

**AC 2008-516: EDUCATION OF WOMEN IN ENGINEERING GRADUATE
SCHOOLS IN JORDAN: AN EMPIRICAL PERSPECTIVE**

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Education of Women in Engineering Schools in Jordan: An Empirical Perspective

Abstract Young women in Jordan have begun to demand greater freedom than in the past. Although there are still some traditional practices that govern women's life style. Women's participation in different aspects of life has been increasing over the last years; their interaction along with the Jordanian society has begun to take different shapes, the contribution of women to their families, society and in the workforce has been more significant than it was formerly.

In this paper, we will address the factors that limit the enrollment of women in graduate engineering schools; these factors include cultural and economical reasons, labor market outlooks, status and prestige. We study the interrelationship among these factors, the positive impacts on the economy and on some sectors of the engineering industry in general. As we believe that women in engineering related fields have significant role in supporting and enriching these fields. The effective participation of women engineers will help sustaining the society by empowering the women through her participation in all fields, enhancing the Jordanian women's skills, knowledge and access to information.

Introduction

In some developing countries in the Middle East, the role of women in the society was traditionally limited to tasks strongly related to "taking care of their family members" and raising children at home. This narrowed the role of women as productive and efficient contributors of the community and the workforce. It also adversely affected the development process of Jordan's economy.

As the Jordanian society starts evolving and adopting new values and rules, new practices began to appear. Women start seeking graduate and higher education in different professional fields, and they start to get more and more involved and contribute to the economic and social development of the society. The accumulated successes that women achieve in practical life motivate more of them to participate in the educational process. It also increases the percentage of women as a reliable partner to their coworkers. It is worthy to note that the involvement of Jordanian women is not uniform across all educational disciplines at the higher education level. Some disciplines attract more women than the other disciplines. Some empirical observations indicate that most women move toward studies in the humanities, business, and arts rather than engineering related fields. There are many reasons for that, but mostly, the participation of women in engineering and science related fields are less due to family responsibilities, and social and cultural norms as being the primary barriers. The same observations apply to graduate level education. More details are discussed throughout this paper.

In this paper, we present and address some of the factors that limit the enrollment of women in graduate engineering schools; these factors include cultural and economical reasons, labor market outlooks, status and prestige. We study the interrelationship among these factors, the positive impacts on the economy and on some sectors of the engineering industry in general. We believe that participation of women in engineering related fields has significant impact in

supporting and enriching engineering and science related fields. The effective participation of women engineers helps sustaining the society by empowering the women through her participation in all fields, enhancing the Jordanian women's skills, knowledge and access to information.

Present Situation

As stated, the demand of women for participation in the workforce of Jordanian society is increasing. Nevertheless, engineering is still one of the sectors that attract the least number of women. There are certainly some key factors for these limitations to be identified in Jordan. We discussed and shared some of these limiting factors among some Jordanian business owners' and Jordanian women living in Jordan and abroad. We present some of the empirical observations here:

1. *Inherent Social Constraints:* The Jordanian women were affected with all the inherited social constraints that may deviate their thinking from getting involved in certain activities. Some of these activities do not welcome women. For instance, attitude tests in the 1970's demonstrated that social implications and social responsibility issues have a significant effect on girls' choices, but little on boys'¹. This is in spite of the fact that studies indicated that men and women are attracted to the engineering profession for similar reasons, including ability in mathematics and science, career opportunities, challenge, and good salary prospects.
2. *Cultural Reasons:* As with some other cultures in the developing countries, we empirically observed that Jordanian women are historically perceived as "soft," "delicate," and "less technical." This mentality is also not uncommon in developed countries. This puts a damper on the attitude of some parents to encourage their daughters to study engineering and technology-related fields of study.
3. *Economical Expectations:* It is expected that women make less money than men. This is more applicable in engineering and technical fields, we observed empirically. Some women are discouraged from participating in engineering graduate schools because they don't feel that they can make as much money as their male counterparts.
4. *Gender-based False Image:* Some business owners' informally indicated that there exists a false image among many businesses that hiring a woman to do a certain engineering tasks will limit the expectations of the employer from her. On the other hand, it is indicated that hiring a male engineer does not have any social barriers that might prevent him from doing all the tasks associated with a certain job.
5. *Maternity Leave:* Another reason that the businesses owners' are aware of are the responsibilities they have to uphold the Jordanian labor law in relation to the maternity leaves that a female employee might be eligible for. These employers indicate that this may put additional constraints on the will of hiring women in certain positions where deadlines and daily basis follow-ups are crucial to sustain a smooth work flow. This is the case in many engineering projects and positions.

Diagnosis and Analysis

Engineering is still often seen as a “dirty,” “heavy,” and “manual” occupation for “strong” men and unsuitable for women and it has generally lagged behind other professions². Some studies suggest that the dominance of men and the attitudes and behavior of teachers tend to reinforce this view³.

However, there has been a general trend of expansion of women into these professions. This is due to a number of factors such as the changes in the employment market from heavy to light manufacturing, service and inside office jobs, improved working conditions, including reduced working days and weeks, and more part-time work (although there is still a tendency for many professionals to work very long hours), and a general improvement in the position of women to some managerial tasks⁴. Also, it is worth mentioning that new technology has largely replaced traditional engineering occupations by computer-based work, which is more attractive for both sexes⁵. Based on statistics published by the Jordanian Engineers association in 2007, the percentage of women engineers up till Dec.31.2006 was 14.6 % of the total number of engineers as we will show in Fig.1. The ratio of women engineers in different engineering fields is shown in Table.1⁶.

As shown in the table, it is obvious that the percentage of women engineers alternates from one engineering track to another, and this is due to the idea that engineering have relatively low status, and there is considerable misunderstanding about what they actually do. There is also some confusion between the jobs of professional engineers and other technical personnel such as, for instance, car mechanics and electricians. This is likely to make the profession less attractive to women⁷. It is noticeable that the engineering tracks that involves lot of indoors work (office or laboratory work) such as the architecture and chemical engineering attracts more women to it rather than other tracks that involves heavy duty and on site tasks.

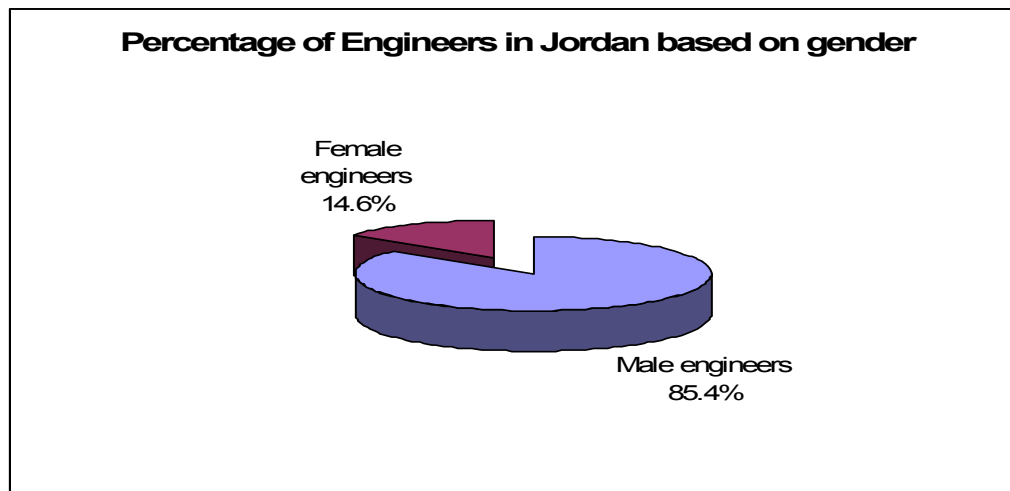


Fig.1 Percentage of Engineers in Jordan Based on Gender

Engineering track	Number of males	Number of females	Percentage of female engineers
Civil	16420	2717	14.20 %
Architecture	3609	1997	35.62 %
Mechanical	12941	846	6.14 %
Electrical	19661	2216	10.13 %
Mining	890	29	3.16 %
Chemical	2717	1776	39.53 %

Table 1. The ratio of women engineers in different engineering fields

Recommendations and Conclusion

Although there have been dramatic increases in the number of women joining the engineering profession over the last decades, women in engineering are still a minority group in Jordan. It has been hypothesized that dramatic changes in the economical and ideological systems led to changes in the way the society deals with both women and engineering, as a result of which they have become more compatible. The effects of the general situation of women and women's involvement in public life accelerated the change rate.

Due to these changes, many companies are now focusing specifically on the recruitment of women as a source of engineers. However, there are also direct benefits from employing more women engineers. For instance, market indicators show that companies with diversified workforce will have the greatest competitive edge⁸. A diverse workforce can also provide better customer match, particularly due to the increasing numbers of women in other professions forming a growing percentage of the engineering customer base, and can provide a range of different approaches to problem solving.

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