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The Glass Ceiling: Is it a State of Mind?

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Subtheme: 12.2: Role of government, industry and university policies in encouraging women in S&T education and careers

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It would be naïve to think that all women are as ambitious as to want to break through the glass ceiling, and indeed in certain categories of employment such as advertising and marketing, they do appear to have made their mark, but science, engineering and technology, do not seem to attract females in the same numbers. We would argue that this lack of advancement is not necessarily due to a lack of opportunity.

This paper addresses the role of women in science, engineering, and technology, assessing the support mechanisms offered to them to succeed in their chosen occupations. The investigation identifies factors that have led to women achieving senior levels in higher education, business, and government in the UK, thus making it through the glass ceiling.

The methodology undertaken in this study includes, desk-based research, analysis of surveys, observations from literature search and surveys, and interviews/case studies of a number of prominent and internationally successful women; and final conclusions. All comprise the three components of the Triple Helix - influence of government through legislation, uptake in academia, and attendant support mechanisms, and impact in industry.

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1. Introduction

The twentieth century saw radical changes for women in the UK. The Equal Franchise Act passed by the Government in 1928, allowed fifteen million eligible women over twenty-one the right to vote in parliamentary elections, and in the 1960s, the introduction of the contraceptive pill, initially for married women only, gave them more control over their own lives, and therefore freedom to take on full-time employment.

This was followed in the 1970s by UK and European gender legislation which was implemented to remove barriers and allow equal opportunities to women during employment, or to those returning to employment. Equal pay, sex discrimination, employment, work and families, and gender equality, have all been addressed, but still the role of women seems to give cause for concern, whether it be in the world of work, in the lack of education, or the gender pay gap. A summary of the legislation [1] includes:

1970 The Equal Pay Act - allowed men and women who were doing the same work to have equal pay and terms of employment, such as holidays, sick leave and pension benefits.

1975 The Sex Discrimination Act - covered non-contractual arrangements including benefits, such as discretionary access to workplace nursery, travel concessions, with special provisions for discrimination on gender reassignment, pregnancy and maternity, and harassment.

2002 The Employment Act - included measures to address discrepancies relating to the pay gap, including women's lower level of work experience, maternity/paternity issues, and the part-time pay gap. An equal pay questionnaire was introduced in April 2003, to make it easier to resolve pay gap disputes.

2006 The Work and Families Act - built on the maternity rights in the Employment Act 2002, to increase the pay period for women from twenty-six to fifty-two weeks.

2007 Gender Equality Duty - created a legal requirement to eliminate unlawful discrimination and harassment on the grounds of sex, and to promote equality of opportunity between women and men.

Yet, in spite of the above legislation, issues of gender equality and, in particular, a high proportion of women not pursuing a career in engineering and technology still prevailed. Factual evidence is given later.

As a starting point in career choices, it is an established fact that girls are more influenced than boys by the home environment, by the school environment, and by the opportunities and guidance offered there-in. It is contended that a combination of circumstances, ranging from parents, influenced by the cyclical nature of employment offered in science and engineering organisations, a press that tends to highlight unemployment in technology companies, and school career officers that often lack an appropriate awareness of careers in science and technology. While significant literature and databases are available to assist pupils in making career choices, the quality of guidance provided to young girls in taking up science or engineering careers is at best inclement, and at worst driven by stereo-typical pre-conceptions.

According to the UK's official graduate careers website 'Prospects Online' [2], a career adviser should provide information, advice, and guidance to help people make realistic choices about education, training and work. Nevertheless, most career advisers appear to hold a first degree in arts or social sciences, and are trained in communication skills, and hence do not usually have the requisite background to influence girls to continue to study science, engineering and technology (SET) subjects.

2. Initiatives to Support Women in Science, Engineering and Technology

To encourage female participation in SET, a number of initiatives have been introduced by professional bodies and organisations which provide formalised support and mentoring to assist girls and women working in these areas. Currently, some of the programmes actively pursuing this aim include:

- The WISE (Women into Science, Engineering and Construction) Campaign was established in 1984 to work in partnership with industry and education to inspire pre-19 girls into Science, Technology, Engineering, Mathematics (STEM) studies and careers by offering systematic support through initiatives on targeted topics and opportunities [3].

- Founded in 2005, the Athena SWAN Charter for Women in Science is supported by the UK Resource Centre for Women in SET and by Equality Challenge Unit. It recognises and celebrates good employment practice for women working in SET in higher education and research in the UK [4], and to date have made seventy-five Awards to institutions' in recognition of their achievements in recruiting, retaining, and supporting women in the science, engineering, and technology fields.

- UKRC (UK Resource Centre) for Women in Science, Engineering, and Technology, is the UKs lead organisation funded by the Department of Business, Innovation and Skills to promote gender equality, and provide training, mentoring, and professional development opportunities to women throughout their working lives, particularly in the areas of science, engineering technology, and the built environment [5].

- The Royal Academy of Engineering (RAE) has been a major contributor to the promotion of diversity in the STEM professions. It is a strong supporter of the initiatives detailed above, and recognises inspiring women engineers through fellowships and awards [6].

- The US Society of Women Engineers (SWE) encourages women to *aspire, advance, achieve,* at every stage of their career. It promotes engineering as a highly desirable career for women by advocating training and development programs, as well as networking opportunities, scholarships, and outreach and advocacy activities [7].

- The UK Institution of Engineering and Technology (IET) [8], and the US Institute for Electronic and Electrical Engineering (IEEE) [9], have programmes to encourage the participation of female members in technical disciplines worldwide.

- Founded in 2000, the IEEE sponsored, the Nerd Girls Club [10] is a growing, global movement with members who cross generation and gender lines, to celebrate individuality, as well as encourage girls to change their world through science, technology, engineering and mathematics, while embracing their feminine power. NerdGirls.com is an international online community with several thousand members who 'celebrate their inner nerd and their femininity' and an important part of their mission is to dispel the myths and stereotypes about women in engineering.

A key issue here is the success or otherwise of such initiatives. For instance, the WISE Campaign aimed at attracting women into science and engineering disciplines has been in existence for more that twenty-five years, and yet the proportion of girls entering engineering departments in UK Universities, in particular, has not increased significantly; as a percentage, ranging from low teens to single figures

This is reflected in the poor representation of women in the engineering professions and workforce. A recent study has indicated that only 9% of UK engineering professionals are women compared to 18% in Spain, 26% in Sweden, and 20% in Italy, representing the lowest proportion in Europe [11]. This continuing lack of female engineers is one of the major barriers to tackling skills shortages in the UK sector.

In the same vein the ATHENA Programme has been operating in UK universities for over ten years, and yet the number of women professors in SET subjects has not seen any marked increase:

Interestingly the following Table illustrates the lack of increase in the uptake of STEM subjects by female students entering universities in the UK over a ten year period [12]:

Subject type	1998-99	2003-04	2008-09
Physical sciences	36	40	41
Mathematical sciences	37	38	38
Computer science	22	24	19
Engineering and technology	14	14	15
Total proportion of female students (%)	**55**	**59**	**59**

Table 1: Percentage of Female Students taking STEM Subjects

3. Current Situation

(a) Academia

Table 2 illustrates SET academic staff by professorial status and gender in UK universities. This shows that although female numbers at professorial level in SET departments in universities are low at 14.5%; non-professorial staff show a fairly healthy 42%.

2010	Female		Male		Total
	No	%	No	%	No
Professor	*3,270*	*18.7*	*14,265*	*81.3*	*17,535*
SET Departments	**1,470**	**14.5**	**8,710**	**85.5**	**10,180**
Non-SET Departments	1,800	24.5	5,555	75.5	7,333
Non-professor	*74,475*	*46.1*	*87,025*	*53.9*	*161,500*
SET Departments	**35,475**	**42.0**	**49,040**	**58.0**	**84,515**
Non-SET Departments	38,995	50.7	37,990	49.3	76,985
TOTAL	*77,745*	*43.4*	*101,290*	*56.6*	*179,035*

Equality Challenge Unit, Equality in Higher Education: Statistical Report 2010 [13]

Table 2: SET, non-SET Academic Staff by Professorial Status and Gender

A perceived barrier facing women who wish to progress their career in academia is being subject to adverse ‘weed-out’, finding that they have to work harder and be better qualified than their male colleagues to be selected or promoted to senior of professorial levels. When they do reach a senior post they require to have more items of merit, and tend to be much older [14].

Another alleged theory is that of gender devaluation, when a woman is appointed to serve as a committee chair, department chair, or dean. When a male has the position it is seen to confer status, respect and power, but when a woman takes the post the status and power seem diminished [15].

A further critical issue that should be factored into this discussion is the impact of women taking career breaks, on their prospects when returning to work, and the consequent impact on their professional career progression. The lack of universally available crèche facilities at work plays its own role here.

(b) Business/Industry

The issue of under representation of women at boardroom level in business and industry has for some time been the subject of much discussion due to the apparent lack of women obtaining company directorships. The leadership position of women on the Board of the top 100 UK companies listed in the Financial Times on the UK Stock Exchange (FTSE) [16], shows disappointing statistics:

Female FTSE Index 100	2010
Female held directorships	**135 (12.5%)**
Female executive directorships	**18 (5.5%)**
Female non-executive directorships	**117 (15.6%)**
Women holding FTSE directorships	**116**
Companies with female executive directors	**16**
Companies with at least one female directors	**79**
Companies with multiple female directors	**39**
Companies with no female directors	**21**

Table 3: Female representation on FTSE Index 100 Companies

In his independent review 'Women on Boards' published by the UK Department for Business Innovation and Skills in February 2011, Lord Davies of Abersoch made several recommendations including that 'All Chairmen of FTSE 350 companies should set out the percentage of women they aim to have on their boards in 2013 and 2015. FTSE 100 boards should aim for a minimum of 25% female representation by 2015' [17].

He was of the opinion that more women in the boardroom would improve the culture and practice, address any unconscious bias, increase transparency in recruitment and the appointment process, and broaden access and nurture the talent pool.

The review found that women made equal progress to junior management level, but then appeared to drop out due to, he concluded, lack of access to flexible working arrangements, difficulty in achieving a work-life balance, and also disillusionment at lack of career progression.

The review discussed the current practice being adopted in several European countries - that of setting quotas. However, his recommendation was not to implement quotas, but that prescriptive alternatives are put in place by the UK government. In countries where quota setting has been applied, the approach had been successful, but this method was thought to include women to equal the gender balance, rather than by recruiting them on merit.

(c) Government

Representation of women currently members of the UK Parliament (House of Commons and House of Lords) is the highest on record since the first General Election in 1918 when women were allowed to stand as candidates. From of a total of 1,623 candidates that year, only seventeen were women, and one was elected.

Table 4 details the current membership of the UK Parliament [18], which shows little difference in Female representation between the two Houses:

May 2011	Men	Women	Total	% Female
House of Commons (members)	**506**	**144**	**650**	**22.1 %**
House of Lords (peers)	**649**	**181**	**830**	**21.8 %**

Table 4: Gender Representation in the UK Parliament

Note that of the 650 MPs (Members of the House of Commons); no more than sixty-seven have a background in STEM subjects, including only thirteen women. Thus less than 2% of the MPs are females with a STEM background [18, 19].

(d) Media

It is often stated that the profession of engineers and scientists would gain status and popularity if it were portrayed more positively and more often in the media and on television. Role models in the media may attract greater attention and, in particular, influence youngsters in their choices of careers. Scientific and professional engineering organisations lay great store in promoting such media presence. Recently a substantive piece of research was conducted on the representation of women in SET in on-line media, the reason being the rapid growth of web pages, and the proliferation in the use of the Internet [20].

The research covered sixteen media related websites, interviews with web authors and young web users. Of the websites, eight were generalist, such as BBC, SkyTV, etc, and eight were SET specific, such as the New Scientist, the Science Museum, etc. Interviews covered some forty others. A key finding is that science information content of online sites is male dominated with far more men than women present. Other observations on a women's role were that:

- SET women are pictured but remain anonymous, or are used mainly as science journalists reporting other's people scientific work.

- There is continued marginalisation, where women are subject to clustering in specific website sections, particularly those about ‘feminine’ subjects or specifically about women. They were portrayed as being peripheral to the theme, and appeared as subordinates, students, young scientist, or relatives to male scientists.
- Presented in terms of ‘feminine’ attributes and activities, notably as caring, relating to children and animals, rather than to the physical world, which is associated with masculinity.
- Predominantly white, middle-class, able-bodied and heterosexual.
- Discussed in terms of appearance, personality, sexuality, and personal circumstances more often than men, detracting from their scientific contributions.

Overall, the analysis showed that online representation of women in SET lacked diversity, and was dominated by a few archetypal portrayals. Among these, key emerging figures are the young female SET communicator and the bad woman scientist.

4. Observations

The above neatly leads to a set of observations. In spite of support mechanisms available in the early years, women are not taking up engineering, business, or even politics as a profession, and of the proportion that do enter, very few are progressing to positions of influence; and yet women in other areas of employment are succeeding in climbing up the ladder.

Reasons given for leaving employment include: poor working conditions, too much travel, lack of advancement, low salary, workplace climate, dislike of boss, lack of train or professional development, and company culture. However, this list could be applied equally to male or female employees. [21]

Female specific reasons include: desire to spend time with family, workplace culture unsupportive of women, being treated in a condescending, patronizing manner, being belittled or undermined by a supervisor.

Women who graduated during the years 1984 to 2010 were asked the question *‘why did women with an engineering degree never enter the engineering field’*. Table 5 details the responses of the 716 questioned:

Reason	No
Management not appealing	**20**
Too difficult	**24**
Low salary	**46**
No advancement	**39**
Not flexible enough	**43**
Could not find a position	**49**
Never planned to enter	**103**
Wanted to start own business	**116**
Did not like the culture	**115**
Not interested in engineering	**161**
TOTAL	**716**

Table 5: Females not Entering Engineering after Graduation

Table 5, therefore, illustrates that not all women who obtain a first degree in engineering choose to continue in the field, with 103 never planning to enter the field, 161 not interested in engineering, and 115 did not like the culture, at the completion of their degree course.

Recent cutbacks by the UK Government in public sector jobs, as a policy to reign in public sector expenditure, are likely to have a number of unintended consequences. Since women make up a much larger proportion of public sector than private sector workers, it is likely that they will be disproportionately affected by the cuts. In the UK, women make up 65% of the public sector work force (about 40% of all women in work in the UK are employed in this sector).

Further, statistics for SET show that women with STEM qualifications make up a much larger proportion of public sector employees than the private sector: There are about 291,000 female STEM graduates, which is 20.8% of all STEM graduates employed in private sector. In comparison, 251,000 women make up 43.1% of all STEM graduates in public sector (UK Office of National Statistics data from January-September quarter of 2009) [19]. Thus the planned Government cutbacks are likely to affect over 250,000 women with STEM qualifications working in public sector!

5. Gender Indicators

Much research has been conducted to measure a number of aspects of equality, and to use these to identify gaps between the genders, and as vehicles to involve women into SET to promote social and economic development, including:

- Global Gender Gap - developed by the World Economic Forum/Global Gender Report 2010 [22].
- Gender Empowerment Measure (GEM).
- Gender Development Index (GDI).
- World Gender Empowerment Map

Note that the GEM and GDI have been developed by United Nations Development Programme (UNDP) to measure inequality [23], while the World Gender Empowerment Map aggregates the data from the Gender Empowerment measure and produces an image of the results obtained on a World Map that instantly illustrates the inequality plot across different parts of the globe. A global map is also produced.

The Global Gender Gap Index, introduced by the World Economic Forum in 2006, is a framework for portraying gender-based disparities and tracking their progress. The Index benchmarks “national gender gaps on economic, political, education, and health based criteria”, and provides country rankings that allow comparisons across regions and nations, and over time. The basic concepts underlying the Index are: it measures gaps rather than levels, and it defines gaps in terms of outcome variables rather than gaps that may represent input variables.

The structure of the Index comprises four measures: Economic Participation and Opportunity, Educational Attainment, Health and Survival, and Political Empowerment. According to the Index UK is ranked 15, USA is 19, while Iceland, Norway, Finland are respectively 1, 2, and 3. The following radar plot illustrates the Gender Gap Index as computed from the data available in the Report in 2010 [22]. Note that for these countries, while the Index is extremely sensitive to the factor on political empowerment, the other factors are relatively equivalent.

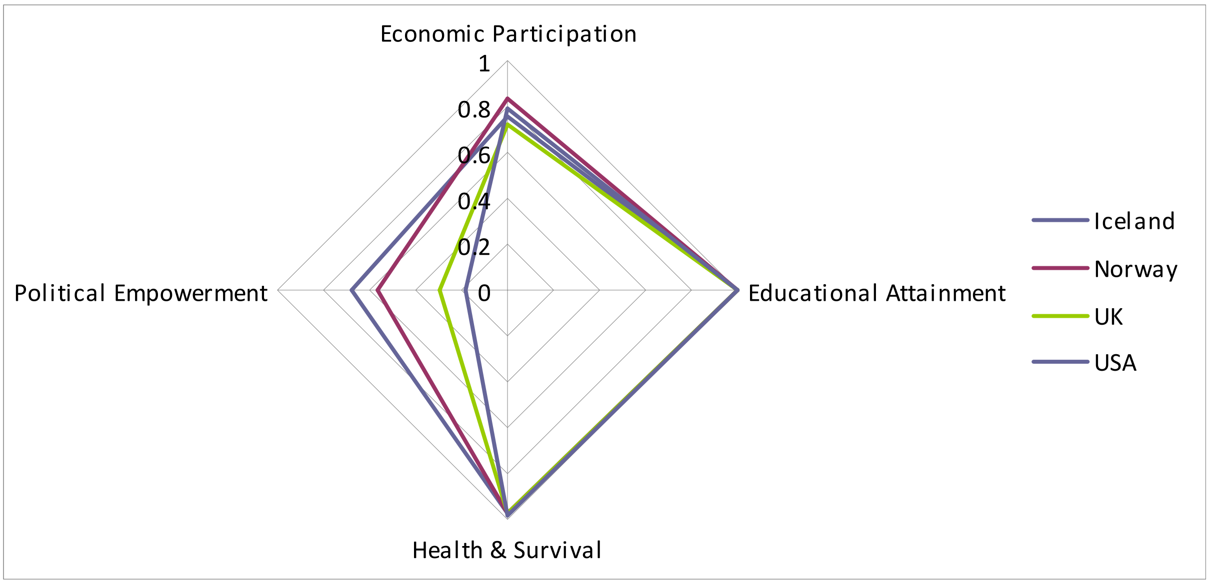

Figure 1: The Gender Empowerment Measure (GEM)

The above Figure is a composite indicator that captures gender inequality in three key areas: the extent of women's political participation and decision-making, economic participation and decision making-power and the power exerted by women over economic resources. The key elements of GEM include the factors (as a percentage of total): seats in parliament held by women; female legislators, senior officials and managers; female professional and technical workers; women in ministerial positions; ratio of estimated female to male earned income. On the basis of this Index, Sweden, Norway, and Iceland, are ranked 1, 2, and 3 respectively, while the UK is ranked 21 and USA is13 [24].

The Gender Related Development Index (GDI) table is a composite index that measures human development in the same dimensions as the Human Development Index (HDI) while adjusting for gender inequality in those basic dimensions. The HDI is a comparative measure of life expectancy, literacy, education, and standards of living, for countries worldwide. It is a standard means of measuring well-being, especially child welfare. It is used to distinguish whether the country is a developed, a developing, or an under-developed country, and to measure the impact of economic policies on quality of life. The components of this Index are - a long and healthy life, knowledge and standard of living. For the UK the Gender Inequality Index is 0.369, for USA this is 0.400, while for Norway it is 0.234 and for Sweden 0.212.

The World Mapper is a device where territories are re-sized on each map according to the subject of interest. In this instance, the information is simplified and produced in a graphical form that represents the computed values for the Gender Empowerment Index across major regions of the world. The graph represents the Gender Empowerment Measure score on a scale of 0-1000. 1000 represents women with equal opportunities to men [25].

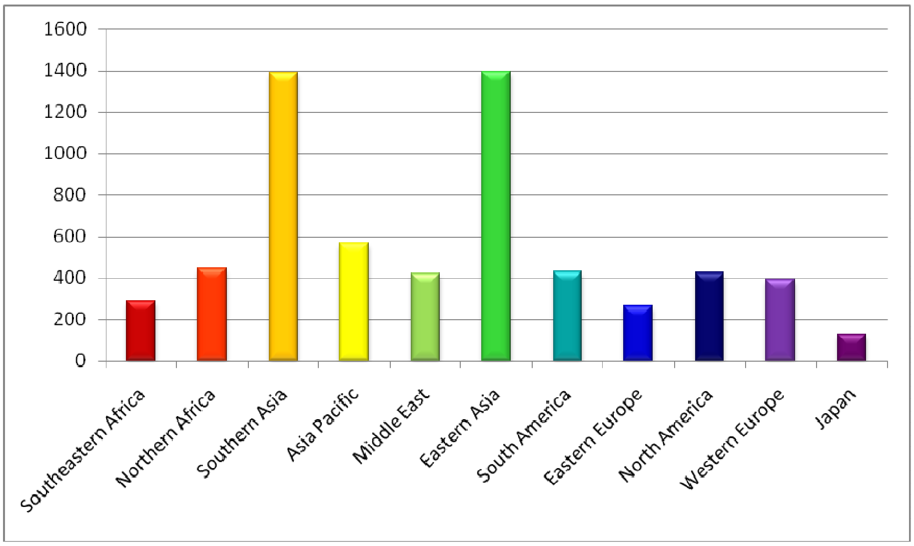

Figure 2: World Gender Empowerment Map

The map shows how populations rate on the Gender Empowerment Measure, using the data from the UNDP Human Development Report [24]; this measure is an indicator of opportunities for women. It takes into account the female share of parliamentary representation; proportions of legislators, senior officials, managers, professional and technical employees who are women; and the ratio of female to male earnings. By this measure no territory has as good opportunities for women as there are for men.

From the Map it may be seen that the territories where women have the most opportunities are in Western Europe. The fewest opportunities for women are in the Middle Eastern territories of Yemen and Saudi Arabia. There was no data for any territory in Central Africa. Territory size shows the relative degree of gender equality for the people living there (population multiplied by gender empowerment measure).

6. Case Studies

In addition to the above research, a series of case studies were undertaken with prominent women working in the SET arena, to reinforce the general observations from the surveys and literature searches. The Case Studies results are based on observations and viewpoints of chairs of technical corporations, prominent industrialists, highly placed females in the defence industry, senior academics, and government officers.

The work carried out has been summarised in the form of responses to queries on specific issues. To make the narrative easy to assimilate, the observations are included as answers to the queries, rather than as a general set of observations.

- **"It has been a long time, but we are not yet there". What do you perceive as the principal obstacle to women becoming successful in engineering in the next few decades?**

Women need the following factors to succeed in any profession: role models, flexible work hours, mentors and champions.

A lack of women in the discipline equipped to succeed against the "odds", which include (a) male co-workers with blatant biases against female colleagues; (b) male co-workers with a subconscious biases against female colleagues; (c) the frequent requirement to choose between career and family life (including the apparent relative rarity of husbands, who supports their wife's career); and (d) the "politically correct" work environment built into many Western companies these days, which while regulating "potentially offensive" speech and behavior also puts stress on inter-group relations by overemphasizing caution in communication outside of one's "group.

Women, particularly school leavers, do not see the big picture of what engineers do. They don't understand the disciplines of engineering and receive very little encouragement to pursue these fields.

Women are often their own worst enemies. Minorities in general need to realize that they are in a powerful position. Being different is powerful. However, bringing up the 'gender' issue is akin to playing the race card in today's society.

Women keep looking for that magic bullet that will help them become successful. People have to empower themselves. They have to have drive and ambition. This is not something that can be gifted, or an obstacle that can be removed. It is risk taking, hard work, long hours, and sacrifice. Anyone can have a job, to truly achieve; you have to work every day at extraordinary success.

Women will not be unsuccessful in engineering in the coming decades. Those women who select engineering as a career make a conscious decision; because of that, they become members of technical staff in companies, high level managers in companies, and professors at universities. This will continue to be the case. The main issue is that in many countries the numbers of women who select engineering as a career are less than men and it's not all engineering fields, but specific ones such as electrical engineering and computer engineering.

Attitudes that cause girls to think that an interest in mathematics and technology is not good are a prime cause for girls not to pursue these areas.

- **To what extent do you blend your personnel and professional life to achieve a work-life balance and what has helped you to be successful in managing your time?**

To succeed there appears to be no work-life balance in the early years of one's career. Later on, with success, and family, one mellows

An understanding partner can be a great help. More so if he is willing to adjust his career to suit that of his female partner.

In some cases, women leave the workplace permanently to raise families because there is no middle ground to work part-time and raise a family.

‘Work-life’ balance is assisted if there is a partner who has a similar moral, ethical, social, etc. background, willing to share equally, be understanding and support the home front.

Love mathematics; love being an engineer, and love the job, are key ingredients in helping to manage time at work and at home.

There is not a lot of ‘blend’ but having family support to allow working when required, and facilitate having both a family and a career is the way to success and happiness. Time flexibility at work is a huge advantage.

- **Did you have a ‘Mentor’, and would you say that guidance and sharing of experiences was a critical factor in your professional career?**

Seeking mentors and guiding others is important. Reliance on advice from various folks at various times is helpful. One’s partner can be a useful sounding board.

Mentoring can be critical. It is invaluable to be able to receive feedback from someone not involved in personnel reviews, from someone who has “been there before”. Impartial guidance is crucial.

With male mentors, guidance is limited to the tasks needed to be completed. Need to be able to navigate around the personalities to be successful.

Someone to talk to and use as a sounding board is always a great thing, but not certain that a specific person as mentor can help career development. At the end of the day, it is the individual who makes or breaks our career, and a bit of luck is not such a bad thing either.

- **It is thought that the presence of women in the Boardroom can improve business performance. Do you think there is any truth in this observation?**

As the only woman in the boardroom for the past six years, it is noted that women need to continually prove themselves to be taken seriously. Nevertheless, women need to know that it is realistic and need live role models that are making it today.

Increased diversity in the boardroom can improve business performance for companies with diverse markets and partner ecosystems, since the board should be able to understand (and to some reasonable degree reflect) the market, customers, and partners of the company that they are directing. Diversity improves business performance.

Women in the boardroom will make the team think differently. The presence of any competence in the boardroom, along with different perspectives, will always contribute positively to business performance, so of course this is true.

- **Do you sense that men still have a ‘gender bias’, or since more women become visible in Engineering, has this attitude changed?**

Several men in decision making positions have little exposure to women in similar positions. They are not sure how to “deal” with them. They are used to having home makers at home who follow their “directives”. Hence they often view questions from a woman as challenging their authority rather than another view point.

Some men don’t like competing with women and still believe that women are only moving up as a token of diversity and not due to their qualifications.

Most people have certain gender (and other) biases as part of their upbringing in society. To what degree they allow these biases to interfere with their relationships with coworkers and other professionals is the question?

In the technological field, intellect reigns supreme - this is what is wonderful - it is the great equalizer. People who are unqualified, unmotivated, or untalented, simply do not last.

- **Are School Career Advisors taking due care to encourage female students to take up the option of Engineering, or is it still presumed to be the domain of the male student?**

It is tough for women to balance work and family and the “maneuvering” that is needed to get promotions. Organizations make no concessions for women who often have to burn the candle at both ends.

No, because school advisors don’t have enough exposure to what engineering careers are either and teachers are not skilled and have no time or resources to incorporate these topics in the classroom without substantial external volunteers and help.

Career advice may be given, but some change their mind in mid-course from Engineering or Computer Science, into Arts or Humanities, as the former require intense work and devotion.

To become an engineer or computer scientist you have to LOVE to solve the problems for the sake of solving them. You have to be able to take tremendous self satisfaction in knowing that you were able to crack the solution (after what may be hours and hours of effort) and then move on to the next problem. Being an engineer to me is a kind of addiction. This is not a gender issue.

- **With all the government legislation, professional societies for the advancement of women in Engineering, and a growing number of gender-based Awards, what would you surmise to be the reason for the still low participation of women in engineering?**

In India there are women in engineering - it is not an issue - the problem is the high exit at mid levels - typically those with ten plus years experience. It is rare to see women beyond thirty-five or forty years of age in organisations unless the organisation has a specific women friendly policy.

Some provocative statements including suggestions such as: special societies and gender-based awards hinder, rather than help, by making women look like the odd ones in the field. Even worse, laws to simply promote people of “under-represented groups” to some degree hurt, since as a result everyone from group X that has achieved their position based on their personal accomplishments, drive, and stamina, begins to be viewed by people outside of X as having received the position as a result of some government quota.

What is needed is government legislation with real measurements and real teeth to punish cases where gender (or racial or other) bias is impacting the structure of a company

It may be that “favoritism” or “reverse discrimination” (as oxymoronic as that phrase is) contribute to the reasons for low female enrollment in engineering - why would a young girl want to enter a field where she will be the strange one? A few are motivated by such a thing, but most people want to belong to a group, not stand out from it.

Stereotypes of smart women are unappealing to youth and no access to the big picture of what engineers do.

You cannot legislate, promote, and award folks into the kind of dedication, talent, and effort that is required for engineering (or other complex science and technology related fields).

There is a general perception in many countries that women are not smart enough to deal with mathematics and physics. It’s funny because there is no such perception for the medical profession. There is also the fact that the generation Y wants to make money as quickly as possible and they feel like engineering doesn’t pay well and won’t make them a CEO of a company. In the US that it’s not only that women do not want to become engineers but in general students don’t prefer engineering as a career.

Women are not starting into the careers, in the first place, as evidenced by the statistics for the percentage of engineering students who are women, and also that they are getting more pressure than they want to deal with in the attitudes of those in the field once they start working.

- **Do you think that the much maligned 'Glass Ceiling' still exists?**

Of course it exists. No one will publicly admit it. It is only in rare organizations that they have succeeded in breaking it, and that is because of extraordinary visionary leadership.

Yes it does exist, for any group not already significantly represented at the top. As concrete examples these may involve Japanese men and European women in an organization run by Italian-American men; Caucasian men in an organization run by Russian men; European men in an organization run by European women. On the other hand, I have seen a number of people break through the "Glass Ceiling" through their own skill, initiative, and persistence.

It's more of a "sticky floor", where individuals make up excuses to hold back a woman's success and making her work far harder than others to reach the same level of success as her peers.

No, look at the number of CEOs, number of women on corporate and non-profit boards of directors. The numbers are representative of the number of women who are qualified and are working in the field. Note many women still prefer to stay home. The need is to focus on challenging the youth to become more creative, goal oriented, and success driven.

Yes, it will exist as long as there are men with attitudes about women, but then, there are also other attitudes that will be used against others, since business worlds are very competitive.

7. Conclusion

In conclusion, it is apparent that much goes on to assist women working in engineering to progress to the highest level in their chosen field, be it academia, business or government. Although not an uncomplicated or simple endeavor, success and progression has more to do with the skill, persistence and confidence of the individual. The workplace is full of assorted challenges which have to be tackled head on to be beaten.

It is no doubt still a man's world, but slowly and surely women are making progress to tilt the balance, thus, through their own efforts and on their own merit, dispelling the myth of the glass ceiling

The following comment encapsulates the spirit of the findings of the study:

"In general, women can do anything and they should be given the chance to further themselves. Company policy of treating women and minorities "differently" can be insidious. Individuals should be hired because they are good, not because they are women. As a manager engineer; it is the skills set of candidates and not their gender that is important".

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