSIONS IN INDIA.* http://unpan1.un.org/intradoc/groups/public/documents/APCITY/UNPAN023829.pdf (Accessed 4 May 2013).

Amua-Sekyi, E. T. (1998). *Ghana: Education for girls.* Paper presented at the Women's Center at Eastern Washington University, May 1998.

Anker R. (1998). *Gender and jobs: sex segregation of occupations in the world*. International Labour Office, Geneva.

Attewell, P. (2001). 'The first and second digital divides'. *Sociology of Education*, 74 (3), pp.252-259.

Bayt (2009). 'Telecommuting in the Middle East workplace'. Bayt.com (reported in *Emirates Business* 24/7), Dec 7th 2009.

Barker, L.J., & Aspray, W. (2006). 'The state of research on girls and IT'. In J.M. Cohoon & W. Aspray (eds.), *Women and information technology: Research on under representation*. pp. 3–55. Cambridge, MA: MIT Press.

Barron, B. (2004). 'Learning ecologies for technological fluency: Gender and experience differences'. *Journal of Educational Computing Research*, 31(1), pp.1-36.

BBC (2010). *Low literacy levels can affect web use.* http://news.bbc.co.uk/local/tees/hi/tv_and_radio/newsid_9108000/9108659.stm （Accessed 4 May 2013）.

Becker, G. (1991). *A Treatise on the Family*, Cambridge, MA, Harvard University Press.

Berg, A. (1996). *Digital Feminism, PhD Thesis*, Norwegian University of Science and Technology, Trondheim.

Berheide, C. W. (1992). 'Women Still 'Stuck' in Low-Level Jobs'. *Women in Public Service: A Bulletin of the Center for Women in Government*, 3 (Fall).

Bettio F. and A. Verashchagina (2009). *Gender segregation in the labour market: Root causes, implications and policy responses in the EU*, Luxembourg: Publications Office of the European Union, p.32.

Beyer, S., Rynes, K., & Haller, S. (2004). 'Deterrents to women taking computer science courses'. *IEEE Technology and Society Magazine*, 23(1), pp.21–28.

Blau F. D. and M. Ferber (1987). 'Discrimination: Empirical evidence from the US', *American Economic review*, Vol.77, No. 2, pp.316-320.

Boneva, B., Kraut, R., & Frohlich, D. (2001). 'Using email for personal relationships: The difference gender makes'. *American Behavioral Scientist*, 45, pp.530-549.

Bonfadelli, H. (2002). 'The Internet and Knowledge Gaps: A Theoretical and Empirical Investigation'. *European Journal of Communication*, 17(1), pp. 65-84.

Booysen, L. (2000). 'Challenges facing black and white women managers in South Africa'. *Management Today*. June 2000, pp.22-28.

Boslaugh, S. (2007). *Secondary Data Sources for Public Health: A Practical Guide.* Cambridge University Press.

Bradley, H. (1989). *Men's Work, Women's Work,* Cambridge, Polity Press.

Bridges.org (2002). *Spanning the Digital Divide. Understanding and tackling the issues.* Bridges.org. Durbanville. 73.

Brodman, J., & Berazneva, J. (2007). 'Transformina Opportunities for Women Entrepreneurs'. *Information Technologies and International Development, Special issue on Women's Empowerment and the Information Society*, 4(2), pp.3-10.

Buchmu ller, S., Gesche, J., Nina, B., & Stephanie, S. (2011). *Pers Ubiquit Comput*, 15:743–758, DOI 10.1007/s00779-011-0388-y.

Bunz, U. (2005). *Gender differences on computer-email-Web fluency and computer-mediated-communication competence: A meta-analysis*. Paper presented at the annual meeting of the International Communication Association Conference, New York, NY.

Burke, Catherine (2001). 'Women, Guilt, and Home Computers'. *CYBERPSYCHOLOGY & BEHAVIOR* ,vol. 4, no. 5, 2001. Mary Ann Liebert, Inc. 614.

Bush, V. (1945). 'As We May Think'. *The Atlantic Monthly*, 176(1).

Butler, J. (1990). *Gender Trouble*, New York, Routledge.

Catalyst (2006). *2006 Catalyst Member Benchmarking Report.* http://www.catalyst.org/knowledge/2006-catalyst-member-benchmarking-report (Accessed 6 April 2013).

Chatty, D. (2000). 'Women working in Oman: Individual choice and cultural constraints'. *International Journal of Middle East Studies*, 32(2), pp.241-254.

Clewell, B.C., & Braddock, J.H. (2000). 'Influences on minority participation in mathematics, science, and engineering'. In G. Campbell, Jr., R. Denes, & C. Morrison (eds.), *Access denied: Race, ethnicity, and the scientific enterprise*. pp. 89–137. New York, NY: Oxford University Press.

Cockburn, C. (1983). *Brothers: Male Dominance and Technological Change*, London, Pluto Press.

Cockburn, C. (1985). *Machinery of Dominance: Women, Men and Technical Know-How.* London: Pluto Press.

Cohoon, J.M. & Aspray, W. (eds.) (2006). *Women and information technology: Research on under representation.* Cambridge, MA: MIT Press.

comScore (2010). *Women on the web: how women are shaping the Internet.* http://uxscientist.com/public/docs/uxsci_5.pdf (Accessed 5 February 2013).

Cotter, David A., Joan M. Hermsen, Seth Ovadia, and Reece Vanneman (2001). 'The glass ceiling effect'. *Social Forces,* December 2001, 80 (2), pp. 655–682.

Cukier, W. (2007). *Diversity – The Competitive Edge: Implications for the ICT Labour Market.* Report submitted to the Information and Communications Technology Council (ICTC).

www.ryerson.ca/tedrogersschool/diversityinstitute/news/Diversity-The-Competitive-Edge.pdf (Accessed 8 December 2012).

Davis, S. S. (2005). 'Women weavers on line: Rural Moroccan women on the Internet'. pp. 159-185 in C. Ng & S. Mitter (eds) *Gender and the digital economy: Perspectives from the developing world*. New Delhi: SAGE Publications.

Derbyshire, H. (2003). *Gender issues in the use of computers in education in Africa*. Paper prepared for the Department for International Development, UK.

Elnaggar, A. (2008). 'Towards gender equal access to ICT'. *Information Technology for Development*, 14(4), pp.280-293.

eMarketer (2013). *eMarketer_US_Internet_Users, 5.* http://wenku.baidu.com/view/c4877f0bf78a6529647d5379.html (January 2013).

Ernst and Young (2009). *Groundbreakers: Using the Strength of Women to Rebuild the World Economy, 19.* http://www.vitalvoices.org/sites/default/files/uploads/Groundbreakers.pdf. (Accessed 5 May 2010).

eTForecasts (2012). *Internet User Forecast by Country April, 2012 Version, Summary, 13* http://www.etforecasts.com/products/ES_intusersv2.htm (Accessed 9 February 2013).

Evans, T. & King, B. (1991). *Beyond the Text: Contemporary Writing on Distance Education.* Deakin University Press, Victoria, Australia.

Federal Glass Ceiling Commission (1995). *Solid Investments: Making Full Use of the Nation's Human Capital*. Washington, D.C.: U.S. Department of Labor, 4.

Fink, C., and Kenny, C.J. (2003). 'W(h)ither the digital divide', *info*, vol. 5, iss. 6, pp. 15-24, (online Emerald) http://www.logipaignion.ucy.ac.cy/courses/EPL011/readings/fink-kenny.pdf （Accessed 6 January 2013）.

Fortson, B. L., Scotti, J. R., Chen, Y., Malone, J., & Del Ben, K. S. (2007). 'Internet use, abuse, and dependence among students at a Southeastern regional university'. *Journal of American College Health*, 56(2), pp.137-144.

Geldof, M., & Unwin, T. (2005). *Becoming an information society: The role of new IT in development.* Wilton Park Conference.

Global Knowledge Partnership (2003). *Youth, poverty, gender: ICT for development success stories. Knowledge for Development series.* Kuala Lumpur: GKP Secretariat.

Gras-Velazquez, Agueda, et al. (2009). 'Women and ICT, Why are girls still not attracted to ICT studies and careers?' *INSIGHT. WHITE PAPER, JUNE 2009, 2*

Green, E. and Adam, A. (eds) **(**1999). 'Editorial Comment', *Information, Communication & Society*, vol. 2, no. 4, pp. v–vii

Grimshaw, Damian and Rubery, Jill (2007). *Undervaluing Women's Work*, EOC Working Paper, no. 53, Manchester: Equal Opportunities Commission.

Gurumurthy, A. (2004). *Gender and ICTs: Overview report*. Brighton, United Kingdom: Bridge. http://www.bridge.ids.ac.uk/reports/CEP-ICTs-OR.pdf (Accessed 9 December 2012).

Harcourt, W. (Ed.). (1999). *Women@Internet*, p. 240, Palgrave Macmillan.

Harcourt, W. (2002). 'Women's activism on the Net'. *Gender, Technology and Development*, 6(1), pp.153-157.

Hargittai, E. (2004). 'Internet access and use in context'. *New Media and Society*, 6(1), pp.137–143.

Herring, S. (1994). *Gender differences in computer-mediated communication: Bringing familiar baggage to the new frontier.* Paper presented at the 113th Convention of the American Library Association, Miami. http://www.mith2.umd.edu/WomensStudies/Computing/Articles%2BResearchPapers/gender-differences-communication (Accessed 8 January 2013).

Huyer, S., & Tatjana, S. (2003). 'Overcoming the gender digital divide: Understanding ICTs and their potential for the empowerment of women'. *INSTRAW Research, Paper Series No.1*. http://www.un-instraw.org/en/docs/gender and ict/Synthesis Paper.pdf. (Accessed 6 April 2009).

ICRW (2010). *Bridging the gender divide, How Technology can Advance Women Economically.* http://www.gbchealth.org/system/documents/category_1/359/Bridging-the-Gender-Divide-How-Technology-can-Advance-Women-Economically.pdf?1345230669 (Accessed 4 April 2013).

ITU (2004). *World Summit on the Information Society (WSIS): ICTs and Gender.* http://www.itu.int/osg/spu/wsis-themes/ict_stories/ICTsandGender.html. (Accessed 8 February 2013).

ITU (2009). *Measuring the Information Society, 2009.* http://www.itu.int/ITU-D/ict/publications/idi/material/2009/MIS2009_w5.pdf (Accessed 1 January 2013).

ITUC (2010). *Decisions for work: An examination of the factors influencing women's decisions for work (Brussels)*, 21- 31. http://www.ituc-csi.org/IMG/pdf/femmes_En.pdf **(**Accessed 2 February 2013).

ITU (2011). *Measuring the Information Society, 2011.* http://www.itu.int/net/pressoffice/backgrounders/general/pdf/5.pdf (Accessed 3 November 2012).

ITU (2012a). *Women and Girls in ICT, Tech needs Girls.* http://www.itu.int/en/action/women/Pages/default.aspx (Accessed 5 February 2013).

ITU (2012b). *DIGITAL INCLUSION, A Bright Future in ICTs, Opportunities for a New Generation of Women.* http://www.itu.int/ITU-D/sis/Gender/Documents/ITUBrightFutureforWomeninICT-English.pdf (Accessed 3 March 2013).

ITU (2012c). *Promoting digital literacy.* https://itunews.itu.int/En/2592-Technology-careers-beckon.note.aspx (Accessed 5 March 2013).

ITU (2013). *The World in 2013, ICT Facts and Figures.* http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2013.pdf (Accessed 3 May 2013).

Jain, S. (2006). *ICT's and Women's Empowerment: Some Case Studies from India*. http://www.ifuw.org/seminars/2007/jain.pdf (Accessed 5 February 2013).

Janis, Amy, et al. (2011). 'EVE-OLUTION: WHY WOMEN RULE THE WEB, UNDERSTANDING THE DIGITAL LIVES OF WOMEN AROUND THE WORLD'. *3D DIGITAL DIMENSIONS*, 1.

meraka (2006). Women in the Information and Communication Technology Sector in South Africa. http://women-in-ict.meraka.csir.co.za/images/7/76/National_print.pdf (Accessed 4 May 2013).

Jepson, A., & Perl, T. (2002). 'Priming the pipeline'. *ACM SIGCSE Bulletin*, 34(2), pp.36–39.

Jonung, C. (1998). 'Occupational segregation by sex and change over time', In Inga Persson and Christina Jonung (eds), *Women's work and wages*, Routledge, London/New-York, pp. 36-71.

Kabeer, N. (2003). *Gender mainstreaming in poverty eradication and the millennium development goals: A handbook for policy-makers and other stakeholders.* Ottawa: International Development Research Centre (IDRC).

Kelan, E. K. (2007) 'Tools and Toys: Communicating Gendered Positions Towards Technology', *Information, Communication and Society*, 10, 3, pp.357-382.

Kelkar, G., & Nathan, D. (2002). 'Gender Relations and Technological Change in Asia'. *Current Sociology*, 50(3), pp.427-441.

Kemp, S. and Squires, J. (eds), (1998). *Feminisms: An Oxford Reader*, Oxford, Oxford University Press.

King, Elizabeth and Anne Hill (1993): *Women's Education in Developing Countries: Barriers, Benefits and Policies*, Johns Hopkins University Press, Baltimore.

Kraut R., Brynin M., Kiesler S. (eds.) (2006). *Computers, phones and the Internet: domesticating information technology*. New York: Oxford University Press, pp.145–67.

Krotoski, A. (2004). *Chicks and joysticks: An exploration of women and gaming.* Entertainment and Leisure Software Publishers Association White paper.

Lenhart, A., Lewis, O., & Rainie, L. (2001). *Teenage Life Online.* Pew Internet & American Life Project. http://www.pewinternet.org/~/media//Files/Reports/2001/PIP_Teens_Report.pdf.pdf （March 213）.

Lewis, S. et al. (2006). *The next wave of gender projects in IT curriculum and teaching at universities.* Paper presented at the 8th Australian conference on computing education, Hobart, Australia. In D. Tolhurst & S. Mann (eds.), *ACM International Conference Proceeding Series* (vol. 165, pp.135–142). Darlinghurst, Australia: Australian Computer Society.

Marcelle, G. M. (2004). 'Thinking big to accelerate gender equality and transformation in the ICTs arena'. *Gender, Technology, and Development,* 8, pp.31-52.

Margolis, J., & Fisher, A. (2002). *Unlocking the clubhouse: Women in computing.* Cambridge, MA: MIT Press.

McNeil, M. (ed.) (2007). *Feminist Cultural Studies of Science and Technology*, London, Routledge.

Milek, A., C. Stork, and A. Gillwald (2011). '*Endendering communication: a perspective on ICT access and usage in Africa', Info*, Emerald Group Publishing Limited, 13 (3), pp.125-141.

Min, Seong-Jae (2010) . 'From the Digital Divide to the Democratic Divide: Internet Skills, Political Interest, and the Second-Level Digital Divide in Political Internet Use'. *Journal of Information Technology & Politics*, 7, pp.22–35.

National Academy of Sciences, National Academy of Engineering, and Institute of Medicine (1997). *Adviser, teacher, role model, friend: On being a mentor to students in science and engineering.* Washington, DC: National Academy Press.

National Science Board. (2008). *Science and engineering indicators – 2008.* Arlington, VA: National Science Foundation.

OECD (2000). *SCHOOLING FOR TOMORROW, Learning to Bridge the Digital Divide.*

http://www.literacy.org/sites/literacy.org/files/publications/wagner_learning-digitaldivide_oecd_2000.pdf (Accessed 5 March 2013).

OECD (2007) **.***Directorate for Science, Technology and Industry, Committee for Information, Computer and Communications Policy.* Working Party on the Information Economy – ICTs and Gender. DSTI/ICCP/IE(2006)9/FINAL. www.oecd.org/dataoecd/16/33/38332121.pdf (Accessed 3 February 2013).

OECD (2011). THE FUTURE OF THE INTERNET ECONOMY, A STATISTICAL PROFILE http://www.umic.pt/images/stories/publicacoes5/Statistical%20Profile%20PECD%20HL%20Meeting.pdf (Accessed 4 May 2013).

Ogan, C. L., et al. (2005). *The more things change, the more they stay the same: Gender differences in attitudes and experiences related to computing.* Paper presented at the annual meeting of the International Communication Association, New York, NY.

Oxaal, Z. and Baden, S. (1997). 'Gender and Empowerment: definition, approaches and implications for policy'. Draft Report Num. 40. *Bridge.*

Parmar, A. (2003). 'Micro-credit, empowerment, and agency: Re-evaluating the discourse'. *Canadian Journal of Development Studies*, 24(3), pp. 461-476.

Patil, D. A., Dhere, A. M., & Pawar, C. B. (2009). 'ICT and empowerment of rural and deprived women in Asia'. *Asia-Pacific Journal of Rural Development*, 19(1), pp.1-22.

Pew Internet (2005). *How women and men use the* http://www.pewinternet.org/~/media//Files/Reports/2005/PIP_Women_and_Men_online.pdf.pdf (Accessed 3 March 2013).

P. Fraser-Abder and J.A. Mehta（1995）. 'Literacy for all' in Missing Links: Gender Equity in Science and Technology for Development. *DRC/INIFEM/IT*. pp. 201-218

Phipps, A. (2002). 'Engineering women: The "gendering" of professional identities'. *International Journal of Engineering*, 18(4), 409–414.)

Phillips, A., & Taylor, B. (1986). 'Sex and Skill: Notes towards a Feminist Economics'. pp. 54-66 in Feminist Review (eds) *Waged Work: A Reader*. London: Virago.

Raghuram, P. (2004) 'Migration, Gender, and the IT Sector: intersecting debates', *Women's Studies International Forum*, 27, pp.163-176.

Roberts, D. F., Foehr, U. G., & Foundation, H. J. K. F. (2004). *Kids and media in America*. p. 380, Cambridge University Press.

Rubery J. and C. Fagan (1993). '*Occupational segregation of women and men in the European Community'*, European Community, Synthesis report of the network of experts on the situation of women in the labour market, University of Manchester.

Sanders, J. (2005) . 'Women and IT: Fast Facts'， presented at: International Symposium of Women and ICT: Women and ICT: Creating Global Transformation, June 2005, Baltimore, USA.

Seymour, E., & Hewitt, N. M. (1997). *'Talking about Leaving: Why Undergraduates Leave the Sciences'*, Colorado: Westview Press.

Sharma, U. (2003). *Women Empowerment Through Information Technology*. Authors Press.

Singh, K., Allen, K. R., Scheckler, R., and Darlington, L. (2007) . 'Women in computer-related majors: A critical synthesis of research and theory from 1994 to 2005', *Review of Educational Research*, 77, 4, December 2007, pp.500-533.

SPIDER (2012). *Empowering women through ICT*. http://www.spidercenter.org/sites/default/files/Empowering%20woment%20through%20ICT.pdf (Accessed 9 March 2013).

Steinke, Jocelyn. (1999). 'Women scientist role models on screen. *Science Communication,* 21(2), pp.111–136.

Tandon, N. (2006). Information and Communication Technologies in Bangladesh Trends, Opportunities and Options for Women Workers.' **http://www.networkedintelligence.com/wp/wp-content/uploads/2010/10/ICTs-in-Bangladesh_Trends_Opportunities-and-Future-Options-for-Women-Workers.pdf (**Accessed 5 **March 2013).**

Thewlis M., Miller L. & Neathey F. (2004). 'Advancing Women in the Workplace: Statistical Analysis', *Working Paper Series,* No. 12, Equal Opportunities Commission.

The World Bank (2012). *The World Development Report, 2012, GENDER EQUALITY AND DEVELOPMENT*. pp. 115/342. http://siteresources.worldbank.org/INTWDR2012/Resources/7778105-1299699968583/7786210-1315936222006/Complete-Report.pdf （Accessed 1 March 2013）

UNICEF(2002). Barriers to Girls' Education, Strategies and Interventions. http://www.unicef.org/teachers/ （Accessed 10 May 2013）

US Bureau of Labor Statistics (2005).*Women in the Labor Force: A Databook* http://www.bls.gov/cps/wlf-databook-2005.pdf （Accessed 3 March 2013）

Vale, C. M., & Leder, G. C. (2004). 'Student views of computer-based mathematics in the middle years: Does gender make a difference? ' *Educational Studies in Mathematics,* 56(2), pp .287-312.

Valenduc, G., et al. (2004). *Widening women's work in information and communication technology,* Synthesis report of the European project www-ICT, IST-2001-34520, European Commission - Fondation Travail, Université ASBL, Work & Technology Research Centre.

Valkenburg, P. (2004). *Children's responses to the screen: A media psychological approach*. Mahwah, NJ: Lawrence Erlbaum Associates.

Varma, R. (2007). 'Decoding the female exodus from computing education'. *Information, Communication and Society,* 10, pp.181–193.

Varma, R. (2010). 'Why so few women enroll in computing? Gender and ethnic differences in students' perception'. *Computer Science Education*. Vol. 20, No. 4, December 2010, pp.301–316.

Wajcman, Judy. (1991). *Feminism confronts technology*. Pennsylvania: Pennsylvania State University Press.

Wajcman, J. (2004). *TechnoFeminism*. Cambridge, U.K.: Polity Press.

Wajcman, J. (2009). 'Feminist theories of technology'. *Cambridge Journal of Economics*, 2009, 1 of 10 doi:10.1093/cje/ben057.

Walterova, Iva & Lars Tveit (2012). 'Digital local agenda: bridging the digital divide'. *Transforming Government: People, Process and Policy*. vol. 6, no. 4, pp.345-357.

Warschauer, M. (2003a). 'Dissecting the "Digital Divide": A Case Study in *Egypt'*. *Information Society*, vol. 19, 4. p. 297.

Warschauer, M. (2003b).*Technology and Social Inclusion: Rethinking the Digital Divide.* The MIT Press; Cambridge, Massachusetts; London, England, 10

Wheeler, D. (2007). 'Empowerment Zones? Women, Internet Cafes, and Life Transformations in Egypt'. *Information Technologies & International Development*, 4(2).

Wickham, J., Collins, G., Greco, L, & Browne, J. (2008). 'Individualization and equality: women's careers and organizational form'. *Organization*, 15(2), pp.211-231.