An Empirical Study on Lecturers' Perceptions of Digital Gender Equality in Malaysia

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ABSTRACT

The purpose of this study was to examine lecturers' perceptions of digital gender equality in Malaysia. A Likert-scale questionnaire was designed to measure perceptions of digital gender equality and was administered to 55 lecturers online. Data were analyzed using SPSS 26.0. First, Mann-Whitney U test revealed that there were no significant gender differences in lecturers' perceptions of digital gender equality, while Kruskal-Wallis H test indicated no significant differences in relation to age and job experience. Wilcoxon signed rank test showed that four items were significant at $p < 0.05$, while another eight items were significant at $p < 0.001$. The overall group mean showed that lecturers' perceptions of digital gender equality were low, indicating that the majority failed to notice the impediments that women face in the digital era. Overall percentages indicated that lecturers held unrealistic views of women's participation in the digital economy probably because they lacked knowledge on the disproportionate numbers of women who are still living in the agrarian areas. In light of the findings, several recommendations were made to increase digital gender equality in Malaysia.

1. Introduction

Research shows that women are still lagging far behind men in the digital dimension, leading to a persistent gender gap across different aspects of digital technologies. Obstacles to gender digital equality are generally related to poor infrastructure, financial limitations, negative technological attitudes and low perceptions of technology. Other hindrances are constraints related to safety and security, besides sociocultural and institutional factors. To ensure greater participation in the digital environment, women should receive equal opportunities to improve their digital literacy, while digital organizations should promote greater gender diversity and inclusion. Greater focus on gender dynamics can increase the potential for true gender equality in digital leadership. Additionally, empirical data and geographic coverage on technological indicators in relation to gender are still scarce, especially for developing countries such as Malaysia. Information on gender-related effects of technology should be systematically gathered using valid and reliable measures of gender digital equality (Sey & Hafkin, 2019).

Wajcman, Young and Fitzmaurice (2020) reiterated that the digital economy has brought desirable socioeconomic outcomes, while enhancing global productivity and wellbeing. Nevertheless, the digital gender divide still persists, regardless of a nation's overall digital technology levels, socioeconomic status, income levels or geographical location. Women are still vastly underrepresented in the digital transformation across high-, middle- and low-income nations despite the emphasis on gender equality. Despite various measures and initiatives taken to increase women's empowerment and gender equality within the digital world, a significant gender gap still prevails that greatly limits women's participation in the digital economy and realization of its advantages.

Emerging digital educational infrastructures often offer little educational access for women in underdeveloped and developing nations. Further, gender inequalities also limit the number of women in science, technology, engineering and mathematics (STEM), while stereotypical masculine associations with STEM often create gendered identities, biases and stereotypes. Since education alone will not reduce gender inequality, stereotypes and gendered spaces, Malaysia should strive to eliminate all gender power relations and associations to promote gender equality in the digital realm. Despite the initiatives of the 2020 Beijing Declaration and Platform for Action, measures to increase women's participation in the digital economy are still lacking. While digital processes and tools can empower them, technology alone cannot resolve the systemic problems causing the digital gender divide; therefore, effective measures are urgently required to increase women's participation and inclusion in the digital economy, while ingrained stereotypes, practices and discriminative norms against them should be eradicated. In short, gender inequality stemming from intersecting socioeconomic, political and cultural barriers must be promptly addressed across different contexts (Wajcman, Young & Fitzmaurice, 2020).

1.1 Significance and purpose of the study

Perumal and Dastane (2017) summarized that the escalating use of digital technology, often characterized by masculine language and modes of operation, has led to increasing gender imbalance in the corporate world. Talented women who possess digital expertise are dramatically underrepresented in Malaysia due to biased selection, gender discrimination and the glass ceiling that limit their professional advancement. There is a growing need for skilled employees in the digital sector, yet employment of digitally skilled women is limited. Research exploring the causes of female underrepresentation in science and technology would generate deeper understanding on the barriers that prevent them from actively engaging in digital technology, especially in reaching the upper echelon. Despite rapid globalization, socioeconomic liberation and mushrooming cyber-communities, gender inequality in the digital domain still prevails, making women feel marginalized and isolated. Current findings would shed some light on the factors responsible for the limited presence of women holding senior positions in digital technology so that measures can be taken to increase their participation. The purpose of this study was to examine lecturers' perceptions of gender digital equality in Malaysia.

2. Literature Review

A review of literature was conducted to determine the research gap and provide a theoretical framework for the study. According to the World Economic Forum (2020), Malaysia is still trailing behind in terms of gender equality, ranking 104th out of 153 countries and the second lowest among ASEAN countries. Additionally, it ranks 97th in economic empowerment, indicating a decrease since 2018, with its female workforce rate at only 55 percent. Moreover, only 16 percent of members of parliament and ministers in Malaysia are women. To speed up its digital transformation, organizations need to better utilize the female human capital of the nation. Additionally, Malaysian women are still very much behind in digital leadership compared to other developed countries; only a minority hold leadership positions that require high digital expertise. To make Malaysia's digital economy become more comparable to that of other developed countries, gender equality in human resource development should be intensified.

APEC (2021) highlighted that the pandemic has created a high dependency on digital technology, particularly in political, economic and business leadership. While digitalization has provided greater opportunities for people who are educated, digitally literate and advanced in technological skills, it has expanded the existing gender gap, with many women facing major limitations in terms of digital knowledge, technology, capability and infrastructure. There is a high level of digital illiteracy, particularly among women from rural or disadvantaged backgrounds who are unable to tackle rapid technological changes and advancements. They are unable to acquire fundamental digital literacy due to their low accessibility to the essential facilities and technological platforms. Moreover, older women are also less inclined to accept technological changes and adapt to the current work environment, while infrastructure and support needed to help them adapt to new changes are lacking. Lastly, women tend to experience higher job risk due to technological replacement and a lack of digital knowledge and skills.

In his article, Azuar (2021) quoted several prominent Malaysians who had addressed women's underrepresentation in the digital world. For example, Fuziah Salleh, a member of parliament, admitted that Malaysia is still lagging behind in terms of gender equality, stressing that policymakers need to promote equal work, flexible hours, equal pay and a more empathetic work environment for women. Further, Zarizana Abdul Aziz, Due Diligence Project co-founder stated that, while physical autonomy affects everything from the right to life to the right to liberty and security, it is not the first right granted to women under the Malaysian Married Women Act. Additionally, Karima El Korri, UN resident coordinator for Malaysia, Singapore and Brunei Darussalam noted that the pandemic has exposed the gap on women's rights, stressing that women have suffered more in terms of massive job losses, wrecked livelihoods, inability to access sexual/reproductive health and rights, domestic violence and unpaid work.

Lastly, Khairy Jamaluddin Abu Bakar, a Malaysian politician, declared that violence against women is a health issue since it violates their human, integrity and sexual rights, emphasizing that women in such situations are more likely to engage in such high-risk behaviours as smoking and substance abuse that could lead to chronic diseases and mental health disorders. Lastly, he also admitted there are still social and legal gaps that need to be bridged for women and girls, focusing not only on their protection, but also on their overall wellbeing (Azuar, 2021).

Anjumin (2022) quoted Christina Liew, a Malaysian politician, who reiterated that gender bias remains a prevalent issue worldwide, including Malaysia despite women's emancipation dating back to the 19th century women's rights and feminist movements. Malaysia is behind Singapore, Myanmar and Indonesia in terms of gender equality despite the continuing pleas against gender discrimination in the areas of recruitment, employment, workplace equality and promotion opportunities. While Malaysia has implemented the 30 percent target for women's participation in public decision-making, its leadership and political arenas are still highly male-dominated whereby women are grossly underrepresented in both parliament and state legislatures. Moreover, gender bias is still prevalent because of the lack of interest among policymakers, legislators, law enforcers and politicians, besides weak enforcement due to the lack of political and public will.

Human Rights Centre (2022) at University of Essex pinpointed several impediments faced by women in relation to Internet communication technologies (ICTs) in many developing countries. Socioeconomic and cultural barriers often prevent or limit women's access to ICTs that further amplify the gender divide, thus constituting a perpetual stumbling block to creating an equitable digital society. Distinct socioeconomic disadvantages among women, including the persisting gender wage gap, together with the relatively high price of Internet access, significantly limit women's adoption of ICTs, particularly in female-headed households. In developing countries, many women are still economically dependent on their spouses, thus having limited control over finances. Further, unequal division of labour also results in fewer women possessing independent income, which in turn, significantly affects their access to ICTs. Besides socioeconomic impediments, factors such as geographical isolation and poor technological infrastructure also prevent them from accessing ICTs.

While these situations adversely affect both genders, for women, physical inaccessibility is worsened by the power inequalities and sociocultural norms that shape society. In developing countries with distinct gender disparities in education, income and political power, cultural norms frequently limit women's online access, for instance, their access to Internet cafes is often restricted in communities that limit their public exposure. Further, limited ICT access often interferes with their rights to retrieve information and freedoms of expression, religion, association and participation in public affairs, besides curtailing their rights to work and to attain a better standard of living. In brief, restricted access to digital goods and services adversely affects the employment, entrepreneurial opportunities, cultural life and standard of physical and mental health among women (Human Rights Centre, 2022).

Besides limited access to ICTs, women also face several barriers related to the applications of ICTs, one of which is their low literacy and numeracy resulting in low digital skills. Despite having access to the Internet, they often encounter a lack of appropriate online content and a hostile/unsafe cyber environment. First, the lack of relevant content often translates into the lack of tangible value for them in using the Internet that in turn discourages them from investing money or time on it. Further, Internet filtering policies may also limit their access to health/sexuality information, thus affecting their wellbeing and reproductive rights. Second, hostile cyber environments marked by negative stereotypes, attitudinal biases, conservative gender roles, harassment and hate speech inevitably impede their Internet use. Due to the existing digital gender gap, online hostility remains unchallenged and becomes self-perpetuating that further limits their participation in public or political discourse (Human Rights Centre, 2022).

Ayamany (2023) quoted Wan Nuradiah Wan Mohd Rani, Ipsos Malaysia's head of public affairs who indicated that 52 percent of Malaysians perceived that the promotion of women's equality has reached the point of discrimination against men, while an almost equal proportion of Malaysian men and woman believed that the push for gender equality is affecting men. Additionally, a large percentage of Malaysians perceived that men are expected to do too much to support equality, while another 71 percent agreed that women can only achieve equality with men's support. Another 33 percent stated that a man who looks after his children at home is a lesser man, while 76 percent indicated that gender equality still has a long way to go in Malaysia. Lastly, 58 percent revealed that they were too scared to advocate for gender equality for fear of repercussions against them.

The Malaysian Reserve (2022) revealed that there are currently more female graduates, but far fewer female employees in Malaysia, particularly in the digital workforce. While an increasing number of women are enrolling in tertiary institutions annually, they are still underrepresented in the job market, contributing to more than half of the unemployment rate. The majority of unemployed females tend to do housework or shoulder family responsibilities, while others are still attending a training program. The gender wage gap, motherhood penalty and gender stereotypes often discourage them from reaching executive positions. Since women tend to get lower pay than their male colleagues, they will have less savings for retirement. Although the law prohibits the termination of pregnant employees, it does not specifically stop discrimination against pregnant jobseekers. Therefore, it is crucial to eliminate all sociocultural barriers against women to ensure gender equality since it will benefit all strata of Malaysian society by raising its per capita income by at least 26 percent.

Sey and Kinglsey (2022) summarized four causes that deter women from digital leadership in ASEAN countries, including Malaysia. The first cause is people-related, stemming from a lack of human capital or people's behaviour, beliefs and attitudes. Many individuals use deficit narratives against women by using marginalized or oppressed demographics as the cause of their own problems. People-related causes often suggest that gender inequality in education, industry, policy making and leadership is caused by women themselves as they lack the desire, motivation or skills to acquire them.

The second cause is related to structures and systems of socioeconomic and political institutions. Digital inequality is caused by how organisations, markets or entire economies and governance systems operate as well as how social institutions are organized. Inequalities are still rampant in historical or contemporary socio economic and political infrastructure, including judicial and legal systems that exacerbate the economic and geographic segregation of the genders. The third cause of inequality stems from policies that put women at a disadvantage, including those that discourage women to work in the same industries as men. Often there is absence or poor implementation of a mandate for equal pay for equal work. There are also very few papers, reports or media stories that refer to the performance of specific policies, strategies or initiatives on gender equality. Lastly, the fourth cause of inequality is related to the pandemic that highlights digital access and entrepreneurship as the remedy to gender inequality. While some perceive that the pandemic has worsened gender inequality, others view it as having offered e-commerce opportunities for women.

Jobstreet (2022) revealed six common signs of gender inequality in Malaysia. In the context of digital gender equality, women still encounter gender biases and discrimination with 22 percent experiencing discrimination during the recruitment process. Additionally, some companies still use masculine or feminine terms in job advertisements, using sexist rather than gender-neutral language. Second, the amount and type of workload further reflect gender inequality at the workplace, for instance, 56 percent of Malaysian women have experienced being allocated more work than men with the same job descriptions. Third, some performance reviews are gender-biased whereby female employees do not get the same positive appraisals despite having similar background and performance as their male peers. Fourth, women lack not only equal and consistent access to career development opportunities and resources, but they also lack career support through mentorship that prevents them from continuously meeting expectations, achieving results and evolving in their careers. Fifth, the wage differentials in Malaysia still reflect gender salary differences, with male employees' monthly salaries being higher than those of women. Lastly, women often face promotion discrimination with fewer opportunities to climb up in their career ladder compared to men, who in turn outnumber them in being promoted to executive positions.

Mohd Isa, Ismail and Mohd Fuza (2022) asserted that several issues tend to hinder Malaysian women's participation in entrepreneurship that has become increasingly digital. First, gender role stereotypes often compel women to shoulder family-related obligations, such as child-rearing and household chores, with them playing the role of a spouse or mother. Second, many women not only lack knowledge and skills related to entrepreneurship; they also tend to devote less time on business management to fulfil the dual responsibility of home- and career-making. Third, women often face the glass ceiling that prevents them from achieving higher ranks in a male-dominated society, while cultural inhibition and respect for tradition tend to restrict their job mobility. Fourth, since many have to use personal savings or family funds, they are rated as high-risk clients who lack collateral, credit history or consistent job history. Lastly, those from the rural areas also lack basic infrastructural support, technology access and ancillary business services networks for digital entrepreneurship.

Although higher education among women is increasingly common, their workforce participation is still much lower than men (Khor, 2023). While women made up 47.7 percent of Malaysia's population in 2020, their workforce participation rate was only 55.5 percent in 2021. Several factors tend to prevent them from being key players in the digital era. Men are four times more likely than women to become information technology experts, while women often get three to four percent less for the same technical job at the same company. While women make up half of the technology users, they are often not regarded as a significant part of the digital equation. To empower them with digital knowledge and skills, several factors should be considered, including equal digital access, equal ability to utilize technology and equal ability to become digital consumers and producers.

3. Methodology

3.1 Instrument

A Likert-scale questionnaire was designed to measure perceptions of digital gender equality in Malaysia (Yong, 2023). Items were derived from a document, "Global Attitudes Towards Gender Equality" produced by Ipsos MORI (King's College London, 2019). The total score is 90 (81-90 = high, 72-80 = Average, 62-71 = Low). The questionnaire was pilot-tested on 25 lecturers to establish its validity and reliability using SPSS 26.0. Results showed that its Cronbach alpha value was 0.84, indicating that it has the internal consistency to collect meaningful data.

3.2 Sample

The sample of this study comprised 55 lecturers who were recruited through email, WhatsApp and Messenger. They were from five private colleges in Sabah and Sarawak and came from ethnically diverse communities. Their demographic information is found in Table 1.

Table 1: Demographic characteristics of respondents

Characteristic	**Category**	**Frequency**	**Percentage (%)**
Age	22-32	10	18.2
	33-43	19	34.5
	44-54	16	29.1
	55-65	9	16.4
	Above 55	1	1.8
Gender	Male	16	29.1
	Female	39	70.9
Job experience (years)	1-5 years	16	29.1
	6-10 years	0	0.0
	11-15 years	12	21.8
	16-20 year	5	9.1
	More than 20 years	22	40.0

3.3 Data collection and analysis methods

Subjects were required to complete the questionnaire online. Data were automatically transferred onto a spreadsheet and subsequently analyzed using SPSS 26.0. First, Mann-Whitney U test was conducted on digital gender equality to determine if there were any significant gender differences, while Kruskal-Wallis H test was conducted to determine if there were any significant differences in relation to age and job experience. Second, Wilcoxon signed rank test was conducted to determine the level of significance of each item using a hypothesized value of 3.5. Lastly, overall group mean and percentages of agreement were calculated for each item to gain an overall impression of lecturers' perceptions of digital gender equality in Malaysia.

4. Findings

First, Mann-Whitney U test revealed that there were no significant gender differences in lecturers' perceptions of digital gender equality, while Kruskal-Wallis H test indicated no significant differences in relation to age and job experience (see Table 2).

Table 2: Results of Kruskal-Wallis H and Mann-Whitney U tests

Fixed variables	**Non-parametric test**	***p*-value**
Age	Kruskal-Wallis H test	0.643
Gender	Mann-Whitney U test	0.321
Job experience	Kruskal-Wallis H test	0.530

Wilcoxon signed rank test showed that four items were significant at $p < 0.05$, while another eight items were significant at $p < 0.001$ (see Table 3).

Table 3: Wilcoxon signed rank test based on a hypothesized value of 3.5

Item	***p*-value**
Women are less likely than men to use the Internet to increase their income or to participate in public life	< 0.001***
Access, ownership and use of digital tools should be gender-neutral	< 0.001***
Women tend to have diverse vulnerabilities under different conditions in the digital age	0.181
Gender stereotypes and cultural norms often hinder/limit women's access to digital technologies	<0.022*
Affordability of the Internet and the cost of smart devices seriously affect poor women	0.436
Women with more education are more likely to use the Internet than those with little education	0.829
Women are less likely than men to have advanced ICT skills	< 0.001***
Basic infrastructure influences women owning and using mobile devices	0.908
Women in rural and remote areas have poor network quality and limited interoperability	< 0.001***
Lack of operator/agent trust and fear of deception limit women's ownership and usage of mobile devices	0.106
Automated decision-making systems (ADMS) should be gender-sensitive	0.064
The gender digital divide causes fewer women to have access to digitalized services	< 0.001***
Women-owned e-commerce companies face more barriers than those owned by men	< 0.001***
Women account for only a low percentage of digital start-ups	0.001***
Discrimination and education-related barriers often keep women from participating in math and science fields (STEM)	< 0.001***
A diverse set of stakeholders is crucial to advance gender equality in the digital age	<0.004*
In terms of ICT employment, women lag well behind men	< 0.001***
Women account for a low percentage of ICT specialists	0.005*

***$p < 0.001$; *$p < 0.05$

The overall group mean of digital gender equality was 57.27 (low). Percentages of "strongly agree" and "agree" were collapsed to gain a general view on lecturers' perceptions of digital gender equality in Malaysia. Overall percentages showed that lecturers had low awareness on the issues and challenges faced by women in the digital world. For example, only 12.7 percent (12.7 + 0.0) strongly agreed/agreed that women are less likely to use the Internet to increase their income or to participate in public life. Only about 24 to 29 percent were aware that (1) women are less likely than men to have advanced ICT skills, (2) the gender digital divide has caused fewer women to have access to digitalized services and (3) discrimination and education-related barriers often keep women from participating in math and science fields. Only about 31 to 34 percent acknowledged that (1) women-owned e-commerce companies face more barriers than those owned by men, (2) women account for only a low percentage of digital start-ups and (3) women lag well behind men in terms of ICT employment. Lastly, only 42 to 49 percent knew that (1) women have diverse vulnerabilities under different conditions in the digital age, (2) gender stereotypes and cultural norms often hinder/limit women's access to digital technologies and (3) women account for a low percentage of ICT specialists (see Table 4).

Table 4: Percentages of agreement on digital gender equality items

Item	**1**	**2**	**3**	**4**	**5**
Women are less likely than men to use the Internet to increase their income or to participate in public life	25.5	41.8	20	12.7	0.0
Access, ownership and use of digital tools should be gender-neutral	0.0	5.5	9.1	54.5	30.9
Women tend to have diverse vulnerabilities under different conditions in the digital age	5.5	21.8	23.6	40	9.1
Gender stereotypes and cultural norms often hinder/limit women's access to digital technologies	3.6	32.7	21.8	30.9	10.9
Affordability of the Internet and the cost of smart devices seriously affect poor women	7.3	18.2	23.6	36.4	14.5
Women with more education are more likely to use the Internet than those with little education	1.8	25.5	21.8	20	30.9
Women are less likely than men to have advanced ICT skills	7.3	45.5	25.5	14.5	7.3
Basic infrastructure influences women owning and using mobile devices	3.6	14.5	25.5	49.1	7.3
Women in rural and remote areas have poor network quality and limited interoperability	0.0	7.3	10.9	47.3	34.5
Lack of operator/agent trust and fear of deception limit women's ownership and usage of mobile devices	3.6	25.5	20	47.3	3.6
Automated decision-making systems (ADMS) should be gender-sensitive	3.6	18.2	40	27.3	10.9
The gender digital divide causes fewer women to have access to digitalized services	1.8	32.7	41.8	21.8	1.8
Women-owned e-commerce companies face more barriers than those owned by men	3.6	30.9	34.5	27.3	3.6
Women account for only a low percentage of digital start-ups	3.6	27.3	34.5	32.7	1.8
Discrimination and education-related barriers often keep women from participating in math and science fields (STEM)	16.4	34.5	20	27.3	1.8
A diverse set of stakeholders is crucial to advance gender equality in the digital age	1.8	5.5	23.6	43.6	25.5
In terms of ICT employment, women lag well behind men	12.7	34.5	20	30.9	1.8
Women account for a low percentage of ICT specialists	12.7	27.3	18.2	34.5	7.3

Strongly disagree = 1, Agree = 2, Neutral = 3, Agree = 4, Strongly agree = 5

The overall group mean indicated that lecturers' perceptions of digital gender equality was low, indicating that the majority failed to notice the impediments that women face in the digital era. Overall percentages indicated that lecturers in the current study harbored misconceptions and held unrealistic views of women's participation in the digital economy probably because they were unaware that disproportionate numbers of women are still living from hand to mouth in the rural and remote areas.

5. Conclusion

Current findings showed that Malaysian lecturers did not have a true picture of women's gross underrepresentation in the digital milieu, particularly those living in the rural and remote areas that still lack adequate electricity supply and running water. Coming from middle-class backgrounds and teaching in the town areas, they lack exposure, knowledge or interest with regards to the multifarious problems experienced by women from technologically backward communities.

Although the World Economic Forum (2020) estimated that gender equality will not be achieved for another 217 years at the current rate of progress, many Malaysians think that it will take only 20 years or less. While overestimating the prevalence of female politicians in their country, 55 percent agreed that women should be better represented and that things would improve if more women held leadership positions in both government and private organizations. About 56 percent believed that things have progressed far enough when it comes to giving gender equality, reflecting a sense of complacency. In brief, many Malaysians are still unaware that there is still a long way for women to be better represented in the digital economy to raise their socioeconomic status.

According to UNICEF EAPRO (2020), women in developing countries tend to use outdated handsets and operating systems characterized by lower-end mobile phones with low functionality. Accordingly, digital manufacturers should strive to offer upgraded products and services to women. Additionally, gender inequality in education often leads to women having low reading and writing proficiency; therefore, audio or visual aids should be used to support and retain female users, for example, text-to-speech features will enable them to hear written content read aloud, while interactive voice response (IVR) can reach more female users with low literacy. Lastly, digital providers should offer digital products and services that safeguard women's wellbeing by protecting their personal information or data via a gender lens that ensures data security, protection and discretion.

Khera et al. (2022) found that women's inclusion as users and leaders of digital financial services not only addresses gender inequality, but it also narrows the gender gap in leadership that in turn enhances the performance of digital financial firms. Therefore, women's participation in digital finance should be increased to promote digital gender equality, including their access to, and use of, financial services that leads to socioeconomic progress. Women who can access financial services not only can actively participate in the labour force, but also contribute to both domestic and national revenue. To increase their financial inclusion, obstacles that affect women, such as mobility and time constraints should be eliminated, for example, by giving them access to digital financial accounts that circumvent interactions with bank agents. Since women's financial inclusion is a powerful lever that can boost gender equality, while simultaneously raising socioeconomic growth, financial stability and income equality, both public and private sectors should facilitate women's entry into digital leadership roles. Lastly, consumer protection agencies and regulators should play an active role in the prevention of explicit or implicit gender biases that impinge on women's rights and freedoms.

Khor (2023) postulated that five primary elements are essential to promote gender equity in the Malaysian digital economy. First, the work environment should be inclusive to embrace diversity and provide equal opportunities to both genders. Second, women leadership should be promoted at all levels with equitable selection, promotion and retention criteria. Third, the work environment should be safe and welcoming, including flexible work arrangements and childcare so that women can have a dual career. Fourth, the corporate culture should be open, inclusive and secure, while seriously addressing the sociocultural pressures faced by women. Lastly, both public and private sectors should strive to provide education, training and digital opportunities to all.

Since digital gender inequality is rampant in emerging communities, advancing digital gender equality is everyone's moral-ethical responsibility. It can be attained by increasing women's connectivity to digital infrastructure, digital tools and skills, participation in scientific fields as well as technical leadership and entrepreneurship. Allowing women to access digital tools, information and services helps increase their socioeconomic potential that in turn improves their livelihoods, financial security and resilience. Nevertheless, women can only progress in the digital economy with greater access to such digital infrastructure as electricity, Internet connectivity and digital products and services, besides the fundamental literacy and skills to capitalize on digital tools and gadgets. While digital technologies have created a more connected realm, more women should be involved in constructing that realm to reap its future benefits. Women's digital inclusion is not only a moral-ethical issue, but is also a global force of stability that promotes prosperity and progress. Therefore, developing countries such as Malaysia must gather data and insights to eliminate the unique barriers facing women in the digital economy. Encouraging more women to engage in ICTs is critical in narrowing the gender pay gap and advancing female digital leadership and e-commerce, with female leaders acting as mentors and advocates (Germain, 2023).

Ismail (2023) quoted Jill Kouri, Global Chief Marketing Officer at HCLTech who reiterated that both public and private partnerships should encourage more women to assume software engineering roles, starting from the top. Stakeholders should demand greater change from their partners and providers, emphasizing ethical and responsible artificial intelligence for any design and development as well as supplier diversity. Collaboration between public and private organizations can encourage the next generation of women to choose digital engineering or digital consulting as a career path. Moreover, they should purposefully focus on both genders and socioeconomic diversity by involving school leavers who are unable to afford college, for example, by recruiting and training them through digital apprenticeship programs that aim to create a 50/50 gender split for all entry-level jobs.

Bahous (2023) highlighted the role of Sustainable Development Goal 5 (SDG 5) as the heart of the 2030 Agenda for digital gender equality. It is the great multiplier, smart investment, foundation and prerequisite to eliminate the new form of poverty caused by gender bias. As a game changer, innovative digital technology offers huge potential benefits when used wisely since they can help countries to attain their SDGs. If appropriately used, it is an enabler that intensify various efforts to transform women's livelihoods, for example, by helping them to obtain their own bank accounts that will unlock both financial inclusion and socioeconomic opportunities. Since the gender digital divide has compounded existing inequalities, while disproportionately excluding women in low-income communities, collective efforts of the public and private sectors as well as civil society are urgently needed to harness the power of equality via digital technology. To promote digital rights as women's rights, countries should assert the centrality of inclusion, intersectionality and systemic change as well as to eliminate digital gender bias/violence in all forms by innovating various institutions, while eradicating the gender stereotypes and biases that reduce women to second-class citizens.

Liller (2023) recommended that the transformative potential of digital technology for women must be harnessed and the potentially harmful risks be mitigated. First, greater and more sustained investments should be made to increase women's digital literacy and familiarity with technology that will enable them to participate effectively in the digital economy and gain access to digital services such as online education, healthcare and banking. Additionally, e-commerce and technology-based businesses should offer women more flexibility to help them manage both paid and unpaid work that is essential for economic empowerment.

Training on digital literacy should be provided to aspiring female entrepreneurs, while online marketplaces can facilitate women entrepreneurs into new markets. Second, women should be encouraged to capitalize on ICTs by enhancing their digital skills and presenting them with female role models that in turn will increase their opportunities to pursue careers in STEM that predominates the corporate world. Third, to get more women involved in the creation of, and decision-making, around digital technology, emerging data-driven solutions should eliminate harmful gender stereotypes and patterns of discrimination. Online content and technology should be developed with, and for women, in a way that considers their unique needs and priorities within a framework that prioritizes, protects and promotes human rights.

Finally, to increase generalizability of findings, future research on digital gender equality should use a large sample. Current findings were based on lecturers' perceptions; therefore, future studies should examine those of teachers or other relevant groups from other locations since they may pose significant group, gender or age differences.

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