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Factors impacting Jordanian women in computing case study: Hashemite University

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ABSTRACT

We consider pursuing the Jordanian women their graduate studies in Information Technology disciplines as an indicator of socio-economic development and empowering women in Jordan. This paper presents the first study of multi-variate stereotypes that shape the problem by addressing the following factors: travel abroad, family matters, skills and experience, traditional and cultural differences, scholarship opportunities, financial matters, and language complications. These factors were extensively studied, and their effects were estimated by applying the linear-regression, one-way ANOVA, and Scheffe tests. The scholarship opportunity ($R^2 = 0.354$), travel abroad ($R^2 = 0.281$), and financial matters ($R^2 = 0.226$) were the most influential factors on Jordanian women's decision in pursuing their graduate studies. On the other hand, skills and experience stereotype ($R^2 = 0.076$) has the least influence.

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1. INTRODUCTION

Women remain under-represented in all scientific and technological fields, despite playing a predominant role in building society hand-in-hand with men [1]. It is well-known that education is vital for both genders because it is the most powerful way to lift people out of poverty. Nevertheless, we believe in its essentiality to women since it helps them claim their rights and realize their potential in politics, economics, and social areas. Rashti states that "The rational for a need to focus on women's achievements in higher education is considered a key social development indicator measuring women's statues and conditions in any country" [2]. Besides that, joining graduate studies schools makes the world better for women and protects them from any type of abuse or violence [3], [4].

Lin [5] identified the most significant barriers and challenges faced enrolled women in higher education in the USA: the commitments of multiple roles, lower level of self-confidence, and insufficient family and social support. Whereas the author of [6] listed the top four barriers to college completion: under-preparation, institutional barriers, personal non-academic barriers, and college tuition costs. The author of [7] highlighted the barriers that under presented women in science, technology, engineering, and mathematics (STEM) fields in the USA. Work-life balance, time management, low self-confidence, lack of female role model, fewer numbers of women in science and engineering classes, and a male-dominated environment recorded as the most critical barriers facing women in the STEM field. Moreover, good receiving support from family, kind treatment from

the advisor, fund availability, and absence of sexual harassment helped women in the STEM field pursue their studies in the USA.

Adult women students in other countries may endure diverse difficulties. For example, the absence of mentors, failure to find an appropriate balance between career and family were the reasons behind underpresenting women as students and researchers in the social sciences in Africa [8]. The African women, who pursued their graduate studies in scientific disciplines is affected by gender, race, and third world marginality through their educational goals [9]. The author of [9] highlighted how the chilly environment faced by African women motivated them to accomplish their goal and to resist the negative racial stereotyping regarding their African identity such as emotional costs, loss of opportunities, the burden of domestic responsibilities, neglect of spouse and children, and shortchanging of their leisure and long study duration period to accomplish their graduate studies. Another study [10] highlighted a set of factors that increases the dropout rate of postgraduate women in South Africa. The author of [11] identified some challenges female doctoral students in Ethiopia experience in their doctoral program. Further, another study [12] showed that affirmative action had not guaranteed gender equity in South African and Kenyan higher education systems.

In Asia, gender-based discrimination starts in childhood and carries throughout to university enrolment [4], [13], [14]. However, the Asian University for Women successfully eliminates certain factors that prevent many women from continuing their education, but more work is still required to unlock the social, political, and economic potential of a generation of women [15]. For example, more attention should be given to gender equity, including promoting leadership opportunities for female students, counteracting traditional gender tracking by providing support for women in male-dominated fields, and educating a complete campus climate through student support services and an explicit emphasis on diversity [15]. On the other hand, the authors of [16] showed that certain families in Pakistan do not allow women in general and married women, particularly for higher education because of social, cultural, religious, economic, and educational factors. Unfortunately, supporting married women's education depends upon family attitude, educational status, financial stability and husband viewpoint. A similar situation faced Indian women when pursuing their higher education [17]. In the same way, Malaysian women have experienced difficulties in obtaining higher education due to structural and attitudinal barriers, the equitable participation of women in higher education and their cultural backgrounds [18]. Another study in Iran [19] indicating the importance of balancing the traditional perspective of motherhood and educational responsibilities to increase the number of women in higher education.

Other studies stated that gender inequality is traditionally structured in all life matters in the Middle East [20], [21]. This situation applies to many Arab Muslim societies, as well as some Western societies [21]. Many studies [22]-[24] investigated the barriers that can prevent Saudi women from continuing or even starting their education. The author of [23] pointed out that transformative learning plays a role in the development of Saudi women's confidence. The author of [24] indicated that organizational, cultural, and personal barriers were the main challenges faced by women leaders in the higher education sector in Saudi Arabia. Women's training and education will increase the level of their competence and leaderships to inferior and subordinate the positions of men [25]. Recently, women access the information technology (IT) field, but some find the prospect of a career in IT to be profoundly unappealing. This inspired us to identify barriers/ stereotypes that discourage Jordanian women from pursuing their study in IT and having it as a career. This study took place on the Hashemite Kingdom of Jordan, a young, moderate, stable, and peaceful country with limited natural resources such as water, gas, and oil [26]. On the other hand, Jordan is aware of human resources' importance; therefore, it places a great emphasis on education [27]. This makes most Jordanians equipped with high education and professional level compared to other people in the region. King Abdullah II urged the Jordanian Governments to support and move the Information Communication Technology sector forward. His majesty believes in the fundamental role of women in the Kingdom's socio-economic and political life; therefore, he was involved in enacting the necessary legislation to guarantee that.

Generally, women form the bulk of the work, and men serve as bosses [28]. Men are most likely to be found in positions with the greatest power, pay, and prestige [1], [29], [30]. To the best of our knowledge and experience, the disparity between women and men has enduring persistence in the recruitment and retention of women at all IT levels worldwide. Therefore, a fundamental question should be raised "Whether IT really needs women, or whether women need IT" [30]. The research literature reports several obstacles in women's pathway in entering the IT disciplines and finding or maintaining their academic or industrial positions. These obstacles are categorized into two groups: internal and external obstacles. Internal obstacles include sex-role stereotyping, lack of aspiration, role conflict, and low self-esteem. External obstacles include lack of

encouragement and collegial network, little financial support, family responsibilities, lack of mobility, and hiring and promoting practices [1], [29], [31], [32].

Further, women continue to be under-presented in computer science at both graduate and undergraduate levels [1], [31], [33]. This situation has been justified based on two reasons: (i) the disturbing possibility that computer science behaves in a way that limits women to be a part of it, such as experience with computer [32], abstract characteristics of software use [31], the cultural values embedded in educational software and computer games [31], knowledge about computer science [32], and safe access to the workplace [31]. (ii) demographic trend shows an increasing number of males compared to the females entering IT discipline during the next decade [31] due to some existing barriers that have been extensively reported in the literature, such as discriminatory behavior in classroom environment [32], [34], personality [32], gender differences and how they correlate to the student's performance [32], [35], scarcity of role model [31], and the lack of supportive community [32]. Further details can be found in the comprehensive studies on multi-variate factors that impact the number of women studying computer science major and highlight some suggestions and effective strategies to increase recruitment and retention of women students over the past decade [32], [33].

The question that should be raised is "Whether the women enjoy with the same ability, experience, and professional skills as men in pursuing their graduate studies in the IT disciplines or not?" the literature reviews confirm that the answer is highly associated with the society view and is most likely correlated with the whole role of women in socio-economic and cultural life [9], [20], [21]. Finally, it is worthy of highlighting that there is no gender differences in the performance quality or ability in the IT disciplines, but the existence of differences in experience [20] leads to less success, non-comfortability, and the lack of confidence among females studying IT major. This does not refer to breach a good balance between the major requirements of spending a long time in front of the computer programming and the satisfaction of family responsibilities such as house-cleaning, child-bearing and child-rearing [1], [20], [30]-[32].

Therefore, the need to prove women's academic merit and intellectual competence is considered as a heavy burden on women's shoulders [1]. In addition to that, it is mandatory to teach the women how to relate with each other and how to treat each other as a source of knowledge [25]. The lack of the role model plays a predominant role in the number of women majoring in one of the IT disciplines and contributing positively in industry and academia [31]. This causes a well-known terminology *"Pipeline Shrinkage"* (that is defined as the ratio of women to men involved in computing from high school to graduate school [30], [36]) that has been solved by *"Funneling Effect"*, which is defined as a proposed set of strategies used to expand the number of women in academia [1]. This increases and manages the under-represented group of women with the whole group produces a better solution comparable to having one homogeneous group [30].

This paper aims to: (i) identify women's obstacles when committed to have a degree. (ii) increase community awareness of women's obstacles when pursuing their graduate studies in IT schools. (iii) provide recommendations to governments, educational institutions, and the community to support women.

The paper is organized as follows: Section 2 presents various obstacles for women's lack to pursue their graduate studies. Section 3 identifies and analyzes the faced stereotypes, describes the used method and claims the produced results. In the end, the conclusion and future work are listed in section 4.

2. RESEARCH METHOD

We developed a structured questionnaire that highlights the main obstacles preventing Jordanian women from pursuing their graduate studies in the IT sectors at the Hashemite University. In this Section, we describe the used method to attain the results by recognizing the target sample and the statistical package used to undertake the analysis. The target population in this study is the Jordanian women in the IT sector of ages ranging from $18 - 40$ years. The collected sample size is 105 out of 120 women at the Hashemite University, Zarqa, Jordan. It is worthy of highlighting that 15 samples were rejected due to incomplete or inconsistent responses to questions. The rate of the accepted sample was 87.50%.

The questionnaire consisted of thirty-one questions. The first four questions used to measure the participants' demographic information related to the age, marital status, academic degree and work sectors. The remaining questions are used to measure women's barriers to accomplish their graduate studies: Travel abroad, family matters, skills and experience, traditional and cultural differences, scholarship opportunities, financial matters, and language complications. Every single obstacle was measured by a set of criteria as shown in Figure 1.

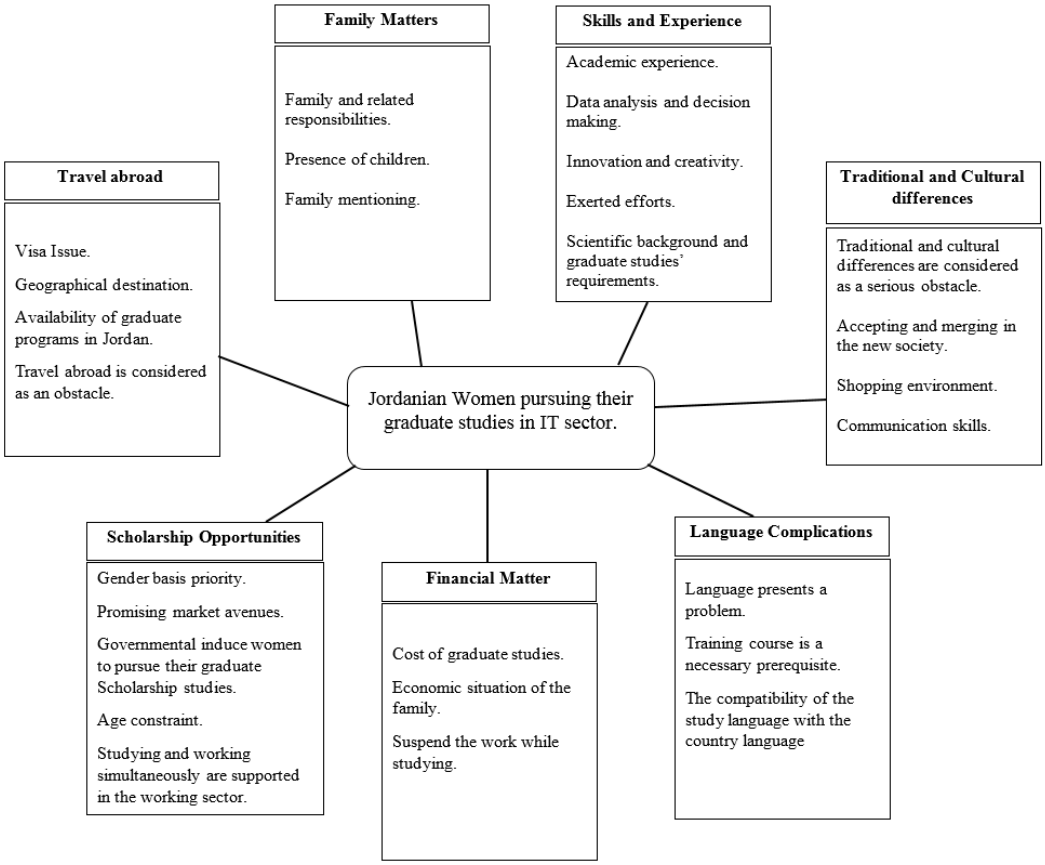

Figure 1. The set of criteria per obstacle

Each question in the distributed survey had a possibility of a five-point Likert scale. A Likert scale assumes that the strength of stereotype is linear from Always to Never and assumes that stereotype can be measured. For example, each of the five responses would have a numerical value that can be used to measure the stereotype under study. For the purposes of calculation, Always $=$ 5, Often $=$ 4, Sometimes $=$ 3, Seldom $=$ 2, and Never $=$ 1. To properly address the effectiveness of various stereotypes impact on Jordanian women in pursuing their graduate studies in the IT field at the Hashemite University, we developed the following hypotheses to be tested against the NULL hypothesis.

- Hypothesis 1 (H_1): Travel abroad has an influence on Jordanian women in pursuing their graduate studies in the IT field at Hashemite University.
- Hypothesis 2 (H_2): Family matters have an influence on Jordanian women in pursuing their graduate studies in the IT field at Hashemite University.
- Hypothesis 3 (H_3): Skills and experience have an influence on Jordanian women in pursuing their graduate studies in the IT field at Hashemite University.
- Hypothesis 4 (H_4): Traditional and cultural differences have an influence on Jordanian women in pursuing their graduate studies in the IT field at Hashemite University.
- Hypothesis 5 (H_5): Scholarship opportunities have an influence on Jordanian women in pursuing their graduate studies in the IT field at Hashemite University.
- Hypothesis 6 (H_6): Financial matters have an influence on Jordanian women in pursuing their graduate studies in the IT field at Hashemite University.
- Hypothesis 7 (H_7): Language complications have an influence on Jordanian women in pursuing their graduate studies in the IT field at Hashemite University.
- NULL Hypothesis (H_0): There is no influence of the above mentioned stereotypes on Jordanian women in pursuing their graduate studies in the IT field at Hashemite University.

3. RESULTS AND DISCUSSION

The $SPSS$ has widely used software for statistical analysis of the data in various applications such as government surveys, health researchers, education researchers, and data miners [37], [38]. Analysis of conducted experiments was carried out by using $SPSS$ version 20. We initially made a simple descriptive analysis to characterize the frequency of every single obstacle on pursuing Jordanian women their graduate studies in the IT sector at Hashemite University. Table 1 shows statistical summaries of all stereotype criteria, including the mean, standard deviation, rank, and grade represented by μ, σ, r, and g, respectively.

Table 1. The statistical summaries of the mean, standard deviation, rank, and grade represented by μ, σ, r, and g, respectively, for all stereotype criteria

Stereotype	Criteria	$Mean$ μ	$Stdv.$ σ	$Rank$ r	$Grade$ g
Travel abroad	Visa issue	2.10	1.10	4	Low
	Geographical destination	3.47	1.29	3	Medium
	Availability of graduate programs in Jordan	4.05	1.05	1	High
	Travel Abroad is considered as an obstacle	3.85	1.16	2	High
	Total	3.37	1.15	–	Medium
Family Matters	Family and related responsibilities	4.05	1.09	1	High
	Presence of children	3.86	1.10	2	High
	Family mentioning	2.25	1.01	3	Low
	Total	3.39	1.07	–	Medium
Skills and Experience	Academic experience	1.75	0.91	3	Low
	Data analysis and decision making	2.10	1.05	1	Low
	Innovation and creativity	1.67	0.78	5	Low
	Exerted efforts	2.01	0.87	2	Low
	Scientific background and graduate studies requirements	1.73	0.86	4	Low
	Total	1.85	0.89	–	Low
Traditional and Cultural Differences	Traditional and cultural differences are considered as a serious obstacle	3.94	1.08	1	High
	Accepting and merging in the new society	3.49	1.09	2	Medium
	Shopping environment	2.63	1.10	3	Medium
	Communication skills	2.04	1.07	4	Low
	Total	3.02	1.09	–	Medium
Scholarship Opportunities	Gender basis priority	1.86	0.97	5	Low
	Promising market avenues	1.96	0.99	3	Low
	Governmental induce women to pursue their graduate studies	1.91	1.10	4	Low
	Age constraint	3.35	1.17	1	Medium
	Studying and working simultaneously are supported in the working sector	2.71	1.40	2	Medium
	Total	2.36	1.12	–	Low
Financial Matter	Cost of graduate studies	4.20	0.84	1	High
	Economic situation of the family	4.20	0.94	2	High
	Suspend the work while studying	3.85	1.19	3	High
	Total	4.08	0.99	–	High
Language Complications	Language presents a problem	3.08	1.29	3	Medium
	The compatibility of the study language with the country language	3.54	1.26	2	High
	Total	3.59	1.13	–	High

The mean of the responses was ranged from 1.67 (Seldom to Never) to 4.20 (Always to Often), and the standard deviation was ranged from 0.78 to 1.40. Question 14 concentrates on the innovation and the creativity of the female recorded the lowest value of 1.67 (Seldom to Never), thus indicating the minor frequency perceived obstacle. Both questions 26 and 27, which concentrate on the cost of graduate studies and the family's economic situation, respectively, recorded the highest value of 4.20 (Always to Often), indicating them as the highest frequently encountered obstacles. The details of the participants' demographic information and barrier stereotypes are presented below:

1. Demographic Variables

   As mentioned earlier in this paper, the questionnaire comprised of four questions related to age, marital status, academic degree, and work sectors. The age was classified into three categories $18 - 22$, with 72.2%, $23 - 30$, with 23.8%, and 31 years and above with 4%. The marital status was divided into two groups, single and married, with percentages of 92.1% and 7.9%, respectively. The academic degrees

were 28.0% High School students, 3.0% Diploma students, 57.0% Bachelor students, 10.0% Master students, and 3.0% Professors. The remarkable point is that 28.0% of the survey respondents are high school students eager to pursue their graduate studies. The result is inconsistent with other countries such as the USA, where high school students are mainly focused on getting college degrees, not getting graduate degrees. Finally, the work sector was classified as non-working with a value of 12.9% or working in the personal, governmental, or private sector with a value of 1.0%, 83.1%, and 3.0%, respectively.

2. Barrier Stereotypes
   We use the questionnaire to rank the most vital obstacles that limit Jordanian women from continuing their graduate studies: Travel abroad, family matters, skills and experience, traditional and cultural differences, scholarship opportunities, financial matters, and language complications. A set of criteria was used to measure every obstacle, as shown in Table 1. Every single stereotype was measured by a set of criteria, as mentioned in Section 2. Each criterion was ranked based on the participant's response to evaluate the effect of the perceived stereotype. Then, the results were classified into three categories: High, medium, and low in column labeled grade, as illustrated in Table 1. Financial matters and language complications scored the highest perceived obstacles with a value of 4.08 and 3.59, respectively, while the lowest perceived obstacles were skills and experience, and scholarship opportunities with a score of 1.85 and 2.36, respectively. On the other hand, the family matter, travel abroad, and traditional and cultural differences recorded moderate obstacles with values of 3.39, 3.37, and 3.02, respectively. The above results are consistent with the nature of Jordanian society in terms of environmental aspects, economics, and regulations. The financial situation has a great influence on the probability of Jordanian women to accomplish the graduate study, which is consistently homogenous with all communities in the world. The language complications recorded the second-highest obstacle, where the instruction language is different from the spoken language in the Jordanian society [39]-[41]. It is worth mentioning that the Jordanian government follows King Abdullah's II recommendations on providing equal chances of internship and scholarship to women to accomplish their academic studies [42]. Therefore, the scholarship opportunity has little influence on hindering women from pursuing their graduate study by recording a low grade. The most interesting result about Jordanian women is the high confidence in their abilities to solve problems and make appropriate decision by scoring the lowest perceived obstacle in this study. The reasons behind this phenomenon are the existence of a good supportive mentor [43], a solid scientific background, an excellent educational atmosphere they have been grown up with it [44]-[47]. Besides, Jordanian women functionally practice their full right in every single aspect of building Jordan hand-in-hand with the men [48].

Figure 2 shows the result of the linear-regression test. The test was invoked to measure the effect of the above mentioned hypotheses on accepting or rejecting the NULL hypothesis (H_0) as presented below:

1. Travel abroad
   The travel abroad stereotype has the second-highest effect on Jordanian women pursuing their graduate studies in the IT field, reaching 28.1%. We found the regression test with a positive direction rate equal to $R = 0.53$. Thus, we accepted the alternative hypotheses and rejected the null hypothesis because of the F-test value scored 38.712, with a p-value $= 0.005,\ p < 0.05$.
2. Family Matters
   The family matters stereotype was observed in the Jordanian women who pursued their graduate studies in the IT field, reaching 18.7%. We found the regression test with a positive direction rate equal to $R = 0.432$. Thus, we accepted the alternative hypotheses and rejected the null hypothesis because of the F-test value scored 22.775, with a p-value $= 0.005,\ p < 0.05$.
3. Skills and Experience
   The skills and experience stereotype has a little impact on the Jordanian women in completing their graduate studies with a value of 7.6%. We found the regression test with a positive direction rate equal to $R = 0.276$. Thus, we accepted the alternative hypotheses and rejected the null hypothesis because of the F-test value scored 8.166, with a p-value $= 0.005,\ p < 0.05$.
4. Traditional and Cultural Differences
   The effect of the traditional and cultural differences stereotype on our study reaching 21.2%. We found the regression test with a positive direction rate equal to $R = 0.46$. Thus, we accepted the alternative hypotheses and rejected the null hypothesis because of the F-test value scored 26.573, with a p-value $= 0.005,\ p < 0.05$.

5. Scholarship Opportunities
   The scholarship opportunities stereotype has the highest effect on Jordanian women pursuing their graduate studies in the IT field reaching 35.4%. We found the regression test with a positive direction rate equal to $R = 0.595$. Thus, we accepted the alternative hypotheses and rejected the null hypothesis because of the F-test value scored 54.329, with a p-value $= 0.005$, $p < 0.05$.
6. Financial Matters
   The financial matter stereotype has the third-highest effect on Jordanian women pursuing their graduate studies in the IT field reaching 22.6%. We found the regression test with a positive direction rate equal to $R = 0.476$. Thus, we accepted the alternative hypotheses and rejected the null hypothesis because of the F-test value scored 28.891, with a p-value $= 0.005$, $p < 0.05$.
7. Language Complications
   The language complications stereotype on the studied sample of the Jordanian women recorded reaching 13.5%. We found the regression test with a positive direction rate equal to $R = 0.368$. Thus, we accepted the alternative hypotheses and rejected the null hypothesis because of the F-test value scored 15.492, with a p-value $= 0.005$, $p < 0.05$.

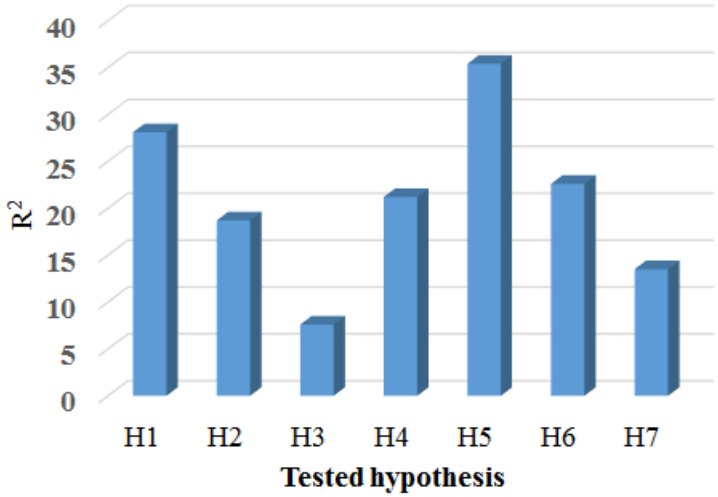

Figure 2. The percentage of R^2 value per tested hypothesis

In this paper, the one-way ANOVA [49] was applied to determine whether the Jordanian women with various academic degrees agree on perceiving the same obstacles that prevent them from pursuing their graduate studies in the IT disciplines, as shown in Table 2. Moreover, we need to confirm whether the perceived obstacles had the same impact on the women's ability to pursue their graduate studies. The value of the F-test reached 1.236, with an associated significant p-value $= 0.301$ which is greater than the alpha value $(\alpha = 0.05)$. The obtained result confirms a total agreement between the various academic degrees of Jordanian women in their point of view about the main obstacles that limit their chances of continuing their graduate studies.

Table 2. The one-way ANOVA tests the standpoint of the Jordanian women based on their academic degree regards their chances in pursuing their graduate studies in the IT sector

Homogeneity	*Sum of Squares*	*df*	*Mean Square*	*F − test*	*Sig.*
Between Groups	0.363	4	0.091	1.236	0.301
Within Groups	7.045	96	0.073		
Total	7.407	100			

The Scheffe test [50], [51] was used to compare Jordanian women's views about the perceived stereotypes as shown in Table 3. The obtained results illustrate no statistical variance differences between the various

groups classified by academic qualifications toward the perceived stereotypes. Consequently, all aforementioned stereotypes play a predominant role in limiting Jordanian women's opportunity to achieve their higher degree.

Table 3. The Scheffe test measures the variance differences between the various point of view based on the academic degree about the perceived stereotypes

Academic Degree	*Academic Degree*	*Mean Difference Between the first two columns*	*Standard Error*	*Sig.*	*95% Confidence Interval*	
					Lower bound	*Upper bound*
High School	*Diplom*	0.10185	0.16456	0.984	-0.4150	0.6187
	B.Sc.	0.12264	0.06252	0.432	-0.0737	0.3190
	M.Sc.	-0.00185	0.09979	1.000	-0.3153	0.3116
	Ph.D.	0.00309	0.16456	1.000	-0.5138	0.5200
Diploma	*High School*	-0.10185	0.16456	0.984	-0.6187	0.4150
.00.	*B.Sc.*	0.02079	0.16046	1.000	-0.4832	0.5248
	M.Sc.	-0.10370	0.17832	0.987	-0.6638	0.4564
	Ph.D.	-0.09877	0.22118	0.995	-0.7935	0.5960
B.Sc.	*High School*	-0.12264	0.06252	0.432	-0.3190	0.0737
	Diplom	-0.02079	0.16056	1.000	-0.5248	0.4832
	M.Sc.	-0.12450	0.09287	0.773	-0.4162	0.1672
	Ph.D.	-0.11956	0.16046	0.967	-0.6236	0.3845
M.Sc.	*High School*	0.00185	0.09979	1.000	-0.3116	0.3153
	Diplom	0.10370	0.17832	0.987	-0.4564	0.6638
	B.Sc.	0.12450	0.09287	0.773	-0.1672	0.4162
	Ph.D.	0.00494	0.17832	1.000	-0.5552	0.5650
Ph.D.	*High School*	-0.00309	0.16456	1.000	-0.5200	0.5138
	Diplom	0.09877	0.22118	0.995	-0.5960	0.7935
	B.Sc.	0.11956	0.16046	0.967	-0.3845	0.6236
	M.Sc.	-0.00494	0.17832	1.000	-0.5650	0.5552

Finally, it is time to highlight some recommendations in order to win the battle of presenting females in pursuing their graduate studies in the IT sector.

1. The entire IT sector should bridge the gap between women's constitutional rights and the practice in the real-life scenario.
2. Training and workshops should be directed to resolve language complications faced by women.
3. Women should be decision-makers and risk-taker in their lifestyle to reach their goals.
4. Women need to have strong family and government support, qualified mentors, and continuous training to assist them in a long pathway.
5. Educational institutions, government, and the international community should overcome travel abroad, family matters, skills and experience, traditional and cultural differences, scholarship opportunities, financial matters, and language complications obstacles.

4. CONCLUSION

This paper presents the first study of multi-variate stereotypes that identify various stereotypes face Jordanian women in pursuing their graduate studies in information technology (IT) disciplines. We have shown that the scholarship opportunity and travel abroad scored the highest perceived obstacles. Skills and experience scored the lowest perceived obstacles by applying the linear-regression, one-way ANOVA, and Scheffe tests. Despite the different academic backgrounds of the participants, they perceive the same rank and grade of obstacles. This indicates an actual gap between constitutional rights and the practice in the real-life scenario, limiting women's development and advancement.

We predict many avenues for future work. First, establishing a database for women experts in IT and activating it via universities and colleges social networks. Another avenue is to increase the number of opportunities and enhance the quality of provided services for women in the education and workforce participation in information communication technology.

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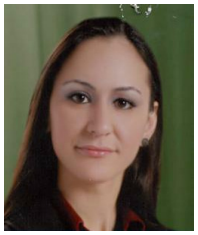
BIOGRAPHIES OF AUTHORS



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