Challenges Faced by Women in Technology: Jordanian Experience in Academia

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Abstract: *There is a massive gap between the number of men and women employed in academia worldwide, especially in the technology field. Jordan suffers from such a lack of gender diversity. In this research, a questionnaire was used to collect demographic, social, obstacle, and discipline-specific data from women about their participation in the technology field in academia. The results showed that women face multiple barriers that prevent their advancement in academia in the information technology field. Supporting women in academia and enabling them can benefit society and women in technology in general, especially at the entry level. For these reasons, Jordanian universities must plan to support women at work in academia in general and in the technology field more specifically.*

Keywords: women, information technology, gender bias, academia, gender equality

1) There should be equity in employment positions or some employment positions should be reserved for women (e.g., Like Perlman Quota).
2) more women must participate in the employment process so other women will feel more comfortable contacting them for jobs.
3) Make work policies more flexible, especially for mothers in the Middle East region, where they face many challenges to working.
4) Finally, there should be an understanding of how diversity encourages open discussion and sharing of knowledge among women and men working in the technology industry (Teague, 2000).

This study aims to reduce the gap in technology jobs between men and women. According to many studies, a variety of social and structural factors affect women's inclusion in the technology industry. The standard perspective in Middle Eastern society is that men are better at management and control (Gill et al., 2010).

The inclusion of women in the technology industry would give society, families, and children the benefits of education, improved health, economic growth, and reduced poverty (Sharkey & Moghadam, 1998). Communities should focus aiming to employ and involve women in technology and decision-making to maximize benefits in all areas of social, industrial, agricultural, and economic life. Another critical point would be to involve women in the preparation, analysis, and design of technological academic programs in technologyrather than a user of these programs only (Gill et al., 2010).

The reason for the low number of women in the computer technology field is that they have no role models. Girls should be encouraged to learn about computer science early in their education by being exposed to new resources and

1. Introduction

The level of diversity, inclusivity, and representation of women's positions in organizations, specifically in technology, is still down. Diversity increases business value, so technology companies need more women's participation and knowledge in their workforce to develop better products and solutions (Tacsir et al., 2014).

Years ago, companies with a diverse workforce yielded better returns and experienced lower volatility, higher performance, more profits, and increased productivity. These positive aspects can be attributed to the enhanced collective social sensitivity and increased collective intelligence that comes with the presence of female employees (Tacsir et al., 2014).

According to many studies, only about one out of four technology positions are held by women. Women are paid less than male counterparts, . Women leaders are well presented, more organized, and have more of an effect on employee development, performance, and profits than male leaders. The main things that women want are opportunities, consideration, and recognition (Tacsir et al., 2014).

Women should have the same opportunities as men in the technology and economic fields, but this is not the case. This truth is hidden because of the lack of documents and private information about employment in organizations and companies. Women are still back away from using mobile devices, the Internet, and many other technology applications (Gill et al., 2010).

Attracting women to the technology field is challenging; however, there are different ways to encourage them to pursue careers in technology:

10) Focusing on women's participation in technology in terms of education and jobs is a challenge to eliminate the negative role of women and thus make the difference (Zachmann, 2018).

2. Methods

Research Design
This is a descriptive cross-sectional study with an applied quantitative approach. Specifically, an online questionnaire was used to gather quantitative data to understand women's perceptions, challenges, and barriers regarding working in the technology field in academia. Survey design to examine.

Sample and Sampling Technique
The questionnaire was sent to all female workers in technology in academia. The sample consisted of 27 subjects.

Data Analysis
Data were analyzed using frequencies, percentages, and means in SPSS.

3. Results and Discussion

The sample mean age was 37.56 (SD=6.15) and ranged from 26 to 51 years old, from which we can conclude that the academic women in our study are young and have recently and belatedly completed their studies in information technology. The sample comprised one professor, one associate professor, seven assistant professors, and the remaining were lecturers. This indicates that the specialization is recent. The demand of women for education in this specialization is also recent because many obstacles have hindered women in completing their higher education.

The sample was distributed among 18 public universities (66.7%) and nine private universities (33.3%). The sample was distributed as follows: Al al-Bayt University (29.6%), Hashemite University (11.1%), University of Jordan (11.1%), AlBalqa Applied University (7.4%), the World Islamic Science and Education University (7.4%), and the others (33.3%). After looking more in depth at the data, we observed that female IT academics are less represented in private universities. In fact, some private universities had no female IT professors at all.

Figure 1 and Table 1 show that computer science is the dominant field for information technology majors. Approximately half (44.4%) of the participants specialized in computer science, with the remaining specializations being distributed as follows: other (18.5%), information systems (14.8%), software engineering (11.1%), educational technology (7.4%), and computer engineering (3.7%). The reason computer science is the most common major is that it was the original IT field. The other majors mentioned are fairly are new specializations.

advanced methods such as new courses and multimedia programs. Furthermore, developing trainees on these methods will increase the desire to learn more (Islam, 2017).

The number of jobs in information technology (IT) is always growing because science itself is always growing. Many studies focused on the ways to encourage and attract students to this field, especially women, by teaching subjects in exciting ways, especially the introductory courses, and by encouraging the students to participate in projects and research. These activities will strengthen the relationship and confidence between students themselves and others and allow them to enjoy working and profiting from the industry (Klawe, 2017).

Diversity in academia and the workplace will improve business and increase productivity; however, many studies proved that the wide gap in technology jobs and technology knowledge between men and women is due to political and historical reasons perpetuated not only by men but also among women themselves (Islam, 2017).

Although some research shows that many successful academic programs are attracting women to the information technology field, the biggest drawback is. school, so it is a crucial place to begin. We believe that most women are creative and can change the world, even if differences exist in terms of power, class, discipline, experience, personality, and viewpoint (Ashcraft et al., 2016).

Summary of Proposed Solutions
1) Encourage girlsto participate in technology in the school stage by developing new methods for teaching about multimedia technology (Islam, 2017).
2) Diversity in ability, background, and experience will diminish the work challenges (Ottaway, 2004).
3) Women are creative and can have a positive impact in the working environment (Albert &Breternitz, 2016).
4) Giving women opportunities to conduct and participate in research will build confidence in them (Klawe, 2017).
5) Building campus (Klawe, 2017).
6) Making computing social, so a team of women can do the job (Holman et al., 2018).
7) We notice an increase in women in various fields of sciences on information technology and computer engineering, and this leads us to find an integrated line that must be taken care of and encouraged at different educational stages (Milesi et al., 2017).
8) For the sake of development and innovation and to ensure the growth of economic, scientific, and military competition, the diversity of male and female workers is essential (Corbett & Hill, 2015).
9) Many women do not want to work in the IT field, especially leadership positions, due to the lack of support (Ahuja, 2002).
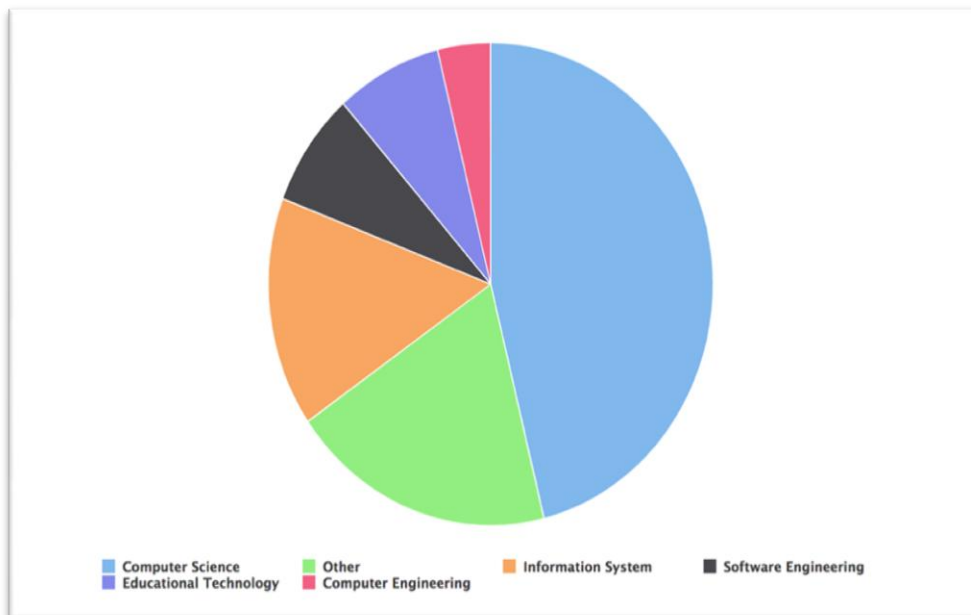
Figure 1 Fields of Work

Table 1: Sample Descriptive Statistics

		Total	
		N	%
Place of work	Private university	9	(33.3)
	Public university	18	(66.7)
Field of work	Computer engineering	1	(3.7)
	Computer science	12	(44.4)
	Educational technology	2	(7.4)
	Information systems	4	(14.8)
	Software engineering	3	(11.1)
	Other	5	(18.5)
Current leadership position	Assistant dean	1	(3.7)
	Department head	3	(11.1)
	Program coordinator	1	(3.7
	Director	1	(3.7)
	Faculty member	1	(3.7)
	System administrator	1	(3.7)
	Product manager	1	(3.7)
	None	18	(66.7)
Position level	Assistant professor	7	(25.9)
	Associate professor	1	(3.7)
	Lab supervisor	4	(14.8)
	Lecturer	11	(40.7)
	Product manager	1	(3.7)
	Professor	1	(3.7)
	System administrator	1	(3.7)
	Programs coordinator	1	(3.7)

The majority of the participants (66.7%) had no leadership positions. The rest were distributed as follows: department head (11.1%); assistant dean (3.7%); diploma programs coordinator (3.7%); director (3.7%); faculty member (3.7%); systems administrator (3.7%); and product manager (3.7%).

Table 2: Statistics for the Sample Opinions

	Min	Max	Mean	Std. Dev
As a woman, do you find support from your work?	0	5	2.96	1.37
Does your university encourage women's inclusion in making decisions?	0	5	3.30	1.35
Do you think the IT field is a complex subject because of math, science, and algorithms?	0	5	1.96	1.85
Is the IT field an unwelcoming field for women?	0	5	1.96	1.74
In what way (if any) would you say your gender has impacted your chances of receiving (or not receiving) a promotion at your current workplace?	0	5	2.44	1.85
Do you think that the influence of family (children, parents, and spouse) plays a significant role in curtailing women's employment in technology?	0	5	3.04	1.48
Do you think that the role of society plays a significant role in curtailing women's employment in technology?	0	5	2.70	1.41
Do you consider that certain subjects (e.g., machine learning, robotics, artificial intelligence, and networks) are studied more by men than women?	0	5	2.52	1.60
Do you face resistance from your colleagues when you suggest ideas?	0	5	2.37	1.55
Do you face resistance from your colleagues when you give a job assignment?	0	5	2.37	1.67
Do you get ignored at meetings?	0	4	1.67	1.61
Do you have support from women in your department?	0	5	2.85	1.38
Are you included in any collaborative work discussions with your colleagues?	0	5	2.89	1.50

Approximately 48% of the participants lived in the capital city of Amman, while the rest originated from Irbid (22.2%), other cities (11.1%), Al-Mafraq (3.7%), As-Salt (7.4%), and Zarqa (7.4%). Table 2 shows the statistics for the sample opinions. These opinions were assessed using a 6-point scale (0 = not at all; 5 = strongly agree). As a woman, it is essential to get support from work, but the data showed that only 33.3% received support. The universities' level of encouragement or inclusion of women in decision-making

was also less than expected—only 25.9% included women in decision-making or at least encouraged their inclusion.

In terms of promotions, gender has less of an impact because rules for promotions are well established in most universities, and there is some transparency in the promotion process. Gender has only impacted 29.6% of the sample in their chances of receiving (or not receiving) a promotion at their current workplace. Women usually face resistance when they are in leadership positions; this challenge was less prevalent in this sample, though: 37% of women academics were ignored at meetings;22.2% faced resistance from colleagues when they gave them job assignments, and 14.8% faced resistance from colleagues when they suggested ideas.

Another critical issue is women's support for each other; it helps them with many aspects of their work. Of this sample, 37% found support from other women in their departments, and 47% of subjects were included in any collaborative work discussion with their colleagues. Support from the university and her employer is also crucial to a woman's success. 70.3% of the sample found support at work, which is a good indicator of women's working circumstances.

Most women did not think that IT is a complex subject because of math, science, and algorithms; only 37.0% of women felt that, which is a piece of great news. Also, most women did not consider IT to be an unwelcome field for women, while only (25.9%) believe that.

Figure 2: Barriers Women Face at Work

When women were asked whether their family members' influence on them played a significant role in curtailing their employment in information technology, 66.6% answered that it plays a significant role. The data in Figure 2 and Table 2 show that family and society have a significant influence over women's roles in academics. On the positive side, women receive encouragement and development from their families; however, on the negative side, in reducing their role and limiting their capabilities.

To support a work/life balance, 85.2 % focused on more flexible work schedules. Improved human resources processes to increase gender balance in jobs was a topic approved by 92.6 % of the study participants. 55.6% of the sample answered "yes" because modern science is evolving and keeping pace with life's changes, so we need more time to check, update, and renovate. 77.8 % of the study participants argued that the distance to work is a barrier for women in academics. 55.5% of the sample stressed that only because they need a detailed and intensive practical side and a long time working in experiments and laboratories, certain majors are confined to males.

Table 3 indicates that 85.2 % of the participants answered "yes" to more flexible work schedules to encourage work/life balance, while 14.8 % answered "no." 92.6 % said "yes" to the adaptation of human resources programs to increase gender equity in jobs, and 7.4 % said "no" to the sum of the participants. 14.8% said IT is a hard-working job for women and 85.2% said it is not. Around half of the respondents (55.6%) reported that it is too difficult to keep up with the skills required to maintain an IT job, while 44.4% said it was not too difficult. Most of the participants (77.8%) indicated they wanted more organized mentorship programs for women, while 22.2% said they did not want more of these programs. In terms of the whether distance between home and workplace restricts job opportunities, most of the participants (81.5%) answered that distance is a challenge; 18.5% said "no" to this same question.

The suggestions and solutions to meet the challenges and obstacles and thus improve the working conditions of women in academics, based on the opinion of the study sample, were as follows:

If employees understand which tasks are priorities, they can focus on fulfilling requirements and not attempt to perform several duties at once. Middle Eastern culture has both a positive and negative effect on women and their ability to have a career in IT. The positive effect is that women can be encouraged—society needs to understand the importance of women in academia. From a negative standpoint, the regional culture has many rules for women which create barriers and make things like careers impossible.

Use the teaching methods and strategy to decrease the burden, time work, office hours and not obligating them to give late evening lectures.

Relationships with colleagues could be enhanced by establishing laws to protect women's rights, giving them equal opportunities and having certain expectations. Finding ways to confidentially report any misuseof authority against women, reforming regulations to promote diversity, gender balance, and freedom in the workplace by putting clear rules and policies, will help avoid gender discrimination.

Table 3: Yes and No Questions Frequency and Percentage

		Total	
		N	%
Do you think more flexible work schedules to support work/life balance should be introduced for women?	No	4	(14.8)
	Yes	23	(85.2)
Do you support the adjustment of human resources systems so that there is gender balance in employment?	No	2	(7.4)
	Yes	25	(92.6)
Do you think that IT is a difficult field for women to work in?	No	23	(85.2)
	Yes	4	(14.8)
Is it too challenging to keep up with the skills needed to do the IT job?	No	12	(44.4)
	Yes	15	(55.6)
Do you think more formal mentorship programs should be in place for women?	No	6	(22.2)
	Yes	21	(77.8)
Do you think that the distance between home and workplace limits work opportunities?	No	5	(18.5)
	Yes	22	(81.5)

Highly recommended are solutions that bridge the communication gap (e.g., chat sessions and periodical discussions), making the jobs performed in team's principle, providing nursery places to take care of children. Finally, the existence of guidance and mentoring programs for women in academics, especially at the beginning of their careers and enrollments in the educational institutions.

4. Conclusion

Women believe it is difficult to have opportunities in the workplace because their voices, ideas, and opinions will not be taken seriously. We can't ignore gender bias: we have to face it and persuade the other party that women can do (McGrail, 2018). We believe in diversity, exchanging the skills, opinions, and open discussions about problems. We have to concentrate on the strength, awareness, and commitment of men and women to help each other in managing and organizing the work prosperity.

All women have the ability to participate and share their stories about education, work, development, failures and successes with other women, girls, men, and children, whether they are at home, in school, at universities, or in the workplace. We are not ignoring the gender bias, but we need to control it as much as possible for the next generation so that young women can be welcomed by the other party and enter the work world with confidence.

References

[1] Ahuja, M. K. (2002). Women in the information technology profession: A literature review, synthesis and research agenda. *European Journal of Information Systems,11*(1), 20–34. https://doi.org/10.1057/palgrave/ejis/3000417

[2] Albert, C., &Breternitz, R. (2016). *Empowering women's success in technology.* Center for Work & Family.

[3] Ashcraft, C., McLain, B., & Eger, E. (2016). Women in Tech: The Facts 2016 Update: See what's changed and what hasn't. *National Center for Women & Information Technology,* 76. https://www.ncwit.org/sites/default/files/resources/womenintech_facts_fullreport_05132016.pdf

[4] Corbett, C., & Hill, C. (2015). Solving the equation—The variables for women's success in engineering and computing. *AAUW.* https://doi.org/10.1103/PhysRevA.75.063427

[5] Gill, K., Brooks, K., McDougall, J., Patel, P., & Kes, A. (2010). Bridging the gender divide: How technology can advance women economically. http://www.icrw.org/publications/bridging-gender-divide?utm_content=bufferf7dcc&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer

[6] Holman, L., Stuart-Fox, D., & Hauser, C. E. (2018). The gender gap in science: How long until women are equally represented? *PLoS Biology*, *16*(4), 1–20. https://doi.org/10.1371/journal.pbio.2004956

[7] Islam, S. I. (2017). Arab women in science, technology, engineering and mathematics fields: The way forward. *World Journal of Education*, *7*(6), 12. https://doi.org/10.5430/wje.v7n6p12

[8] Klawe, M. (2017). 3 ways to get more women into IT field. *The Chronicle of Higher Education*. https://www.chronicle.com/article/3-ways-to-get-more-women-into-tech/

[9] McGrail, K. (2018). *Changing the story of women in the workplace.* LinkedIn. https://www.linkedin.com/pulse/changing-story-women-workplace-kelly-mcgrail/

[10] Milesi, C., Perez-Felkner, L., Brown, K., & Schneider, B. (2017). Engagement, persistence, and gender in computer science: Results of a smartphone ESM study. *Frontiers in Psychology*, *8*(April), 1–9. https://doi.org/10.3389/fpsyg.2017.00602

[11] Ottaway, M. (2004). *Women's rights and democracy in the Arab world.* Carnegie Endowment for International Peace. http:

[12] Sharkey, H. J., & Moghadam, V. M. (1998). Women, work, and economic reform in the Middle East and North Africa. *African Studies Review*, *41*(2), 213. https://doi.org/10.2307/524864

[13] Tacsir, E., Grazzi, M., & Castillo, R. (2014). Women in science and technology: What does the literature say? *Inter-American Development Bank*, (February),

32. https://publications.iadb.org/en/publication/11913/women-science-and-technology-what-does-literature-say

[14] Teague, J. (2000). Women in computing: What brings them to it, what keeps them in it? *Gates*, *5*(1), 45–49.

[15] Zachmann, Karl. (2018). Women in STEM: Female role models and gender equitable teaching strategies. Sophia, the St. Catherine University repository website: https://sophia.stkate.edu/maed/ 272

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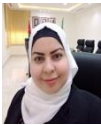
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