Tarbiat Modares University

The International Journal of Humanities

RESEARCH ARTICLE | SPECIAL ISSUE: WOMEN'S STUDIES

Knowledge-based Economy as an Opportunity to Closing the Gender Gap

Leila Falahati [1]

Received: 12 January 2020
Accepted: 23 July 2020
Published: 1 April 2021

1 Assistant Professor of Gender and Development, Department of Women's Studies, Institute for Social and Cultural Studies, Ministry of Science, Research and Technology, Tehran, Iran.
E-mail: Falahati@iscs.ac.ir

How to cite this article
Falahati, Leila (2021). Knowledge-based Economy as an Opportunity to Closing the Gender Gap, *The International Journal of Humanities* (2021) Vol. 28 (2): (58-68).

Abstract: In the last three decades, along with the development of knowledge-based economy, the development of businesses related to this field has also taken a growing trend and the concept of entrepreneurship has found an important role in the growing economy. Knowledge-based economics as an emerging field and with the focus on information technology and communication technology grew significantly. According to the International Telecommunication Union (2016), ICT-related businesses will account for 95% of all global companies, as well as one-third of all global formal-related businesses in the next decade. The purpose of the present study is to explore the contribution of women in the Persian Gulf region in the field of science, technology and knowledge-based economy using the documentary research method. The research results revealed that in the said field, there is an extensive opportunity to reduce the economic gender gap. Comparing the trend of women's participation in this field shows that the progress of women has been smooth in some countries while in some others, more development is needed. Suggestions have been made for the development of women's technical and professional knowledge, balancing between work and life, and implementing supportive policies.

Keywords: Gender Gap; Science and Technology; Knowledge-based economy; University Graduates.

Introduction

Over the past two centuries, many transformations have been taken place in economic resources and factors of production, in other words, economics, information, and knowledge have replaced physical capital and energy. A large number of economists believe this alternative was the beginning of the third industrial revolution, in the evolution of which

information technology and knowledge replaced the main sources of production. With the prominence of knowledge and the centrality of knowledge-based products in the economic development of countries, knowledge as a new product with characteristics different from other goods led to a new economy called knowledge-based economy (Sediqh, 2005). The concept of the knowledge-based economy has undergone various changes from 1960 to 1995, defined by the Organization for Economic Cooperation and Development (OECD) as an economy that is directly based on production, distribution, and use of knowledge and information (Suzanchi Kashani, 2010). The knowledge-based economy has seven important features including the creation and introduction of new ideas, creating a decent environment for economic activities, a general change in the structure of the economy, international orientation, resource abundance economy, increasing the employment of specialized personnel, and ICT infrastructure. In total, acknowledging the existence and centrality of such knowledge in this economy as a major resource is one of its important features (Elamkhah & Kashani Shahedani, 2015).

Along with the development of knowledge-based economy, the development of businesses related to this field also took a growing trend and the concept of entrepreneurship in connection with it found a pivotal role in this growing market. The knowledge-based entrepreneurship grew significantly as an emerging field, mainly with the core role of information and communication technology. According to the International Telecommunication Union (2016), ICT-related businesses will account for 95% of all global companies, as well as one-third of all formal world businesses in the next decade. Besides, information technology will have a central role in job creation over the next decade. In Europe, 85% of the net share of job production is projected to be concentrated in this area.

While global trends indicate the rapid and widespread growth of knowledge-based businesses, especially in the field of information and communication technology, the latest statistics show that while this field is gender neutral and is considered a great opportunity for women's empowerment, at the same time, a wide gender gap in this area is documented. According to Richter (2018), although a major part of the global economy is managed by professional information and communication technology companies, the share of women in this sector is very low. Accordingly, only 26% of employees at Microsoft and 43% at Netflix are women. However, when technology-related careers are considered, the share of women decreases even more. In 2015, women accounted for only 25% of managerial positions, including top and middle managers, among the top 500 companies surveyed. In other words, the gender gap in this field is wide and needs to be observed. However, the most salient reasons for gender gap in this field is the underrepresentation of women in STEM fields and lower share of them in research and development (R&D). According to International Labor Organization (2018) statistics, women have only 21% share in the management of knowledge-based economy, while it is recognized as one of the key areas for construction of graduates' employability. The purpose of this study is to compare the current

capacities of women in the field of science and technology in a sample of Islamic countries in the West Asian region and to examine strategies to reduce the gender gap in this field.

Theoretical Background

The gender gap in the knowledge-based economy, due to the nature of this economy, is directly related to the inequality of men and women's representation in science, technology and innovations. Theoretically, the gender gap in technology and innovation have been studied from different theoretical approaches.The leaky pipeline is one of the prominent frameworks to explore the underrepresentation of women in science and technology. Based on this framework, women will disappear or evaporate in the line of progress to the top level of career, which is called the "leaky pipeline" phenomenon (Berryman, 1983). Women's disappearance in research and their challenges in accessing higher education positions has rooted in their difficulties such as work-life conflict and dominations of masculine ethos on science fields. Meanwhile, some studies indicating that the main reason for small proportion of women in knowledge based economy is due to fewer women graduates from engineering and technology fields.

Besides, many attempts have been made to increase women's representation in technology through CEOs of large companies, which do not seem to have been very successful. For example, Google has so far invested $265 million in 2014 and 2015, Intel has invested $300 million for 5 years and Apple has invested $50 million in 2015 to increase the representation of women and racial groups. The percentage of women and the black in large technology companies have not changed significantly and have only improved by 1% or can be said to have remained relatively stagnant throughout the year (Cakebread, 2017; Dennehy & Dasgupta, 2017; Google, 2016; Guynn, 2015). Having analyzed the presence of women and different racial groups in the tech workforce in Silicon Valley, Gee and Peck (2017) found that the number of blacks and Latino experts has declined over the past eight years. Based on the theory of leaky pipeline, women's opportunities and experiences in various economic strata, from macro to micro, educational systems and procedures and social policies have historically influenced unequal access to quality education, employment, wealth, resource management, and work environment (Grusky & Hill, 2017) and will not be compensated in a short-term process.

Feminist studies on technology (Lerman et al., 1997; Faulkner, 2001; Wajman, 2004) have apprehended a historical approach on the sociology of technology. Given the role of technology in the developments of the contemporary world, the techno-feminist studies intend to study the relationship between gender and technology (Lohan, 2000; Faulkner, 2001). Investigating from a historical approach, Wajman (2009) believes that the study of gender and technology effect on the academic level began in the 1970s with a critique of the patriarchal nature of technology and science by radical feminists and Eco-feminists. They have been critique of the nature of technology and science, while some feminists condemn the whole technology because it is inherently detrimental to women and inconsistent with some women's role expectations.

Social-feminists, generally, sought to act contextually in their work, and take the Marxist analysis beyond the class to answer the question that why and how modern Western technology has become a masculine realm; to examine the gender impact of modern divisions of labor and allocation of women to the home environment, to explore the impact of a range of important technologies from refrigerators to probes and suspension bridges, and to examine the reproductive, ethical as well as productive effects of labor organization or technology plan (e.g. Oakley, 1974; Cockburn, 1983; Corey et al., 1985; Karamara et al., 1988; Wajman, 1991, citing Wajman, 2009). One of the most important findings in this regard was Cowan's important research on home technologies (1983), which after examining the impact of technology on women's workplaces, found that the common belief that technology makes our lives easier has been wrong; in fact, mechanization and the presence of technology at home instead of disentangling women from hard housework, has served to raise cleanliness standards.

Overall, feminist studies on technology have seriously criticized technology outcomes and its categories, showing that in modern societies, gender plays an important role in the interpretation of any product as technology, and gender determines whether that skill is categorized as important or unimportant. For example, Barry (2013) cites the results of a study by Bowker and Starr (1999) who by examining various technologies, showed that an electric iron in the hands of a woman who irons clothes is not technology, but when her husband repairs it, is considered as technology. In this process, with the advent of "information technology", there is still the perception that this technology is masculine, but cyber feminists believe that these technologies are completely neutral and provide opportunities for utilization and exploitation for both sexes. One of the most important approaches in the study of the relationship between women and technology in the last decade is techno feminist approaches, especially based on the view of Wajman (1999, 2004, 2009). According to Wajman (2009), gender is integrated into the process of technology products, and the type of technology product can also cause or prevent the establishment of gender-based power relations. Accordingly, women's priorities, needs, and identities are linked to digital technologies, and with all the fragmentation in feminist approaches towards technology, feminists share a common concern about the impact of class divisions on the relationship between men and women. Wajman (2009) believes that more women must expand their skills and their technical ability in expanding technology, the more positive social and economic developments they will experience.

Empirical Background

The gender gap in tech economy is widely realized around the world. According to the latest UNESCO (2016) report, there is a wide gender gap in the field of tech-economy. The women share in management positions in tech companies is also very low, so that in 2016, among 518 high-tech economy companies, women on the CEO boards (16%) almost twice as many as their male counterparts (9%) had the professional technological experience. In other words, women need more experience to be in managerial positions, and men are more likely to reach managerial positions. Pierce (2010) study shows that in the UK, while

women account for half of the country's workforce, only 14.4% of them work in the technology sector, and less than 10% of them do professional careers. The underrepresentation of women in this field is closely related to the underrepresentation of women in technical and engineering fields in higher education. In the UK, for example, 15% of undergraduate engineering students are women, but their share in the knowledge-based economy is about 14%.

In addition, working women in this field experience numerous problems. A study by Holt et al. (2008) shows that women leave the tech industry on average after 10 years, and approximately one-third of women in the United States (32%) and China (30%) leave after one year of employment. Also, the fields of science, technology, engineering, and mathematics have the lowest number of women in their management positions worldwide. In terms of global rates, in 2015, women accounted for about 12.2% of board members in the ICT industry, which is by far lower than the consumption management (17.4%) and financial management field (16.9%) (Hewlett et al., 2014).

Women in Canada have a lower presence in high-level occupations such as engineering and computer science, to the extent that according to statistics from 2015 to 2016, the number of women in physics and natural sciences and biological technologies is about 54.7%, in mathematics and information technology and computer science is about 26.5% and in the fields of architecture, engineering and technology is about 20.3%. Therefore, the underrepresentation of women in technical and engineering fields directly affects their low share in the technology labor market. In Canada in 2016, among the 25-34 year engineering students, men were twice as likely as women to enter professional careers related to their field of study. In the same year, women make up about a quarter (23.1%) of computer and technology specialists and a seventh (13.7%) of majors in civil, mechanical, electronics, and chemical engineering. In 2015, the income of women with a bachelor's degree in technology and engineering accounted for about 82% of men's income; in other words, there was an income gap of about 18 percent (Statistics Canada, 2017).

In the European Union, men are still ahead of women in technical and engineering fields in higher education, but at the same time, the gender gap in engineering, industry, and construction is wide. The rate of women graduating in engineering, industry, and construction in the whole EU is about 27.4%, in Finland 22.3%, in France 26.2%, in Germany 20%, in Switzerland 15.6%, and in The UK is about 23%. Women seem to be narrowing the gender gap in science and engineering over time. In 2016, women accounted for more than a third (40%) of basic science and engineering professionals, which is a 20% increase in comparison with 2007. The share of women in technology remains low, and in 2016, women make up 32.2% of employees in the advanced industries and knowledge-based sectors in total (European Union, 2017).

Furthermore, we should note the interesting finding of UNESCO (2014) which shows that out of the total number of women working in technical jobs, 53% of them leave these jobs while this rate among the men is 31%. In other words, women leave the technical and engineering market 22% more than men every year. Besides, in the United

States, while women's participation in the economy has exceeded 55 percent, only 11 percent of all employed engineers are women. In 2015, women made up almost a quarter (24%) of the technical and engineering population. The gender gap in engineering and computer jobs is more significant so that 25.5% of jobs are related to computers and mathematics and 14.2% are related to architecture and engineering (Falahati, 2018).

The 2018 report of the US Center on the women share in technical occupations in Silicon Valley shows that while women make up between 35% and 52% of the total employees in the six major IT companies, their share in specialized-technical occupations is between 10 up to a maximum of 20%; in other words, women in this field are more present in non-specialist jobs. Overall, the study found that women have the largest share in Apple and the lowest in Twitter in technical jobs.

Disappointment with getting a decent job at school also affects women, so that out of the total number of women studying in engineering, 38% give up or never enter the technical labor market. The existence of expertise and technical skills is also one of the obstacles and challenges for women in technical jobs. Pierce study (2010) shows that 61% of employers in engineering fields have cited the most important challenge is to hire a workforce with the necessary and specialized skills in the field of technology and engineering. In addition, 32% of various companies stated that graduates in these fields do not have the necessary skills. Women's managerial experience is also one of the most important challenges for promotion in technical jobs. Therefore, several factors such as a low share of women in technical and engineering fields in higher education, masculine employment environment, high level of expectations from women for managerial positions, the gender gap in women's income, and negative attitudes to jobs cause women's underrepresentation in this field.

Research Methodology

The main approach of this research is based on the documentary study and statistical data analysis method related to women's presence in areas related to knowledge-based economics, science, and technology in a number of Islamic countries. In this study, first, through documentary study, information about Islamic countries, which are mainly in Asia and Africa, was examined in different databases. The list of data published by UNESCO (2015) on the global statistics concerning women in science, technology, engineering, and mathematics in Asia shows that, on average, 30% of R&D researchers in Asian countries directly dealing with Information and technology production are women, but the countries of East Asia, Oceania, South Asia and West Asia have the highest levels of inequality, and only 20% of researchers in each of these regions were women. Central Asia, meanwhile, had the highest equilibrium in the region, with women making up 46 percent of researchers. The Central Asian countries of Azerbaijan and Kazakhstan were the only Asian countries in which women made up the majority of researchers. Based on this, an attempt was made to select Islamic countries that are geographically located in South and Southwest Asia, mainly in the Persian Gulf. The data analysis first examines the role of women in

higher education in countries as well as their contribution in the fields of science and technology and then explores the indicators related to the development of knowledge-based economy.

The Share of Women in the Fields of Science and Technology

With the development of educational infrastructure in the last four decades, most countries in the world have seen an increase in the share of women in higher education, a trend that has undergone many changes in Asian countries. Analysis of the trend of women's presence in the countries surveyed (Table 1) shows that in most countries, women with at least a bachelor's degree have experienced a growth of at least 3% to 32%. Trends in countries such as Saudi Arabia (32.2%), Bahrain (25.4%), and Qatar (17.4%) indicate that human resource capacity in these countries has grown significantly in the last four decades and the presence of women in the field is expected. Economic development, especially science and technology, can be a good driving force for economic development in the era of the Fourth Industrial Revolution. However, a review of the status of women in science and technology-related fields shows that despite a large number of women in higher education in the countries surveyed, their share in specialized fields related to science and technology is low.

Table 1. Comparison of the percentage of university-educated women with at least a bachelor's degree

Country	Year	Percent	Growth	Country	Year	Percent	Growth
Bahrain	1965	1.8	25.4	Oman	2003	8.5	7.7
	2018	27.2			2015	16.2	
Iran	1956	.1	14.6	Jordan	1961	.3	12.6
	2016	14.7			2010	12.9	
Egypt	1986	1.8	3.5	Palestine	2004	13.1	5.9
	2017	5.3			2018	19	
Iraq	1957	.2	7.7	Qatar	1986	15.3	17.4
	2013	7.9			2017	32.7	
Emirates	1975	4.1	32.3	Saudi-Arabia	2000	9.5	15.7
	2018	36.4			2017	25.2	

Source: World Bank (2019)

As revealed in Table 2, the share of women in the fields of science and engineering is different; in other words, the comparison of these data shows that women have more presence in the fields of applied sciences and less share in the technical and engineering fields. A comparison of the countries surveyed in the field of science shows that Oman (75.1%), Iran (69%), Bahrain (66.3%), Jordan (65.2%), and Qatar (64.7%) have the highest share of women in this field, respectively. Sudan (41.8%) has the lowest share. A survey of engineering shows that Oman (52.7%), Tunisia (41.1%), Sudan (31.8%), Palestine (31.3%), and the United Arab Emirates (31.1%) have the highest share of female students in the engineering fields, respectively. From the total of the countries surveyed, the comparison of women's shares in these two fields shows that women had a lower share in

Technical engineering fields. The minimum share of women in science is 41%, but in the field of engineering, this share is reduced to 3.4%.

Table 2. Proportion of Women's Presence in the Field of Science and Technology in a sample of Islamic Countries

Country	Year	Science	Engineering	Total
Bahrain	2014	66.3	27.6	42.6
Jordan	2011	65.2	13.4	51.9
Iran	2015	69	23	38.7
Lebanon	2011	61.5	26.9	43.5
Oman	2013	75.1	52.7	56.8
Palestine	2013	58.5	31.3	45.3
Qatar	2013	64.7	27.4	34
Saudi-Arabia	2013	57.2	3.4	38.8
Sudan	2013	41.8	31.8	41.4
Tunisia	2013	63.8	41.1	55.4
Emirates	2013	60.2	31.1	41.6

Source: UNESCO (2015)

The underrepresentation of women in technical and engineering fields in a systematic process leads to a decrease in their share in research and development (R&D) and the power to control valuable resources such as knowledge production. Research and development has a very important role in the development of new technologies and technologies related to the industry as well as the labor market. In other words, this sector is the link between industry and academia and leading the knowledge-based economy. A comparison of the situation of women in research and development in Asian countries shows that South Asia with 17% has the lowest share of women researchers among other regions, but when the countries of the Persian Gulf are separated, this figure increases to 37%. However, a comparison of the share of women in technical and engineering fields in comparison with the groups of basic sciences, medical sciences, and humanities and agriculture in Table 3 shows that in all countries in this group the share of women is low. Comparing the situation of countries shows that Bahrain (32.1%), Morocco (26.3%), Iraq (25.7%), and Iran (19.6%) have the highest percentage of women in research and development in technical and engineering and technology-related fields, respectively. At the same time, countries such as Saudi Arabia (2%), Oman (6.2%), and Palestine (9.6%) have the lowest share in this group.

Table 3. Women Researchers based on the Specialized Field in a Sample of Islamic Countries

Country	Year	Science	Engineering	Medical	Agriculture	Human Science
Bahrain	2013	40.5	32.1	45.9	-	43
Egypt	2013	40.7	17.7	45.9	27.9	49.7
Iran	2010	34.3	19.6	29.5	24.5	25.5
Iraq	2011	43.6	25.7	41.4	26.1	33.7
Jordan	2008	25.7	18.4	44.1	18.7	31.7

Morocco	2011	31.5	26.3	44.1	20.5	27.1
Oman	2013	13	6.2	30	27.6	23.1
Palestine	2007	21.2	9.6	25.5	11.8	27.9
Qatar	2012	21.7	12.5	27.8	17.9	34.3
Saudirabia	2009	2.3	2	22.2	-	-

Source: UNESCO (2019)

Conclusion and Recommendations

The prominent role of technology in the growth of societies, especially advanced societies in the last century, has revealed the rapid development of the Fourth Industrial Revolution. Technology tools and the digital arena are reflected in all economic and social dimensions, as they form an important part of the future of the labor market. With the development of technology, the economy is also experiencing significant changes and its dependence on physical resources such as land and agricultural products or natural resources has been reduced and the production of technology has been taken place in the global economy as the capital goods. These developments are taking place at a time when women lose twice as many jobs as men as technology expands and machines replace human beings, based on the reports released by the World Economic Forum in 2019. In other words, despite the increase in women's access to higher education in the last four decades, their presence in the economy and labor market is not based on the production of economic values and ownership of resources such as technology and practically with the development of artificial intelligence more women will be eliminated from the labor market. A study of women's shares in areas related to the production of knowledge and technology in geographical areas shows that in the West and South Asia region, the largest gender gap is in the presence of women in the field of technology and women's share in research and development. However, according to the latest report of the World Bank, the Middle East region needs more women to participate in the transition from an underground resource-based economy to a knowledge-based economy. Examining the reasons for this underrepresentation was one of the goals of this article and comparing the trend of women's presence in the field of research showed that underrepresentation of women in technical and engineering fields in higher education has led to a decrease in women's share in knowledge production and knowledge-based economy. Besides, a review of global experiences has shown that many women with technology-related education are reluctant to stay in the market and leave jobs easily.

Cultural constraints as well as the masculinity of technology and ignorance of employment opportunities in this field are some of the factors that can be mentioned in the review of global experiences. However, many countries in the Middle East have tried to attract more women to the field through various initiatives and incentives. For example, in the UAE Development Plan, with the recognition of the need for a strong human resource base in science, technology, and engineering, the development of a knowledge-based economy has become a priority for the

government. Given that only 1% of the workforce is Emirati, the low percentage of Emirati citizens' employment in key industries has turned to concern. As a result, policies have been introduced to promote the education and employment of Emirati citizens and greater participation of Emirati women in the workforce. Female Emirati engineering students are attracted to engineering jobs because they can achieve financial independence, these disciplines have a high social status, and thus provide opportunities to participate in creative and challenging projects, as well as numerous job opportunities. As noted in the data analysis, Saudi Arabia is one of the countries with the lowest share of female researchers in technology and is therefore developing technical and vocational education as part of an overall plan to reduce dependence on foreign labor. One of the measures to develop technical and vocational education was the establishment of 50 technical colleges, 50 girls' higher education institutions, and 180 industrial institutes by 2017. In this project, 500,000 students, half of whom were girls, were trained. Thus, boys and girls were trained in technical and professional occupations, including information technology, medical equipment, plumbing, electricity, and mechanics. Iran has also taken various measures to develop the presence of women in the field of technology, including providing incentives for the establishment of knowledge-based companies to graduates, as well as the development of science and technology parks and increasing the share of women in this field. As noted in the data analysis section, these innovations have led to an increase in the share of Iranian women in technology-related research and development. Overall, it can be said that these measures have not yet been able to provide a proper share for women in this field and more attention should be paid to the role of women in the development of knowledge-based businesses that determine the future of the global economy. Decades of social and educational science research show that gender differences in the technology ecosystem are the result of a complex and intertwined set of structural and social/psychological barriers to the access and opportunities of women and minority groups at school, university, in the field of the technology workforce, technology entrepreneurship, and venture capital. These growing barriers prevent women from attending early computer courses to get a degree in computer science, entering the tech job market, advancing at the leadership level, launching tech startups, and investing in them. This unequal deprivation of women in the tech workforce limits the strength of their tech workforce and hinders future competitiveness and national economic growth restricts access to employment opportunities for the majority of the population and reduces economic inequality. Although the advancement of technology has provided an opportunity to address long-standing patterns of social, educational, and economic inequality and the lack of racial and gender diversity among the world's workforce, entrepreneurs, investors, and shareholders, the technology itself deteriorate existing inequalities (Squab, 2017). As technological advances continue to accelerate, innovation and automation are expected to continue to have a negative inequality impact on the relocation of low-skilled workers, women, and

minority groups (World Economic Forum, 2018). At this critical juncture, the technology sector has a unique opportunity to demonstrate its leadership position through providing innovation, Problem-solving, product and capital development, and the implementation of comprehensive solutions to expand technology and improve sustainability. To rapidly and efficiently increase the presence of women in technology ecosystems, a comprehensive approach is needed to address each of the basic structural, social, and psychological barriers that lead to underrepresentation in the technology sector. A comprehensive approach requires theoretical and strategic initiatives, the leadership of technology managers and government officials, stakeholder engagement, significant capital and human resources, and continuous evaluation of interventions' effectiveness and efficiency. The following are the most important strategies in this area:

1-Increase opportunities at school education: Significant national, local, and state education reforms are needed to improve access to quality preschool education, to fund schools to purchase equipment and facilities (including technology, science labs, etc.), and to employ qualified and experienced teachers in all classrooms for all students to have the opportunity to acquire basic knowledge and skills. At the high school level, we also need to change attitudes and to present role models for girls to succeed and improve their knowledge about various areas of science and technology-based businesses, especially ICT-based businesses, to prepare them to enter college.

2. Expand computer science education. Public school education requires policy changes, educational reforms, and financial investments to develop rigorous standards for computer education, to increase access to computer science courses, to award certificates to teachers, and to ensure that courses of science are recognized as one of the requirements of graduation through course units. These changes are needed to ensure that all students have the opportunity to benefit from computer training. It is important to note that these educational opportunities not only provide access to introductory courses but also provide opportunities in cybersecurity, networking, web design, etc., and thus provide students with access to the university and the marketplace.

3-Development of entry routes to technology jobs: Routes to enter the technology labor market need to be further developed and expanded to reduce barriers to entry for job seekers, to expand the supply of technical and non-technical talent, and to pave the way for the transfer of these talents to the technology labor market. Workforce development initiatives include: reforming university curricula to better meet technology needs and setting up internship camps that develop skills in certain areas, and holding internships where young professionals working on different projects of companies develop skills and social capital while gaining access to important networks. These programs should be done in partnership with industry managers to ensure that the curriculum is in line with the needs of technology companies while prioritizing talent development in local communities to ensure that companies reflect the communities in which they are located.

Besides, entrepreneurship and venture capital require initiatives to inspire disadvantaged entrepreneurs, to plan for entrepreneurs and start-ups, and to establish communication between entrepreneurs with diverse backgrounds and power social networks within communication technology.

4. Implementation of comprehensive strategies: In the field of higher education institutions, technology companies, and venture capital companies, comprehensive organizational strategies should be implemented and prioritized to create a comprehensive and diverse work environment. These actions should begin with a strong commitment to diversity and inclusion at the highest levels of executive management and include core organizational values and diversity specific objectives and provide consistent reports and data on employee satisfaction and demographic status.

5-Expansion of various patterns in technical and engineering field: To eliminate gender stereotypes about the ability of individuals in technical and engineering fields, especially computer engineering and the characteristics of experts in this field, dealing with computer experts with different backgrounds can be very effective' it can reduce stereotyped threats and increase disadvantaged students' ambition from preschool age to the time of entering university and labor market. This exposure can be reflected in the media through the distribution of movies, TV shows, advertisements, and social media campaigns, as well as through direct interactions, including visiting classrooms, holding field camps, job exhibitions, conferences, counseling, and networking programs. Increasing diversity among professors, teachers, technology leaders, investors, and board members also breaks stereotypes and provides students, staff, and entrepreneurs with ambitious role models. It also reduces access to various patterns of misunderstandings around computer engineers and shows the variety of jobs they can have, while also showing how technology can be a tool for solving social challenges.

6- Creating partnerships between the private and public sectors to train the workforce in technical and engineering fields: given the existence of institutionalized inequalities at the heart of society, which is one of the main reasons for women's underrepresentation in technology, macro partnerships between the private and public sector is needed so that non-profit, educational, governmental and industrial organizations come together and move towards the goal of collective influence.

7- Modeling and informing about women entrepreneurs: One of the most important measures in encouraging women to participate more in this field is modeling and implementing promotional policies to introduce successful role models of women entrepreneurs in the region and internationally and to raise awareness on the high rate of personal satisfaction of self-employed women and business owner (despite the challenges).

8- Encouraging female students to develop business: One of the characteristics of women in these countries is the high share of educated women and at the same time their low share in the labor market. Given the high unemployment rate among educated women,

it is necessary to try to provide motivation and information to female students to develop entrepreneurship and small businesses during university. The most important challenge for women in this sector is social expectations of employment and the traditional definition of work. They expect to have a mostly government job after graduation and earn money from a stable source. However, during university, they are not familiar with any kind of continuous training in the field of individual business development. Changing the motivations of female students in this field is highly important and improving business skills plays an important role in their agency.

9- Promoting Financial Literacy and Knowledge: Low level of financial literacy and monetary skills is one of the most important obstacles for women in business development and it is considered one of their causes for concern. This issue is seen among women as one of the general challenges in different groups. However, due to the necessity of having financial skills among this group, it is necessary to start paying attention to financial literacy training in different educational courses from the school and encourage women to manage financial resources personally and have more agencies in the development of their business by changing their attitudes towards financial procedures and issues.

10- Family Support and Work-Life Balance: Work-life balance is one of the most important challenges for women to participate in society. Economic work requires concentration, time, energy, and constant planning, all of which conflict with women's family responsibilities, and women need careful planning and family support to succeed in this field. Due to their flexible time, personal businesses provide an opportunity for women to adjust their responsibilities more easily; on the other hand, due to the high level of economic responsibility and environmental tensions, they put additional strain on them. In other words, the development of these businesses is profitable for women in terms of time and they have the power to manage time; on the other hand, due to high responsibilities for business development, investment and market development, women will go through lots of internal pressure and stress. Promoting the culture of society in terms of accompanying, cooperating, and supporting women entrepreneurs has an important role in their success.

References

[1] Berryman, J., (1983). 'Small Business Failure and Survey of the Literature'. *European Small Business Journal*, 1(4), 47-59.

[2] Bowker, G., & Star, S. L., (1999). *Sorting Things out. Classification and its Consequences*. MIT press.

[3] Bray, F. (2013). 'Gender and Technology. Women, Science, and Technology: A Reader in Feminist Science Studies', *Annual Review Anthropology*. 36:37-53.

[4] Cakebread, C., (2017). 'Apple Reiterated its Commitment to Diversity and Inclusion, but it made Little Progress in the Last Year and is still Predominantly White and Male'. *Business Insider* (November 9, 2017)

[5] Cowan, R. S., (1983). *More Work for Mother*. Basic Books.

[6] Dennehy, T. & Dasgupta, N., (2017). 'Female Peer Mentors Early in College Increase Women's Positive Academic Experiences and Retention in Engineering'. *PNAS*, April 14, 2017.

[7] Elamkhah, A. & Kashani Shahedani, M. (2015). 'A Review of Knowledge-Based Economics

Literature: From Formation to Practice', *Technology Development Quarterly*, 11(44). Pp. 17-27.

[8] Eurostat, "Tertiary Education Statistics," Eurostat: Statistics Explained (2017).

[9] Falahati, L., (2015). 'The Fourth Industrial Revolution and the Employment Challenge for Graduate Women', Research Week Proceedings, Research Institute for Social and Cultural Studies, Tehran.

[10] Faulkner, W., (2001). 'The Technology Question in Feminism: A View from Feminist Technology Studies'. Paper Presented at the Women's Studies International Forum.

[11] Gee, B. & Peck, D., (2017). The Illusion of Asian Success: Scant Progress for Minorities in Cracking the Glass Ceiling from 2007–2015.

[12] Global Gender Gap Report (2018). World Economic Forum.

[13] Google (2016). EEO-1 Report, 2016

[14] Guynn, J., (2015). Exclusive: Google Raising Stakes on Diversity. *USA Today* (May 5, 2015).

[15] Grusky, D. & Hill, J., (2017). *Inequality in the 21st Century*. Avalon Publishing.

[16] Harding, S. G. (1986). *The Science Question in Feminism*: Cornell University Press.

[17] Hewlett, S. A., Luce, C. B., Servon, L. J., Sherbin, L., Shiller, P., Sosnovich, E., & Sumberg, K., (2008). The Athena Factor: Reversing the Brain Drain in Science, Engineering, and Technology. *Harvard Business Review Research Report*, *10094*, 1-100.

[18] ITU (2016). Global ICT Development Index

[19] Lerman, N. E., Mohun, A. P., & Oldenziel, R., (1997). 'The Shoulders We Stand on and the View from here: Historiography and Directions for Research'. *Technology and Culture*, 9-30.

[20] Lohan, M., (2000). 'Constructive Tensions in Feminist Technology Studies'. *Social Studies of Science, 30*(6), 895-916.

[21] Pfaffenberger, B., (1992). 'Social Anthropology of Technology'. *Annual Review of Anthropology*, 491-516.

[22] Price, J., (2010). 'The Effect of Instructor Race and Gender on Student Persistence in STEM Fields'. *Economics of Education Review*, 29(6), 901-910.

[23] Richter., F., (2018). *The Tech World Is Still a Man's World*, Statista.

[24] Schwab, K., (2017). 'The Fourth Industrial Revolution'. *Currency*.

[25] Sediqh, G., (2005). *Knowledge-Based Economics: A New Approach to Economics*, Tadbir Eghtesad Research Institute, Tehran, First Edition,

[26] Stanley, A., (1995). *Mothers and Daughters of Invention: Notes for a Revised History of Technology*: Rutgers University Press.

[27] Statistics Canada, (2017). 'Postsecondary Enrolments by Institution Type, Sex, and Field of Study.'

[28] Suzanchi Kashani, E., (2010). *Approaches and Principles of Knowledge-Based Economy: Expediency Discernment Assembly*, Strategic Research Center, Tehran, First Edition

[29] UNESCO (2016). *World Social Science Report 2016*, *Challenging Inequalities: Pathways to a Just World.*

[30] UNESCO Institute for Statistics, July 2015 (presentation by Mr. Alessandro Bello during UN-Wide Capacity Building Workshop on Innovation Policies for SDGs in the Arab Region (Amman, 15-19 April 2018).

[31] UNESCO Institute for Statistics, (2019), Women in Science,FS/2019/SCI/55 http://uis.unesco.org/sites/default/files/documents/fs55-women-in-science-2019-en.pdf

[32] Vice President for Science and Technology, (2017-2018). Report of the Working Group on Evaluation of Knowledge-Based Companies

[33] World Bank Open Data (2020), https://data.worldbank.org/

[34] Wajcman, J., (2004). Techno Feminism. *Polity, Cambridge*.

[35] Wajcman, J., (2009). 'Feminist Theories of Technology'. *Cambridge Journal of Economics*, 34(1), 143-152.

The International Journal of Humanities (2021) Vol. 28 (2): (58-68)

The International Journal of Humanities

اقتصاد دانش‌بنیان به‌مثابه فرصتی برای کاهش شکاف جنسیتی

لیلا فلاحتی [۱]

تاریخ دریافت: ۱۳۹۸/۱۰/۲۲
تاریخ پذیرش: ۱۳۹۹/۵/۲
تاریخ انتشار: ۱۴۰۰/۱/۱۲

[۱]. استادیار جنسیت و توسعه، گروه مطالعات زنان، مؤسسه مطالعات فرهنگی و اجتماعی وزارت علوم، تحقیقات و فناوری، تهران، ایران.
E-mail: Falahati@iscs.ac.ir

چکیده: در سه دهه اخیر همراه با توسعه اقتصاد دانش‌بنیان، توسعه کسب‌وکارهای مرتبط با این حوزه نیز روند رو به رشدی به خود گرفت و مفهوم کارآفرینی نیز در پیوند با آن نقش مهمی در اقتصاد رو به رشد در این حوزه پیدا کرد. اقتصاد دانش‌بنیان به‌عنوان حوزهای نوظهور و عمدتاً با محوریت فناوری اطلاعات و فناوری ارتباطات رشد معناداری یافت. براساس گزارش اتحادیه بین‌المللی مخابرات (۲۰۱۶) در دهه آینده، کسب‌وکارهای مرتبط با حوزه فناوری اطلاعات و ارتباطات ۹۵ درصد از کل شرکت‌های جهان را تشکیل می‌دهند و همچنین یک‌سوم از کل مشاغل رسمی جهانی مرتبط با این حوزه هستند. هدف این مطالعه بررسی سهم زنان منطقه خلیج فارس در عرصه علم و فناوری و اقتصاد دانش‌بنیان با استفاده از روش اسنادی است. نتایج پژوهش نشان می‌دهد در حوزهٔ علم و فناوری و اقتصاد دانش‌بنیان فرصت بسیار خوبی برای کاهش شکاف جنسیتی به‌ویژه در عرصه اقتصاد است. مقایسه روند حضور زنان در این عرصه نشان می‌دهد در برخی از کشورها مسیر حرکت زنان در این عرصه هموار شده و در برخی از کشورها نیاز به برنامه‌ریزی بیشتری است. پیشنهادهایی مبنی بر توسعه دانش تخصصی زنان، ایجاد تعادل در کار و زندگی، توسعه سیاست‌های حمایتی ارائه شده است.

واژه‌های کلیدی: شکاف جنسیتی، علم و فناوری، اقتصاد دانش‌بنیان، دانش‌آموختگان دانشگاهی.