

## **'All Engineering Work is Not Men's Work': The Curious Case of 'Gendered' and 'Non-Gendered' Engineering Work**

**Nayyara Tabassum<sup>1</sup>**

### **Abstract**

---

This paper seeks to deconstruct stereotypes of all engineering work as male-centric and homogeneous by positing the idea that there are two kinds of engineering work – field jobs and desk jobs which allows a repositioning of masculinities and femininities in engineering. Engineering technologies can be both gendered and non-gendered. It also intends to understand the various strategic approaches of subversion and resistance adopted by women engineers to improve the quality of their work lives. This interview-based study was conducted in India with female engineers from various engineering backgrounds to provide feminist insight that there is a need to re-imagine engineering work beyond its embodiment of hegemonic masculinity in order to disrupt the male imagery of engineering work, and that real change can be brought about not just with the passing but practice of laws to protect women's rights at the workplace.

---

**Keywords:** Engineer, gender, field/desk jobs, gender stereotypes, gendered/non-gendered technology, heterogeneity

### **1. Introduction**

Popular imagination has never conceived a woman as an engineer. Women are often depicted as successful interior designers or physical assistants in movies, advertisements and magazines. But a female engineer is never shown, possibly because she is an aberration, a character not quite believable. A 'Draw an Engineer Test' study carried out among school children in the US asked two questions – 'What does an engineer do?' and 'Draw a picture of an engineer at work'. A majority answered that an engineer builds and fixes and depicted an engineer as a male (Knight and Cunningham, 2004). These deep-rooted stereotypes held by even children highlight two important things, (a) stereotyped work in engineering and (b) gender stereotypes of engineers. This effectively serves to exclude women and femininity from the profession. Left unchallenged, a gendered imagery and stereotyping of engineers and the engineering profession become a reinforcing cycle where the women who do enter the profession are seen as outsiders in a 'male' profession and any engineer not 'building and fixing' is seen as performing lesser, unimportant work. The twin problems of (a) stereotyped work in engineering and (b) gender stereotypes of engineers can be located to technology where men and women are not equal stake-holders. This problem has been investigated in many Western countries, yet literature is sparse and sporadic on non-Western countries. This research aims to look at the problem from the perspective of women engineers in one of the non-Western countries having a high growth rate of graduate engineers (Banerjee and Muley, 2007) – India, by attempting to understand the work experiences of women engineers in the engineering profession and how they negotiate with gender stereotypes at work. First is the question on what constitutes engineering work. Is engineering work homogeneous and male-centric? Second, what issues, if any, arise for female engineers due to gender stereotyping of the engineering profession? This paper seeks to formulate answers to these questions.

---

<sup>1</sup> PhD Candidate, University of Milan, Italy, MPhil, University of Cambridge, UK, Via Carlo Forlanini 21, Milano 20133, Italy. Phone number: +39-3892697775

## 2. Theoretical Context

Theoretical foundations on feminist technology studies can be traced to the arguments that technology was both a source and consequence of gender relations and vice-versa (Cockburn, 2009; Wajcman, 1991; Faulkner, 2001). Feminist scholars emphasised the intertwined roles of capitalistic industrialisation and technological processes as sources beyond patriarchy responsible for the relationship between masculinity with male power and technology (Cowan, 1983; Cockburn, 1981). It was during this stage of feminist technology studies that attention was drawn to gender identities in gender-technology relations. Women's under-representation in technology-centred professions such as engineering is a pervasive trend in different parts of the world in contemporary times (Lohan and Faulkner, 2004; Parikh and Sukhatme, 2004). It is a cause for concern because women are disinterested or deterred from these professions due to their strong associations with masculinity. But of greater concern is the fact that women who are part of this profession, the women engineers - are a minority and are vulnerable to exclusion and marginalisation at work. Another issue that arises with a masculine profession is its monolithic identity, and a need to look at possible heterogeneities in the engineering profession (Faulkner, 2007). The theoretical context of this research study proposes that subjective experiences of women shed light on women's under-representation but more importantly, explain the continual performance of gender at work through the self-perpetuating processes of gender stereotypes at work. The constant tensions and contradictions in performing either their feminine gendered selves or masculinised engineering identities at the workplace explicate the meanings of technology and the consequent understanding of professional engineering identities.

### 2.1. Symbolic Gendering of Engineering Work

Male-dominated professions such as engineering are symbolically gendered as masculinised workplaces. Such marking of workplaces as gendered occurs not only due to the preponderance of men workers in the profession but also because of the cultural interpretations of certain types of work as masculine. Because of the durability of engineering technology with an imagery of masculinity, the work culture of the engineering profession is symbolically associated with men and masculinity and women engineers constitute an anomaly and aberration with engineering being seen as a 'man's job' (Cross and Bagilhole, 2002; Faulkner, 2007). -Masculinity is embodied in engineering work through technological artefacts employed at the workplace. It can also be embodied in the possession and usage of technical knowledge and practice (Faulkner, 2001). The control and exercise of technical expertise are the bases of masculine stronghold at an engineering workplace. Such ideas of control and domination are also synonymous with cultural norms of hegemonic masculinity where power is concomitant with male traits. The association of masculinity with positions of power and control, and henceforth with work or professions which endow power is consistent with the situation in India, where men are often considered superior to women. As such, positions of power, control and domination are seen as naturally and rightfully belonging to men than to women (Johnson and Johnson, 2001). Because of the very nature of the engineering profession being symbolically associated as masculine, questions on what actually constitute engineering assume pertinence. Very often, in male-dominated professions, the characteristics and traits of the dominating gender are imbued upon the overall hue and colour of the profession and any conformity/deviation to/from the normative gender role expectations are seen as 'gender authentic/inauthentic' (Faulkner, 2007). The practice and performance of such socially constructed attitudes and behaviour serve to engender organisational structures at the workplace in favour of the numerically dominant gender (men) to gain an upper hand over the other (women), in the engineering profession.

### 2.2. Gender Stereotyping of Professional Identities

Divisions between men and women engineers are not always so clear-cut, especially when there are overlaps between some traditional boundaries and stereotypical, normative gender patterns are challenged (Talbot, 2010). Such workplaces become the playing field of a varied range of hegemonic and subordinate masculinities and femininities (Connell and Messerschmidt, 2005). Women are afforded less respect in male-dominated gender stereotyped jobs where they are seen as violating gender stereotyped norms. Even in positions of power and domination, women would be assigned less respect than their gender-consistent male counterparts (Heilman and Wallen, 2010). As a result, tensions in traditional notions of power, authority and respect occur when women are in superior positions than men or when young engineers (male or female) are in positions of power over older engineers.

Tensions in gender identities are often caused when men and women cannot 'do gender' in conventional ways (West and Zimmerman, 1987). 'Doing gender' as envisaged by West and Zimmerman (1987) includes not just conformity but also resistance to normative versions of gender. Normative versions of gender or gender norms in a particular culture have been formed through the doing and performing of gender over time which become embodied and constructed as gender identities within the discourse, in short, gendered identity is an embodied action conceived and constructed historically (Butler, 1990). The arrangement of binaries in a hierarchy is designed around opposition and exclusion where the categories cannot mingle with each other and the former dominates over the latter (Derrida and Kamuf, 1991). The binaries in the engineering profession – for instance, man/woman, technology/non-technology, engineering/management, technician/social (Faulkner, 2007) – create an 'Other' (Derrida and Kamuf, 1991) in the form of the category in the latter or subordinated position by forging a distinct identity for one with the help of the other. Through the formation of such binaries, women engineers cannot 'be' both women and engineers. They have to 'be' either one or the other.

By 'being the 'Other' and simultaneously occupying the position of the dominant category, it signifies a subversion of identity where 'the sign represents the presence in its absence' (Derrida and Kamuf, 1991, pp. 62) challenging the dominant's position. The 'Other' or the 'abject' (Kristeva, 1982) is constructed and constituted in its being expelled from the body for it does not belong to the subject. In a similar fashion, the woman engineer is an 'Other'. She is seen as not belonging to the engineering workplace of an organisation. In professions which are traditionally designated as masculine or feminine, gender-inconsistent workers experience 'role strains' (Cross and Bagilhole, 2002). 'Role strains' could lead to a subversion and proliferation of identity possibilities and raise the potential for multiple discursive positions for women. Such discursive positions are not set apart from compulsory heterosexual femininity but constitute an essential part of it in a way similar to a Foucauldian sense of power as never being divorced from resistance (Nayak and Kehily, 2006; Butler, 1990; Foucault, 1978). These tensions potentially disrupt conventional gender roles and relations and yet serve to preserve traditional gender roles despite threats to conventional gender differences (Cross and Bagilhole, 2002). While women engineers may sometimes feel the need to adhere to masculine norms, at the same time, they may make men feel less like 'men' leading them to re-affirm their masculinity by acting against women and their interests (Padavic, 1991); propelling a vicious cycle in motion where the interests of one gender (female) to challenge gender stereotypes are followed by the interests of the other gender (male) to sustain such stereotypes. While women engineers, in some situations, may strive to exhibit masculine ways of behaviour in order to be accepted members of the engineering profession, in other situations they may behave or are expected to behave (both of which can sometimes be mutually reinforcing) in stereotypical feminine ways to preserve their femininity and their gendered selves (Heilman and Wallen, 2010; Faulkner, 2009).

### 3. Methodology

Feminist scholars have criticised viewing women as inanimate, unfeeling research objects. Instead, a feminist approach seeks to understand respondents' perspectives on an equal platform where the researcher and the respondent can exchange and discuss their feelings and experiences in a supportive, humane environment (Harding, 1987). This interview-based study aimed to achieve an intersubjective understanding, making some limited claims in understanding the experiences of female engineers by virtue of its conversational nature. Thoughts and perceptions of women's varied experiences, critical in this study, were taken into account. In order to explore the problem in India, fifteen female engineers from a variety of engineering sectors were interviewed, all of whom were working in India. Due to the fact that fifteen interviews are not sufficient material to base generalisable claims, the sample was used instead to offer subjective insights that may be valid only in the context of this study, in a particular time period, or geographic area. This however, does not, negate their importance.

#### 3.1. Female Engineers in India

India is a rapidly developing country. According to the World Economic Forum's Global Competitiveness Report, 2014-15, it ranks quite high in the quality of its scientific research institutions and availability of scientists and engineers at ranks 52 and 45 respectively. Yet, with a ranking of 135 out of 187 in UNDP's 2014 Gender Inequality Index (UNDP, 2014), women constitute a disadvantaged group. Female participation in the labour force, according to the World Economic Forum's Global Competitiveness Report, 2014-15, was at a measly 133 rank out of 144 countries. In fact the low labour force participation points to an under-representation of women in engineering colleges. Findings by Parikh and Sukhatme (2004) too had confirmed that female engineers constituted only 16.2% of the total enrolment in engineering colleges. These issues clearly highlight the tenuous association of women with the engineering profession and its possible consequences for women engineers.

As India is a democratic country, there are a number of laws to protect the rights and safety of workers. Some laws particularly relevant for women engineers have been listed in Table 1:

**Table 1: Labour Legislations Regarding Women Engineers**

NAME OF ENACTMENT	PROTECTIVE PROVISIONS
The Factories Act, 1948	Prohibition of employment of women during night hours, only allowed between 6 a.m. and 7 p.m. (Section 66) Prohibition of overlapping shifts (Section 58)
The Mines Act, 1952	Provision of separate toilets for males and females, and washing facilities for women workers; convenient and accessible at all times (Section 20)
The Maternity Benefit Act, 1961	Maternity benefits to be provided on completion of 80 days working and 12 weeks of paid leave.
The Equal Remuneration Act, 1976	Payment of equal remuneration to men and women workers for same or similar nature of work protected under the Act. No discrimination is permissible in recruitment and service conditions except where employment of women is prohibited or restricted by or under any law.

Source: Ministry of Labour and Employment, Government of India

The extent of the legal implementations in engineering practice is discussed. This study utilised the work experiences of engineers working in various sectors. For the purposes of this study, engineers have been classified into two broad types – infrastructure engineers (those who worked in the infrastructure sectors, for example, power or oil sector) and software engineers (those who worked in the software sector, for example, information technology or computer science).

#### 4. Research Findings

The findings shed light on the nature of engineering work and engineering technology. It also raises issues that may be faced by female engineers due to gender stereotyping of the engineering profession.

##### 4.1. Gendered and Non-Gendered Engineering Technology

Engineering work is synonymous with technological understanding and its practical applications. The importance of technological understanding was expressed by engineers: 'You will definitely need some understanding of technology ... at least, basic knowledge of electronics and communications.' (Software engineer) 'These are things only an engineer can do; no one else can do it.' (Infrastructure engineer) Interviews with the fifteen engineers probed to find out if technology is gendered at work. A number of infrastructure engineers felt that their work, especially field jobs were gendered and seen as more congruent to men. Physical work, lifting of heavy objects typifies the stereotypical image of a male engineer. By extension, the image of the profession too gets stereotyped as masculine. 'You need to physically work, lift heavy objects and get dirty on the field. Men say this job is not for women, they dissuade us.' (Infrastructure engineer) On the other hand, software engineering is unencumbered by masculine images. The following statement showed that software technology in engineering is not gendered. 'Anyone, man or woman, can excel at learning software.

All you need is knowledge and aptitude.' (Software engineer) Technology is gendered only in infrastructure and not in software engineering. A reason why software technology was found to be non-gendered could be due to the nature of software technology. Software technology is intangible and invisible. Software technology is not a 'simple' technology similar to domestic technologies (example, the microwave) (Cockburn, 1997). Nor is it a heavy and masculinised manufacturing technology. It is invisible. It does not require the lifting of heavy tools and is neither heavy nor light. It is intangible. Because of its intangibility, the technology cannot be claimed and controlled by one group. It remains open to be used by those who possess the knowledge. It is gender neutral and can be equally appropriated by both men and women engineers. Infrastructure technology, on the other hand, is physically heavy, visible, tangible and quantifiable. Because of its visibility and tangibility, it can be touched, controlled and claimed by one group.

The idioms of physical and heavy in infrastructure engineering can be associated with men and masculinity. The implications of using such technologies which need not be gendered and can be appropriated by both men and women should be explored further.

#### 4.2. No Homogeneous Engineering Work: Field Jobs versus Desk Jobs

While technological understanding is important for both infrastructure and software engineers each performed their jobs differently and in different work environments. Infrastructure engineers performed either field jobs or desk jobs, or both. They primarily worked at field jobs on site locations and sometimes at desk jobs in a managerial capacity. As one infrastructure engineer said about field jobs: 'You are not really an engineer if you have never worked in on-site projects.' (Infrastructure engineer) Software engineers, on the other hand, worked only inside offices at desk jobs where they used and designed computer software.

'Our only workplace is at the office desk.' (Software engineer)

The field job-desk job distinction also brings into focus the implicit hierarchy between high innovativeness and low innovativeness required in the jobs. Software engineers usually performed a very micro aspect of a huge project. They felt that their work did not require them to be creative or innovative. 'Our work is not at all innovative. You are asked to do something by the company, you do it. It's nothing new.' (Software engineer) In contrast, infrastructure engineers felt that their work was innovative. 'We have to think creatively, be innovative ... and learn how to use new technological equipments. We then build things with minimum costs and maximum returns.' (Infrastructure engineer)

#### 4.3. Systematic Attempts to Deter Women

Women engineers faced several challenges because of gender stereotyping of engineers as masculine and engineering work as male work. Interviews with fifteen engineers showed that a myth exists that men made better engineers. Despite similar qualifications, men are perceived and treated as technologically more capable than women engineers in infrastructure engineering. 'Maybe some of us possess better technological understanding than others. But it does not differ from man to man or man to woman ... Differs from person to person. There is certainly a perception that men are better engineers but that is a myth.' (Infrastructure engineer) On the other hand, there was no such perception or myth in software engineering where men and women were judged on the basis of their capabilities and knowledge, and not on their gender. 'Technological capability is not gender-based. It depends from person to person. As long as you are capable and you do your work well, you will get recognition at work.' (Software engineer) The perception that men were technologically more capable was pervasive in infrastructure engineering. As a result, women infrastructure engineers felt the need to prove their technical expertise by working extra hard. 'You have to prove at every step that you are worth this job. To let people rely on you, you have to prove yourself.' (Infrastructure engineer) Software engineers, on the other hand, felt that they did not need to prove their technological abilities any more than men engineers did. Capability mattered and not the gender of the engineer. 'My boss and mentor is a woman and I haven't seen anyone more technically inclined as she is. Everybody looks up to her and if somebody has a problem they can't solve, be they male or female, she is always the one people go to for advice or help.' (Software engineer) A number of women expressed that female engineers are not preferred during hiring processes. 'People feel that being a woman is a drawback in the oil and gas sector and not just in India, in other countries too. For example, this guy from (US based company) told me, 'You are the first woman well-logging maintenance engineer I have met'. They hesitate to take women because in field jobs, you need to work in very tough conditions. It is physical effort ... kind of tools I work with are very heavy ... not just electronics stuff but also very heavy stuff.' (Infrastructure engineer) Most of the fifteen interviews showed that a strong 'men's club' still existed in engineering. Field jobs are especially important in the career of infrastructure engineers for promotions and also in earning an extra income. But men encouraged women engineers to do desk jobs and tried to keep them away from field jobs through various means, either overtly or covertly.

'Men see field jobs as men's jobs and they try to keep us away from them.' (Infrastructure engineer) While desk jobs for senior women often involved high-level research work, for juniors, desk jobs were equivalent to secretarial work and there was very little respect attached to such work; the notion being that such jobs did not require specialised technical engineering skills and could be done by anyone with a minimum level of education. As such, desk jobs for junior engineers were seen as a demotion with little prospects for furthering careers. 'Every time I insist on a field job, my boss tells me, 'you are a girl...you need not go.

Learn paperwork now' and if I keep insisting, he would assign me to do some paperwork so that he can send a man instead. And I wouldn't be able to go as I am kept busy with useless paperwork.' (Infrastructure engineer) In desk jobs, women engineers were preferred over their male colleagues. While most women engineers were unhappy at being assigned desk jobs, there were also some who took pride in being given desk jobs. 'You know, women are more organised than men ... women can be trusted ... that's why my boss always trusts me with important paperwork.' (Infrastructure engineer) Getting the chance to work at field jobs was only one half of the battle. Women engineers working in teams at work sites can also be coerced into accepting suggestions from colleagues as they constitute a minority. 'Often, we are forced to accept ideas of the men during field jobs. Men tend to stay united in groups to exclude and oppose us. Women support each other yet our numbers are too small for anything useful ... it is hard because I am the only woman in my team.' (Infrastructure engineer) Many female engineers who worked at field jobs said that on-site facilities in field jobs were not female-friendly. Outdoor facilities (or the lack of it), such as toilets, reinforced the systematic exclusion of women. This was not a problem with desk jobs in the software sector where there were toilets for both men and women in their offices. But in field jobs, women engineers tended to be at a disadvantage regarding toilets.

'My main problem was that I was the only woman and I had to go to the jungle with a group of male engineers and ... there were no toilets for women.' (Infrastructure engineer) 'In the fields, you have to work for long hours ... I have stayed till 10 'o clock at night ... And there you don't have proper toilets. Men use bushes or open spaces and women engineers, if they are lucky, would have make-shift toilets in the area ... or otherwise, would be forced to wait till they go back to their office.' (Infrastructure engineer) A large number of interviewees stated that their very bases of femininity were often questioned by men. Dress codes in field jobs comprises of helmets, work boots and coveralls, all of which are mandatory according to legal laws (company regulations) for safety reasons. The mandatory western-style clothes for field jobs threaten traditional patriarchal notions in India, and can pose an unwelcome attraction in rural parts (Tarlo, 1996). A number of women said that coveralls were seen as western clothes and female engineers working in rural areas or small towns avoided wearing them. Women engineers who refused to wear coveralls routinely put their physical safety at risk to protect their femininity and their reputation. 'I would personally prefer to wear coveralls because then it's safer ... but I don't because it's a small place ... and people talk.' (Infrastructure engineer) The wearing of helmets and work boots was mandatory, strictly enforceable and engineers were not allowed inside the field without them. But it was not the same for coveralls.

'The thing with coveralls is that, unlike with boots or helmets ... there is no one to enforce wearing coveralls ... so nobody is obliged to follow these rules.' (Infrastructure engineer) Yet, there were some women engineers who did put their safety before reputation. There were others too who were hired by their companies only if they agreed to wear safety coveralls in field jobs. 'While I was interviewed for my job, I was specifically asked if I would be willing to wear coveralls on-site. I agreed ... and I got the job.' (Infrastructure engineer) Women who wore coveralls often faced jokes or taunts regarding their femininity. Women employed various tactics of humour and interactional styles as self-defence strategies to protect their professional and gender identities. 'It's a joke for me now. They (male colleagues) call me 'a guy with long hair'. But I have started ignoring these ... And instead (to a male colleague who annoys me the most) tease him too that he waxes his eyebrows.' (Infrastructure engineer) For software engineers though, clothing did not constitute a site of struggle at the workplace as they worked at desk jobs. This was expressed by software engineers: 'We have a dress code with proper guidelines of attire for both men and women ... and we just follow that ... you are not allowed to wear certain clothes ... and different companies have different guidelines ... and you just follow them.' (Software engineer) A number of women infrastructure engineers said that they were excluded from informal support groups and had unsupportive male colleagues. 'If a male colleague gets stuck in solving a problem, he gets help and advice from other male colleagues. If a woman does the same thing ... we won't get any advice. In fact, they will then call us inefficient and incapable as engineers ... also, places for top positions are few and competition is high ... so support is even less in top positions.' (Infrastructure engineer)

The flip side of doing jobs well is making mistakes at work. For software engineers, gender of the engineer was not considered when mistakes were made. Mistakes at work were mostly forgivable except in the production units where every mistake can be a huge mistake. 'Whoever makes a mistake - a man or woman, a team or an individual - accepts responsibility. Gender, age ... nothing matters ... a mistake is a mistake.' (Software engineer) On the other hand, gender of infrastructure engineers was important in evaluating the penalty for mistakes.

Mistakes committed by men could be pardonable but for women engineers, mistakes may cost their reputation as engineers. 'Men can make mistakes; no one makes a big deal out of it. If women make mistakes, they would constantly be reminded of it. Their mistakes become a topic of discussion in men's circles and some men would go so far as passing remarks like, 'Women are just like that' or 'This is the problem with women engineers.' (Infrastructure engineer) Almost all women out of the fifteen interviewees said that they would be penalised if they did not work overtime. Women engineers were paid for extra work and although overtime seemed to be a choice, it was not so in practice. The dedication of engineers to their work and their validity as 'good' engineers was gauged through the number of extra hours they put into work. Although overtime work in field jobs conflicted with labour laws (The Factories Act, 1948), these legal rules were neglected in practice. In fact, those junior women engineers who refused to work night shifts or back-to-back after-hours were unofficially penalised in various ways. The following example illustrates how a junior engineer's refusal for overtime work undermined her and rendered her field job presence defunct and powerless. 'I was told to work after-hours in emergencies. I agreed ... but my boss wanted me to work overtime on the field - not just for emergencies but every day. When I refused, my boss appointed a male colleague to take my place in the field after-hours every day ... my job role is actually quite meaningless now...' (Infrastructure engineer) Women software engineers may be unwilling to work night shifts due to night safety issues in India. And although companies provided night-cab facilities for those working night shifts, women risked their safety at night to protect their image as 'good' engineers. 'I am a woman, and staying until late hours and going back home so late is not safe ... Nobody forces me to work overtime. But if you don't, you have to face sexist comments from some male colleagues. Some male colleagues say that women do not make good engineers because women do not always work overtime. So now I have started showing that I can also work till late, that I am a good engineer.' (Software engineer)

#### 4.4. Strategies of Subversion and Resistance

Women engineers have not been silent receptors of gender stereotyping of their professional identities. They actively either conformed or resisted gender stereotypes to their advantage in order to gain control of their work environments. Many women stated that women in powerful positions were seen as threats to men and their masculinity. Lack of support for women also translated into an increase of conflicts between women and men at work. Male engineers may refuse to work under female bosses and sometimes may even take up the issue with the management – successfully or otherwise; successfully as evident in the following case: 'When I was newly appointed the head of the [name] Project, one male engineer who did not even know me then ... came to know that the new head was going to be a woman. Even before I started work, he requested the management to redistribute him as he would not work under a woman. Shockingly enough, he was shifted to another department as requested!' (Infrastructure engineer) Women engineers often faced conflict situations if they were in positions where they could exercise power over men. Conflicts occurred when young women engineers in field jobs supervised and directed older workmen. 'Handling the workmen becomes an ego issue. They are like, 'Why should we take orders from a woman who is actually 20 years younger than us?' First, I am like, their daughters' age ... plus I am a woman. Some of my male colleagues too face problems with workmen. But to take orders from someone who is young and a woman on top of that ... they create problems...' (Infrastructure engineer) To cope with such conflicts, women engineers adopted tactics of intimidating workmen by speaking loudly and using a sharp tongue publicly in front of everyone. 'Well, what can you do? You have to be strict with them ... it's easier with the younger ones who are more willing to listen to you ... with the older ones it's difficult ... so you have to be strict with them.' (Infrastructure engineer) '...to manage people from the driver level to the supervisor level ... Just arguing with them constantly has given me a sharp tongue. Now I have become famous at work as someone who intimidates and shouts at my juniors!' (Infrastructure engineer) 'They ignore you and are rude to you ... They don't know how to respect you when you are nice to them ... so you have to shout at them to make them listen to you.' (Infrastructure engineer)

Women engineers also resorted to traditional notions of femininity to gain control over work situations. Sometimes women engineers pretended to be emotionally upset with their male seniors and colleagues to get out of unfavourable situations. With strict laws on sexual harassment, men engineers avoided reprimanding women engineers. 'Some women do that. Their mistakes are not overlooked but bosses will think twice before scolding women for fear women will cry and create an uncomfortable situation.' (Infrastructure engineer) Another way of achieving control and power by women engineers is by using notions of traditional chivalry by men with women. Women engineers, who dealt with state officials on behalf of their organisations, received preferential treatment in comparison with men engineers from other organisations.

'I used to be the only woman head of department out of all companies, waiting to meet the state official ... Sometimes with good official relations, you can have privileges ... you get priority over others ...' (Infrastructure engineer)

## 5. Conclusions

There are several main points that emerge from the findings. Interviews with these fifteen women showed that field jobs were noted to be prized above desk jobs in the infrastructure sector. Women engineers are marginalised at field jobs but preferred for desk jobs. Accounts by women engineers too revealed that certain skills required in desk jobs (such as being organised) were seen as feminine skills. This supports a traditional cultural notion of women doing feminine jobs. In the male/female duality of field job/desk job, the latter ranks lower and is seen as an 'easy' job in comparison to the former which is 'hard'. The idea of field/desk jobs distinction can also be explained through the public/private sphere concept. Women are seen as belonging to the private sphere and are therefore seen as 'natural' occupiers of the private, 'internal' space of desk jobs. Men engineers belong to the public sphere – working outside at field jobs. Another related explanation can be that field jobs are also high status jobs. They are high status jobs because these jobs grant power to engineers by controlling workmen and also in gaining recognition at work. Women who are seen as the inferior gender are tried to be kept away from appropriating high status, power and control at work. Engineering work has long been perceived as 'men's work' (Cross and Bagilhole, 2002; Faulkner, 2007). Because of the connotations of engineering as physical work and heavy work, it is not seen as a 'natural' profession for women. Also, with women as a numerical minority, it automatically marks out the woman engineer as an alien and outsider. But the idea of engineering as 'men's work' was found to be explicit in infrastructure engineering and not in software engineering. This means that all engineering work is not 'men's work'. Software engineering, because of the nature of its work – inside the private sphere of an office and use of invisible, intangible technology, includes women not as outsiders but as equal counterparts belonging to the profession.

On the other hand, in infrastructure engineering, men systematically colluded with each other to exclude women engineers. The work conditions of software engineers were arguably much better than that of infrastructure engineers. Yet, issues such as working overtime, arising due to gender stereotypes cannot be brushed off. Deterring women takes place through informal mechanisms (such as informal 'men's club') or by bypassing formal mechanisms. At the formal level, the work culture in engineering was affirmative and stood for women's safety. Some laws, such as the Equal Remuneration Act of 1976 were practised to the letter. Women engineers were paid equally as men engineers and also got paid during maternity leave (The Maternity Benefit Act, 1961). Yet, other laws, especially those related to working overtime (The Mines Act, 1952, The Factories Act, 1948), were breached. Women engineers were not silent receptors but adopted strategies to adapt to the engineering work culture (for instance, speaking in a loud, sharp voice to control workmen). This means that the work culture of engineering is not just constituted by a fixed form of masculinity or femininity where men always hold power over women in patriarchal society (Connell and Messerschmidt, 2005), but that such norms can also be reversed through alternative practices of subversion and resistance. This further suggests that a gendered engineering work culture does not necessarily mean that women are always subjugated and disadvantaged but could be in controlling positions too. Finally, this paper subscribes to the feminist insight that there is a need to re-imagine engineering work beyond its embodiment of hegemonic masculinity in order to disrupt the male imagery of engineering work, and that real change can be brought about not just with the passing but practice of laws to protect women's rights at the workplace. It attempted to deconstruct all engineering work as essentially masculine and homogeneous by positing the idea that there are two kinds of engineering work – field jobs and desk jobs, and tied to it, a more nuanced approach is needed to understand how status and prestige, traditionally male bastions of power, are associated with certain kinds of engineering work. It also opened up possibilities of envisioning engineering technologies not just as gendered, but also as non-gendered. To conclude, gender stereotyping of female engineers as 'not belonging' to high-status engineering work continue with systematic exclusionary attempts to marginalise and discriminate against women, and women creatively dealing with it by employing strategies of subversion and resistance. State laws and work organisation cultures need to work together to foster positive, long-term changes.

## References

- Banerjee, R., & Muley, V. P. (2007). Engineering education in India. Report to Energy Systems Engineering, IIT Bombay, sponsored by Observer Research Foundation, September, 14.
- Butler, J. (1990). *Gender trouble and the subversion of identity*. New York and London: Routledge.
- Cockburn, C. (1981). The material of male power. *Feminist Review*, 41-58.
- Cockburn, C. (1997). Domestic technologies: Cinderella and the engineers. Paper presented at the Women's Studies International Forum.
- Cockburn, C. (2009). On the machinery of dominance: Women, men, and technical know-how. *WSQ: Women's Studies Quarterly*, 37(1), 269-273.
- Connell, R. W., & Messerschmidt, J. W. (2005). Hegemonic masculinity rethinking the concept. *Gender & society*, 19(6), 829-859.
- Cowan, R. S. (1983). *More work for mother: The ironies of household technology from the open hearth to the microwave* (Vol. 5131): Basic Books.
- Cross, S., & Bagilhole, B. (2002). Girls' jobs for the boys? Men, masculinity and non-traditional occupations. *Gender, Work & Organization*, 9(2), 204-226.
- Derrida, J., & Kamuf, P. (1991). *Between the Blinds: A Derrida Reader*. Harvester Wheatsheaf, Hemel Hempstead.
- Faulkner, W. (2001). The technology question in feminism: A view from feminist technology studies. Paper presented at the Women's studies international forum.
- Faulkner, W. (2007). Nuts and Bolts and People'Gender-Troubled Engineering Identities. *Social studies of science*, 37(3), 331-356.
- Faulkner, W. (2009). Doing gender in engineering workplace cultures. II. Gender in/authenticity and the in/visibility paradox. *Engineering Studies*, 1(3), 169-189.
- Foucault, M. (1978). *The history of sexuality: An introduction*. Vol. 1. New York: Vintage.
- Harding, S. G. (1987). *Feminism and methodology: Social science issues*: Indiana University Press.
- Heilman, M. E., & Wallen, A. S. (2010). Wimpy and undeserving of respect: Penalties for men's gender-inconsistent success. *Journal of Experimental Social Psychology*, 46(4), 664-667.
- Johnson, P. S., & Johnson, J. A. (2001). The oppression of women in India. *Violence against women*, 7(9), 1051-1068.
- Knight, M., & Cunningham, C. (2004). Draw an engineer test (DAET): Development of a tool to investigate students' ideas about engineers and engineering. Paper presented at the ASEE Annual Conference and Exposition.
- Kristeva, J. (1982). *Powers of horror* (Vol. 98): Columbia University Press New York.
- Lohan, M., & Faulkner, W. (2004). Masculinities and technologies. *Men and Masculinities*, 6(4), 319-329.
- Ministry of Labour and Employment, G. o. I. (2013). *Annual Report 2013-2014*. Delhi.
- Nayak, A., & Kehily, M. J. (2006). Gender undone: subversion, regulation and embodiment in the work of Judith Butler. *British Journal of Sociology of Education*, 27(4), 459-472.
- Padavic, I. (1991). The Re-Creation of Gender in a Male Workplace. *Symbolic Interaction*, 14(3), 279-294.
- Parikh, P., & Sukhatme, S. (2004). Women engineers in India. *Economic and Political Weekly*, 193-201.
- Talbot, M. (2010). *Language and gender: Polity*.
- Tarlo, E. (1996). *Clothing matters: Dress and identity in India*: University of Chicago Press.
- UNDP (United Nations Development Programme). (2014). *Human Development Report 2014*. New York.
- Wajcman, J. (1991). *Feminism confronts technology*: Penn State Press.
- West, C., & Zimmerman, D. H. (1987). Doing gender. *Gender & society*, 1(2), 125-151.
- World Economic Forum. (2014). *The Global Competitiveness Report 2014-2015*.