

Women's Employment in Technical Areas-Case Study of a First Woman Signal and Telecommunications Engineer of Indian Railways

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Abstract

Women's entry into non-conventional areas is observed in the contemporary India with women emerging equally in various fields, though it is still tokenism with only a few women being represented in leadership positions. The Female Work participation rate is declining in recent years. In India only 25.51 percent of the Labour Force constitute women (Annual Report 2016-17, Ministry of Labour and Employment 901 Pg.118) and 94 percent of these women work in the informal and unorganized sector (Geetika et al, 2011). There have been several researches which have evidenced that the women are forced to give up their career for marriage and child care, which happens more at the mid management levels as women struggle to maintain work and life balance. According to a survey conducted by Kelly Global Workforce Insights, 2015, Science, Technology, Engineering and Maths (STEM) fares the worst where as high as 41 percent of the women in technology based companies have been reported to have left after 10 long years of experience (KGWI, 2015) primarily for being not able to manage the dual burden of home and career. Nearly 81 percent of the women in STEM sectors perceive bias in performance evaluation. There is a huge gender gap in the field of science and technology in terms of women's participation, promotion, and sustenance. There are several areas in which women's entry can be seen and woman entering into Railways as a technocrat in the early 1980s is rather a rare phenomenon in the given social construction. In this background, to find a woman leader in Indian Railways (IR) one of the toughest government departments with 35 years of outstanding public service is a reflection of the grit and determination of the woman to be upheld as a role model to others aspiring to working in science and technology. This paper discusses the Challenges and prospects of a woman Railway technocrat in Southern Railways.

KEYWORDS: STEM, Leadership, dual burden, tokenism, bias, work life balance, glass ceiling.

Introduction:

The status of women in India was first revealed through the formal Government of India Report "Towards Equality" 1975 which was really an eye opener for the State to understand the issues that the women and girls face in the society in the Indian context. Historically, parents have not wanted to spend too much on a girl child's education for various socio-cultural reasons. Discrimination against woman begins before her birth as the practice of female feticide would show; she has been considered a burden from day

one (Reshma & Ramegowda, A., 2013). In India, the patriarchal society has a deep rooted preference for the male child (Mota, Casaca, 2016). The widely prevalent system of dowry is seen as a compulsory element in a daughter's marriage regardless of her contribution to the family's income (Mota M. Casaca, 2016 & Nitya, 2013).

Issues around women, particularly inclusiveness and leadership that were discussed in the UN Conference in September, 1975, continue to be the topics of discussion even to this day. The same problems and challenges continue to persist in the 21st century. There has been considerable research on the status of Indian women which bring out that women are victims of patriarchy, hatred, biases, prejudices and stereotypes (Mota M. Casaca, 2016 & Nitya, 2013). Social and cultural barriers prevent them from entering the labour market. It is often presumed and preconceived that participation in STEM fields is tough with arduous working hours, hence not suitable for girls and women. According to the figures of 2015-16 All India Survey of Higher Education by the Ministry of Human Resources Development, Government of India, total enrolment in higher education has been estimated to be 34.6 million of which 16 million are girls constituting 46.2 percent of the total estimate.

In the Report of the National Task Force for Women in Science, Department of Science and Technology⁷ Ministry of Science and Technology, Government of India, (2008) the members noted the 'glaring fact' that the percentage of women amongst professional scientists (and they used the term inclusively for all STEM) is extremely low (average 20 percent) compared to the percentage of women among science students where the national average was 40.5 percent. In fact the Department of Science and Technology has constituted in March, 2016 a Standing Committee for promoting women in Science to address the low representation of women in Science and Technology domain.

The aforementioned task force found that stereotypical perceptions about occupations exist. The "image of Science and Technology as a male only domain is a dominant perception" and once women are married and have family responsibilities they would quit because it is expected by society that families are priorities for women. The general feeling among people is that a 9-5 job will best suit woman to balance home and career. The fact is that such concerns and sexist notions of associating only women to home or household activities, emphatically convey the dominant discourse of patriarchy to reinforce the sub-ordination and docility of women, and associated politics of not allowing women to emerge.

Literature Review:

Review of related studies in the field has been presented to understand various issues in women employment and leadership positions, the strategies to balance home and career by women. The experiences at school level determine entry of girls into the science streams. Yardi et. al (2017) found that there are several commonalities and stark differences between the US and India in so far as women in the field of computer science are concerned. While in the US, Computer science is considered nerdy, in India parents prefer that their daughters studied Computer Science. Engineering and Medicine as the fields of choice. In the US, students report gender disparity. They also report that teachers gave preferential treatment to male students. Whereas in most other areas and later in life,

in their homes and offices Indian women students do report bias and discrimination, they state they find none of it in schools.

Gupta (2007) finds that while entry into science stream is encouraged, parents hesitate to send their girls to elite institutes such as the Indian Institutes of Technology since this may entail travelling out of town, living there and studying in a predominantly male environment. All this is perceived to be fraught with social risks. Also getting admission in such elite institutions would need expensive coaching and tuition and **parents are less inclined to spend on expensive coaching on girls since in a patriarchal society benefits of expensive higher education would accrue to the husband's family. In the working space, Gupta also finds that in most organizations women are lacking in decision making levels.**

Saha 2013 has said that there is widespread bias in household expenditure in education both in rural & Urban India when per capita expenditure on education for male and female students is analysed. These household's decision to allocate fewer resources to meet educational expenditure for females may be influenced by differential returns for such investments for males & females. Khandka et.al (2012) report that **education empowers women and has a positive effect on the well being of their families, society and nations.** In their report, the Task Force set up by the Ministry of Science and Technology in evaluating and enhancing women's participation in STEM fields, found that among practitioners of science and technology in India, women were in a minority. Many qualified women **drop out of the workforce due to reasons such as family priorities, bias at the workplace, isolation,** etc. The task force also found that there was lack of women at the senior most administrative and policy making positions. They also state that right from birth, females are perceived as burdens and are rejected.

In order that women develop both academically and professionally, it is important that they have proper mentors. Availability of a strong mentor would ensure that the woman continues in STEM stream. Lack of guidance in technicalities of the job, knowledge and experience sharing, support and instruction and "intellectual provocation by the mentor to mentee" would ensure that women do not quit STEM and persist in it. (Dawson et.al., 2015)

It is important and necessary to have women in leadership positions who can stand up for women and be heard. Mere Tokenism or Provision will not be enough. Kurup and Others (2017) report that the meeting to discuss Women in Science drew focus on the requirement of mentoring for women in STEM, networking and leadership building. Women need to move from isolation to networking.

From the literature survey it could be understood that the social perception about the girls education and their concern on family as the priority often stand as barrier in deciding which type of course that the woman should choose and what nature of career to select. It is understood from the literature survey that the girls choose computer science and medicine as their choice in the contemporary context thereby stereotyping further. Entering into Engineering and Technology again makes them choose soft core areas and not Mechanical or civil engineering. Even if they choose these fields, it is quite rare to see women joining mechanical or civil engineering fields to remain the work that their

male counterparts do. Further, parents perceive that the investment or expenditure on girls education and on coaching does not bring the returns to their family and hence do not invest on their daughter's education. There is a perception that instead of investing on their education, if it is saved, could be used for their wedding and gifts or dowry to be paid. Such perceptions are not associated with expenditure on education of their sons which indicates the extent to which patriarchy is present and prevent women from progressing even though in some studies it is evidenced that education of women helps to improve the well being of family and nation. It is further revealed that family priorities, work place bias and isolation, lack of knowledge and guidance on the technicalities on the appointed position and, work, actually force the women to go to the extent of leaving the job. It is suggested that there is a need mentor to the women to sustain in STEM for which the support from peers, management etc re necessary. Networking among the women employees is also a must to share, mentor and sustain. Hence the state, the family, work place, the education institutions need to focus on strategies based on above mentioned issues, where the perception starting from considering girls education as not bringing returns to parental home to the women's priority must be family, must be rebalanced with attitudinal change, as these are basic needs, before attempting to ensure women's participation.

Issues of Women in STEM:

There has been gender bias in disciplinary choices of women in the beginning. With the advent of privatization, where massive opening has been on the job oriented, innovative, new courses related to Science and Technology, the private colleges took Education as a commodity and students as products completely commercialized education, giving up totally the social sciences and humanities and started focusing on Science, Management, Technology, commerce. Students in rural areas were motivated to join higher education by arranging transport to pick and drop them back in their door steps, where they had no option but to choose the S&T courses alone. Hence increasing enrolment if at all is there since 1990s of girls in STEM fields could be attributed to the above phenomenon where the students have not been left with choice to make other than STEM which does not stand to convey that girls are increasingly enrolling into STEM Courses. There are three issues surrounding women in STEM;

- women joining the science stream;
- retention, respect and
- recognition of women in STEM; and obstacles faced by women in STEM.

It is globalization and privatization that helped the girls to enroll in STEM and get a college degree & in this field. Gender differences do exist in Engineering and Technology where the girls outnumber in Computer science Engineering courses and boys continue to outnumber in Mechanical Engineering, thereby indicating that the reforms introduced in no way changed completely the disciplinary choice of girls and boys from making their choice to masculine and feminine disciplinary choices as traditionally being opted for. Same is true with science where Physics and Chemistry are still considered as domains of men and biology, micro biology etc are still the choice of women. Though again it could be observed that girls also choose such Natural science courses beyond Botany or Zoology, still their movement on the ladder is stuck after a

point say with either Undergraduate or if allowed for some girls to continue with parental educational and economic background, government Scholarship to the Post graduation with only a miniscule percentage to move forward to Doctoral Degree. So there is a leakage and drop out of girls in STEM fields which commences from graduate degree onwards.

The issue is what happens to girls who made a choice to STEM. Why do they drop out? Was it for personal or social reasons or both. If the focus of education and employment are not the same for boys and girls and men and women, what is the use of speaking of gender equality, where to start? Without structurally addressing the issues, is it is unfair to talk about the women's quit from STEM? These questions are to be answered before proceeding to talk about women to sustain in STEM.

Entry of Women in Indian Railways:

- Railways is a major sector in India, a public sector which being an equal opportunities organisation has provided entry of women, though there are perceived structural and social barriers for women. But still women employees constitute just 7 percentage to the total. (Indian Railway Annual Statistical statements 2015-16) Statement 40(II) & Statement 40(VII)) When it comes to technical, leadership and decision making positions, the figure is still lower.

It is evidenced as per the Indian Railway recruitment History, that the Women have been entering the Indian Railways Services since the 1950s. The first woman Officer was an Accounts Officer, who joined Indian Railways in 1956. However, it took more than 25 years before a woman joined the Railways as an Officer in the Signal and Telecommunications Department. Hence there have been gender barriers which are socially and culturally in built preventing women from studying and entering into such technical fields. Women who wish to enter such fields are real role models to other women as it is really an adventure and experiment to show to society what women can do if opportunity is provided. It is in this background the present study has been attempted to provide a successful case study of a woman Railway technical officer in the Signal and Telecommunication Department. A day should come where, the prefix of woman signal officer, not be given, when it would be quite common either for women or men to become an engineer in the railways. Such mainstreaming would be initiated and inculcated by presenting in a research and gender perspectives the role models.

In the given social structure and gender imposition, it is equally true that the women quit STEM fields not because they lack the ability or talent but because they do not have proper guidance in the form of a mentor or a role model to follow. Feeling of isolation, not having female peers and difficulty in balancing a demanding career with a fulfilling family life makes them leave¹. Although things are changing considerably, that change is not as pervasive as it ought to be. In this context, it is worth bringing the retention of a woman Indian Railway services in the completely male dominated area namely Woman Chief Signal and Telecommunications Engineer for nearly 35 years. There are only around 35 Women Signal and Telecommunications Engineers scattered all over Indian Railways and on Southern Railway there is only a handful at present. Hence, selection of one of the women for the case study for this paper, so that her experiences can be told for the benefit of women aspiring to STEM areas of work.

Significance for the Study:

Although there is considerable literature available about the status of and challenges faced by working women yet there are very few narrative accounts available about the individual women in STEM areas whose experiences are written about. The Indian Academy of Sciences has been creating a database of women scientists in India. In the recent past, with the achievement of the Indian Space Research Organization in launching 100 satellites into space in one go, the presence of women scientists has come into national focus and a number of newspapers and periodicals have covered these women achievers.

There is no literature available on the women engineers and technocrats on Indian Railways. The Indian Railways, the fourth largest railways network in the world, employing 1.3 million people, is a highly technical and operations oriented organization which employs women in various roles. Although there is no bar on women entering any area of operations in the railways, yet, there are very few women in the technical services especially in the higher echelons. Giving a narrative account of one of them would add to the meagre literature on experiences of women technocrats from which lessons can be learnt. The narration of this successful woman's experience in a tough job would inspire young girls and women to join the STEM stream. Seeking knowledge and adding to the meager literature in the field are other needs that are sought to be fulfilled.

With this background, the present study would focus on the following objectives:

Objectives:

To analyse the nature of issues of Women entering and sustaining in STEM fields based on the literature survey.

To present a role model of a successful Woman Chief Signal and Telecommunications Engineer in Indian Railways as case study, with the kind of issues, challenges faced and strategies followed to sustain

To offer suggestions for future women entering STEM fields to thrive and sustain to break the gender gap in STEM.

Methodology:

The study has been conducted in Tamil Nadu, choosing Southern Railway as its research area. Case study method was adopted to intensively analyse and present a role model for future women in enter such areas which is still considered as domains of men. For the purpose of this study, a Woman Chief Signal and Telecommunications Engineer who put in enormous effort to enter such area, struggled and sustaining in the field for a long has been chosen, though there are women who entered recently.

Tools of collection of Data

Case Study Methodology has been followed for this research paper. A free flowing modified interview method was adopted wherein the interviewee was given a list of topics on which she was invited to talk about in any order she preferred. The interviewee was encouraged to speak freely and as informally as she wished. She was advised that her interview was being recorded to which she consented. She spoke in English and Tamil. The recording itself consisted of multiple sessions and later transcribed.

Limitations of the Study:

This is a single case study. Interviewing more number of women officers in the technical fields in the Railways would have increased the scope and depth of analyses to this study and would have made it possible to generalize the results for a larger group. Although there are only about 35 women officers in all in the Signal and Telecommunications of Indian Railways, and they are spread over the length and breadth of the country, logistics issues precluded the researcher from conducting more interviews. However, the single case study does not anyway prevent to understand similar experiences of women in the same field given that the Women's Studies researches are based on women's subjective experiences.

This is a single case study pertaining to one technical department of one Zone on Indian Railways. Further study involving the entire women officer population in STEM departments of the Government of India would make it possible to generalize results. It paves the way and shows direction for the conduct of a full study of women in STEM not only on IR but also the entire Government of India and its constituent departments. Government organizations such as Bhabha Atomic Research Centre (BARC), Indian Space Research Organization (ISRO), Central Public Works Department (CPWD), State Electricity Boards, the Meteorological Department are highly technical departments where the nature of work is different, difficult and almost round the clock and which boast of women in their rank and file. An in depth study of the women in these departments would throw light on the status situation issues and challenges of these women and enable making recommendations for overcoming these issues. It would also enable sharing of best practices and exchange of ideas and information, on programs of creating mentoring networks for Women Scientists and Leadership training

Woman Chief Signal and Telecommunications Engineer of 35 years of Sustenance in the domains of Men:

Ms. M. Kalavathy. A 1982 batch Signal and Telecommunications (S&T) Officer in Southern Railway has 35 years of sustained experience in the field. She is currently the Chief Signal and Telecommunications Engineer in charge of Projects in Southern Railways, Chennai. She was recruited by the Union Public Service Commission, Government of India, through the Combined Indian Engineering Services Examination. Ms. Kalavathy's journey in the completely male dominated domain of Signal and Telecommunications of the Indian Railways is a story to narrate and share the experience to young women about how self belief, determination, confidence and the 'will' to face any adversity can take one to the pinnacle of one's career.

Ms. Kalavathy shared the challenges she faced in an organization which had hitherto not seen a single woman climb into the driver's cab of a train engine. Her narratives did cover the various forms of the gender bias, isolation faced, absence or lack of mentors, strenuous and arduous work in the field, the round the clock working hours and the strategies adopted to overcome the barriers. She relates a couple of hostile situations faced and handled successful as Kalavathy never wanted to take a step back rather handled them with courage to move forward.

It is observed that more women are joining education and employment stream but the retention rate in career except in socially secured employment in public sector, has been quite low particularly in the technical and leadership position or what has hitherto

been referred as domains of men. Challenge has always on balancing career and home, as expected and practiced by the society, the members of the family. It is often believed that failure of women balancing career and home, leads to family instability which force the women to give up job. It is quite rare to see members of the family extend co-operation to balance career and home by sharing or appointing support services to women. Moreover the stereotyped expectations that the home, care economy, including child and elder cares and other social reproductive activities are primarily women and even sharing of such work by men would amount to loss of identity of masculinity or acquiring femininity etc are quite difficult to avoid in the society. Such perceptions and expectations put the women into everyday struggle adding to their drudgery. It is the challenge for every women to personally prove at home front to balance career and home and also remain as a role model at the professional front. Every woman is caught up with such issue and get going with the gender stereotypical belief to continue perform by balancing both without questioning rationally such social impositions. The women continue to take on their head to keep up the expectation to maintain home and career balanced. If they fail they choose to quit. Does it not contribute to social and gender injustice? No it has not been thought and analyzed in such perspective and society keeps growing without any sensitivity towards the women's role.

Socio economic Profile:

Ms. Kalavathy, known to all as Kala, is the second of six children of whom the eldest five are daughters and the last child is a male. She states this is because her parents were under tremendous pressure to have a son; a state of affairs reflective of the patriarchal society in which there is a deep ingrained desire to have a male child. Although her father is highly qualified and her mother is also educated and a working woman to begin with, they could not withstand this societal and familial pressure. In the words of the interviewee, "the last one is the brother that answers why so many daughters.". But, none of the daughters were treated any less than the son. In fact by the time the brother arrived the elder daughters were in senior school, well on their way to higher education. Her father who retired as a Judge of High Court and later held high positions on various Commissions was very clear that all his children would get the best possible education and that they would all be economically independent. Her mother was often discouragingly told of a saying in Tamil that even a king who had five daughters would become a Pauper. But the couple did not weaken in their determination educate all their children. This is borne out by the fact that all six of them are professionals. Kalavathy and her siblings had a very traditional upbringing; they grew up playing traditional outdoor games of hopscotch, 'I Spy', and even climbing trees. The elder three daughters wore traditional clothes and were slightly restricted about staying outdoors and the age old custom of girls having to return home before dusk, and not venturing out at all, once puberty was attained all have been reinforced. As they grew up, they made sure that the younger daughters did not have the pressures and restrictions that they faced. Her mother had a job in the State Government which she quit in order to travel with her husband and keep home and take care of the children- her father's rising status in the society was also perhaps one of the reasons she quit her job, said Kalavathy. While they were not rich, they were affluent enough to get all the good things in life. It was her mathematics teacher in school who inspired her to take up mathematics, who was her

mentor and role model. She went to the prestigious College of Engineering in Guindy, Chennai where she joined the Electronics stream. Upon Graduation, she joined Bharat Heavy Electrical Limited (BHEL) in Bangalore. But the "controlled atmosphere" of working there with the stress on the time cards and punching did not make her comfortable. She appeared for the Union Public Service Commission Engineering Services Examination, and cleared in her first attempt and got selected for the Signal and Telecom Service of the Indian Railways.

On the very first day on her job she was told that the job was very difficult, strenuous, with round the clock working and she would not be able to do it. She was told that the best thing for her would be for her to go back to BHEL, an Eight hours job, which would suit her as she is a woman. But she refused to be discouraged or frightened. She was the first woman ever in an Engineering Service on the Southern Railways, and she was not going to let herself or women down. Her first boss gave her only one piece of advice: "go to the field and learn the job. Otherwise you will not be able to succeed at the higher levels". She was unmarried in those initial months of joining service. She applied herself to the job completely, climbing signal poles, walking on the tracks, going on motor trolley and "foot plate" inspections (on board engine inspections) in short, doing all the work that men officers used to be doing. She recalls how the first time she did foot plating, the driver of the train was so shocked to find a woman getting into his engine that he created a scene and asked her to alight at once and threatened to not start the train if she did not. Finally after a 10 minute fracas when both she and the engine driver remained stubborn, the issue was settled by a senior male colleague who explained to the driver that Kalavathy is an officer and had every right to perform her inspection duties. The train was finally started, with the senior officer also accompanying! These two incidents were reflective of the bias faced by her in the early days of her career- the discouragement, preconception that she would be not be learning and sustaining on such tasks of working with engines, and the kind of hostility faced in the train engine etc which are enough to make anybody quit.

In Indian Railways as in any large organisations there are certain jobs that are seen as sought after, some that are strenuous, some that are less important, some field postings, some desk work and thus "good postings" and "avoidable postings" categories are available. Since she never fussed about any "posting" and took on all assignments with alacrity, she made a name for herself and earned a reputation in the place of work as the "Woman" officer who worked like a man. It is with caution mentioned here that women need not be compared with men or male tasks as women have their own way of operating which need not necessarily be like men. However, for centuries together, the men only have been in work and hence any area of work where women enter is often compared with work performed by men and to see how these women are doing. This attitude and approach needs to be given up. Also gender sensitivity needs to be adopted.

She had to face serious personal discomforts particularly during menstruation as she did not have toilets in the small stations she had to visit and had to go to the local residents' houses to attend to nature's calls. Often bladder control would be the only way, which she became habituated to. In the office she would have to use the men's toilet or go to a distant women's toilet. The younger women employees do not face such problems

now she said, as these issues have been well addressed and toilets are provided in the offices and stations. It is true to acknowledge that the workplace is more 'woman friendly', now, compared to the past.

She has never been subjected to any harassment of any kind Kalavathy stated, during her 35 year long career, except in just one year, where her boss did not like her and graded her performance poor. She appealed her case but she did not succeed in getting a better appraisal, though she managed to get the order that she does not have to report to the same person. The issue has resulted in foregoing promotion for a year further got cascading impact of delaying another promotion. She believes and subscribed that there is certainly subtle discrimination. Women were viewed with prejudice, were **expected to fail**. Kalavathy's statement appears mild and subtle, but carries lot of meaning to the young women. Women do have to work harder to doubly prove themselves she added.

Kalavathy expressed further that despite all the achievements and outputs she has made, she has not been considered for any training or skill development programs either in the country or abroad till very late in her career. She has been able to achieve home and career balance mainly because of the complete support of her husband, her extended family, and the infrastructural and other enabling facilities provided by her organization. Although her job was 24x7, 365 days, whenever she went on night inspections or attended an accident site, she could take time off for rest. The residential quarters provided by the organization had facilities for live in house help. Her parents lived in the same town and so she could call upon her mother to baby sit in emergent situations. Thus, she did not experience that she was doubly burdened to the extent that she was forced to give up her job. There were occasions where there were conflicting situations of roles, but they were attended by adapting to situational priorities and got resolved she claimed.

It is to be underlined that Kalavathy in such non-conventional areas of work could thrive with the support provided by parents and husband, which served as facilitative factors and not to experience the dual burden. There is a great difference between the challenges of working women with support system, and without support system, between hired services and parents or parents in law taking care of the children, between residential employees and the travel from distance, with and without facilities for mobility, with and without access to civic amenities. Had Kalavathy been put up to face the latter in aforesaid issues, the comfort level would have totally been different and conflicting situations would have been higher. It was support from family and provision of necessary infrastructure, which helped Kalavathy to not to feel the pain of absence of such support and facilities.

In her own service, there obviously was no female role model for her. Nor any mentors who guided, instructed, taught her the ropes or counseled her. She did occasionally go to Senior Women Officers in the Accounts and other Departments when she had a personal problems. But on technical matters she had to rely on male superiors who with one or two exceptions were not helpful. Role Models and Mentors within the organization were thus not available. Owing to this, she makes sure that she is

approachable to younger women officers and does her best to help them both on the technical and personal front. Lack of mentoring and role models has made her doubly determined that other younger women do not suffer with such issues, that she did face with. Mentoring is a job she takes very seriously.

It could be inferred that there is a specific need for exclusive sessions and mentoring to explain and describe the technicalities of the job, give an exposure and remain as role model for the young and emerging women. The patriarchy based administration must be changed by providing gender sensitization to both men and women officials at the entry point and it has to be integrated at all levels of administration. Training has to be inbuilt to bring about sensitivity towards gender issues, be it facilities, infrastructure, participation in committees, recognizing with appreciation etc, both men and women must be represented and the perspectives of both men and women be included without any bias or overpowering of one or the other. That would be humanistic perspective with an alternative focus to be inclusive, which will help in sustainability on the one hand, hold the human values upright and also facilitate the professional ethics.

Analysis and Discussion:

1. Childhood, influence, society, norms, gender.

Social background of the interviewee is typically South Indian, conservative patriarchal and patrilocal but the fact is that the family was progressive to educate all the children and get them employed that too in the male dominated areas.

Nature and nurture are two sides of the same coin. A woman becomes who she is not only because of the genes that control the color of her eyes, hair and skin that are on the outside and her intelligence that is inside but also by her surroundings and upbringing. Nurture is what she goes through from the time she is conceived (mother's health and habits) to when she is born. Being born in a family as a daughter when the parents hoped for a son is an experience that many daughters in the Indian society are familiar with. However, it is the social status and the educational levels of the parents which ensures that the daughters are treated equally, educated with a view to their getting jobs and become economically independent.

Kala is a mixture of these two. While accepting that parents had so many children because they wanted a male child "the last one is the brother that answers why so many daughters", she grew up to be an independent person with very clear ideas ("really fed up of this BHEL kind of job and morning, evening you are controlled by time and punch card which I felt like a flock of sheep") of what she wanted or not.

Her mother gave up her job to travel with her father, since getting posted to the same station could have been a problem and also because of status "it doesn't look may be nice". Caustic remarks "such as even a king will turn pauper if he has five daughters" were made to her parents. But "any place that the educated go to is a superior place" indicates the stand taken by the parents to educate daughters.

Her parents told them often that education alone would give them good lives. Her parents repeatedly drilled into their heads that "Education, education only will change

your life, your way of life and recognition". Education was given such importance that going out and playing stopped, so studies could be pursued. Beyond the family, at school teachers are guides and role models, the people who recognize and encourage talent. For Kala, it was her seventh grade teacher Paulin who brought out the hidden talent and inclination towards mathematics. Again, it is a reflection of social norms that existed in the 1950s to 1970s that people were hesitant to send girls to Engineering and also Maths. "They were a bit hesitant, girl, and then engineering college not heard of", as she put it. For her mother, Engineering colleges used to automatically denote boys or only for son.

Kala also says, "some point my mother asked is there a separate college for girls, she had to ask because she could not digest like studying with boys". Later their outlook changed as the younger children's' turns came up for them to go to schools and colleges and they were allowed to attend co-educational institutions. It may also have been because of the elder daughters' influence- "we also told them there is nothing wrong, so more and more confidence". "Even in the Engineering college in the electronics stream there is some common acceptance like girls will go to electronics only , one or two had gone to mechanical". This goes to show the mindset of people in so far as girls are concerned and the genderization in the professions. Peer influence is seen in the application to public sectors jobs, in applying to the combined Indian Engineering Services or even in not wanting to go abroad as others were doing to pursue higher studies.

Thus we may conclude that family support and encouragement to pursue studies, acquire skills and enter the job market are necessary conditions though not sufficient conditions, to the achievement of goals. Gender perceptions of academic subjects which the girls can choose to or professions that they can pursue very much existed. Role models and mentors from the outset are necessary as they point the path to the future and to accomplishments.

Workplace- environment, biases and prejudices - Challeges in overcoming

The workplace can be a highly biased milieu in so far as it applies to women. In the early 1980s there were not as many women in the organized sector as there are now. Middle class men in those days were still at the stage of educating their daughters and getting them a college degree, a B.A or B.Sc. in order to make them more attractive in the 'marriage market' as also to enable them to be better mothers in terms of helping their children with studies and manage the household. A very few of these graduates actually found a job or made a choice to go to work. A patriarch who sent his daughters to high school and college to acquire degrees, felt "broad minded" and progressive, in such context. Therefore, for men who came from similar background in which the upbringing of the men themselves would have been such that they would have found it difficult to accept a woman working on an equal platform as they do, to have a woman officer equally associating with same job, could have been a cultural shock. Reactions of one such man, her senior, explains it all - "you may be the first person to come to Southern Railway or anywhere, because in my 30 years of service I have never heard a lady joining this signal department so far". The workplace was highly androgenic, male dominated; especially her department which had never seen a woman officer before. To a young woman this was discouraging, putting her in a mental dilemma, "am I prepared for it... should I join or not join...". However, she overcame her fears telling herself, "whether first lady or second lady it does not matter, what is the requirement of the job, let me do

it, why should I listen to people, so go ahead...” and joined the Railway Service and surprised everybody. “Everywhere, like, people were looking at me as though I was an object from other planet so I was made to feel you are a lady, you are a lady, you are a lady”. It was her first Head of Department who advised her not to think about her gender, if she started thinking about it, she would never learn anything and if she did not learn she would become self conscious, added the Head. “Forget about your gender, start feeling comfortable and start learning your job”. The organization was not geared up to accept women in terms of provision of infrastructure also in that there was no earmarked accommodation for women at the training hostel or separate toilets in offices till then. So in many ways she was a pioneer. Men, very senior people would say to her “Why you have come and suffer, it is not meant for you, it is not meant for ladies, very tough job, very tough working it will be very difficult for you”. This could be because there were always only men doing these technical jobs and they had not seen women before in such jobs. Their personal experiences on the job must have led them to think that its a male’s work only and a sari clad women would not be able to perform these activities. They may have thought that in fact they are looking out for her and giving kind and well meaning advice. It is quite conceivable that they may not have imagined all this could be discouraging to her. Also, the thought of being biased to her because of her gender might not have occurred to them.

Another incident of genderization which she relates goes thus. She was travelling in first class with a high travel authority (I ‘A’ pass) which she showed to the Travelling Ticket Examiner. Seeing the “Pass”, a fellow passenger who happened to be a senior Railway officer asked her if she was a Railway Officer’s daughter, straight away assuming that she herself could not be a Railway officer. This set her wondering that if a woman travelled on a I ‘A’ Pass could she only be a wife or daughter of a male officer and not an officer herself? “More eye opening for me, yes, you are going to be the role model or you have to set a path that you are capable of doing whatever the men folk or whoever done so far”, she told herself. Her experiences made her realize that she had to be a role model to future generation of women officers. She sought and obtained a field posting and worked so that “I wanted to tell people or whoever would come following me should know we are capable of doing fieldwork like signal, looking after stations, maintenance or commissioning projects, anything.”

Till her marriage she immersed herself in her work. After marriage too she continued at the same pace. With the arrival of her first daughter she continued to work in the field with full support from her husband, who would look after their daughter when she had to be away day or night and “he would wait for me with food everything.” She feels spiritually that solutions can always be found - “your professional life as well as your personal, you can always balance, some solution or the other will come”. Support systems provided by the Railways such as residential quarters situated close by, housing for household help, parents and sisters visiting, strong spousal support all enabled her to achieve home career balance. She prioritized too – taking leave during children’s sickness, family functions etc. or leaving children in the care of others to attend important official matters. Her husband also took leave to stay behind to look after home and children. There was a case where a man thinks his wife’s job is equally important. His own family, home and children were important enough to her husband for him to take leave of absence to take care and not have a view that it is a woman’s work so she

better find ways of doing it without expecting him to take time off for household charges and child care. There were a few senior women officers in the Accounts department whom she could approach and who were able to guide and counsel her on private matters but on the technical job she had no one to look up. So, in every way she was a pioneer and path setter and except for an occasional piece of advice, she had to learn on the job with the help of subordinates who were very good to her.

3. For Other Women.

Kala advises other women to be confident, never give up, work smart. She believes in the importance of mentoring and therefore makes it a point to call the junior women officers and asks and listens to their problems both official and personal. What she has learnt she shares, she teaches and always is very much 'self aware' that she is someone, the other women look up to. It is important to know one's job and do it well so that no body questions one on that. She considers that mentoring is very much a part of her job profile.

From this it could be observed the importance of Mentoring and the need for every woman to be a mentor. If every woman shared her experiences, taught others what she learned, is there for other women, the work place would be an easier place for the new woman on the block to negotiate. This is the lesson learnt by Kala who conveyed the same to future young women employees in general and technical employees in particular.

Ms. Kalavathy is a role model who has been proving herself balancing both home and professional responsibilities successfully. She has been able to achieve a good work-home balance with the support of her husband, who himself is a technocrat, the organization and her extended family. Prioritization, time management, dedication, being a mentor and a role model all come as easily to her as commissioning of a 300 kilometer long railway line through the most hostile of terrains.

There are personal, psychological and social factors which operate with women's sustenance in career and that too in areas which is still considered as Male domain. For Kalavathy balancing home and work could be facilitated by the following:

1. Her determination to sustain in the field
2. Family support and her better half in the same field served as facilitative factors
3. The support systems and the encouragement by the friends and officials at the work place and above all, to not to get locked with the gender stereotypes. It demonstrates that women can operate equally well in STEM fields, just as in other areas by handling the social, personal and political factors which often obstruct women's progress.

With the increasing participation of women the role models like Kala and her experience teaches us immensely the following.

One hails from an educated but a conservative family which was expecting a boy after five girls. In the social context, high education did not stop a highly placed member of the society with daughters alone. The reproductive health of the woman was perhaps not as much a concern in the social expectation on son preference. If the expectation of the parents is not to consider five girls as wards but still expecting a boy to be heir in

such educated, employed families, the vulnerability of less educated families of adhering to social norms in those years need not be exaggerated. After five children any woman in the present day would have lost the interest in having more children, but such was the bonds of patriarchy and social norms obligations and even longing for, that in those days women persisted with child bearing to begot a boy. Kala's parents did not discriminate on the education of the daughters but this is not the case of average households. Mother had a stereotyped risk perceptions and was not comfortable sending daughters to engineering college, riddled with doubts but the conviction and self confidence enabled the father and Kala to venture in those years to study Engineering, withstanding societal pressure. She conveys to the youngsters that there will be pressure but one has to overcome and try to utilize the support systems to one's favour. It is to convey that women employed not only bring economic independence but also use the otherwise unused talents which directly contributes to nation building and development which must not be compromised for the sake of unpaid care economy. From a gender and humanistic perspective, taking the current labour market challenges particularly the privatization, global market competition etc it is quite challenging for women to be at peace at the work where orders are taken on a time bound basis and delivery is to be done in time to sustain in the market. Hence husbands of women in the future generation would have to be different and must have different expectation, contributions, perceptions altogether. Men need to emerge from out of the stereotyped expectation of a woman so that conflicting situations are avoided. Kala is already a role model. There are many other meanings which are conveyed through the experiences of Kala, at the work front. Women's failure is celebrated indirectly, work place hostility is inevitable, family priority cannot be ensured unless family and official facilities support are extended one needs to be independent in decision making to choose and stay in the choice of career, hostility sometimes is hidden and beneath the surface, push is one to demanding work so that they will quit, promotions may need to be foregone and all humiliation and marginalization, not being included in decision making committees, not providing the women friendly basic facilities etc all of which will certainly force the women to think twice to stay or not. Kala's story stands as a testimony to many women with such dilemma to not to give up but to proceed without minding the disturbances and hostility.

Findings and Suggestions:

The study has analysed the state of women employees in Indian Railways and in STEM field with both the literature survey and a case study narrative of professional experiences of a pioneer woman as technical Communication and Signal Officer in Indian Railways. The following inferences could be drawn and presented as findings of the study.

- The socio-cultural background of the first woman technocrat in a leadership position on Indian Railway has been narrated, in which early life history along with schooling and influences on her have been brought out.
- She hails from an well informed educated and both the parents employed family background however with a stereotyped gendered expectation of son preference.
- Mother voluntarily gave up job due to father's transferrable job as also in keeping with status as Judge. Patriarch society has not reversed such trends; employed women in the highest cadre do not require their husbands to give up their job in similar circumstances.

4. The S&T department provides specialized highly technical services in the Indian Railways. Train movement is entirely on the basis of Signals and Communications. Any failure in circuits or equipment has far reaching effect on train operations. The job profile is therefore very tough, the working hours are arduous, the work itself very strenuous and stressful. Women in this field are very few in number. Kala was viewed with suspicion in so far as her ability to work is concerned. It was expected that she would remain absent frequently and would not be able to succeed.

But Kala broke all such expectation and finally proved herself that women can enter and sustain in STEM fields provided support system work both at personal and professional front and above all the self determination to face the challenge.

5. Challenges in the form of bias, prejudices, stereotyping exist and still continues but one should deal or handle with the notion that these are issues that need to be tackled in order to rise up the organization ladder and remain as role models for future women to follow.

6. Striking home and career balance was achieved with the support of husband, extended family and organization which not only supported but also accommodated Kala to withstand pressures to not to leave such technical job stating the reason of family responsibility or being woman it is difficult to continue.

7. Organization helped by providing secure residential quarters with housing for household help like cook and maid, infrastructure utilities, rest after night duties, paid maternity leave, transportation facilities, paid leave etc. which further helped her to sustain and not to fall back citing household pressure.

8. She had no Mentors and Role Models. This made her determined to provide mentoring for other women officers what she lacked. She takes her job to include mentoring also and volunteer herself to offer herself to guide, counsel and mentor to young women which indicates her utmost gender sensitivity and commitment. The professional system needs more number of such persons who would further motivate other women to enter and help to reduce the gender gap at work places.

9. Given that the young women leadership and their participation in non-conventional areas are on the increase, it is equally necessary to document such role models to make it available to other upcoming women to follow.

10. The role model women in each sector, may need to commit to mentor the young women professionals particularly sensitivity over gender so that in future they would perform gender sensitized leadership.

11. There are a group of professionally qualified women who shy away from taking up leadership positions, due to the pressure of balancing home and careers or social learning which failed to give them adequate confidence to express their willingness. Hence every institution and organization may have entry level motivation and sensitization campaign both for men and women, where women may be focused additionally on the person entered inhibitions and to gain self confidence and self esteem.

12. Sexual harassment at work places and the kind of gender based violence which are being reported at the public space demotivate the women to take up jobs which are quite

challenging and also amidst the dominant presence of women. So each institution may need to have a gender policy be framed and the sexual harassment prevention and prohibition Act 2013 be implemented to provide an peaceful and smooth environment lead the work.

Conclusion:

The study of review of literature on Gender issues in STEM, and the successful case study narrative of a first Woman Officer in Telecommunication and Signal in Indian Railways convey several serious gender implications through subtle forms. Women, given the opportunity, try their best to enter and stay in STEM field, but the path is not always as smooth as experienced by men. There are always a set to support systems that is needed and women have to look out for such supportive means to balance their dual role. This has never been an issue for men, though there are exceptions. In the 21st Century, relatively more women are joining paid work, and the young women leadership, it is the need of the hour that the more women join the labour force and sustain to rise to leadership and decision making levels thereby contribute directly to the nation building. Both the literature survey and the narrative of Kala, primarily indicates that women's entry is happening already into the domains of men, and STEM. There is need for more women to enter STEM to serve as role models and also utilize the human resource. They have to be motivated, guided and facilitated in this right from the family, school and in higher education institutions. Society needs to change in its attitude to women. Family support is crucial in women rising up in their careers to leadership positions. Organizations need to bring in all possible measures to enable progress in career and achievement of work life balance. This is through measures such as equal opportunities in decision making, training and skill development, flexible timings, safe modes for travel, personal safety at work place, provision of basic facilities and without creating hostile environment. Similar problems need to be addressed for promoting and facilitating women's presence and advancement in STEM careers. It is reiterated that given the opportunity in any area be it defense, space, economics, entrepreneurship, politics, management, etc women will prove and excel, provided the same encouragement is offered both from the personal and professional fronts without any social and gender barriers deep rooted in the name of patriarchy reinforced further by various social institutions. Change has to come from family further transferred to transform the world with alternative perspective through educational institutions, class, caste, religion, literature, media, epics, culture, state, law, etc. thereby ensure the change to make women to sustain in labour market and non-conventional areas.

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