Proceedings of the 4th International Conference on Educational Innovation and Philosophical Inquiries
DOI: 10.54254/2753-7048/11/20230758

How ICT Development Since the 1990s Has Contributed Differently to Gender Equality in High-income, Middle-income and Low-income Countries

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Abstract: Gender inequality is a global issue. It is well known that ICT (Information and Communications Technology) development has a place in promoting gender equality, and many international organizations that aim to promote gender equality have adopted measures on ICT expansion in the process of promoting gender equality. Since the 1990s, ICT has been introduced almost globally, and the lack of access to ICT has improved even in the more disadvantaged regions. The existing literatures have answered positively to the question of whether ICT has contributed to the development of gender equality, but no studies have been conducted to determine whether ICT development has had a different impact on the promotion of gender equality in high-income, middle-income, and low-income countries, and middle- and low- income countries are at different stages of development. If it is true that development of gender equality in middle- and low-income countries has been deeply influenced by ICT development, it can be assumed that the continued promotion of ICT development is effective in reducing gender gap in these countries. Therefore, in this paper, GDI (Gender Development Index), HDI (Human Development Index), GGGI (Global Gender Gap Index), investment in ICT with private participation (current US$), mobile cellular subscriptions, individuals using the Internet (% of population), and fixed broadband subscriptions were used to explore whether the development of ICT since the 1990s has had a differential impact on the development of gender equality in the United States, Norway, Mexico, China, Mali, and Yemen. The final result showed that the contribution of ICT development to gender equality since the 1990s is more significant in middle- and low-income countries, and the positive correlation between ICT development and gender equality is more pronounced in middle- and low-income countries.

Keywords: gender equality, gender gap, human development, information and communication technology, information diffusion

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DOI: 10.54254/2753-7048/11/20230758

1. Introduction

With its constant and rapid evolvements, ICT has become an integral part of the modern world. ICT has a significant impact on how humans learn, work and live in society, and it is pervasive in our lives. ICT networks cover all places where humans live and are constantly being improved to facilitate human life. The phrase "information and communication technology" has been used by academic researchers since the 1980s, it is the combination of information processing, computing and communication technologies, and these technologies include computers, the Internet, broadcasting technologies, and telephony. Despite the revolutionary nature of ICT capabilities, it is not evenly distributed. In short, wealthier countries and individuals enjoy greater access and are therefore better positioned to seize the advantages and opportunities offered by ICT. According to the research result of World Bank, in 2016, the percentage of people who can use mobile phone in the world occupied over 75%, but access to computers and the Internet is still in its early stage in developing countries given the limited infrastructure and the high access costs that come with it. In the United States and other places, this lack of access to ICT has created what is known as the digital divide. However, even though ICT promotion in developing countries is still in its infancy, the huge role of ICT in education, healthcare, science and in driving the world forward cannot be ignored.

Aside from the developments of ICT, another aspect of the society has also gained increasing awareness and attention – gender inequality, which has long been a global issue. The Global Gender Gap Report suggests that, at the current rate of progress, it will take 132 years to reach full parity, which is a 4-year improvement compared to 2021 which indicated 136 years [1]. Other reports show that North America and Europe are regions most advanced in closing the gender gap; whereas the gender gap remains more severe in North Africa and South Asia. In terms of employment and job market statistics, the ratio of the number of women employed to the number of men employed has increased significantly from 1970 to 2000 but has stalled since then; there has also been a sharp decrease in occupational segregation. Another important indicator of gender inequality is the pay gap. Women's pay has always been lower than men's; yet the gap has been closing from 1980s to 2000s but has remained relatively flat afterwards. Hence a general conclusion on gender inequality, from a global perspective, is that there have been substantial reductions in all indicators of gender inequality, however the progress has been slowing or been at a stall.

It is well known that ICT is in a vital position to promote gender equality. One of the reasons why ICT promotion is so important to gender equality is that it provides an opportunity for female to take part in the global market. ICT helps them to access information and improve efficiency of this progress, enhance coordination, and improve quality of information collected and shared for development planning. Another reason is that ICT allows women to access basic needs such as healthcare and education, which can increase the survival rate of women in disadvantaged areas and provide them with guaranteed access to better living conditions. Furthermore, the development of ICT has also had an impact on reducing the inherent perception of gender inequality in society. In this case, this research aims to explore whether ICT development has promoted gender equality and whether there are differences in the extent to which it has progressed in high-income countries, middle-income countries, and low-income countries.

In Section 2 the existing relevant literature will be summarized, in Section 3 the collected data will be analyzed and make inferences, in Section 4 the findings for the three sample groups will be concluded, and in Section 5 a comprehensive summary of the full article will be provided.

2. Literature Review

GU He-jun analyzed the factors influencing the educational enrollment of 7-18 aged children in rural China, and the contribution of mobile phone, the Internet, television and other information technology

DOI: 10.54254/2753-7048/11/20230758

development to school enrollment of children by using the data from the China Health and Nutrition Survey (CHNS) between 1991 and 2009. Using the Probit model to explain the impact of information technology on the educational investment to children in rural China, and internal rate of return (IRR) to calculate the expected rate of return on educational investment, GU found that the development of information technology, such as telephones and the Internet, was found to significantly increase girls' enrollment and promote gender equality in education, while the spread of television had a less significant impact on gender equality. However, Gu also concluded that the investment decisions in education in rural China depend not only on the economic comparison of investment costs and expected benefits, but are also influenced by culture and household income [2].

Gurumurthy discussed the structural barriers affecting women's access to new ICTs. By collecting data and presenting the studies conducted by other researchers, she analyzed this structural barriers in terms of women's access to the Internet and socio-cultural barriers to women's access. Gurumurthy found that women were minority users in almost all developed and developing countries, and even in developing countries where women made up a high percentage of users, the total users themselves were a very small elite group. Based on these findings, Gurumurthy summarized some of the sociocultural factors that hinder women's use of ICT, especially in rural areas. These factors included cultural attitudes that discriminate against women's access to technology and technology education, women were less likely to own communication assets and do not have income to use public facilities, etc. The ultimate conclusion was that if the intended benefits of expanding communication networks and living a wider range of information were to be realized, culturally specific strategies were needed to remove barriers to women's access to information [3,4].

Marie Sicat, Ankai Xu, Ermira Mehetaj, Michael Ferrantino, Vicky Chemutai in the article argues that the digital technologies provide an opportunity to empower woman and close the gender gaps between men and women. The authors take quantitative and qualitative studies in gender, trade, and technology to find out the areas that need future considerations and improvement. The cases are mostly applicable and collected in developing countries but they also collected data from the developed countries. By analyzing official occupational employment statistics and time-use surveys in the United States, the author examines women's online consumption behavior and its association with employment trends in e-commerce related jobs (Case study 1). The gender dimensions of e-commerce trade in Southeast Asia and South Asia were examined through a gender disaggregated analysis and survey of 2880 merchants and 1174 e-commerce ecosystems in two subregions (case Study 3). From the studies, the authors found that there are differences in the export sectors that women and men take part in and female led firms tend to export more. Their ultimate result is that the main things that the government should do is that to address the regulatory challenges which include inter alia, customers procedures for e-commerce in both imports and exports, logistic cost and digital regulations [5].

Marie Sicat proposes two new business frameworks based on case studies and gender distribution in various industry sectors and employment situations, which provide emerging analysis tools and frameworks for gender practitioners to enable government departments to formulate effective policies and enable practitioners to narrow the gender gap in the industry through e-commerce [5]. Moreover, Marie Sicart also mentioned the huge problems women face in the digital economy. First, the inequality between women and men in the proportion of Internet access. In the data, women are 10% more likely to own a mobile phone than men, which is caused by social norms [6]. Even if they own a mobile phone, women are 26% less likely to use the Internet than men [7]. Second, Malmstrom and Wincent states that gender discrimination still exists. Men and women pay different prices when shopping and are treated differently when borrowing [8]. Third, Akerman proposes that in the digital field, female graduates are usually smaller [9].

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Fazilat Siddiq used a meta-analysis to measure ICT literacy and the differential variables that might change these, and the results confirmed and showed that the gender difference in K-12 education for females favored girls, although the magnitude was small, but the consistency means that we should not ignore it [10,11]. In addition, more research results show that boys only have better self-efficacy in the ICT domain, but not better ICT literacy [12].

Weiping Wang, Xiaohui Jiang, and Chenglong Zhang (2022) based on the global data of PISA (Programme for International Student Assessment) 2018 used the cross-country (regional) analysis method to investigate the gender inequality and the applicability of cultural explanations for digital ability of adolescents. Finally, the following findings were obtained: first, female digital ability was lower than male digital ability, and this trend was true in all sample countries or regions. Second, the gender gap is still found after controlling for multiple confounding factors, which confirms the reality of digital gender inequality (gap). Third, cross-country (regional) analysis based on multiple regression techniques not only fails to support sociality. The explanation of inequality also found the conclusion of the gender equality paradox, that is, the more unequal the gender in the social level, the smaller the lexical gender gap. Data from the 2018 survey are used in this study. Although a total of 79 countries and regions participated in the survey, after removing the samples with missing key variables, 286 710 students from 51 countries and regions were still left. Therefore, from the data used in this study, this paper supports the view that digital gender inequality (gap) exists, and opposes the optimistic conclusion of some literatures that the digital gender gap does not exist or tends to close over time (compared with the official report of PISA2006), and the authors proposes several solutions to the problem like bridging the gap between female and male gross enrollment ratio at different education levels, especially at primary and secondary school and the education sector and schools should provide equal opportunities for women to increase access to and use of digital technologies and devices [13].

Annika Agélii Genlott, Åke Grönlund (2016) states that in OECD countries, there is a gender gap between boys and girls, which is that boys always lag behind girls in literacy, but usually perform better than girls on mathematics. They proposed that ICT may play an important role in addressing this gap, and in order to yield a better result they argue that ICT needs to be integrated with other learning factors, and in this study, they measure the effects of “Write to Learn” (WTL). In the study, the authors use quantitative method and two control groups to compare results among students. The study shows that WTL generate the best results, but the ITU (Individual Technology Use) method has a worst performance. Therefore, they concluded that ICT must be integrated into the factors of learning because ICT based on a socio-cultural perspective and including effective arenas for collaborative learning, feedback and formative assessments are key factors for learning [14].

In conclusion, the ICT field can help women and men narrow the gender gap in many aspects such as women empowerment even in commercial fields. However, due to factors such as digital divide, discrimination or other cultural factors, women are often unable to access the ICT field. As a result, most women cannot reasonably use ICT to narrow the gender gap. Second, the gender gap between men and women in ICT remains unproven, with some saying that women have lower digital skills. Some people say that women have a slightly stronger digital ability in k-12 education, but men have better sense of self-efficacy, which also leads to the fact that most women do not join the ICT field and use ICT literacy to narrow the gender gap.

3. Data and Sample

In the light of the introduction, the research focuses on six countries, and they will be divided into a high-income country group, a middle-income country group and a low-income country group. For the high-income country group, Norway and the United States have been selected as the sample, since ICT in these two countries is well developed and these are also two countries that are relatively gender

DOI: 10.54254/2753-7048/11/20230758

equal for most countries and regions. For the middle-income country group, China and Mexico have been chosen as the sample because these two countries are among the middle-income countries with strong economic power, and both pay great attention to the development of the Information Technology industry since the 21st century, which means that the development of ICT in these two countries is more comprehensive. And Mali and Yemen have been selected as the sample of the low-income country group due to their relatively late in ICT rollout and lag behind in gender equality.

Since the end of the 20th century, the development of ICT has reduced the cost of communication, and the global communication flow has increased as a result. Since its invention in the mid-1990s, mobile phones have become common in both developed and developing countries, and the Internet access has been widespread since the mid-1990s and followed by the development of fast broadband. On this basis, the data is chosen for the period from 1990 to 2020. Since the GDI is controversial and the more accepted GGGI was not cited until 2006, from 1990 to 2006 the data we chose to measure gender equality is GDI of the Human Development Report, and from 2006 to 2020 we chose our data from the GGGI.

The data being used as the measurement of ICT development is collected from the World Development Indicators of the World Bank, and they are investment in ICT with private participation (current US$), mobile cellular subscriptions, individuals using the Internet (% of population), and fixed broadband subscriptions. These infrastructures are considered to be the basic tools for ICT development.

3.1. A Comparison of the Impact of ICT Development on Advancing Gender Equality in Norway and the United States

As one of the 17 Sustainable Development Goals from united nations, ICT development is central to them. For women around the world, information and communication technologies (ICTs) can be used for personal security, better access to education and jobs, financial inclusion or access to basic healthcare information. These benefits depend on women having meaningful access to ICTs, a factor that affects the gender gap even more.

The sustainability goals aim to achieve gender equality and empower all women and girls, and call for increased use of enabling technologies, particularly ICTs, to contribute to women's empowerment. Similarly, one of the most important reasons ICTs are for gender equality is to provide jobs and level the playing field. Second, ICTs provide basic access for women in all fields, enabling them to access basic needs such as health care and education.

From the data revealed by Table 1, this work used Gender Development Index, GGGI and Human Development Index as references. From the Global Gender Gap Index (GGGI) in the table 1, the data shows that with the gradual increase in the number of Internet access and mobile phone usage, GGGI is also on the rise. Meanwhile, the four reference parameters in GGGI are Economic Participation and Opportunity. Educational Attainment, Health and Survival, Political Empowerment. From 2006, the US index in Education and Health has been very high, fluctuating around 0.98. However, both Political Empowerment and Economic Participation have increased, with the most significant increase in Political Empowerment, from 0.096 in 2006 to 0.332 in 2022. From the perspective of HDI, men and women in the United States have approached and become equal, because the reference indicators of the two are only measured from the aspects of education and medical security, and the United States is already the world's leading level in this aspect. With the development of ICT which shows a positive correlation with gender equality, the gap between men and women in HDI will become smaller and smaller. From the perspective of GDI in the United States, it is gradually increasing with the development of ICT. While there is still a pay gap between men and women, it is also narrowing, and gender equality is increasing.

DOI: 10.54254/2753-7048/11/20230758

Table 1: Comparative table of data on gender equality and ICT development in the US.

The United States								
	Gender Equality [1,15]				ICT Development [16]			
Time	GDI	HDI(Female)	HDI(Male)	GGGI	Investment in ICT with private participation (current US$)	Mobile cellular subscriptions	Individuals using the Internet (% of population)	Fixed broadband subscriptions
1990	0.987	0.864	0.875			5283055	0.787429	
1991	0.988	0.866	0.877			7557148	1.163194	
1992	0.988	0.870	0.882			11032753	1.724203	
1993	0.987	0.873	0.884			16009461	2.271673	
1994	0.988	0.877	0.888			24134421	4.862781	
1995	0.989	0.878	0.888			33785661	9.237088	
1996	0.987	0.880	0.892			44042992	16.41935	
1997	0.988	0.884	0.894			55312293	21.6164	
1998	0.991	0.887	0.896			69209321	30.0932	705900
1999	0.990	0.888	0.897			86047003	35.84872	2754286
2000	0.989	0.889	0.899			109478031	43.07916	7069874
2001	0.989	0.889	0.899			128500000	49.08083	12792812
2002	0.989	0.889	0.899			141800000	58.7854	19881549
2003	0.986	0.888	0.901			160637000	61.69712	27744342
2004	0.985	0.891	0.904			184819000	64.75826	37352520
2005	0.987	0.892	0.904			203700000	67.96805	51156350
2006	0.998	0.896764	0.907834	0.704		229600000	68.93119	60237701
2007	0.987	0.898762	0.910161	0.700		249300000	75	71704000
2008	0.987	0.898932	0.910469	0.718		261300000	74	77130000
2009	0.988	0.900547	0.911709	0.717		274283000	71	79992000

DOI: 10.54254/2753-7048/11/20230758

Table 1: (continued).

2010	0.988	0.904344	0.914879	0.741	285118000	71.69	84522000
2011	0.988	0.906291	0.916916	0.741	297404000	69.72946	88317000
2012	0.987	0.908544	0.920102	0.737	304838000	74.7	92514000
2013	0.989	0.910769	0.921284	0.739	310698000	71.4	96032000
2014	0.99	0.913239	0.913239	0.746	355500000	73	97810000
2015	0.99	0.914277	0.914277	0.740	382307000	74.5542	102212000
2016	0.989	0.925851	0.916097	0.722	396000000	85.54442	105714000
2017	0.99	0.91862	0.927732	0.718	400000000	87.27489	108200000
2018	0.992	0.921583	0.929276	0.720	348242000	88.4989	110756000
2019	0.9940.997	0.924936	0.930538		355695000	89.43028	114269000
2020		0.917541	0.920514	0.724	351477000	90.9	121176000

The situation is different in Norway, where the GDI is on a downward trend and the Gross National Income Per Capita of men and women in the GDI is declining even as ICT penetration increases. As is revealed by Table 2, the value of this GDI fluctuates greatly between men and women. For example, the income of men reached $70,178 in 2004 and peaked at $84,213 in 2008. However, after the outbreak of the financial crisis, the income of men continued to fluctuate around $72,000 and reached $74,444.99 in 2021. Women showed the same trend, but after 2008, the gap between the two was not decreasing, but widening. However, the gap between men and women is also narrowing by other measures. According to GGGI, Norway and the US are following the same trend, both reducing the gender gap in job opportunities and political empowerment and the gender gap in health and education has declined, but the difference is small because the proportion of men attending high school is declining.

According to the comparison between the two countries, the data from the Table 2 indeed show that with the development of ICT, the income level of men and women is gradually increasing. In the United States, the income level gap between men and women is gradually decreasing, while in Norway, there is a slight fluctuation. Both countries share the same trend in education and health care, where the numbers have moved towards parity with slight fluctuations. Most notably, in terms of women's political empowerment, both countries have seen significant improvements with the development of ICTs.

Table 2: Comparative table of data on gender equality and ICT development in Norway.

Norway								
	Gender Equality [1, 15]				ICT Development [16]			
Time	GDI	HDI(Female)	HDI(Male)	GGGI	Investment in ICT with private participation (current US$)	Mobile cellular subscriptions	Individuals using the Internet (% of population)	Fixed broadband subscriptions
1990	0.979	0.828	0.845			196828	0.707299	

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Table 2: (continued).

1991	0.978	0.834	0.853			234423	1.407395	
1992	0.979	0.840	0.858			282918	2.216366	
1993	0.977	0.846	0.867			371403	2.783991	
1994	0.976	0.861	0.883			588478	4.15245	
1995	0.978	0.860	0.880			981305	6.42322	
1996	0.978	0.868	0.888			1261445	18.25031	
1997	0.981	0.875	0.892			1676763	20.41788	
1998	0.985	0.887	0.900			2072000	22.56011	
1999	0.987	0.893	0.905			2664000	40	
2000	0.988	0.905	0.916			3224000	52	23297
2001	0.990	0.905	0.915			3593000	64	88541
2002	0.991	0.906	0.915			3790000	72.84	205307
2003	0.988	0.911	0.922			4060829	78.13	398758
2004	0.987	0.918	0.930			4524750	77.69	671666
2005	0.989	0.924	0.934			4754463	81.99	991349
2006	0.99	0.928	0.937	0.849		4868916	82.55	1244536
2007	0.991	0.929	0.938	0.806		5037650	86.93	1457265
2008	0.997	0.934	0.937	0.824		5211207	90.57	1577430
2009	0.998	0.934	0.936	0.823		5354554	92.08	1668231
2010	0.996	0.936	0.940	0.840		5599286	93.39	1723355
2011	0.997	0.942	0.943	0.840		5725447	93.48998	1785676
2012	0.997	0.0.943	0.945	0.840		5797502	94.64998	1857724
2013	0.995	0.948	0.948	0.842		5692052	95.0534	1910720
2014	0.993	0.947	0.951	0.837		5737961	96.3	1977129
2015	0.99	0.946	0.953	0.850		5714890	96.81033	2050460
2016	0.989	0.950	0.955	0.842		5729569	97.2982	2106975
2017	0.99	0.953	0.960	0.830		5719665	96.3576	2165221
2018	0.99	0.953	0.962	0.835		5720892	96.49166	2205861
2019	0.99	0.951	0.962			5775830	98	2260605
2020				0.842		5825584	97	2387661

DOI: 10.54254/2753-7048/11/20230758

3.2. A Comparison of the Impact of ICT Development on Advancing Gender Equality in China and Mexico

Mexico's information technology industry is booming, and so is its workforce. Mexican universities graduate more than 110,000 engineers a year, or more than 20 percent of all university graduates. The depth of the talent pool has begun to attract significant investment from big tech companies and venture capitalists. Now Monterrey in Nuevo Leon and Guadalajara in Jalisco are known as the Silicon Valley of Latin America. As revealed by Table 3, from 1990 to 2021, individuals using the internet （% of population） in Mexico has been constantly increasing from 0.00% in 1990 to 71.97% in 2020, and the fixed broadband subscription also increased from 15000 in 2000 to 21936131 in 2020.

The development in ICT indeed made a lot of change to people's daily life. ICT promote the provision of education, health and government service, as well as expanding the coverage areas of information, which improve the equality of information that received by people regardless of their gender. In Table 3, it shows that the Human development index of female and male, and it is apparent that the gap between female and male is getting closing from 1990 to 2005. Also, the data from the Gender Development Index, which used to measure the gender equality shows that this index is getting more and more close to 1, which indicate that the gender gap is narrowing during this period. In addition, based on the data from the Global Gender Gap Report from 2006 to 2022, the Global Gender Gap Index of Mexico is increasing, and the its rank increase rapidly in recent years. The work observed that with the development in ICT, the gender gap indeed closing from 1990 to 2022, and the gender equality is increasing.

Table 3: Comparative table of data on gender equality and ICT development in Mexico.

Mexico								
	Gender Equality [1, 15]				ICT Development [16]			
Time	GDI	HDI(Female)	HDI(Male)	GGGI	Investment in ICT with private participation (current US$)	Mobile cellular subscriptions	Individuals using the Internet (% of population)	Fixed broadband subscriptions
1990	0.906	0.623	0.687		..	63,926	0.00	..
1991	0.908	0.625	0.688		..	160,898	0.01	..
1992	0.911	0.629	0.691		..	312,647	0.02	..
1993	0.913	0.632	0.692		..	386,132	0.03	..
1994	0.916	0.638	0.696		..	569,251	0.04	..
1995	0.918	0.639	0.696		1,000,000	688,513	0.10	..
1996	0.917	0.645	0.703		43,500,000	1,021,900	0.20	..
1997	0.920	0.654	0.711		526,300,000	1,740,814	0.63	..
1998	0.920	0.661	0.719		1,201,500,000	3,349,475	1.27	..
1999	0.919	0.667	0.726		348,500,000	7,731,635	1.86	..
2000	0.921	0.675	0.732		2,214,300,000	14,077,800	5.08	15,000
2001	0.921	0.678	0.736		311,000,000	21,757,599	7.04	50,000
2002	0.922	0.685	0.743		2,124,000,000	25,928,266	11.90	231,486

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Table 3: (continued).

2003	0.925	0.692	0.748		1,285,000,000	30,097,700	12.90	428,371
2004	0.933	0.701	0.752		695,000,000	38,451,135	14.10	1,057,282
2005	0.939	0.707	0.753		120,000,000	47,128,746	17.21	1,922,352
2006				0.6462	801,000,000	55,395,461	19.52	3,020,000
2007				0.6441	120,000,000	66,559,462	20.81	4,504,422
2008				0.6441	562,000,000	75,303,469	21.71	7,532,633
2009				0.6503	..	83,193,574	26.34	9,641,168
2010				0.6577	799,700,000	91,383,493	31.05	10,582,865
2011				0.6604	1207,000,000	94,583,253	37.18	11,566,069
2012				0.6712	2,129,500,000	100,727,228	39.75	13,077,276
2013				0.6917	2,117,600,000	106,747,373	43.46	12,747,873
2014				0.6900	4,502,040,000	104,948,339	44.39	13,032,519
2015				0.6990	2,886,900,000	107,688,282	57.43	14,757,686
2016				0.7000	3,586,600,000	111,730,635	59.54	15,923,971
2017				0.6920	6,613,800,000	114,329,353	63.85	17,000,482
2018				0.7210	3,597,650,000	120,165,322	65.77	18,358,920
2019				0.7600	2,717,210,000	122,035,192	70.07	19,353,056
2020				0.7540	4,211,500,000	122,898,392	71.97	21,936,131
2021				0.757	448,460,000			
2022				0.764	..	..	..	..

In the past 30 years, the scale of China's software and information technology service industry has expanded rapidly, and the technical level has been significantly improved. It has developed into an important organization of strategic industries. From Table 4, it reveals that the demand for and use of information technology products has also increased dramatically. Individuals using the internet (% of population) grow from 0.00% in 1990 to 70.40% in 2020, and the mobile cellular subscriptions also increased dramatically. The fixed broadband subscriptions grow from 22660 in 2000 to 483549500 in 2018.

The rapid development in ICT in China triggers the economics growth, contributes to the wide spread of large amount of information, and creates a lot of new jobs for people. Thanks to the growth of ICT, women and men today can have equal opportunities to receive new information, and women can also find satisfactory jobs in the society. As can be seen from Table 4, it shows that with the development in ICT the Human development Index for female and male in China are both increasing from 1990 to 2005, and the gap between them are getting smaller overtime. Also, the Gender development Index from 1990 to 2005 is getting more and more close to 1, which indicate that the gender gap is closing. From 2006 to 2022, Global Gender Gap Index is used to reflect the change in gender equality. From the GGGI between 2006 to 2022, although there are some fluctuations in the index, it generally reflects a gradual increase in GGGI. Therefore, based on those data, there is a trend of increase in gender equality in China.

Table 4: Comparative table of data on gender equality and ICT development in China.

China								
	Gender Equality [1, 15]				ICT Development [16]			
Time	GDI	HDI(Female)	HDI(Male)	GGGI	Investment in ICT with private participation (current US$)	Mobile cellular subscriptions	Individuals using the Internet (% of population)	Fixed broadband subscriptions

DOI: 10.54254/2753-7048/11/20230758

Table 4: (continued).

1990	0.873	0.442	0.506		..	18,319	0.00	..
1991	0.875	0.452	0.516		..	47,544	0.00	..
1992	0.881	0.467	0.529		..	176,943	0.00	..
1993	0.888	0.480	0.541		..	638,000	0.00	..
1994	0.891	0.493	0.553		..	1,568,000	0.00	..
1995	0.894	0.503	0.563		..	3,629,000	0.00	..
1996	0.894	0.513	0.573		..	6,853,000	0.01	..
1997	0.891	0.520	0.584		3,970,000,000	13,233,000	0.03	..
1998	0.896	0.531	0.593		..	23,863,000	0.17	..
1999	0.897	0.540	0.602		..	43,296,000	0.71	..
2000	0.901	0.551	0.612		5,653,000,000	85,260,000	1.78	22,660
2001	0.907	0.563	0.621		325,000,000	144,820,000	2.64	336,280
2002	0.914	0.575	0.630		1,430,000,000	206,005,000	4.60	3298,490
2003	0.920	0.588	0.639		..	269,953,000	6.20	11,219,010
2004	0.927	0.601	0.648		..	334,824,000	7.30	24,939,630
2005	0.933	0.614	0.658		..	393,406,000	8.52	37,353,000
2006				0.6560	..	461,058,000	10.52	50,853,000
2007				0.6643	..	547,306,000	16.00	66,414,000
2008				0.6878	..	641,245,000	22.60	82,879,000
2009				0.6907	..	747,214,000	28.90	103,978,000
2010				0.6881	..	859,003,000	34.30	126,337,000
2011				0.6866	..	986,253,000	38.30	156,487,000
2012				0.6853	..	1,112,155,000	42.30	175,183,000
2013				0.6908	..	1,229,113,000	45.80	188,909,000
2014				0.6830	..	1,286,093,000	47.90	200,483,000
2015				0.6820		1,291,984,200	50.30	277,046,000
2016				0.6760	..	1,364,934,000	53.20	322,597,000
2017				0.6740		1,469,882,500	54.30	394,190,000
2018				0.6730	..	1,649,301,700	59.20	407,382,000
2019				0.6800		1,746,238,000	64.11	449,279,000
2020				0.676	..	1,718,411,000	70.40	483,549,500
2021				0.682	..			
2022				0.682	..	..	..	..

Base on the data from Mexico and China in Table 3 and 4, the investment in ICT with private participation (current US$), mobile cellular subscriptions, mobile cellular subscriptions (per 100 people), and individuals using the internet (% of population) are all increasing from 1990 to 2021 in both countries. The mobile cellular subscriptions and mobile cellular subscriptions (per 100 people) is higher in China than that in Mexico, but the Individuals using the Internet (% of populations) is higher in Mexico than that in China.

The work observed that the Human Development Index of female and male, and the Gender Development Index in Mexico between 1990 and 2005 as can be seen from Table 3 and 4 are generally higher than those of China, but they both exhibit a trend of closing in gender gap. In addition, based on the Global Gender Gap Index that collected from both countries, it is apparent that the index is initially lower in Mexico than that in China, but gradually the GGGI become higher in Mexico, and the rank of Mexico overtaking that of China over the period from 2006 to 2022.

DOI: 10.54254/2753-7048/11/20230758

3.3. A Comparison of the Impact of ICT Development on Advancing Gender Equality in Mali and Yemen

Mali had a late start in ICT and by the 1980s, the government had developed major infrastructure projects, largely owned by European government partners, as a way to improve and expand communications. Since 2000, the Malian government has participated in the UN's Global Alliance for ICT and Development and the Connect Africa projects to further increase computer and Internet availability.

Cell phone usage in Mali has increased significantly since the 1990s, but despite this, the domestic telephone system offers minimal service and is still being improved, and the Internet usage is low by international standards. According to the Global Initiative for Inclusive ICTs, until 2020, there was no country policy and program outcomes by areas of ICT accessibility in Mali [17]. However, according to the International Telecommunication Union, in 2020, the percentage of individuals using the Internet in Mali occupied only 27% of the total population, which was much lower than that in the world and Africa, respectively at 59% and 30%. And in 2021, by comparison with the population coverage of 3G and LTE/WiMax in the world, which were 95% and 88%, those figures in Mali were 68% and 47%. Also, in 2021, only 0.66 out of every 100 people in Mali subscribed to fixed broadband, while there were 17 out of every 100 people in the world subscribed to fixed broadband, but this figure was also higher than that in Africa, which was only 0.6 out of every 100 people [18].

Gender issues are also more pronounced in Mali. Lack of education and the influence of social attitudes lead to female disadvantages in Mali. The literacy rate in Mali was low, especially among women. However, the adult literacy rate for women in Mali has increased from 23% in 1996 to 32.7% in 1999 [19]. Also, religion, patriarchal society, and gender-based violence are the main negative factors affecting the lives of Malian women. Mali has ranked low in the GDI and GGGI.

As is revealed by Table 5, between 1996 and 2005, the GDI and the HDI for female and male in Mali have been on a steady upward trend, respectively rose from 0.736 to 0.806, from 0.233 to 0.325, and from 0.317 to 0.403. In addition, the gender gap between female and male has been decreasing in fluctuation, from -0.084 in 1996 to -0.078 in 2005. During this period, the development of ICT has also been enhanced, the data on mobile cellular subscriptions and individuals using the Internet (% of population) both showed steadily increase, with the former rising from 1187 to 761,986 and the latter from 0.002055 to 0.507063. Furthermore, between 2006 and 2020, the GGGI which was used to measure gender equality during this period, has also increased from 0.5994 to 0.6210, but was in a fluctuating stage from 2009 to 2018. And the data on mobile cellular subscriptions and individuals using the Internet (% of population) during this period show a very significant increase in the rate of growth compared to the 1996-2005 period for both data, respectively from 1,512,948 to 25,315,598, and from 0.729627 to 27.4. Also in 2006, data on the fixed broadband subscriptions was able to be investigated and cited in the research, which also showed a remarkable upward trend, from 3085 to 243,806. However, what can also be noted is that the data for mobile cellular subscriptions fluctuated between 2014and 2018, and in addition, the data for fixed broadband subscriptions can also be observed fluctuating throughout the period from 2011 to 2017.

This work observed that between 2009 and 2018, Mali's GGGI experienced significant fluctuations, and over about the same period, data for mobile cellular subscriptions and fixed broadband subscriptions also in fluctuating periods. Based on these, it could be inferred that there is a correlation between the development of ICT and the development of gender equality in Mali. What can be believed is that in Mali, even though the development of ICT is still in a relatively nascent stage, the promotion of ICT has had a definite impact on the development of gender equality, and despite some fluctuations, the gender gap has generally narrowed.

DOI: 10.54254/2753-7048/11/20230758

Table 5: Comparative table of data on gender equality and ICT development in Mali.

Mali								
	Gender Equality [1, 15]				ICT Development [16]			
Time	GDI	HDI(Female)	HDI(Male)	GGGI	Investment in ICT with private participation (current US$)	Mobile cellular subscriptions	Individuals using the Internet (% of population)	Fixed broadband subscriptions
1996	0.736	0.233	0.317			1187	0.002055	
1997	0.739	0.244	0.330			2842	0.010086	
1998	0.752	0.255	0.339			4473	0.019794	
1999	0.758	0.266	0.351			6387	0.06091	
2000	0.769	0.274	0.357			10398	0.142546	
2001	0.779	0.286	0.368			23997	0.185897	
2002	0.787	0.296	0.376			45974	0.227046	
2003	0.795	0.308	0.387			247223	0.310364	
2004	0.801	0.316	0.394			406861	0.43282	
2005	0.806	0.325	0.403			761986	0.507063	
2006				0.5994		1512948	0.729627	3085
2007				0.6019		2530891	0.81	3200
2008				0.6117		3438568	1.57	5272
2009				0.5860	383000000	4460543	1.8	8244
2010				0.5680		7440383	2	8019
2011				0.5752		10821930	2.2	8482
2012				0.5842		14612835	2.8	4320
2013				0.5872		19749371	3.5	2909
2014				0.5779		23505559	7	
2015				0.5990		22698915	10.33	3499
2016				0.5910		20217697	14	21444
2017				0.5830		22034110	18.9	15400
2018				0.5820		21955565	21.4	120934
2019						22925482	24.2	142522
2020				0.6210		25315598	27.4	243806

The present-day Republic of Yemen is a very young country, having been officially formed in 1990 from the merge of the former North and South Yemen, and for this reason, Yemen's development policies are not yet very mature, including the policy of developing ICT. However, Yemen's ICT policy is slowly progressing towards achieving its goals and objectives in order to be in compliance with its obligations to its people and the international society. Many projects have been conducted in different departments, yet, the intended results have unfortunately not been met [20].

Yemen has a good digital telecommunications network that covers all governorates and most local areas [21]. According to the Global Initiative for Inclusive ICTs, until 2020, Yemen had introduced policies of ICT in the areas of web, TV and multimedia, mobile telephony, e-books and digital contents, Internet availability and usage among persons with disabilities, inclusive ICTs for all in education, enabling ICTs for all in employment, e-government and smart cities for all, and procurement of accessible public goods and services for all citizens, but among them, the policies for mobile telephony, e-government and smart cities for all, and procurement of accessible public goods and service for all citizens have not been implemented. However, Yemen does not have policies in the area of enabling assistive technologies and ICTs for independent living [22]. Also, according to

DOI: 10.54254/2753-7048/11/20230758

the International Telecommunication Union, individuals using the Internet in Yemen in 2017 was 27%, which was much lower than that in the world and Arab States, respectively 46% and 48%. Also, in contrast to the fixed broadband subscriptions in the world and Arab States, whose figure were 17 out of every 100 people and 8.7 out of every 100 people, Yemen's fixed broadband subscription figure for 2020 was not promising, with only 1.2 out of every 100 people. However, the population coverage of 3G was much better. In 2020, Yemen had a high 3G population coverage of 95%, exceeding the world and the Arab States at 94% and 93% respectively [23].

Leaving aside the issue of gender equality, Yemen also has serious human rights problems, such as restrictions on freedom of expression, press and religion, as well as prolonged pretrial detention and arbitrary arrests of citizens. And gender issues were also very serious, with 6.1 million girls and women in need of gender-based violence services, according to a 2020 UNFPA (United Nations Population Fund) estimate, as well as an increase in cases of gender-based violence and child marriage during the COVID-19 pandemic. Yemen ranked last in GDI and GGGI perennially.

As can be seen from Table 6, the GDI and HDI for female and male showed a gentle upward trend from 1990 to 2005, respectively rose from 0.534 to 0.664, from 0.252 to 0.372, and from 0.472 to 0.561. The gender gap in Yemen was large during this period, although it also had a slowly decrease, from -0.22 to -0.189 year by year, and it is worth mentioning that there were minor fluctuations between 2003 and 2005. In particular, the rate of change in both the GDI and the gender gap was very high between 1994 and 1999. During this period, ICT in Yemen also evolved, and between 1992 and 2005, mobile cellular subscriptions grew from 1550 to 2,277,559, and though growth was slow in the first few years, the rate of growth increased significantly from 1998 over the previous years. And the data for individuals using the Internet (% of population) also showed a slow increase from 0.000621 to 1.048598 between 1996 and 2005. Besides, between 2006 and 2020, the GGGI also grew slowly in fluctuation from 0.4594 to 0.4940, where there were very remarkable fluctuations between 2014 and 2020. Mobile cellular subscriptions and fixed broadband subscriptions also fluctuated in growth between 2006 and 2020, respectively rose from 2,977,781 to 15,178,000 and from 2718 to 391,000. Data for individuals using the Internet (% of population) maintained a steady increase between 2006 and 2017, from 1.247824 to 26.71835.

This work observed that between 1994 and 1999, Yemen experienced a significant increase in GDI growth and reduction in the gender gap, while mobile cellular subscriptions were gaining momentum to boost growth, although the most remarkable increase began in 1998. Moreover, it could also be noticed that Yemen's GGGI experienced notable fluctuations between 2014 and 2020, at the same time, data for mobile cellular subscriptions and fixed broadband subscriptions also experienced significant ups and downs. Based on these, it could be inferred that there is a correlation between the development of ICT and the development of gender equality in Yemen. We believe that even though Yemen's ICT-related policies are still in their infancy, the promotion of ICT at this stage does have a catalytic effect on gender equality.

Table 6: Comparative table of data on gender equality and ICT development in Yemen.

Yemen								
	Gender Equality [1, 15]				ICT Development [16]			
Time	GDI	HDI(Female)	HDI(Male)	GGGI	Investment in ICT with private participation (current US$)	Mobile cellular subscriptions	Individuals using the Internet (% of population)	Fixed broadband subscriptions
1990	0.534	0.252	0.472		10000000			

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Table 6: (continued).

1991	0.540	0.256	0.473					
1992	0.545	0.261	0.478			1550		
1993	0.551	0.266	0.483			5170		
1994	0.560	0.270	0.483			8191		
1995	0.573	0.282	0.493			8250		
1996	0.590	0.296	0.501			8810	0.000621	
1997	0.605	0.307	0.507			12245	0.015025	
1998	0.621	0.319	0.514			16146	0.023323	
1999	0.635	0.329	0.518			27677	0.056629	
2000	0.642	0.338	0.527			32042	0.0825	
2001	0.649	0.347	0.535			147837	0.090802	
2002	0.654	0.355	0.543			486667	0.518769	
2003	0.659	0.362	0.550			675162	0.604734	
2004	0.660	0.367	0.557			1476000	0.881223	
2005	0.664	0.372	0.561			2277559	1.048598	1498
2006				0.4594	213600000	2977781	1.247824	2781
2007				0.4510		4349000	5.01	11000
2008				0.4664		6445000	6.89	26000
2009				0.4609		8313000	9.96	54000
2010				0.4603		11085000	12.35	84000
2011				0.4873		11668000	14.905	109000
2012				0.5054		13900000	17.4465	167300
2013				0.5128		16844700	20	256800
2014				0.5145		17100000	22.55	340000
2015				0.4840		15021953	24.08541	395000
2016				0.5160	28000000	16433055	24.57921	276219
2017				0.5160		15357868	26.71835	369004
2018				0.4990		15297789		386330
2019						15238000		382000
2020				0.4940		15178000		391000

Based on the analysis of the data collected on gender equality and ICT development in Mali and Yemen, it could be inferred, based on the data level, that there is a strong link between ICT development and the promotion of gender equality in both countries. This is evidenced by the fact that both gender equality data and ICT development data show an overall increasing trend, and that mobile cellular subscription data and fixed broadband subscription data also show significant fluctuations during the same period when GDI, HDI and GGGI fluctuate.

4. Empirical Results

Based on all the data being collected, there is an apparent positive relationship between the development of the ICT and gender equality. For developed countries like Norway and United States that we discussed in the article, their ICT are already advanced and continue to grow from 1990 to 2020. In these two high-income countries, although there are some fluctuations in the data, but there is a clear trend that the income level for men and women are increasing, and the significant improvements in women's political empowerment also indicates that the gender gap is getting smaller.

However, since the ICT may already fairly advanced in high-income countries before the 90th century, the positive relation between the development of ICT and gender equality may be more evident in middle- and low- income countries like Mexico, China, Yemen, and Mali. In these

DOI: 10.54254/2753-7048/11/20230758

countries, the development of ICT is relatively backward. In 1990, almost no one used the Internet in these countries, and the number of mobile cellular subscriptions was also very small. Similarly, the GDI and HDI of these countries were also relatively low at this stage and the gap between the HDI of women and men is relatively large. However, with the development of ICT, the number of Mobile cellular subscriptions continues to rise, and the proportion of the total population using the Internet also continues to grow. With the continuous development of ICT, the GDI of these middle- and low-income countries have shown an upward trend, and women and men The gap between HDI and GGGI is constantly narrowing, and GGGI is also on the rise, although there will be some fluctuations in certain time periods. High-income countries such as Norway and the United States in the article, their HDI, GDI and GGGI have developed with the increase of ICT index but the upward trend is not particularly obvious, and their GDI images are close to the level, so the positive relation of ICT development and gender equality is probably more obvious in middle- and low- income countries.

Thanks to the development of ICT, it eliminates a lot of restrictions and for women and men and create many opportunities for women to close the gap between them and men. With the development of ICT, both men and women can obtain new knowledge from the internet. Women can also learn all kinds of news and information from the internet, which narrow the gap between them and men and largely eliminate the patriarchal or cultural disadvantage of women relative to men. With the improvement of education level, women's awareness of self-reliance and self-improvement has gradually increased. More women realize the importance of gender equality and advocate that on the internet, thus awakening more women's consciousness of subjectivity and willingness to change the status of inequality. With more and more women realize the importance of gender equality and learn knowledge from the internet. It needs to admit that there are some fluctuations in gender equality and it even decreases in some periods of time when ICT index is increasing. Therefore, there might be other forces that affect the gender equality like political effects or religion effects, but it is difficult to measure those two effects and on what extent do they affect the development of gender equality.

5. Conclusion

Overall, based on the data collected, there are two conclusions about the relationship between ICT development and gender equality advancement, namely that there is indeed a significant positive correlation between ICT development and gender equality advancement, and that since the 1990s, ICT development has contributed more significantly to gender equality in middle- and low- income countries compared to high income countries. What can be believed is that as information and communication technology use increases, the gender gap decreases. Moreover, the reason behind this can be attributed to the fact that with the development of ICT, it has enhanced the transmission of information, both by increasing the number of people to whom a message can reach and also by increasing the efficiency and speed of information exchange. Thus, the development of ICT can increase the flow of information about any gender equality advocacy and any awareness movement; it can also transmit ideas about the importance of gender equality from developed to developing countries, which can encourage people in developing countries to take action to promote gender equality and close the gender gap; and it can also allow women to receive basic medical needs and educational needs as a way to ensure that they have better living conditions; it also provides opportunities for women to enter the global market by improving skills, equipping women with digital devices and providing training to help women to teach them how to make the most of these tools [24].

However, there are shortcomings in this research. As in the collected data, it could be found that in some time, although the data of ICT development has increased, the data of gender equality developments has decreased. Therefore, in addition to ICT, policy, religion, culture and custom are also factors that affect gender equality. Unfortunately, there are limitations in the data that can be

DOI: 10.54254/2753-7048/11/20230758

collected, such as the inability to obtain more detailed data on, for example, different regions within a country, and for practical reasons, this research was unable to obtain additional visual data because of the lack of fieldwork. It is hoped that a more detailed and comprehensive survey can be done in the future based on this article to explore the factors that affect gender equality at a deeper level. Finally, better living conditions and development for women in any region, and a continued narrowing of the gap between men and women is envisioned.

References

[1] *World Economic Forum, (2022). Global Gender Gap Report 2006-2022. https://www.weforum.org/search?query=global+gender+gap+report*

[2] *Gu, H. (2013) ICT, Gender Equality and Education in Rural China——The Empirical Evidence from CHNS Data. POPULATION & DEVELOPMENT, 19: 47-56.*

[3] *Gurumurthy, A., (2004). Gender and ICTs: Overview Report. https://www.researchgate.net/publication/297737202_Gender_and_ICTs_Overview_Report*

[4] *Marcelle, G.M., (2000). Transforming Information & Communications Technologies for Gender Equality.https://www.researchgate.net/publication/237447040_Transforming_Information_Communications_Technologies_for_Gender_Equality*

[5] *Sicat, M., Xu, A., Mehetaj, E., Ferrantino, M., Chemutai, V. (2020). Leveraging ICT Technologies in Closing the Gender Gap. Leveraging ICT Technologies in Closing the Gender Gap (worldbank.org)*

[6] *UNCTAD, (2017). INFORMATION ECONOMY REPORT 2017. DIGITALIZATION, TRADE AND DEVELOPMENT. http://unctad.org/en/PublicationsLibrary/ier2017_overview_en.pdf*

[7] *GSM Association, (2018). Connected women - The mobile gender gap report. https://www.gsma.com/mobilefordevelopment/wpcontent/uploads/2018/04/GSMA_The_Mobile_Gender_Gap_Report_2018_32pp_WEBv7.pd*

[8] *Malmstrom, M., Wincent, J., (2018). The digitization of banks disproportionately hurts women entrepreneurs.https://hbr.org/2018/09/research-the-digitization-of-banks-disproportionately-hurts-women-entrepreneurs*

[9] *Akerman, A., Gaarder, I., Mogstad, M. (2015) The skill complementarity of broadband internet. Quarterly Journal of Economics, 130: 1781-1824.*

[10] *Siddiq, F., Scherer, R. (2019) Is there a gender gap? A meta-analysis of the gender differences in students' ICT literacy. Educational research review, 27: 205-217.*

[11] *Voyer, D., Voyer, S. D. (2014) Gender differences in scholastic achievement: a meta-analysis. Psychological bulletin, 140(4): 1174.*

[12] *Aesaert, K., Van Braak, J. (2015) Gender and socioeconomic related differences in performance based ICT competences. Computers & Education, 84: 8-25.*

[13] *Wang, W. Jian, X. Zhang, C.(2022) The Gender Equality Paradox: Global Digital Gender Divide and Its Cultural Explanations—A Cross Country (Region) Analysis Based on PIS2018. Studies in Foreign Education, 49: 19-35.*

[14] *Genlott, A. Grönlund, Å. (2016) Closing the gaps-Improving literacy and mathematics by ict-enhanced collaboration. Computer & Education, 99: 68-80.*

[15] *UNDP, (2021). Human Development Report. https://hdr.undp.org/gender-development-index#/indicies/GDI*

[16] *The World Bank, (2022). World Development Indicators. https://databank.worldbank.org/source/world-development-indicators*

[17] *The Global Initiative for Inclusive ICTs, (2020). Country Profile of Mali. https://g3ict.org/country-profile/mali*

[18] *International Telecommunication Union, (2022). DataHub of Mali. https://datahub.itu.int/data/?e=MLI&c=&i=*

[19] *Dumas, J.H.A., (2002). ICT AND GENDER EQUALITY POLICY: LESSONS OF THE MALI TELECENTRES. https://www.proquest.com/openview/3928ee35654f31071fd806d64a246af2/1?pq-origsite=gscholar&cbl=18750&diss=y*

[20] *Taufiq Hali Ghilam Al-madhagy, (2013). ICT Policy in Yemen. https://www.slideshare.net/taufiqghilan/ict-policy-yemen*

[21] *Mareai, B., (2018). REALITY OF INFORMATION AND COMMUNICATION TECHNOLOGY IN THE REPUBLIC OF YEMEN. https://www.researchgate.net/publication/323586322_REALITY_OF_INFORMATION_AND_COMMUNICATION_TECHNOLOGY_IN_THE_REPUBLIC_OF_YEMEN*

[22] *The Global Initiative for Inclusive ICTs, (2020). Country Profile of The Republic of Yemen. https://g3ict.org/country-profile/yemen-republic-of*

[23] *International Telecommunication Union, (2022). DataHub of Yemen. https://datahub.itu.int/data/?e=YEM&c=*

DOI: 10.54254/2753-7048/11/20230758

[24] *International Chamber of Commerce, (2017). 3 Reasons Why ICT Matters for Gender Equality. https://iccwbo.org/media-wall/news-speeches/3-reasons-ict-matters-gender-equality/*