REPORT: AN ASSESSMENT OF THE PARTICIPATION OF WOMEN IN SET INDUSTRY FOR DEPARTMENT OF SCIENCE AND TECHNOLOGY

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1 SECTION 1:

INTRODUCTION AND RATIONALE FOR THE STUDY

Persistent gender imbalances in the workplace, but particularly in the Science, Engineering and Technology (SET) sector continue to impact negatively on South Africa's global competitiveness in growing and sustaining its economy, particularly its knowledge economy. One of the major challenges confronting post-apartheid South Africa is that of delivering increased economic growth, wealth creation and improved quality of life for all its citizens. The legacy of apartheid, characterised by racial, gender and social class inequalities, among others, continue to impact negatively on the availability and quality of skills needed to grow the economy. Contributing to these inequalities and to the shortage of skills, particularly in the SET sector, is the country's failure to develop, harness and utilize the SET potential of women who constitute over 50% of the national population. Studies commissioned by the Department of Science and Technology/NACI/SET4Women[1] have all clearly demonstrated the under-representation of women in the SET sector, particularly at senior levels and, in specific fields within the sector. For example, the CREST report[2] recounts that although in 2001 women represented 53% of all higher education enrolments, only 31% of Doctoral enrolments in the Natural Sciences and Engineering were female. Only 7% of Doctoral graduates in engineering were female. The study also showed that only 9% of the teaching staff and 14% of research staff in engineering faculties were female. Furthermore, the report observed that female scientists received only 21% of all research grants awarded by the National Research Foundation (NRF). Of particular concern is the fact that less than 6.4% of all publicly funded research projects were identified as having an explicit 'gender dimension'. Thus, despite the marked increase in women's entry into the higher education system of South Africa during the past decade, women remain under-represented within the SET sector. The bottleneck gets even smaller at postgraduate degree levels, particularly in the field of engineering. This means that only a small proportion of South African women end up working in the SET sector. As available literature suggests, an even smaller number ends up being retained and moving up the promotion ranks within the sector. To illustrate, the Women in Corporate Leadership Census (Business Women Association and Catalyst, 2004) shows that women who enter the SET industry are also under-represented at senior levels given that approximately 60% of all companies have no women board directors. The study measured the number of women on boards in executive management of every listed company on the Johannesburg Securities Exchange (JSE), as well as 17 of the largest state-owned enterprises for the first time in South Africa. The results revealed that women held only 221 of the 3125 directorship positions in these companies and that out of a total of 364 chairs of boards, only 11 were held by women. Furthermore, compared to 357 male CEOs and MDs, only seven were women. As Kahn (2004) concluded, such "stark imbalances in gender and racial representativeness in the science and technology system [...] require urgent attention". Critical to addressing these imbalances is the need to increase the rate and quality of innovation in Science, Engineering and Technology (SET), and to produce a diverse, well-trained and innovative SET workforce that can spearhead economic growth, wealth creation and the improvement of quality of life for the people of South Africa.

Challenges such as gross disparities between the rich and the poor, high unemployment rate, the HIV/AIDS pandemic have in a sense "forced" the public and private sectors to create demand for innovation in an attempt to deal with the double challenges of economic competitiveness and social development (Abrahams & Galant, 2005). These authors argue

[1] See for example the Facing the Facts report published by the Department of Science and Technology/NACI (2004).

[2] Facing the facts: Women's participation in Science, Engineering and Technology (2004), published by the National Advisory Council on Innovation (NACI) and the Department of Science and Technology (DST).

that one strategy for addressing the issue is to grow a national knowledge base which is able to create and sustain levels of innovation which contributes to annual GDP per capita growth as well as ensure scientific and technological innovation is of benefit to the poor.

A second strategy involves addressing the gender imbalances identified above and increasing the recruitment, retention and participation of women in the economy, particularly in the SET sector. Increasing the number of women in the national system of innovation is both a human right as well as a development issue. As the DST acknowledges:

Access to Science and Technology (S&T) for women is necessary to transfer patterns of productivity, contribute to job creation and new ways of working and in promoting the establishment of a knowledge-based society resulting in wealth creation. Access by women to Science and Technology also has the potential to positively contribute to improving the quality of life of women, their livelihoods and households (http://www.naci.org.za/ accessed July 10, 2008).

To this end, the stated goal of the Department of Science and Technology is " [...] to establish a gender equity policy for the Science, Engineering and Technology sector within South Africa's National System of Innovation (NSI) which will inform the sector's initiatives with respect to gender equity mainstreaming". This goal is consistent with South Africa's National Policy Framework for Women's Empowerment and Gender Equality prepared by the Office of the Status of Women in 2000. This framework specifies the key institutional processes, role players, key partners, and mechanisms required to achieve gender equality in both the public and the private sectors of the South African economy. A gender equity policy for the SET sector is an essential element for the realisation of goals enunciated in the national policy framework for the empowerment of women and achieving gender equality in the workplace.

A third strategy involves research and innovation within the various Science, Engineering and Technology (SET) fields, which have been recognised as significant in the efforts towards improving the quality of life and wealth creation opportunities for women globally. As Mario Ramos, group chief executive of Transnet, commented in the Women in Corporate Leadership Census (2004), "unless you *measure*, you do not know *where* you are going or *how* you are going to get there" (our emphasis). In this regard, the DST's National Research & Development (R&D) strategy recognises the critical importance of nurturing human capital necessary for a robust NSI, and also articulates the numerous challenges confronting South Africa in this respect, including the fact that the South African scientific population is aging and shrinking, while our proportion of 1.9 researchers per thousand workers is comparatively low (NACI, 2005). The consequence of aging and shrinkage is a shortage of highly skilled workers in the fields of Science, Engineering and Technology (see for example Lawless, 2005). Another of the factors contributing to the shortage is that of outward mobility of R&D workers (see Kahn et al., 2004). To address this, the R & D strategy takes a strong policy position on the empowerment of women, and particularly for increasing their participation in the economy, including the SET sector. This is evidenced by the appointment of the Science, Engineering and Technology for Women (SET4W) as a permanent national advisory committee of the National Advisory Council on Innovation (NACI).

The Department of Science and Technology (DST) is currently involved in a series of studies on issues affecting the effective recruitment, advancement and retention of women in the SET sector in South Africa. These studies include in-depth interviews with university students and graduates in Science, Engineering and Technology disciplines, focus group discussions on the needs of women in the SET sector, consultative conferences on women in the SET sector and e-mail discussion forums and interviews with successful women in the SET sector. The findings from these studies will culminate in the development of a gender equity policy for the SET sector in South Africa.

The HSRC (Gender and Development Unit) was responsible for the overall management and co-ordination of the projects. The Gender and Development Unit was also tasked with the

responsibility of using findings from the above studies to develop, together with the DST and other stakeholders, a gender equity policy for the SET sector in South Africa. It was in this context that the Gender and Development Unit undertook the quantitative and qualitative assessment of the participation of Women in Industry in the Industrial Science, Engineering and Technology sector on behalf of the Science, Engineering and Technology for Women (SET4W) (also previously known as South African Reference Group on Women in Science and Technology - SARG)

The stated aim of the assessment was to "[...] determine factors contributing to or inhibiting women's participation" in the SET sector of South Africa. In particular, the project objectives were as follows:

Undertake an environmental scan to determine comparable research in South Africa and internationally in this area. This entailed conducting desk research on international best practices with respect to women's participation in the SET sector.

Quantify the number and status of women SET workers in companies with a sizeable technology base. Among other things, this quantitative component of the project provided information relating to issues such as the level of qualifications, fields of study, length (i.e. time spent) in the industry, personal experiences and percentages of women within each of the aforementioned SET sectors.

Identify gaps in gender representativity in industry and the key workplace factors blocking progress. Questions relating to the first part of this objective (i.e. gaps in gender representativity) were included in the survey while the factors blocking progress were explored using a qualitative method.

Develop a best practice guideline document with regard to gender equity mainstreaming for the relevant technology intensive SOEs and private sector companies and produce a comprehensive report for submission to SARG including all the compiled databases. Using information on the international best practices on women in the SET sector as benchmarks, as well as findings from the quantitative and qualitative studies described above, a best practice guideline document and the report was submitted to SARG.

Thus, the study in this report aimed to identify and analyse the various factors impacting on the participation of women in the SET sector in South Africa. The study also aimed to identify the strategies employed by those companies that have been successful in recruiting and retaining women in the industry, and from these, to develop a best practice guideline document for the Department of Science and Technology and the SET sector in South Africa for the effective recruitment and retention of women in the sector.

The report is divided into five sections:

Section 1 introduces and provides a context for the study.

In **Section 2** a review of the local and international literature on the participation of women in Industrial Science, Engineering and Technology is presented. The section briefly examines two theoretical perspectives focused on the lack of women's participation in SET before turning to a discussion of the gender of engineering and information technology respectively. Some specific barriers experienced by women, such as sexual harassment, working time constraints and family commitments, are highlighted. The section is concluded with a reflection on best practice that would increase women's participation in SET as well as how gender policies could achieve this.

Section 3 describes the research design and methodology in this project. Some challenges encountered during the research process conclude this section.

In **Section 4** the findings addressing the three objectives of the study are presented:

- **Objective 1** serves to examine the gaps in gender representativity in industry. A quantitative methodology, in the form of a balanced score-card questionnaire that

required information about women's participation in each of the companies, was sent to an identified contact person in each company to complete. A statistical analysis was performed on the data. Due to the limitations of the information provided by participant companies and the fact that the weighting procedure for gender equity assessment within the SET sector of South Africa has not yet been formulated and agreed to at a policy level, a full balanced scorecard for each company could not be computed. Instead, a summary of the information gleaned from the data with respect to some of the key indicators that would form part of a balanced scorecard is presented in the report.

- **Objective 2** was to determine the factors contributing to or inhibiting women's participation in the SET sector of South Africa. Both quantitative and qualitative methodologies were employed. The latter used in-depth interviews and the former used a survey method (specifically questionnaires) to gather data. The in-depth interviews (qualitative) gathered comprehensive verbal/textual expressions of women's experiences and perspectives of their participation in the SET industry from the most senior woman in the industrial SET company as well as the company's CEO or his or her designate. The questionnaires (quantitative) captured numerical (mostly) ratings of women's (with a SET background) experiences in each company. A thematic analysis was performed on the data from the in-depth interviews and a statistical analysis was performed on the data from the questionnaires.
- **Objective 3** was to identify local and international best practice informed by the literature survey conducted in the study, and, based on that, as well as on the empirical research described in objectives 1 and 2, develop a best practice guideline document.
- **Section 5** presents a set of recommendations (with examples) for policy and practice aimed at increasing the participation of women in the SET industry. From these, a guidelines document aimed at guiding the DST and industry towards developing policies and support and development structures for improving the participation of women in the SET sector is presented (see Addendum 1).

2 SECTION 2:

WOMEN'S PARTICIPATION IN INDUSTRIAL SCIENCE, ENGINEERING AND TECHNOLOGY: A REVIEW OF THE LITERATURE

> *Until women are fully represented in the fields of science and engineering, society is losing out on the talents of a vast number of potential contributors* (Carol B Muller, quoted by Kgabi, 2005:1).

This study is premised on findings from local and international literature which suggest that on the one hand, women have made strides (with their numbers continuing to grow) in accessing jobs in the fields of science, engineering and technology, particularly in the public SET sector. For example, in South Africa, the 2004 NACI Report, *Facing the Facts, Women's Participation in Science, Engineering and Technology* reported a 10% increase in women's participation in the public SET workforce from less than 30% in 1992 to 40% in 2001. Furthermore, the report concluded that:

> Within the *science councils and other government SETIs*, female R&D personnel increased from 35% in 1996 to 42% in 2001. Despite these improvements, some *important inequities remain.* (http://www.naci.org.za/ retrieved June 29, 2008).

On the other hand, available literature suggests that the more advanced the level of study in SET at universities and technikons, the fewer female enrolments. To illustrate, in comparison to 69% men enrolled for doctorates in the Natural Sciences and Engineering in 2001, women comprised only 31%. In terms of graduations in Engineering, the situation is similar, with 7% women graduating with doctoral degrees compared to 23% men (NACI & DST, 2004). Following this trend, although women's participation has increased in the public SET workforce over the past decade, women still occupy fewer spaces than males in the sector – this includes academic staff in universities as well as research and development (R&D) staff in science councils. In 2001, the proportion of female academic staff was 40% in comparison to 60% male staff, while female R&D staff in the science council sector accounted for 42% compared to 58% male staff. While these numbers might seem reasonable, the majority of these women were white and located in the Social Sciences and Humanities, rather than the Natural Sciences and Engineering (NACI & DST, 2004).

Within the SET industrial (private) sector, the situation is dire, with women remaining under-represented, more so at the top corporate leadership positions. To illustrate, extrapolating from 2003 statistics, Kgabi (2005) noted that compared to 40.7% in government and 51% in higher education, women constituted only 37% of researchers in the business sector. From these trends, Esler, Shackleton and Chinsamy-Turan (2006) conclude that a huge gender gap remains in relation to research productivity and leadership diversity. Furthermore, a 2007 Businesswomen's Association (BWA) census found that women directors as a percentage of all directors on JSE listed companies stood at 8,3%, and that women's representativity in these companies was 10,3%. Furthermore, according to this census, only 11% of JSE listed companies (35 of 318) have 25% or more women directors (www.fin24.com/articles/default/display retrieved July 10, 2008). Thus, this study aimed to identify reasons for this under-representation.

Literature from other countries, including the so-called first-world countries, suggests that this is a global phenomenon. For example, careers in Science, Engineering and Technology have been chosen by more women today and account for half of the Bachelor Degrees conferred. In the United Kingdom, of the 44% of Masters degrees and 37% of PhDs conferred in SET, women only comprise a quarter of the Science and Engineering workforce. In 1997 in the USA, women received 18.7% of the Bachelor's degrees in that year, 19% of

the Masters degrees and 12.2% of the Doctoral degrees in Engineering (Engineering Workforce Commission, 1998). Most European countries have fewer women in Engineering - Denmark (6.4% female Engineers); Ireland (2% female Engineers) and France (5% female Engineers). Furthermore, research conducted by the European Commission (2003) reflects that despite the increase in women's educational attainment in the EU member states during the last 20 years, the number of women in industrial research is lower than in other sectors. In eight of 10 EU countries, women constitute between 18% and 20% of all industrial researchers. Furthermore, it appears that women participate more substantially in industrial research areas which focus on health, social work and financial intermediation. Both international and local literature confirms that as a result of many factors, women in Industrial Science, Engineering and Technology are generally inhibited from participation in the sector. Constructions of gender differences appear to be one of the main factors highlighted in all the literature, with the European Commission (2003) highlighting that women frequently are forced to choose between family and children, and a professional career. As a result of this forced choice and most employers' traditional perceptions of 'mothers' as limited in their performance capabilities, SET loses out on the potential of talented female scientists, engineers and technologists. Similarly, research conducted in SET industries in Australia (1995) highlights that the sector is consistently constructed as a masculine arena which excludes, marginalises, alienates and isolates women within the industry.

Partly explaining the above trends, Evetts (1998: 283) notes that "engineering and management in Engineering are archetypically men's careers". This is the prevalent mindset in most facets of the engineering industry. Engineering is perceived as a masculine profession and consequently women entering the profession are regarded as intruders and cannot expect the same opportunities afforded to their male counterparts. It is difficult to ascertain the impact of gender on SET in South Africa as a result of the dearth of literature on the subject, a gap this study hopes to contribute towards filling.

The study reported in this document was therefore aimed at understanding and explaining women's rates of participation in the SET sector industries and to identify and analyse the various factors that facilitate or inhibit their effective participation therein. While there is considerable literature on women in SET available from countries of the geographical north (the United States and the United Kingdom, in particular), there is a paucity of literature on the South African SET sector. Thus, the literature review in this section examines women's participation in Industrial Science, Engineering and Technology (SET) both internationally and locally. In particular, the review examines the specific factors that affect the recruitment, advancement and retention of women in the sector.

So, what might explain the under-representation of South African women in the SET sector? In order to understand this, it is essential to explicate the key theoretical formulations that underscore and motivate the argument.

2.1 Some theoretical perspectives

Available literature suggests that explanations for the trends in the participation (or lack thereof) of women in the SET sector derive from theoretical perspectives (mostly gender and feminist theories) as well as evidence from empirical research. This section reviews some of the possible theoretical explanations.

2.1.1 Socio-cultural norms and hegemonic masculinity

One explanation for the poor participation of South African women in the SET sector lies in the dominant socio-cultural norms in the society. In any society, social norms tend to

influence men and women's work and in particular, the gender division of labour in families, communities, and consequently in rights and responsibilities between the two sexes. This often means that women's responsibilities revolve around the home while men are expected to go out to work (Serugama & Kotze, 2004). Informed by these norms, some companies may exclude women from jobs/positions considered to be appropriate for men or men who are seen as falling outside the set norms. Furthermore, due to these socially ascribed roles and responsibilities for men and women, motherhood, in particular, tends to limit women's access to the labour market and to progression within industry, resulting in them entering and leaving more frequently, as well as lack of progression and skills development on their part. Based on these social norms, starting from the family and extending into society and the workplace, certain tasks are considered more appropriate for men or women. In relation to technology in particular, Noble (1991) explains that historically it has been man's quest to gain control and domination over nature (in Faulkner 2000), thus the "mastery of nature remains a powerful emblem of technology" both within Engineering and the wider culture (Faulkner, 2000: 90). Consequently technology is perceived as a "masculine culture" (Wajcman, 1991). Faulkner (2000) posits that it is essential to explore in-depth the relative links between gender structures (occupation and education), gender symbolism (cultural associations between masculinity and technology), and gender identity (how people see themselves as women and men) in the gender-technology association.

Linked to the above, a second explanation lies in what has been referred to as hegemonic masculinity. Connell (2005) defines hegemonic masculinity as a type of gendered practice which functions to exemplify and legitimise patriarchy (male authority and power) and the domination of some men over others (e.g., those who are viewed as behaving outside the norm, such as for example, homosexual men), and the subordination of women. Thus, it is the benchmark against which other men are measured and is used as a means of excluding those men who are viewed as not measuring up, as well as women (Faulkner, 2000: 91). As a benchmark, hegemonic masculinity is counterpoised to "subjugated femininity" and is used to identify a certain type of manhood associated with men in power and to sanction those who behave outside of such gender norms. As such, it is "the normative ideal of masculinity to which men are supposed to aim" (Wikipedia). Most men in Kimmel's (1994) opinion do not meet the standards but perform within the confines of masculinity for the benefit of other men. According to Brod and Kaufman (1994) the individual does not feel powerful although men as a group hold and exercise power.

Faulkner (2000: 90) claims that "both technology and hegemonic masculinity are historically associated with industrial capitalism; they are linked culturally by themes of control and domination". Closely related to cultural problems is the "power position in the gender and technology debate which appeals to the understanding of the social context within which particular gender constructions and particular technologies appear" (Faulkner, 2000: 90). For example, this might explain why, internationally, including in developed countries, despite the numerous campaigns to encourage the progress of women in Science and Engineering, women are not playing a significant role in design roles (Faulkner, 2000). Henwood (1996) claims that there is a misconception that women's socialisation has to be modified to match the role of an Engineer and not vice versa. It may thus be assumed that the reason for failure of the initiatives to get more women recognised in Science and Engineering stems from the strong operation of the symbolic association of masculinity and technology. There are a series of highly gendered dichotomies that may be discerned within this association. Faulkner (2000) identifies three of these dichotomies. The first relates to the distinction between being people-focused and machine-focused: this is one version of the sociological distinction between *masculine instrumentalism* (machine-focused) and *feminine expressiveness* (people-focused). In this regard, it appears that if a woman chooses to work within the technology sector, she is potentially rejecting any meaningful engagement in the social world and thus faces 'gender inauthenticity' (Keller, 1985).

The second dichotomy relates to the distinction between hard technology and soft technology, with the latter being associated more with women (domestic appliances). Arising from this hard/soft dualism, is a third dichotomy: styles of thought, since accompanying the association of Engineering with Science is the established gender dualism (Edwards, 1996). On the one hand, objectivist rationality connected to emotional detachment and abstract reductionism approaches to problem solving is claimed to be masculine. On the other hand, subjective reality is associated with emotional connectedness related to concrete, empirical, and holistic approaches to problem solving. Abstract thought and work (scientific reasoning) is generally associated with masculinity, while concrete thought is associated with femininity. However, Faulkner (2000) argues that both sides of the abstract and concrete dualism are requisites within Engineering. In science, these dualisms "are widely held as truths by technical and non-technical people, women and men [...]" (Faulkner, 2000: 94). Numerous studies tend to confirm the operation of the three sets of dualisms, namely; *people* versus *technology* focused, *soft* versus *hard* technology and *concrete* versus *abstract*. These dualisms are evidenced in schools and institutions of higher education where girls are perceived to be out of their depth in the male dominated Science and Engineering professions and tend to be discouraged or actively excluded from the field.

While some strides have been made in overcoming these norms and understandings and many women are now working in jobs which were traditionally perceived as male, the fact that women generally still lag behind in their participation in the SET is cause for concern. Thus Faulkner (2000: 95) sees a crucial point that is often overlooked: the "huge mismatches between the image and the practice of technology with respect to gender." The South African literature does not highlight this mismatch but Stephen (2000) states quite categorically that society's attitudes to women in science in South Africa is not encouraging as society concurs with the global notion that scientific careers are incompatible with a woman's life.

In this regard, it is necessary to examine what so effectively maintains this male dominated domain. Considering the field of engineering as a case in point, an exploration of the dichotomous ways in which work in this field is categorised might help to understand the complexity. The distinction between manual labour and the professional graduate engineer is the most obvious of these dichotomous ways: "These two versions of masculinity embody the often gendered dualism of mind and body" (Wajcman, 1991: 95). Men are considered to be "natural" technologists because they have what is perceived as the suitable rationality and mechanical skills required by the profession. Until recently higher status and credit was attached to the more mathematical and abstract analytical work (often associated with men) and less to hands-on concrete work within engineering education in the USA. But is there any fact in the understandings of engineering as a field most suited to men? So far, no empirical evidence exists to confirm any inborn differences in the technical ability of males and female and the way that males and females engage in technical tasks (Faulkner, 2000). However, there is evidence to suggest that there are some differences in particular settings as found by Turkle and Papert (1990) in their study. Women and girls tend to adopt an interactive approach while men and boys adopt a more linear and formal approach that comprises hierarchical planning. In IT a number of female programmers have been found to favour abstract approaches but the conclusion that Turkle and Papert (1990: 132) arrived at is that "the computer supports epistemological pluralism but the computer culture does not." In both design and programming there are dominant gendered assumptions that males have an innate aptitude and value nominally masculine styles. These assumptions are sustained despite the counterevidence. Consequently aspiring women technologists are excluded.

This notion begs the questions "Could engineering support different epistemological styles of work? Should such a powerful occupation as engineering be predominantly shaped by a singular set of values and styles" (Faulkner, 2000)? Campaigning for equal opportunities has emphasized the benefits that male dominated areas would receive by including both women

and ethnic minorities. The diversity position purports that women contribute different approaches and priorities. This assumption however, may be interpreted as essentialist because it fails to challenge stereotypical constructions such as femininity being associated with subordinate roles and masculinity as the controlling force in society. If the representation of women in Science and Technology improves then it contributes to the transformation of technological products as well as the procedures used (Arnold & Faulkner, 1985).

Rose (1983) argues that women are more likely to bring a caring rationality to technical work. However, the evidence is limited and inconclusive. The exclusion of women based on these assumptions may possibly be identified as one of the reasons that inhibit the participation of women in SET. The South African literature has touched on this aspect in a limited way. For example, Mabandla (UNESCO, 1998) states that "we should not continue to waste our human resources by excluding women since very few women in Africa were employed in Science and Technology occupations". Thus far various aspects relating to women's exclusion from SET were discussed.

A third theoretical perspective that might explain the poor participation women in the SET sector is related to the subjective realities of those employed or working in the SET sector.

2.1.2 Subjective Realities

According to Kimmel (1994) the engineering fraternity is a homo-social performance that affirms a specific version of masculinity which is also a primary resource in advancing the positions and interests of male engineers. Engineers enjoy high status in certain organisations and disciplines and thus they benefit from the "power to create a work style comfortable to them as men" (McIlwee & Robinson, 1992: 138). To illustrate, when stress is placed on the centrality of technology and when competence is displayed aggressively as means to secure top jobs and assignments in an organisation, men tend to benefit at the expense of women. Furthermore, career progression in the engineering field is generally based on involvement in successful projects and membership of networks of contacts and mentors (Melström, 1995), which women do not have access to. Most women who initially lack the hands-on experience and confidence, despite their competence, do not experience the thrill and obsession of their male counterparts (McIlwee & Robinson, 1992; Melström, 1995).

Based on these patterns of homo-sociality produced by engineering, it is not surprising that many women engineers opt to leave the profession. Alternatively they lose out as far as their careers in Engineering is concerned since they do not belong to the 'men's club'. In addition, it is hardly surprising that the access of women into engineering is greeted with hostility by many of their male counterparts. Murray (1993) believes that this challenges what it means to be a man (or the entry of women might spoil their fun) Do not understand the meaning of this bracketed phrase.

Available literature identifies the subjective realities of individuals and groups in the sector as significant in explaining the participation (or lack thereof) of women. Faulkner (2000) identifies three subjectivities of engineers for this purpose: These relate to "the pleasure engineers so palpably take in technology, the exclusion of women based on these assumptions may possibly be identified as one of the reasons that inhibit the participation of women in SET, their ambivalent relationships with power and the identity work they do" (Faulkner, 2000: 104). Faulkner (2000) argues that engineers' pleasure in technology and their close identification with technology are fundamental to the individual identity and shared culture of Engineers. A fraternity is cemented among engineers which inevitably excludes women from significant internal networks. According to Hacker (1989), part of the pleasure

of engineering is a pleasure derived from domination and control over staff and the natural world. The author suggests that the fun that engineers experience with technology may be seen as compensating for the contribution to larger systems of dominance and control. This pleasure may also be seen as a reward for the fragmented roles engineers play in the labour force as well as the limited job satisfaction they experience in other spheres (Hacker, 1989). Hacker's (1989) intention was to demonstrate how the power and pleasure of engineering are linked. She claims that men in engineering have their limited strength or potency symbolically extended through the power of technology. Men who relatively lack power in other spheres of life tend to gain the most pleasure in technology. Henwood (1993: 41) explains: "Technology offers a symbolic promise of power as well as the potential to compensate materially for their relative lack of power by a strengthening of their gender power through the acquisition of technical expertise". Further, aptitude in mathematics and technology offers some engineers certain compensation for a lack control in various areas: "Engineers routinely feel powerless themselves but are viewed as highly empowered by outsiders" (Downey & Lucena, 1995: 172).

Engineers have an ambivalent relationship with power and are rooted in their structural location within the capitalist industry. Due to the ambiguous location between capital, labour and the state, engineers tend to identify themselves with technology since this self acknowledgment provides them with apparent neutrality (Berner, 1992). A number of studies report that most engineers are interested in gaining organisational power (McIlwee & Robinson, 1992). Engineering may thus be viewed as a fraternity constructed around this shared identity with, and pleasure and pride in technology. Obviously, women tend to fall outside this socially constructed fraternity, which might explain why their recruitment into, progression and retention in the SET remains problematic.

This study aimed to identify factors that influence the poor participation of South African women in the SET sector. The next section reviews literature that addresses this question.

2.2 What factors explain the low participation of women in SET?

Although there is considerable literature available on the participation of women in Science, Engineering and Technology, most of it is found in the so-called developed first-world countries. Specifically, studies of women in science have been conducted almost entirely in the developed countries of the north (Campion & Shrum, 2004). Even there, empirical studies that examine the influence of gender are scarce (Faulkner, 2000). This section reviews literature which identifies some important factors that influence women's participation in SET internationally.

2.2.1 Key obstacles faced by women in SET

Liu and Wilson (2001) have identified four main obstacles that restrict women from working in or pursuing a career in IT. These are gender stereotypes and attitudes, family responsibility, working time constraints and lack of confidence. Firstly, the authors assert that one of the major restrictions on women's development and career advancement in IT is the **gender stereotypes and attitudes** of male colleagues. Gender stereotypes and attitudes emanate from family values, societal and media influence as well as education. All these contribute to shaping beliefs, ideas and values. These forms of behavioural and mental conditioning underpin many assumptions and stereotypes that are carried into the workplace. Traditionally, men are expected to hold senior positions while women are employed in lower positions despite the number of women who have entered the IT field. Empirical research has highlighted the fact that occasionally these misguided expectations lead to segregation of the sexes (Liu & Wilson, 2001) resulting in the gendered division of labour so that there is no even distribution of women across the various occupations and industries. In the UK, for

example, many of the women worked in gender segregated jobs, confining them to lower levels in the job hierarchy and denying them a voice or the power to improve their positions (Steven, 2000).

Gender stereotypes include the notion that a woman's role is to simply serve, nurture and care. For example, as the only woman on the management team she would be expected to take the minutes at a senior managers' meeting. Women managers who reject these expectations are labelled troublesome, unreasonable and aggressive. Comments made by male colleagues towards female colleagues are often derogatory and demeaning, particularly with reference to women not being technically minded and the possibility of falling pregnant on the job. In addition, Trauth (2002) found that men make also sexually explicit comments. These derogatory comments and skewed perceptions may impact negatively on a woman's career.

In Liu and Wilson's (2001) study men's negative attitudes increased towards women who were promoted to managerial positions. Life for women in the workplace is made very difficult by these gender imbalances and perceptions. Thus it is assumed that women suffer more hostilities in the profession than men, especially those women who hold positions of authority. Simpson and Holly (2000) assert that gender imbalance creates an organisational culture that is hostile or resistant to women. Furthermore, she points out that organisations with relatively few women in positions of authority are experienced as less welcoming to women and less accepting of women's values, attitudes and behaviours. Women in South Africa and Africa are being encouraged to pursue careers in Science. At a conference held in South Africa in September 1998, the issue of attracting and retaining women in science and technology was discussed. Governments of African countries were urged by leading women Scientists, academics and politicians from Southern Africa to increase opportunities and access for women's participation in Science and Technology in South Africa (UNESCO, 1998). In their study Lui and Wilson (2001) found that female managers identified gender stereotypes and men's attitudes as the second largest restriction on women's careers.

Secondly, **sexual harassment** in the workplace was identified as another problem that women face. According to Evetts (1998), sexual harassment in the workplace is not uncommon. The author claims that some of the relational difficulties of being a woman in the field of Science, Engineering and Technology would be accurately described as sexual harassment. Many women in this field refrain from reporting such incidents for fear of victimisation and being ostracised. This male dominated world does not view such complaints empathically and instead women are made out to be responsible for invoking such behaviour by men. Evetts (1998) tells of a young woman in an Engineering organisation who was touched, whistled at, leered at, insulted and patted on the head. Although she was with her manager who witnessed some of this behaviour, nothing was done about it. It is incumbent upon management to have a clear policy on sexual harassment and that all employees are made aware of the consequences of such acts. Sexual harassment may not be perceived as such by women who take unequal treatment for granted as they do not fully grasp the sexual harassment and challenges to their competence until it is pointed out to them (Trauth, 2002).

Although, no literature could be found on sexual harassment in SET in South Africa. It does not mean that women in SET have not encountered sexual harassment. As more information becomes available in South Africa and Africa, there may be reports on sexual harassment in SET. Many women complained about working time constraints which was a further inhibiting factor in their careers and which is taken up below.

Thirdly, another key obstacle that restricted women's development is **working time constraints**. In order for women to be both mother and employee, it is necessary for

employers to deviate from the norm and allow more work time flexibility. The fixed working times make it difficult for mothers/working women. As a result many women leave permanent employment and opt for part-time employment. Apart from childcare, women have domestic responsibilities. Inflexible working time can restrict women's development in technology. Time constraints in the workplace tend to have a restrictive impact on women's careers as well as their chances of breaking the glass ceiling (Liu & Wilson, 2001).

Fourthly, a major obstacle for women in the IT field as well as in SET in general, is **family responsibilities**, since the belief shared by employers is that women lose their ability to compete when they became mothers and are less likely to be flexible in the workplace. As a result of these distorted beliefs, 'glass ceilings' (see below) are created for women working in the IT profession. Earlier studies have indicated that employers obstruct the promotion of women in IT and provide less training. In addition, they are averse to accommodating women's home lives that involve children (Kavanagh, 1999). In their study, Lui and Wilson (2001) found that female managers identified gender stereotypes and men's attitudes as the second largest restriction on women's careers. Family responsibilities were cited as the largest restriction on women's careers in IT, according to Liu and Wilson's study (2001). An interesting point from Campion and Shrum's (2004) study of Scientists in Ghana, Kenya and India, was that 95 per cent of the men were married compared to three quarters of the women. Women had fewer children, whereas men had more. Sixteen percent of the women were pursuing a professional career in Science with no children. Given the similar age structure of the men and women, this suggests that men and women handle their professional and family lives differently.

In South Africa, available literature unfortunately does not address this issue across race groups but Serumaga and Kotze (2004) found that marriage and children affect white women's participation in the South African labour force. **Role stressors**, which include role ambiguity and role conflict, are found to impact negatively on women. To illustrate, role conflict refers to incompatible expectations associated with a work role which often arises when two or more conflicting demands occur (Igbaria & Chidambaram, 1997). Schwartz-Cowan (1979: 67) argue that "men continue to perceive women as the rearers of their children, so they find it understandable, indeed appropriate, that women should renounce their careers to raise families." As a result, women may leave their jobs and concentrate on family responsibilities. In their study, Igbaria and Chidambaram (1997) examined gender differences in role stressors (role ambiguity and role conflict).

Role ambiguity is faced by many women in SET as they are unclear about their job duties, performance and standards or level of job performance. Women are socialised to develop different job-related expectations in specific occupations than men and if they are unable to meet these expectations, it may cause role stress throughout their careers. Consequently, women may experience higher levels of role stress. Role theory is based on the premise that individuals have limited resources in terms of time and physical, mental and emotional energy (Igbaria & Chidambaram, 1997). The demands and requirements of women playing multiple roles with regards to family and career often create role conflict, role overload and role strain on women (Gallivan, 2004).

Because women have to juggle their roles within the organisation and at home they are invariably not given the opportunity to take on challenging assignments and as a result are overlooked for salary raises and promotion. Since men have fewer career interruptions they acquire more experience, education and human capital. As a result, family responsibilities impact seriously on women's career development as "withdrawal from the labour market

influences wages through human capital depreciation and underinvestment in on-the-job-training" (Mincer & Polachek, 1974, in Chaung, 2003).

It has been argued that women often experience 'role overload' which occurs when they undertake paid employment, and have to concurrently maintain responsibility for domestic tasks, family responsibilities and child rearing. Women executives have reported that they carry a disproportionate share of the responsibilities for home chores (Schwartz, 1989). As a consequence, women may face a greater conflict between household and child rearing responsibilities and organisational duties than do men. The potential for stress and strain arising from work and family domains is heightened as women are required to balance the simultaneous demands of career with those of family where they are essentially responsible for household chores and childcare (Gallivan, 2004; Igbaria & Chidambaram, 1997). Another factor that causes role stress is the fact that women's salaries are lower than men's. It is argued that since wives only enter the workforce during periods of temporary economic need and leave thereafter, they earn the requisite (lower) salaries. The lower salaries and lack of recognition of their abilities and capacity in the field may lead to a lack of confidence in women in SET.

Fifthly, **lack of confidence** has also been identified as a factor impacting negatively on women's participation in the SET sector. For example, despite their educational qualifications, a number of women believe that they lack competence to execute their jobs effectively. Women in SET have inevitably suffered some form of low self-confidence at some point in their working careers. This low self esteem and low self-confidence may be attributed to fears of failure and fears of being labelled incompetent (Lui & Wilson, 2001). Lack of confidence is a barrier to self-development in SET, and low self-esteem can also be quite restrictive.

In addition, there is a tendency among some men to see women as the 'weaker sex'. If women are assertive, they may be negatively labelled by their male counterparts and this contributes towards women losing their self confidence. Recent research has highlighted the fact that a lack of confidence may lead to attrition as well as restricting the development of women in the profession. The numbers of women in Science and Engineering is declining at an alarming rate and this attrition may be attributed to the loss of self-esteem and self-confidence. Greater in-depth investigation has to be conducted into the reasons that underpin women's loss of self esteem and lack of confidence. Added to the lack of self esteem and lack of confidence, is age as an obstacle. Liu and Wilson (2001) also point out that male IT workers earn a higher salary than females. Other issues that were highlighted in their study were a lack of childcare facilities, lack of IT skills and lack of finance.

In addition to the above, available literature also suggests other factors which negatively influence women's participation in SET. One such factor is ***age****. It has been suggested that male and female managers differ in their success and this could be due to the average male manager being older and more experienced than the average female manager. For example, the majority of women in SET are in the age group 25-29 and 30-35 (Igbaria & Chidambaram, 1997). Women are said to possess comparatively less life and work experience and fewer skills. Therefore it is suggested that women in the workplace are likely to be younger and hold lower qualifications (Igbaria & Chidambaram, 1997). Socio-cultural influences play an important role in SET as well as in IT.*

Socio-cultural influences have also been identified as impacting negatively on women in SET. Recent studies (e.g., Trauth, 2002) suggest that women experience a variety of socio-cultural influences which either encourage or discourage their participation in the IT profession. Every woman is an individual who possesses different technological talents and responds to social shaping in a unique and individual way. The IT field is socially constructed as a traditionally male domain which prevents women's participation at a higher level. Trauth (2002) observes that whereas women from communist countries were encouraged to pursue a career in IT, others had to resist a cultural norm where working is unacceptable and in IT, even more unusual. For her, cultural influences are experienced as a restraint in some countries where women are often relegated to the private sphere (the home) and not the IT workplace. Schools have also been cited as promoting gender segregation in certain courses, specifically in mathematics and computer courses. Further, certain staff members favour gender segregation when they encourage males and discourage females from pursuing Science and Technology.

Moreover, as observed by other authors cited in this review, **organisational culture** has also been found to significantly impact on women in SET, where the gendered expectations and processes within an organisation contribute to the real dilemmas that women face in their careers in technology (see for example, Evetts, 1998). Women are made to feel uncomfortable in the organisation –intruders in a male domain. For example, in Evetts' study, women employees in Engineering and Technology cited examples of organisational culture that required them to be submissive, where managers had specific expectations of professional employees and these expectations were gender specific. If women were perceived as confrontational or too aggressive, it could be to their detriment with regards to promotion or other work-related opportunities. On one hand, some women become resigned to organisational expectations and behave in a specific manner in order to satisfy the organisational culture where women are expected to be tolerant and accepting of gender challenges and not provoking confrontation (Evetts, 1998; Trauth, 2002). On the other, this behaviour is believed to be problematic as women are perceived as too weak, submissive and passive to be promoted and are judged as unsuitable for career progress and development.

Furthermore, organisations tend to take on a more competitive and masculine culture which negates the presence of women especially in senior, decision-making management roles (Trauth, 2002). Gender imbalances in an organisation create an organisational culture that can be described as hostile or resistant to women. As a result women are overlooked for promotion and encouraged to steer away from the managerial route as a career path. For example, two career ladders were identified by Trauth (2002) - professional and managerial career ladders. In many organisations, women are encouraged to pursue the professional rather than the managerial route. Consequently, while women become highly skilled Technical Specialists in the profession, the managerial route is closed to them, and they therefore do not have a voice in managerial decisions. The professional path tends to be seen to be more appropriate for women with family commitments (Evetts, 1998).

The above goes together with traditional beliefs (formed through social and cultural conditioning) which hold that there are appropriate roles for men and women and these beliefs exert a major influence on employment opportunities and experiences for women. The traits and behaviours stereotypically viewed as appropriate and possessed by men, for example competitiveness, logical and initiating behaviour, persuasiveness and aggression are believed not to be attributes associated with women. Therefore, women are not suited for certain positions which require leadership, professional or technical skills (Worrel & Rener, 1996). In Nigeria, the United Nations declaration, 1976 – 1985, spurred the Federal Government on to implement affirmative action. Affirmative action accounts for much change

with regard to the promotion of women (Chovwen, 2003). Similarly, South Africa has implemented the policy of affirmative action which saw many women in top managerial positions. However, these statistics still remain far below that of men in managerial positions. Since the perception that women should not pursue the managerial route persists, some organisations allow women to progress up the ladder but only as far as what is generally called the 'glass ceiling' and no further.

But can the **glass ceiling** be penetrated to allow upward mobility of women in SET? This is a question that is probably on the lips of many women in SET who have reached the glass ceiling, and for whom upward mobility is not possible due to an organisational culture that favours men in senior positions. A study conducted by Simpson and Holley (2000) investigates the impact of restructuring on the career progression of women in Transport and Logistics. The findings could have significance for women in SET who have encountered a 'glass ceiling' and are restricted by it. The study looks specifically at organisational change and gender impact. Findings suggest that women are particularly vulnerable during times of organisational change as they are less likely to be seconded into other functional areas, thus limiting access to new skills and management expertise (see also Woodall, Edwards & Welchman, 1997). Further, as the major concentration of women is in junior or middle management, retrenchments and demotion at these levels suggest that the women managers are reduced, thus making the glass ceiling even more impenetrable with fewer women eligible for promotion to senior positions. Despite equal opportunity measures being in place, they are not likely to be considered favourably during times of organisational change.

In a study by Simpson & Holley (2000), women in the USA indicated that they were negative about their career prospects since they believed that men's remuneration was higher and their progress was faster than their female counterparts. Additionally, women were frustrated by the sexual discrimination and 'old boys' networks' that favoured males in hiring and promotion decisions. For example, men in Logistics still hold senior posts although women Logisticians hold higher qualifications, including a more participatory style better suited to the current competitive environment. Further, a study of 300 transport managers established that 75 percent believe that their careers have been restricted by a glass ceiling and sexism in the Transport industry (Holley, 2000). Women in IT are invariably faced with sex bias which suggests that various mechanisms inhibit women from upward mobility irrespective of their qualifications and experience. Evidence of gender bias against women is prolific especially at higher corporate levels. Several papers are cited that suggest the existence of a glass ceiling that inhibits women from reaching the top (Bilimoria & Piderit, 1994). Globally few women and fewer still in Nigeria have managed to penetrate the glass ceiling (Chovwen, 2003). These sentiments (examples, factors?) can similarly be applied to SET as women are not rising to top management levels as they should be. There has been widespread research over the past 20 years to understand what factors influence job satisfaction and the high attrition rate (Niederman & Moore, 2000). According to Moore (2000) **job stress and burnout** were leading causes of IT employees' high attrition rate. IT personnel research has sought to identify gender differences that may explain the low participation of women in the IT industry. Because of the socio-cultural influences, prejudice, gender segregation and other barriers, the attrition rate in SET is high (Igbaria & Chidambaram, 1997). **Social and structural** barriers impact on women's persistence, retention and advancement in IT and consequently women are offered fewer opportunities for promotion and professional development. In New Zealand, for example, a woman in IT was forced to resign from her job because there was no maternity leave available and the organisation could not accommodate her on a part-time basis (Trauth, 2002). Chovwen (2003) found that women who persist with pursuing their careers in the face of opposition, experience extreme frustration and consequently leave the organisation. This can cost the organisation talented

individuals. To add to these problems experienced by women in SET, many mentioned the lack of support and mentorship (Trauth, 2002).

The literature reviewed in this section confirms that recent studies have paid considerable attention to women in management positions worldwide and have reported on the demographic changes in top and senior management positions by debating the status and conditions of professional women. Despite these advances, women still occupy secondary positions worldwide and are also being under-utilised (Mathur-Helm, 2005) and gender inequality is still evident in the labour force.

In South Africa, only recently has attention been focused on problems faced by women in the workplace and in management positions. Despite the voluminous documents on equality and women's rights, women employees are still found in the lowest ranks of organisations, experience difficulty with upward mobility to senior and executive management levels and are not benefiting from government policies and legislation to advance their careers. This is the case in spite of the tremendous advances that South Africa has made to promote and advance women and equity in the workplace. According to Catalyst and Opportunity Now (2004), women are still underrepresented in corporate boardrooms with only 7.1 percent women directors in the country. South Africa still lags far behind the rest of the world whose statistics are also low (Mathur-Helm, 2005).

What attempts have been made to address these challenges internationally?

Towards identifying 'Best Practice'

To remain competitive in this global and technological world, institutions and organisations throughout the world need to move forward and create a well-trained, diverse and multicultural workforce. Necessarily, such a workforce must meaningfully include women at all levels of the organisations. For example, with the decrease of general interest in SET careers and an increase in the demand for Engineers and Scientists worldwide it is essential that organisations look beyond the traditional pool of talent (predominantly men) and target the other half of the population - women. Action can be taken at school, university and the work place level individually as well as in partnerships across the three levels.

But to what extent and in what ways do/can organisations achieve this? Interventions that have been implemented internationally can be broadly divided into: Workplace policies, training and support for women; and gender mainstreaming.

2.2.2 Workplace Policies

Internationally, scholars and policy makers agree that the first step towards achieving gender equality in all fields of employment and spheres of life generally, and in the SET sector in particular is to develop and institute an adequate social infrastructure and policy environment that makes it easier for women to enter the employment arena, get access to promotion and remain employed (see for example, Ainuddin et al, 2005). Numerous policies have been introduced over the past decade to make the workplace friendlier to women employees. With discrimination visible against women in the workplace because of family responsibilities and motherhood, one of the most far-reaching policies is that of the extension of parental and family leave. Despite the human rights' discourse penetrating the world, this has not eliminated gender inequality. According to Gottfried and Reese (2004), there are no women-

friendly policies promoting gender justice by breaking down gender-based hierarchies, enhancing women's independence and increasing their capacity to support and sustain an independent household. Thus, at the global level, informed by a human rights framework, policy initiatives such as the Convention for the Elimination of Discrimination against Women (CEDAW) and the Millenium Development Goals (MDGs) as a global compact have sought to put pressure on States to empower women generally and to prevent their discrimination in all spheres of life.

As a signatory to these international treaties and convention, South Africa has also developed a policy environment that seeks to empower women and facilitate their advancement in areas from which they have been previously excluded. For example, the country implemented equal opportunity and affirmative action legislation as a system of national strategy to redress the past imbalances that were created by the previous dispensation after the first democratic elections in 1994 (Mathur-Helm, 2005). Consequently women's issues were highlighted, such as their rights, equality, welfare and empowerment and attention was focused around these issues. Subsequently in 1996, the South African Government approved the International Convention on Elimination of All Forms of Discrimination (CEDAW) by passing the Gender Policy Framework (GPF) (Mathur-Helm, 2005). The main aim of the GPF was to integrate gender policies by taking into account that:

Women's rights are perceived as human rights; women have equality as active citizens; their economic empowerment is promoted; their social upliftment is given priority; they are included in decision making; they are beneficiaries in economic, social and cultural areas; affirmative action targeting women needs to be implemented.

The GPF guided the process of developing laws, policies and procedures to ensure equal rights and opportunities for South African women. According to the GPF, if South African women do not have equal opportunity, access to resource sharing, control and decision-making, the aim behind the GPF would not have been achieved (Mathur-Helm, 2005).

However, while the policy environment is well-developed and attempts to address gender inequality, indications are that this is not enough, and that unless the broader social and organizational environments facilitate women's participation in various sectors, gender equality will remain elusive. In particular, within the SET sector, which has historically excluded women locally and globally, broader national and local policies are obviously not enough to remove centuries of negative attitudes, perceptions and practices in relation to the participation of women. As such, available literature motivates that in terms of policy, organizations that seek to attract, employ, and retain women at all levels tend to develop **contextualized (particular to the sector) workplace policies** that are specifically geared towards attracting, advancing and retaining women in the organisation. What are some examples of such policies?

First, like any other field, the recruitment of women into the SET sector requires a supportive policy environment. For example, the report by Emmerson, Williams and Sherk (2001) identifies, among others, the following characteristics of organisations that are successful in recruiting, advancing and retaining women at all levels of the organisation:

- a clear, zero-tolerance, policy on sexual harassment and harassment prevention;
- comprehensive health and safety policies also ensure a physically safe environment in which to work;
- strong health and benefits packages which have provisions for coverage of partners and children;
- ,aternity/paternity and family leave provisions; and
- a balance of career and personal life, and career development.

These **family friendly policies** (Simpson, 1998) are introduced as both a pull strategy (to attract women into the sector) and to address the challenge of women having to juggle their roles of motherhood and employees.

In a similar vane, according to a European Commission report (ec.europa.eu/research/**science**-society/**women**/wir/pdf/wir-**best-practice**_en.pdf, retrieved July 10, 2008), SET companies that have been successful in recruiting, advancing and retaining women have instituted polices and programmes which encourage:

Sound work/life balance policies: maternity and paternity leave, childcare facilities or subsidised care, emergency leave to care for sick dependents, and re-entry policies and mechanisms (after maternity leave for example, or after a long absence from the job market when women are engaged in raising children);

Flexible work schedules, opportunities for distance working if appropriate, alternatives to excessive traveling at certain times in the life cycle, through use of new technologies or reassessment of essential job features;

A commitment from the top to gender equality (including equal pay for equal work by men and women), diversity policies and dignity at work – integrated into strategy, reporting mechanisms and performance review systems;

According the report, these measures cannot be successful unless they are accompanied by continuous monitoring, evaluation, auditing, statistics, surveys, staff consultation regarding the polices and programmes, as well as analysis and revision of the policies and programmes as conditions (local, national and international) change.

Furthermore, a 2006 OECD workshop on *Women in Science, Engineering and Technology (SET): Strategies for a Global Workforce* (identified "the implementation of gender responsive budgets by governments, gender-balancing the composition of decision bodies, integrating gender in research agendas and programmes, implementing diversity management in industry and also in academia, and re-defining the assessment of excellence with respect to funding and recruiting policies and practices" as key to increasing the participation of women in the SET sector (www.oecd.org/dataoecd/30/34/38819188.pdf. retrieved July 15, 2008).

From this workshop, three main policy recommendations emerged:

The production of sex-disaggregated statistics to analyse trends and outcomes and monitor progress;

Gender equitable evaluation/assessment criteria and evaluation methods that are fair, transparent and gender neutral; and

More rigorous research to assess the relationship between gender diversity and firm and/or research performance: Does gender diversity, particularly at senior levels, affect performance? This type of work may be able to demonstrate that gender equality has quantifiable benefits that can be linked to economic growth or improved social outcomes.

2.2.3 Gender Mainstreaming

To address the sexist socio-cultural beliefs and gender stereotypes that are pervasive in society and therefore, in most organisations (not only in the SET sector), most research in the international peer-reviewed literature conclude that successful companies often have top leadership leading organisations that are highly **committed** to diversity more generally, and to gender equality more specifically. For example, according to Emmerson, Williams and Sherk (2001), "effective leaders will present the objectives with a rationale and a commitment to success that reorients organizational thinking and opens the way for viable new traditions", including respect for gender equality (http://www.mun.ca/cwse/**BestPractices**.pdf. retrieved June 28, 2008). This could explain why, as Simpson (1998) argues, women in organisations where they are in the minority tend to experience greater career barriers than in an environment where the gender balance is more equal. The SET sector in South Africa, where women do not appear to be penetrating the glass ceiling to top management positions, seems to mirror this trend.

To address the above, those in power should influence change within the organisation. Attempts should be made by employers to eradicate negative gender stereotypes and attitudes and to play an active role in removing traditional concepts of a 'woman's place'. To achieve this, successful SET organisations in particular, mainstream gender in all aspects and at all levels. This is often to institute a paradigm shift from traditional thinking towards women working in SET, towards an organisational culture that values gender equality respects women and believes in their capabilities for SET-related skills. Gender mainstreaming for example, is the "process of creating this knowledge and awareness of - and responsibility for - gender among all [employees in the organization]" (www.who.int/**gender/mainstreaming**/resources/en, retrieved July 10, 2008). It helps individuals and groups to unlearn unconscious biases and assumptions about men and women, and to learn to respect women as equally capable in SET skills and performance.

Local and international literature confirms that in organisations, different ways of viewing or approaching problems, different priorities, professionalism and power factors such as competing for scarce resources, often contribute to hierarchical cultures in the workplace. Newcomers to an organisation can feel excluded as a result of the organisational culture and it may take a long time for that individual's contribution to be acknowledged. If older staff feel threatened by the newcomer, the situation worsens. Organisational level can also be divisive, as managers tend to exploit their power in the workplace. Gender inequality exists at all levels and particularly in management where important organisational decisions are made. To address this, a consortium of 11 non-governmental organisations from Europe, Asia and North America (ACCORD) is devoted to community based and gender sensitive poverty alleviation in Africa (Hadjipateras, 1997). Although Accord does not deal with gender in SET per se, valuable lessons can be learnt from them about policy formulation and best practice. They adopted an analytical framework comprising five steps along the path towards equality between men and women. These are improvement for women in terms of welfare (survival); access to resources (including opportunities for self realisation), conscientisation (an awareness of and will to alter gender inequalities); participation (including an equal role in decision making); and control (in both the personal and public domains) (Hadjipateras, 1997). Although these five steps were used to develop a policy for women in Africa more generally, it could also be adapted for use in SET.

However, commitment to gender equality alone is not enough. As such, the third broad best-practice strategy adopted by organizations relates to training and support, including SET skills training for women recruits and gender training for managers and other employees.

2.2.4 Training and Support

First, special training/coaching for women with high SET potential has been identified as facilitating the successful recruitment, advancement and retention of women in the sector. For example, with partnerships between industry and schools and universities, girls and young women are identified and channeled into SET-related fields of study and, supported financially and through mentoring programmes by SET companies, when they complete their studies they are recruited and mentored into positions within organisations.

Once they are employed, many companies continue with on-the-job training in order to socialize the new recruits into the organisational culture and to build their capacity for successful performance within the organisation. For example, *Opportunity Now*, "a membership organisation for employers who are committed to creating an inclusive workplace for women" (www.opportunitynow.org.uk/.../occupational_segregation/recommended **best practice**/index.html, retrieved July 11, 2008) recommends that successful companies, where possible, use female trainers to provide:

- confidence-building training and training in areas such as customer service, health and safety, personal effectiveness, team working, and
- job specific training
- Unfortunately, many organisations are averse to investing in women with regard to upgrading qualifications and reskilling. Organisations would rather invest in males as they are seen to have a good return (Igbaria & Chidambaram, 1997). Consequently there are fewer women in SET as they do not get the support or mentoring that men do.

In addition to training women employees, successful companies also train their staff for the 'welcoming' and support of the new women recruits, as well as management in gender sensitivity and strategies for recruitment and retention of women scientists (Emmerson, Williams and Sherk, 2001).

Second, in addition to training, available literature identifies **support and mentoring** as strategies for addressing the plight of women in SET, with several studies concluding that mentors are necessary as women invariably feel excluded in the SET sector (Igbaria & Chidambaram, 1997; Liu & Wilson, 2001; Trauth, 2002). Organisations that pay particular attention to provide support and mentoring stand a better chance of successfully recruiting and retaining women in the sector.

Third, allied to the lack of support and mentorship is the fact that there are very few women **role models** in SET as the majority of women who could rise to senior management level are restricted for the various reasons explained earlier or tend to leave organisations before they could rise up the ranks. Men still occupy senior positions in management and if a woman is promoted there will be no female role model to support her. More positive female role models are needed as it would help to promote society's awareness of women's potential to excel in the highest ranks possible, while also empowering and encouraging other aspirant women. Many women in SET have experienced exclusion by their male counterparts and management.

Recent studies reviewed by Lange (2006) suggest that women tend to benefit more from having same-gender role models than men (http://www.findarticles.com/p/articles/mi, retrieved July 15, 2008). Thus, more female role models are required and women need to be given greater access to advanced, specialist training to management and technical skills. In order to boost self-confidence it would be necessary to train women in assertiveness. Salaries should be negotiated in accordance with women's achievements to pave the way for equality in SET.

2.2.5 Conclusion

Literature reviewed in this study demonstrates and confirms that while in the public sector, the numbers of women in science are growing, in industry women continue to be under-represented. Reasons for this are varied and include sexism, socio-cultural perceptions and stereotypes of women, workplace policies and practices that favour men and tend to marginalise women and others. As indicated earlier, this study addresses the question: What factors prevent women from entering, succeeding and remaining in the SET sector in South Africa?

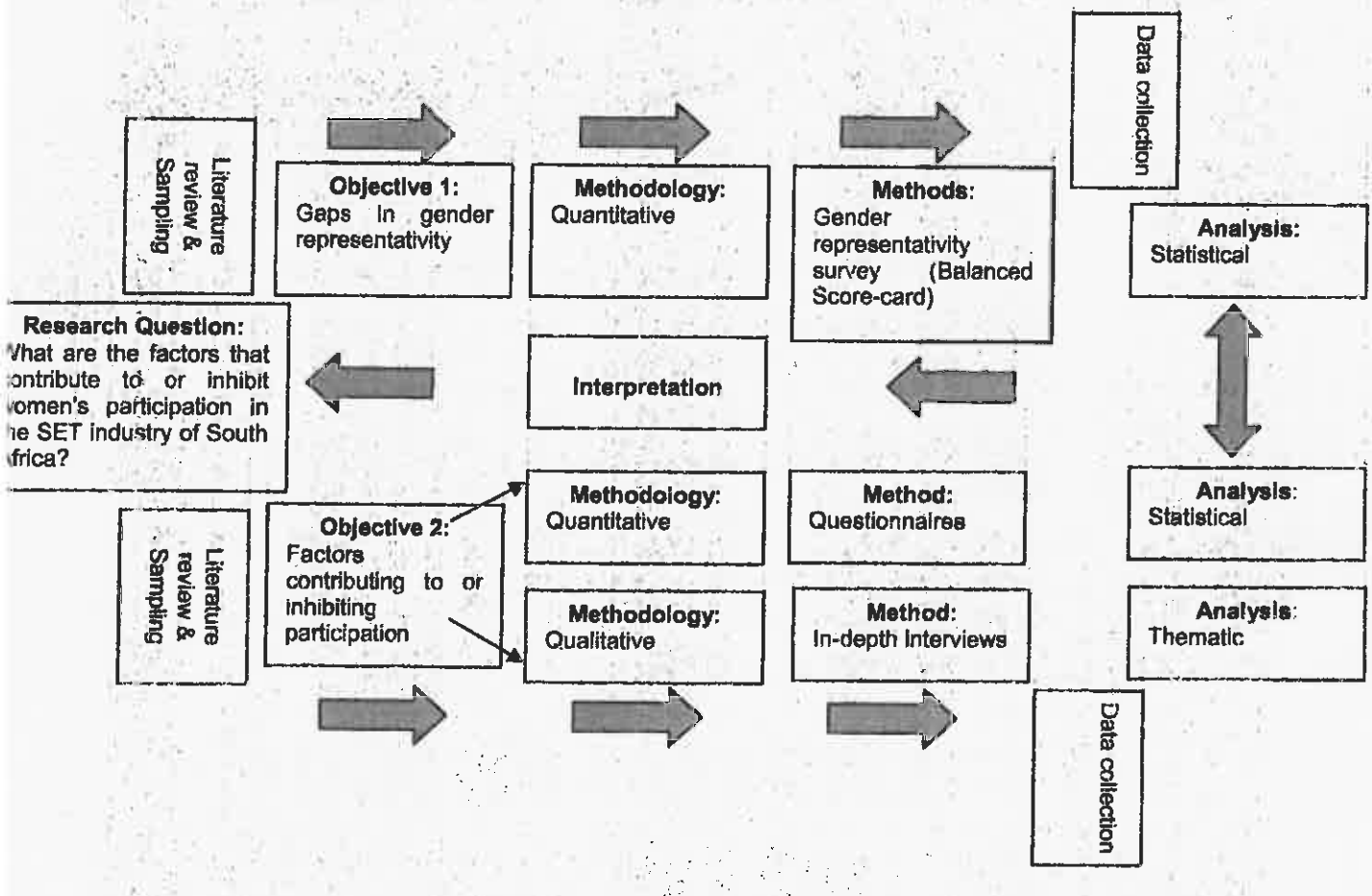
The next section describes the research design and methodology that was used to address the question.

3 SECTION 3:

RESEARCH DESIGN AND METHODOLOGY

As indicate in the sections above, this study addressed the question: What are the factors that contribute to or inhibit women's participation in the SET industry of South Africa? A mixed method approach, which entails both quantitative and qualitative methodologies (Tashakkori and Teddlie (2003, p. 62), was used to address the question (see Figure 1).

Figure 1: Research design and Methodology



In order to address the research question three objectives were identified: **Objective 1** served to examine the gaps in gender representativity in industry. A quantitative methodology, in the form of a balanced score-card questionnaire that required information about women's participation in each of the companies, was sent to an identified contact person in each company to complete. This means that numerical data was collected about the representation of women in each of the participating companies using a survey method. A statistical analysis was performed on the data. Due to the limitations of the information provided by participant companies and the fact that the weighting procedure for gender equity assessment within the SET sector of South Africa has not yet been formulated and agreed to at a policy level, a full balanced scorecard for each company could not be computed. A summary of the information gleaned from the data with respect to some of the key indicators that would form part a balanced scorecard is presented in the report.

Objective 2 was to determine the factors contributing to or inhibiting women's participation in the SET sector of South Africa. Both quantitative and qualitative methodologies were employed. The former involved a survey method (specifically questionnaires), while the latter used in-depth interviews to gather data. The in-depth interviews (qualitative) gathered comprehensive verbal – or textual - expressions of women's experiences and perspectives of their participation in the SET industry from the most senior woman in the industrial SET company as well as the company's CEO or his or her designate. The questionnaires (quantitative) captured numerical (mostly) ratings of women's (with a SET background) experiences in each company. A thematic analysis was performed on the data from the in-depth interviews and a statistical analysis was performed on the data from the questionnaires. Each of these aspects of the research design is expanded on in the sections that follow.

Objective 3 was to identify local and international best practice. To do this local and international literature was reviewed, and, based on that, as well as on the empirical research described in objectives 1 and 2, develop a best practice guideline document.

3.1 Sampling

Specific companies were identified by the Department of Science and Technology in consultation with the HSRC research team. Companies that were selected fell into one of the following categories: (1) listed on the JSE, (2) privately owned, (3) an SMME, or (4) a state-owned enterprise (SOE). Although the aim of the study is to explore factors blocking women's progress, and women were targeted as the majority of participants, DST requested that some men be included in the sample. Interviewees for the in-depth interviews were selected from the following two categories: (1) a senior woman in the organisation with an SET qualification and/or experience, and (2) the CEO or his or her designate in the organisation.

This type of selection is known as purposive or judgemental sampling as the "units to be observed are selected on the basis of the researcher's judgment about which ones will be most useful or representative" (Babbie, 2007, p. 184). It is categorised as non-probability sampling and therefore it cannot be assumed that the sample is representative of the population that it is drawn from, i.e. the population of all women (and men) in the SET industry in South Africa. Results can therefore not be generalised to all other such contexts. The purpose of this study was not, however, to generalise findings to all women in the SET industry in South Africa. Rather, it was important to understand a subset of women's experiences and identify the factors, according to these women (and some men), that block their progress in the industry.

The gender representativity survey would be used as a balanced scorecard to evaluate the status of gender equity in selected organisations and represents only those in the sample. The sample for the questionnaire that was sent to SET women in these organisations is one of convenience as the respondents to the questionnaire are those who completed it and returned it to the research team, i.e. there was reliance on available subjects (Babbie, 2007).

Twenty-seven (27) companies were selected as potential participants in the research. Of these, nine were from the private, six from JSE registered companies, six from SMMEs and six from SOEs. In addition, the research team over-sampled by two or three companies in each category to allow for organisations who might turn down the request to be part of the study. Thus, 35 companies were contacted for permission to be included as research

participants. In the end 28 companies agreed to participate. However, only 22 companies responded within the timeframe set for gaining access and doing the fieldwork (approximately 12 months from August 2005 – August 2006). Table 1 contains details of the number and type of companies that were targeted versus those companies that were willing to participate in the study.

Table 1 Number and type of companies targeted versus companies who participated

Type of company	Companies targeted and contacted	Companies that agreed to participate	Companies that responded within fieldwork timeframe
JSE listed	9	4	4
Private	11	8	6
SMME	8	8	5
SOE	7	8	7
Total	**35**	**28**	**22**

3.2 Research Instruments

Once the sample (N=22) was selected the research team worked on gaining access to each of the companies. A letter was composed by the DST as well as the HSRC explaining the purpose of the study and what would be required from participants. As soon as permission for access was granted by the organisation, data collection commenced. Informed by the theoretical and research literature reviewed in this study, a set of data collection instruments were developed and used. These included:

3.2.1 Gender representativity survey

The aim of the gender representativity survey was to identify gaps in the representation of women at various levels within organisations with a sizeable technology base. This was accomplished by quantifying the number and status of women SET workers in companies. (See Appendix A). The survey also provided data relating to issues such as the level of qualifications, fields of study, years in the industry, personal experiences and percentages of women within each of the aforementioned SET sectors. This information was used to generate a Balanced Score-card.

A member of the HSRC research team asked each organisation to identify the person who could assist with the completion of the survey. The instrument was sent to this individual to fill out and return to the HSRC.

3.2.2 Questionnaires

In order to explore the factors blocking progress of women in the SET industry a questionnaire was administered to women in participating (see Appendix B). The questionnaire contained both closed- and open-ended questions. The latter were included to allow the respondents to express any additional perspectives that they may have on the topic.

The questionnaire was e-mailed to each organisation so that respondents could complete it electronically or on paper. The completed questionnaires were returned via e-mail or collected by a member of the HSRC team.

3.2.3 In-depth interviews

In addition to the quantitative data from the questionnaires key workplace factors blocking progress were explored in in-depth interviews. A semi-structured interview guide was developed (see Appendix C) to direct the interviewer through an open conversation with an interviewee about his or her perspectives on women's participation in the SET industry.

Once both the senior SET woman and CEO or designate in the organisation had been identified, two interviewers (usually one male and one female) from the HSRC team travelled to the organisation and conducted the interview either in the interviewee's office or in another suitable location like a boardroom.

The interview was initiated with an introduction to the study so as to obtain the participants' informed consent and to inform the participants of their autonomy, their right to privacy as well as to withdraw should they so wish. The interviewer began by asking a general question about the interviewee's perspective on the under-representation of women in the SET sector and probed further for certain issues as the interview continued. Generally, interviews lasted between 45 minutes and an hour.

3.3 Ethical considerations

This study adhered to generally accepted ethical considerations for social science research. Organisations were initially contacted for permission to include them in the sample informed consent was obtained from each participant by providing each with a Participant Information Sheet that described the broad aim of the study and set out the rights (to autonomy and anonimity) of the participant. This included, for example, that the interviewee could end the interview at any time without providing an explanation and that he or she needed to consent to the interview being tape-recorded. (Some of the participants did not consent to the recording and thus the interviewer made detailed notes during and after the interview.) The interviewees were asked to sign a Participant Consent Form that confirmed that they had read and understood their rights. Provision of personal information on the consent form was voluntary. Each form is stored on file at the HSRC Gender and Development Unit's offices. The perspectives provided during the interviews remain confidential; no statement can be attributed to a specific individual. For the questionnaires, respondents did not have to include any personal information that would identify them. They therefore remained anonymous.

3.4 Data analysis

First, data obtained from the gender representativity survey were analysed in order to examine the nature and extent of women's involvement in the SET companies that participated in the study. A full balanced score card for each company could not be computed because:

The weighting procedure[3] for gender equity assessment within the SET sector of South Africa has not yet been formulated and agreed to at policy level

Some of the companies did not provide the requested information (e.g. with respect to ownership, post-tax profits, etc).

Second, descriptive statistics were calculated for the demographic characteristics of the respondents. Frequencies and percentages were generated for the statements in the questionnaire and cross-tabulations were performed according to the type of SET industry, age of respondents (recoded to match the life-cycle approach) and position in the company (recoded to management and non-management levels).

Third, the audio-cassettes from the interviews that were tape-recorded were sent to a transcriptionist for verbatim transcribing into an electronic format. Two researchers read through each of the transcripts and generated categories from the meaning units identified during the reading. These categories were captured onto an Excel spreadsheet where a frequency of one was allocated each time the category was raised by an interviewee.

The categories were then used to perform a thematic content analysis of the data. This method allows the analyst to group common categories under a theme, and describe the nuances of the themes, as well as calculate basic statistics on the data. The themes represent the perceptions of the interviewees about the participation of women in the SET industry. The perceptions reflect the beliefs of the women and men who were interviewed and do not necessarily reflect some universal truth. The description of themes includes direct quotations from the interviewees to illustrate some aspect of the theme either in the text or in a box with other similar quotations. As much detail as possible about the context (gender, position in company, type of company etc.) of the interviewee who made a specific comment is included without divulging the identity of participants. The themes are presented in a separate document (Appendix D) for the sake of keeping the report to a reasonable length.

[3] See Appendix D for a short description of the methodological procedure that is followed when computing values of a balanced scorecard

4 SECTION 4:

PRESENTATION OF FINDINGS

The first research question in the study sought to examine the gaps in gender representativity in industry. To achieve this, a gender representativity survey was conducted and 16 companies completed and returned it.

4.1 Examining the gaps in gender representativity in SET industry

The results are presented in the form of a balanced scorecard below. Table 2 below shows the mean and standard deviation scores for the percentages of women who are employed in all the SET companies as a function of level of seniority and benefit from SET sector. Given the limitations of the data provided by the participant companies a summary of the information gleaned from the data with respect to some of the key indicators that would form part a balanced scorecard is presented here.

Table 2 Balanced score-card

LEVEL OF SENIORITY	**Mean**
% share of direct shareholding by women in the company (direct shareholding refers to employee share schemes	0%
% share of indirect shareholding by women in the company (ownership of women outside the organisation)	0%
% of women members of boards of directors	10.88%
% of Women in Executive Management	11.63%
% of women in Middle Management	26.10%
% of women supervisors	29.52%
% of highly skilled women who are not in management / supervisory positions	18.03%
% of women in the junior professional category	29.04%
BENEFIT FROM SET	**Mean**
% spent on skills development for women in past year	.001%
% spent on procurement from women empowerment companies in last year	13.27%

Some of the further insights from the survey include the following:

Only one company reported having a gender equity policy.

Women are better represented at the lower levels of the 16 industrial SET companies that formed part of the survey. Women of colour are less well represented than white women in these companies at all levels, and especially at executive and management levels.

Only one of the companies has a female CEO.

Shareholding by women is low in the companies who participated.

Although some of the companies are spending large amounts on social development and other strategies that encourage women's participation in industrial SET, information about women beneficiaries has not been recorded by any of the companies.

4.2 Women's Experiences in SET sector

The second research question in the study sought to identify South African women's experiences in the SET sector and the factors contributing to or inhibiting their participation. To address this, a questionnaire was administered to a sample of 90 women in SET companies across South Africa.

4.2.1 Demographic characteristics of the respondents

Table 3 below presents the demographic characteristics of the respondents in the study.

Table 3 *Demographic characteristics of respondents to questionnaire (N=90)*

Variable	**%**	**Variable**	**%**
Marital Status		*Company type*	
Single	37.8%	Private	34.4%
Married	43.3%	State-owned	45.6%
Living with partner	8.9%	JSE-listed	11.1%
Separated/divorced/widowed	10%	SMME	8.9%
Race		*Number of children currently living at home*	
African/Black	35.6%	None	41.1%
Coloured	3.3%	One	13.3%
Indian	12.2%	Two to three	42.2%
White	46.7%	Four to five	3.3%
Other	2.2%		
Home language		*Position in company*	
Afrikaans	33.3%	Executive management	1.1%
English	25.6%	Senior management	4.4%
IsiZulu	6.7%	Junior management	16.7%
IsiXhosa	8.9%	Supervisory level	10.0%
SeSotho	5.6%	Skilled professional	58.9%
SePedi	6.7%	Trainee/Internship	4.4%
SeTswana	6.7%	Other – Junior	3.3%
IsiNdebele	1.1%		

Other	2.2%	*Cost to company*	
IsiZulu & SeTswana	1.1%	Less than R100 000	6.7%
English & Afrikaans	1.1%	R100 001 – R150 000	37.8%
English & German	1.1%	R150 001 – R200 000	21.1%
		R200 001 – R250 000	11.1%
Top 3 reasons for work interruptions		R250 001 – R300 000	11.1%
Maternity leave	60.0%	R300 001 – R350 000	2.2%
Study leave	12.5%	R350 001 – R400 000	5.6%
Child-rearing	5.0%	R400 001 – R450 000	3.3%
		R450 001 – R 500 000	1.1%
Age			
20-24 years	11.4%		
25-34 years	63.6%		
35-55 years	25.0%		

Of particular significance in the findings from the questionnaire as presented in the table above are those which suggest that:

Almost half (45.6%) of the respondents were from state-owned enterprises.

Almost 60% of the respondents reported that their position in their company was skilled professional.

Almost 40% of the women had a cost to company of between R100 001 and R 150 000. The cost to company of six of the respondents was less than R100 000 and only one woman reported that her cost to company was between R450 001 and R500 000.

With regards to the personal characteristics of the women who responded to the questionnaire, two-thirds (63.6%) were in the age group of 25-34 years, while 43.3% were married and 46.7% were white. A third (33.3%) of the respondents' home language is Afrikaans. 41.1% of the women had no children living at home, while 42,2% had two to three children currently living at home. Lastly, 60 % of the women reported that they had had work interruptions due to maternity leave.

4.2.2 Women's Experiences in SET companies

Findings that represent the respondents' (women) experiences in the SET companies (private or JSE listed companies, SMMEs and SOEs) they were employed in and the factors that facilitated or inhibited their participation in these companies are presented in Tables 4 to 7 (See Appendix E). The data are represented in a three point scale (Disagree, Neutral and Agree) for all the women who responded to the questionnaire and are expressed as percentages. The responses are categorised into the following types of experiences: Feedback on work performance, Remuneration and promotion opportunities, Work environment, Gender relations in the workplace, Mentorship and career development, Race and gender in the work environment, Implications of a career on in SET for family life, Experiences in the SET industry.

4.2.2.1 Overall views of women in SET sector

Firstly, how do women in the SET sector generally view their work environment? Notably, as Table 4 indicates, the findings suggest that, firstly, with regard to the women's views of the work environment, just over a one third (39%) of the respondents felt that the working conditions in their SET companies take into consideration that they are women. 61.1% view their jobs as stressful, and more than half (52.8%) believe that women deal with obstacles that men don't have to deal with. Secondly, with regard to remuneration and promotion opportunities, more than a third of the respondents felt that, as women, they were not sufficiently rewarded for their efforts, while 50% felt that men are often more easily promoted than women, 64% felt that male colleagues earn more than women at the same level, and 57% thought that men in SET sectors have more opportunities and advantages than women. Thirdly, when asked to rate their companies' feedback on work performance, surprisingly, the women's responses suggest that they were not experiencing gender relations in their SET companies negatively, with 95.6% stating they felt comfortable working with their male colleagues and that 91.8% observing that their male colleagues felt comfortable working with them. Fourthly, when asked to comment, through the scale, on mentorship and career development opportunities in their companies, again, the women's responses were positive, with 53.9% suggesting that they were given the necessary resources and training to do their work, and 62% indicating that they were assigned work that demonstrate their capabilities. However, while literature reviewed in Section 2 of this report suggests that women generally do better when they are assigned a mentor, particularly a woman mentor, 51.2% of the respondents in this study pointed out that they did not have any. Fifthly, contrary to expectations, the respondents also commented positively in relation to the implications/impact of a career in SET for family life, with only 10.7% feeling that family life suffers due to work-related responsibilities and 10.5% indicating that family life suffers due to work-related travelling. This is even though 40.7% of them indicated that their companies often expected them to work overtime. While these are positive results and may suggest that gender inequality is on the decline in South African SET companies, it is also possible that these women's responses camouflage their true experiences and feelings and are a reflection of their awareness that in order to succeed they cannot admit to being disadvantaged or to feeling that they should be allowed time and space for their families.

Sixthly, in relation to their experiences of race and gender in their workplaces, the respondents in this study notably juts under 50% of the respondents felt that black women tended to experience more obstacles that other employees did not, with 52.2% of them indicating that black women were marginalised in their companies. However, only 14.6% of the respondents felt that black women were not given the necessary tools to perform their duties, suggesting that organisational culture and climate tend to play a more significant role in how women experience their workplaces in the SET sector than resources and opportunities. Lastly, with regards to their experiences in the SET sector in particular, as the table above suggests, the responses were again positive, with only 48.8% of the respondents suggesting that they sometimes felt marginalised in the industry, and a surprising 85.4% feeling that women should be encouraged to enter the SET sector, 81.1% suggesting that black women in particular should be encouraged to enter the sector and 71.% feeling that there were excellent career advancement opportunities I the sector.

4.2.2.2 Women's views by position in Company

The second question addressed by adapt presented in Appenidx E was: Does a woman's position (Management or non-managementy) in the SET sector make a difference in how she experiences working in the sector? Table 5 (in Appendix E) presents findngs related to the respondents' experiences according to their position in the SET industrial company: management or non-management. First, the findings above indicate some differences in the ways in which women in management and those in non-

management positions rated their experiences of the work environment. For example, 80% of those in management felt that their positions were challenging compared to 61.2% of those in non-management positions. Similarly, 70% of the managers felt that their jobs were stressful compared to 59.4% of the managers, and 60% of the mangers and 50% non-managers felt that women have to deal with more obstacles that men. In contrast, only 25% of the managers and 27.5% of non-managers felt that their working environment was more suitable for men than for women. The latter may suggest that that the respondents interpreted the question to mean that women should not be in the SET sector than the fact that the working environment has transformed to be more inclusive of women. Further studies should utilise in-depth interviews to investigate this issue more fully.

Second, in terms of remuneration and promotion opportunities, again, women in management tended to express different views to those not in management. For example, while 40% of the managers felt sufficiently rewarded for their efforts at work, only a third (33.3%) of non-managers did. Understandably, compared to only 26.3% of the managers, 57.8% of the non-managers felt that men tended to be easily promoted than women in the SET companies. However, there was agreement in relation to whether men in the SET sector have more opportunities and advantages than women, with 55.6% of the managers and 58.2% of the non-managers responding in the affirmative. Similarly, 58.3% of the mangers and 67.6% of the non-managers felt that their male colleagues earned more than women at the same level.

Third, compared to non-managers, women mangers generally felt more positive in relation to being given regular feedback on work performance. To illustrate, 80% of the managers reported that they were given regular formal performance evaluation compared to 62.7% non-managers, and 80% of the managers reported being given regular informal evaluation compared to 53.6% of the non-managers. While it is understandable that managers, should be given more feedback on their performance, the phenomenon might also explain why women tend not to progress as fast and as high as their male counterparts in the companies, and also why they may feel marginalised and ignored.

Fourth, confirming the findings reported above, the women in this study generally reported positive gender relations in their companies, with all (100%) the managers and 94.2% of the non-managers indicating that they felt comfortable working with their male colleagues, and 95% of the managers and 90.8% of the non-managers suggesting that their male colleagues felt comfortable working with them.

Fifth, with regard to mentorship and career development opportunities, on one hand, most managers (78.9%) and non-managers (56.7%) indicate that they are given work assignments that reflect their capabilities and resources and training necessary to do the work (65% and 50% respectively). On the other, less women in both categories reported that they were given adequate opportunities for professional development (55% of the managers and 44.9% of the non-managers). Of particular significance are the women's indications of whether they had a 'coach' at work who helps address technical issues (55.6% of women managers and only 39.1% non-managers) or a mentor in the organisation (55.6% of the managers and only 26.2%). Few women in both categories felt that they had excellent career advancement opportunities in their companies (45% of the managers and 36.5% of the non-managers). These findings may mean that some of the women who have advanced to management positions may have done so because of the support they got from their 'coaches' and mentors and that those who have not lack such support. Unfortunately, the questionnaire did not ask about the sex of the mentor or 'coach' and the study, therefore,

cannot assess the impact of the sex of the mentor on these respondents' experiences and advancement (or lack thereof) in their organisations.

Sixth, with regards to the imact of a career in SET on family life, it is worth noting that very few women in both categories felt that family life suffers due to work related respondibilities (15% of managers and 9.5% of non-managers), or that family suffers due to work related travelling (16.7% managers and 8.8% non-managers). This is even though more than a third of them indicated that they were often expected to work overtime (41.2% managers and 41.3% non-managers). Seventh, on their experiences of race in their respective SET companies, more women who were non managers tended to feel the negative impacts of race and geder than managers. For example, notably, 56.3% felt that black women needed to prove themselves compared to 28.6% of the managers. However, both categories disagreed with statements suggesting that black women find themselves without the necessary instruments to perform (7.1 % and 18.2% respectively).

Lastly, with regards to their experiences in the SET industry, it is worth noting that most women in both categories felt that thare were excellent career advancement opportunities in the SET industry &5% of the managers and 70.3% of the non-managers) and that they had not experienced any difficulties entering the sector (65% and 58.5% respectively). Most felt that women in general should be encouraged to enter the SET sector (90% and 83.8% respectively) and that black women in particular; should be encouraged to enter the sector (84.2% and 79.6% respectively).

4.2.2.3 Women's views by Age

Thirdly, does a woman's age influence the way in which she experiences working in the SET sector? Using the life-cycle approach (20-24 years of age, 25-35 years of age or 35-55 years of age), **Table 6** (in Appendix E) presents the findings according to the respondents' age group (n=90). The findings suggest that, first, with regards to the work environment, most of the respondents in all three categories believe that their current position is quiet challenging (70%, 62.5%, and 70% respectively). Similarly, women in all categories believed that their working environment was stressful (50%, 60.7% and 63.6% respectively). Very few of the women in the three categories (10%, 16.4% and 18.2% respectively) felt that women often find themselves without the necessary tools to perform their work. However, notably, the findings suggest that age plays a role in the ways in which the women experience some aspects of the work environment, with women in the younger age group feeling more positive about their experiences than the older women. To illustrate, while 70% of the women on the 20-24 years age group agreed that their working conditions took into consideration that they were women, only 30.6% in 25-35 age group and 42.9% of those in the 35-55 years age group felt the same. Furthermore, the older the respondents, the more they believed that women have to deal with more obstacles than men in the workplace (30%, 54.5% and 59.1% respectively). On the one hand, this may suggest that gender things in the SET sector are changing and that gender equality is improving. On the other, it may be that the younger women either do not have enough experience in the sector or do not reflect enough on issues of gender (and race) equality to offer any useful input in this study.

With regards to remuneration and promotion opportunities, the younger women (66.7%) felt sufficiently rewarded for their efforts at work compared to 31.5% in the 25-34 and 31.8% in the 35-55 qge groups. In contrast, more of the older women (63.6%) felt that men are often more easily promoted than women compared to 44.2% of those in the 25-34 age group and

37.5% of the 20-24 age group. Similarly, more women in the older age group (76.9% compared to 63.3% and 20%) felt that their male colleagues earned more than women at the same level. Just over a third of women in the older age group (47.4%) and the younger age group (33.3%) felt that other people were more easily promoted than black women, this compared to only 28.6% of the women in the 25-34 years age group.

In relation to feedback on work performance, more than three thirds of respondents in all age groups reported being given regular performance evaluation, as well as regurla informal feedback on their work. However, on the provision of mentorship and career development, the responses tended to generally decrease with age. To illustrate, while most women in the 20-24 years age group (90%) reported being given the resources and training necessary to do the work, 80% of those in the 25-34 years group and only 50% of those in the 35-55 years age groups reported the same, Similarly, 66.7% of the women in the younger age group reported having a 'coach' at work who helps in addressing technical issues, compared to 42.3% and 35% in the older age groups respectively. Notably, women in the middle age group (25-34 years) seemed to differ from the other two ends of the spectrum in their views of some aspects of mentorship and career development opportunities avai;able to them at their workplaces. To illustrate, 80% in the younger age group reported being given adequate opportunities for professional development compared to 42.9% in 25-34 years age group and 50% in the 35-55 years group. Similarly, while 77.8% of the younger age group, and 77.3% of the older group reported being given work assignments that reflect their capabilities, only 51.9% of the middle age group reported the same. There may be several explanations for these differences. One explanation may be that things are changing for the younger age group and that gender equality is improving, or again, it may be that the younger women are not reflective (or do not care) enough about issues of gender equality. For the older group, it may be that they have learnt to fight for their rights or that they have been in the system long enough to understand how and where to access resources in their companies. Further in-depth qualitative studies would assist in investigating the extent to which the qualitative experiences of women are changing in the SET sector.

The findings in this study seem to suggest that age generally does not make any difference in how women view the impact of a career in SET on family life. To illustrate, very few in all three age groups felt that family life suffers due to work related responsibilities, with none (0%) of those in the 20-24 years age group, 11% of those in the 25-34 group and 15% of those in the 35-55% age group indicating that fgamily life suffers. Similarly, few indicated that family life suffers due to work-related travelling (16.7%, 12% and 5.6% respectively). Again, this is even though slightly more indicated that they were often expected to work overtime, understandably with more of the oldest group answering positively to this than the youngest group (20% of those in the 20-24 years age group, 42.9% of those in the 25-34 years group and 45% of those in the 35-55 age group).

The respondents' views about their experiences in the SET industry suggested that age tended to influence them differently in relation to different aspects of their work. To illustrate, most felt that there were excellent career advancement opportunities in the SET sector, with the number decreasing with age (87.5% among the 20-24 years age group, 74% of the 25-34 years age group and 66.7% of the 35-55 years age group). Just over a third (40% in the 20-24 and 25-34 years age groups) and slightly more than half of the older group (54.5%) felt that they constantly needed to prove themselves because they were women. The number of women who felt that men in SET sector have more opportunities and advantages than women increased with age (from 40% among the youngest women, to 54.7% and 66.7% for the middle and the older age groups).

In terms of views about gender relations in the work place, age did not seem to make a difference in how women in the three age groups experienced their workplaces in the SET sector. For example, 100%, 92.9% and 100% of the women in the three age groups respectively indicated that they felt comfortable working with male colleagues. Similarly, an overwhelming majority (100%, 90.4% and 90.9% respectively) felt that their male colleagues were comfortable working with them. Less than a third in all age groups (20%, 29% and 27.3% respectively) felt that their male colleagues did not take them seriously.

Lastly, in terms of race and gender, age seemed to play a significant role in some aspects of the women's experiences than others. Notably, while only 33.3% of the youngest women (20-24 years) felt that black women often had to deal with more obstacles than others have to, 44.1% of the 25-34 years age group and 75% of those in the 35-55 years age group felt they did. Similarly, while only 25% of the youngest women felt black women were marginalised in the SET sector, just over half of the older women felt so (54.5% of those in the 25-34 years age group and 55.6% of those in the 35-55 years age group). These age-related differences in the views of the women may be attributable to the legacy of apartheid and the fact that the older younger women had not experienced it and their views are informed by their experiences in the post-apartheid era. A more qualitative study would assist to analyse the nature and reasons for these views.

4.2.2.4 Women's views by type of company

The last question addressed in the responses tabled in Appendix E (Table 7) investigated the extent to, and ways in which the types of SET industry (private, SOE, JSE and SMME) the women (n=90) in this study were employed influenced the nature and quality of their experiences in their workplace. First, the findings suggest that in terms of the work environment, the JSE companies tended to be viewed more negatively than the other types of companies. To illustrate, 90% of the women respondents viewed the JSE companies as quiet stressful compared to 64.5% of the women in private companies, 51% in SOE companies and 62.5% in SMME companies. Similarly, 40% of the respondents from JSE companies indicated that women find themselves without the necessary instruments to perform duties compared to only 10% from private, 17% from SOE and none (0%) from SMME companies. In addition, only 22% of the respondents from JSE companies felt that working conditions take into account that they are women compared to 34.5% from private, 43.2% from SOE and 57.1% from SMME companies. The majority of women in three of the four categories of companies felt that women deal with obstacles that men don't have to (61.3% from private companies, 80% from JSE and 75% from SMME). The exceptions were women from SOE companies (35% percent) who thought similarly.

Second, the JSE companies, followed, in most instances, by private companies, had the least number of women who felt positively about their remuneration and promotion opportunities in their workplaces. To illustrate, only 11.1% of those in JSE companies felt sufficiently rewarded for their efforts compared to 34% in SOE, 37.9% in private companies and 50% in SMMEs. In contrast, an overwhelming majority of respondents (90%) from JSE companies felt that men are often more easily promoted than women, followed by 60.7% of women from private companies and 14.3% from SMME and 38.5% from SOE companies. Similarly, 100% of respondents from JSE companies, followed by 82.4% from private companies felt that male colleagues earn more than women at the same level compared to 66.7% from SMMEs and 39.1% from SOEs. Furthermore, 100% of the respondents from JSE felt that men in SET sector have more opportunities than women compared to 44.7% from SOEs, 56.7% from private and 62% from SMMEs. Similarly, more JSE employees

(66.7%) felt that other people more easily promoted than Black women compared to 25% from SMMEs, 29.4% from SOEs, and 36% from private companies.

Notably, with regards to mentorship and career development, again respondents seemed to view JSE companies more negatively than other types of companies. For example, only 30% viewed JSE companies as having given them the resources and training necessary to do work (compared to 33.7% for private, 53.7% for SOEs and 62.5% for SMMEs). However, 70% of JSE employees indicated that they were given adequate opportunities for professional development, while 39% of SOEs, 45.2% of private company, and 65.5% from SMMEs reported the same. Significantly, just over a third (40%) of respondents from all four types of companies indicated that they had a 'coach' to assist with technical issues at work. In terms of mentorship in particular, the picture was even dire: with the SMME scoring the least (14%), followed by JSE companies (30%), the private companies (32.3%) and the SOEs (36.8%).

The findings in this study suggest that the women's views regarding the impact of a career in the SET sector on family life were generally similar across all types of companies, with the majority believing that family life does not suffer due to work related responsibilities (0% in SMMEs -14.3% in SOEs) and family life does not suffer due to work related travelling (0% in JSEs -17% in SOE). Again, slightly more than half in each category indicated that they were often expected to work overtime (27.8% in SOEs; 42.9 in SMMEs; 51.7% in private and 55.6% in JSE companies).

The majority of the respondents also felt that they had excellent career advancement opportunities in the SET sector (from 55.6% in JSE companies, 57/1% in SMMEs, 66.7% in private companies and 82.1% in SOEs). Of significance are the findings which suggest that 90% of the respondents in JSE companies felt that as women they sometimes feel marginalised in their industry, compared to 30.6% in SOEs, 53% in private, and 62.5% in SMME companies. Similarly, most respondents in all company types felt that they were not taken seriously in their industry (62.5% in SOE and JSE companies and 70% in private and SMME companies). Notably, the majority felt that women should be encouraged to access a career in SET sector (from 75% in the SMMEs to 100 of those in JSE companies).

The findings suggest that company type seemed to influence the respondents' views regarding race and gender. To illustrate, the majority of women felt that black women were marginalised in their companies (100% in JSE and SMMEs and 61.5% in private companies, with a slightly better showing in SOEs at 39.3%). More in the JSE companies (100%) felt that black women often had to deal with obstacles others don't have to, compared to 37.9% in SOEs, 50% in SMMEs and 57.1% in private companies. Just over a third (33%) in the JSE companies felt that black women often find themselves without the necessary instruments to perform duties.

With regards to gender relations in the companies, the majority of the respondents ranked their companies very highly in various aspects (e.g., their views regarding working with male colleagues, their views about how their male colleagues felt about working with women, etc). One exception was related to the fact that more in the JSE companies (60%) felt that men are taken more seriously during meetings (compared to 25% in SMMEs, 26.3% in SOEs, and 44.4% in private companies). Similarly, 70% of them (JSE) felt that women were not taken seriously in meetings.

4.3 Senior management's perceptions of women's participation in industrial SET

The second objective in this study was to determine the factors contributing to or inhibiting women's participation in the SET sector of South Africa. In addition to the questionnaire whose results are presented in the section above, in-depth interviews were conducted with the most senior woman in the industrial SET company as well as the company's CEO or his or her designate (n=38). These aimed to gather data related to comprehensive verbal – or textual - expressions of women's experiences and perspectives of their participation in the SET industry from. A thematic analysis of the findings and the managers' views related to recruitment, retention and advancement of women in the sector are presented below.

4.3.1 Managers' Views on Recruitment of Women in SET Industry

The senior women and CEOs interviewed in this study (n=38) identified several factors as negatively impacting on the recruitment of women in the SET sector.

The masculine image of science

The managers interviewed in the study identified the masculine image of science as one of the factors that negatively impacted on women's recruitment into the SET sector. For them, the masculine image of SET means that women often feel that they do not fit into the male-dominated culture. Women tend to view themselves as not capable of doing science, "*Women don't think of becoming a technician. It is a man's world*!" (Female Human Resources manager at a private company).

In addition, women feel that they are measured against a masculine image of science, (for example, that science is for big, strong men who are willing to get their hands dirty). For example, one interviewee felt that because she is physically small during job interviews she is often perceived as young and unable to perform the physical tasks required from her. Following this image of women as small and soft/fragile, both men and women interviewees spoke about women being recruited into the SET sector because they are expected to bring a softer, feminine, more holistic, more emotional, more empathic understanding side to the industry. Women were also described as "more *patient and willing to work with more routine type of work*" and that they "*tend to get all the other stuff that nobody wants to take responsibility for*". There was also a perception among the interviewees that deeper consideration goes into the decisions that women make and that women are outperforming men in the SET sector. This is mostly seen as a benefit for women in the workplace. In contrast, men were constructed as quick decision makers, confident and not affected by moods, but also as very short sighted. As such, women were reportedly recruited to compliment men's roles in the sector. The following excerpts from interviews illustrate:

And then a man comes in and even if he is in a suit and a tie, he's got broad shoulders and he sits and he fills up the whole chair and they say 'now he is going to go out and get himself wet, he's going to get the job done'.

- Senior woman at an SMME

> *My friend is also in my department. We were just chatting the other day because we are carrying these buckets and we are doing something really dirty … can you imagine a nicely dressed young lady with lovely painted nails and high heels doing this job so it does come from your childhood and it does come from the way you are brought up because if you are like a Barbie doll you are not going to do chemical engineering …*
>
> *- Senior woman at a JSE listed company*

Recognising the myth in these views, a third women commented:

> *But in the office environment I have found women to be much more productive than the men in my section where eighty percent are female and all races of women.*
>
> *- Senior woman at a JSE listed company*

In a similar vane, one senior female at an SOE felt that the type of discourse which claimed that women are 'softer', more emotional and so forth, functioned as discriminatory:

> *I don't like the implication that women are softer, they are more creative. I don't like that because that stereotypes you and questions your ability to run a JSE company, for example. We have proven that women are performing.*

She argued that there are few differences between women and men and that the differences between people of the same sex could be greater. In essence, she believed that women and men face similar challenges in the SET industry.

Similarly, a male senior group executive felt that women in the industry tended to be more 'level-headed' and practical than men. He observed:

> *I found my female colleagues to be a lot less given to emotional outbursts in the work environment and had a more level-headed approach to some of the problem-solving issues. Some of my male colleagues, however, have tended to go off on a tangent.*

Certain SET fields, such as working on oil rigs, were viewed as unavailable to women. As one male interviewee in an SMME puts it:

It could be that civil engineering have some logistical issues, e.g. have to go out to sites that are quite rugged and carry heavy equipment.

He further commented that other fields within the sector are more suited to women's normalized roles in society like electrical engineering, "*With electronic you can sit in a lab and design*".

A contrasting/minority view from some of the interviewees was that of women as less demanding in terms of career movement, promotion and remuneration than men and perhaps as better to recruit than men. While this might mean that women get recruited into careers in the SET sector, it may also contribute to their unequal treatment in terms of benefits and promotion.

The next section examines a second factor identified by the respondents as negatively impacting on the recruitment of women into the SET sector: Gender-blind recruitment strategies.

Gender blind recruitment strategies

Using the discourse of meritocracy, six of the 38 interviewees reported that recruitment in their organisations was based on talent and not on race and/or gender. To illustrate, senior women in SOEs felt that although it was important to recruit more women into the SET industry, this should not merely be done as a way to fulfil affirmative action quota. A comment by one of them illustrates:

I want to see more women but we must not do that for the wrong reasons. We must not force gender representation, which is a worldwide problem, particularly in Engineering. That would be very irresponsible.

- Senior woman at an SOE

Lastly, it is difficult even for private companies to attract top professionals to certain geographical regions in South Africa like the Eastern Cape according to a female HR executive:

For black people generally it is more difficult because they believe it is more hip to be in Gauteng, There is more stuff happening internationally and what kind of entertainment do you have in the Eastern Cape.

This statement intersects race and gender.

The next section examines the factors that facilitate or inhibit the retention of women in the SET sector.

4.3.2 Factors that inhibit the retention of women in the SET sector

Literature reviewed in Section 2 of this report suggests that the few women who initially manage to access jobs in the SET tend to leave their companies after a few years of employment. This study sought to establish the reasons for this. These are examined below.

Gender blind retention strategies

One of the factors identified by the interviewees in this section of the study, particularly those in private companies he notion of meritocracy referred to above. This is premised on the belief that people (both men and women) get ahead (get promotion and recognition) based on merit and hard work and not based on gender (or any other identity). The senior employees in this study further justified this gender-blind view with the explanation that the company's aim was not to specifically retain women, but to retain talented people. In these companies, no policies or strategies that particularly target women (their recruitment and retention) exist. In particular, six of the 38 interviewees (across the spectrum of organisational context) specified that their organisations make no effort to retain female employees. For example, one female senior employee critically observed:

At our company, they just say take it or leave it and that's how they work with everybody, men or women. If you don't like it, we will get somebody else

- Female senior employee

Similarly, male participants in senior positions also used this gender-blind discourse in their responses. Like the women, most described their companies' practices as aiming to retain competent 'people', and not necessarily competent women. Again, from their responses, it became obvious that gender was not a factor when decisions were made in management regarding the retention of employees and that no effort was made to target women for retention in these companies. A senior male employee summed it up thus:

It's on merit, capability, personality, skills, value to the workplace. It's really not gender, race or age.

- Senior male at a private company

However, it was not only men who bought into this discourse. Some of the women seemed to have internalised the notion that women were inferior and that it was better to work with male employees. For example, a female HR executive remarked:

I am very male-orientated so I actually prefer working in a male environment than a female one. I actually changed to a company that was all female and I didn't like it. I am used to how they think and their dealings are not so intricate. Women can be emotional sometimes.

A second factor inhibiting the retention of women in the SET companies participating in this study was related to the view that women were often cast into supportive roles for men. The next section is addressed in the next section.

Casting women into supportive roles for men

The views of most senior staff members, and surprisingly including those of women in the SET companies sampled in this study, seemed to suggest that women can only be expected to play supportive rather than substantive technical or professional roles in the SET sector. For example, in interviews with senior employees in various companies, women were often described as 'submissive' and 'lacking confidence' when compared to men. In one case a woman scientist at an SMME reported that she was being paid less than the men scientists because she was not perceived to be the breadwinner. She continued:

> *And also males and females they do complement one another because one has got strength ... and the fact that a man is always seen as a strong person as opposed to the women*
>
> *- Senior executive female at an SOE*

Further evidence of this view and casting of women in supportive roles for men was illustrated by both men and women respondents who reported instances in their workplaces in which women are expected to perform activities traditionally associated with women, such as making tea and looking after others. One interviewee (a female at an SMME) differentiated women who fulfil traditional female roles in the workplace and women who tend to get married or become housewives from "your real professional women, real career women" who would settle for other jobs if they left the company.

One female respondent also described women as complicit in their own oppression and marginalisation in the SET industry. She elaborated:

> *I think because they don't have one iota's notion of what it is like to be independent and to take care of yourself and to take responsibility for yourself, I think they cannot relate to it and so yes that is all they know themselves, their identity in relation to men, they don't actually know anything else. I think women until actually for themselves start to experience that and start to realize it actually feels a lot better your self esteem is a lot more intact if you are doing it for yourself and you are responsible for yourself but I think there are a lot of women that are not even they cannot even see the possibilities, they only see themselves in relation to their husband, in relation to their children, that's their lot in life.*
>
> *-Female engineer at a private company*

Furthermore, according to a male interviewee in a private company, one of the reasons why women leave SET companies is that they tend not to do stimulating work:

> *Don't give them boring monotonous work, no, involve them in everything and make them part of the team and feel at home.*

Some of these views seemed to be countered by views from senior women, particularly those in SOEs who stated that male and female staff in SOEs complemented each other in terms of the work they put out. However, their responses suggested that they were reinforcing the view of women as a support base for men and as merely adding creative touches to the 'real' practical work the men were expected and 'known' to do. One of the senior women's views captures this view well:

> *If you give men a task, they will just want to finish it quickly. The quality and beauty will come from the female counterpart, like placing the diagrams.*
>
> *- Senior woman at an SOE*

Lastly, one view emerging from the responses in the interviews suggested that women may be leaving because they do not have the same levels of technical expertise as men. Confirming the notion of meritocracy, a senior HES manager at a private company explained:

> *On the technical side people admire you for the output of the technical work that you are doing. Lots of female contractors on our site, female engineers who do excellent work and when work is produced nobody looks at them ... there is no difference.*
>
> *Female HES manager at a private company*

The Masculine image of science

One view from the respondents regarding why women leave the SET sector was related to the image of science (and engineering and technology) as a masculine field and the failure/inability/unwillingness to assimilate into into prevailing masculine culture. However, some women were reported to resist this assimilation, arguing instead for carving out their own space within the SET sector industries. According to a female interview in a JSE listed company, this was evidenced by women wearing "pink and frills" to meetings rather than "dark suits".

A senior executive female interviewee at an SOE blamed infighting among the women themselves, claiming that women can also be their own worst enemies:

> *... because now they have to fight one another instead of fighting the issues or if for example they have differences amongst themselves they take it personally which is different with men ...*

Her solution to this problem was to build a network with spaces for women to discuss common issues that they face:

> *... because you always see men often going to play golf, they talk there but you never see a forum where women come together and chat about business issues, when they talk it is about children ... we must also have such forums even if it is informal..... there is a fantastic young lady in production, she is brilliant and she is definitely going to go places, but she is emulating [the men's] bad behaviour and that worries me why does she do that. You don't have to become one of the guys to be as effective ... she is doing all the right things studying, whatever, to get there, but she is going to be held back by her attitude and I have been in my current position for five years but this is my first job from tech so I haven't been exposed to any other industries but I would like to think the way I have carried myself is I don't have to change who I am to fit in.*
>
> *- Senior woman at a JSE listed company*

Also emerging from the interviews was a view that women in SET industry tend to leave because they struggle in this male-dominated sector and that they seldom speak

when they are marginalised. For example, women respondents claimed that women either assimilated into the male culture or became silenced within that environment. Overall, women in SET industries generally had to work extra hard to be recognized as 'good workers'. A comment by one of them captures this view:

> *Women have to work extra hard to earn respect and a lot of them assume that in order to make it in a man's world, you must behave like a man and you actually have to do better than a man in his work.*
>
> *- Senior woman at an SOE*

Confirming their views of women as different from men and of the need to give them 'appropriate' (gender-specific) roles in the workplace, some of the women interviewees felt that through assimilation into masculine culture, women were denying their 'true' selves – their 'femininities'. They believed that women were naturally more nurturing and caring than men and less willing to take risks, and were therefore more cautious in technical environments.

4.3.2.1 The challenge of balancing work and family commitments

Contrary to the findings from the questionnaire which suggested that women in SET did not view balancing family and work responsibilities as a challenge, the interview respondents identified this as a reason for the low retention of women in the sector. According to them, although companies generally accommodate women's commitments to their families, such as allowing them to work from home when a child is ill or working flexi-time, women are expected to deliver the same outputs as men while having to simultaneously be a primary care giver. On one hand, the women interviewees spoke of their companies' willingness to accommodate them in a positive light, particularly, how, as a result, they cope with the work-life balance and even succeed in the SET sector despite having an extra load to deal with. On the other, they acknowledged the fact that being perceived as the primary care-giver in society, women lack mobility to participate in work-related demands such as travelling and doing fieldwork. As a result, they sometimes have to drop out because they cannot balance their work with family commitments or are surpassed by women (young and single) or men who are mobile. To illustrate, two of the senior women commented:

> *I do think that the family set-up is the core of any nation and I don't necessarily think that it is a good thing that women have other people to raise their children. So that is the biggest problem and we have to face it ... And it is not for me to say that I don't want to employ a female engineer cause she might have babies cause a male engineer can leave the company in three years' time. So you have to plan for movement of both genders.*
>
> *- Senior man at an SMME*

> *I still think for a woman her family comes first and the construction industry is a very hard industry and I don't think if you are a quality manager your husband is going to move all over the place for you like one day in PE and next in Botswana and I think that this is once of the factors that make women not want to stay.*
>
> *- Senior woman at a JSE registered company*

In tandem with this view is a fear to have children because of maternity leave policies that bind women to working for at least a year and a half before taking this benefit. Women may

thus be indirectly forced to exit the sector if they do not comply with employment requirements.

Linked to the challenge of balancing work and family responsibility was a common theme amongst female employees in the SET industry that companies were often not flexible enough in terms of accommodating women's family commitments and child-rearing responsibilities. This is not surprising when one considers international literature such as the European's Commission's (2002) report which highlights the forced choices female employees in industry often have to make between family and children, and a professional career, often with little accommodation from the employer. One female interviewee in this study reported:

> *I have a child of two years. On Tuesdays, I have to be at the factory at six o'clock. My child has to wake up at five o'clock so that he can be ready for school. He then has to sit with his father. You get men who can do it and men who can't, and my husband doesn't do it. If my husband isn't there, then I have to drop my child off at my mother at a quarter to six to be here at six and at work, all they say is sorry.*
>
> *- Female senior employee*

To address this, a contrary and interesting view emerged from the interviewees suggesting that while companies are flexible in terms of women's family and child-rearing responsibilities, their policies do not take men's roles for such commitments seriously. Their view was that it was important that female employees' male partners to play a role in these responsibilities so as to provide support for women to advance in their professional careers. For example, a senior woman at a JSE listed company observed:

> *Women must develop a situation where they can cope in their home environment by balancing things on the home front as well as the work front because that's why women are always more tired than anybody else because they have to do all those things.*

Another senior woman at an SOE also commented on the changing roles of men in society and the need too change company policies and practices accordingly:

> *How are young husbands coping with a young mother who has to be sent on business conferences, who has to travel around domestically, it is a challenge, it was always a challenge but I think there again the perception is it is a new society. It is more advanced but it is so interesting the same social issues that affected us twenty years ago affects the community now so we are finding that we have to come in, bring in the partners, speak to the husbands as well.*

Confirming this view, a male Human Resource Director commented:

> *If you get involved in the food business, you can only go home once the job is done. That is reality so we need to be aware that when you appoint a manager, you also appoint a mother and the kids do go to school, they are small and they do get sick. The role of the father at home is also changing and that allows the mother to become more focused on her work environment by sharing the load. But if a woman in a work environment does not have the support of the husband, then she will find it very difficult. Personally, I feel very strongly that the mother is the cornerstone of the family and we are losing that.*
>
> *Male HR director*

Participants' discourses in the interviews suggested that the low retention of women in the SET sector was due to the fact that ideas around what constitutes 'good science' and who is representative of a 'good scientist' are framed within masculinist terms. In other words, 'good science' means hard science (Engineering, Biology, Physiology) best practiced and executed by those who have been constructed as more practical, technically minded individuals –

men. This leaves little space for women to be constructed as 'good scientists', particularly when their roles as mothers, caregivers and homemakers requires that flexitime is often a necessity within the SET industry. According to a male HR executive at a private company its a "*struggle to prove competence all the time*" as women are seen as less committed when they are absent from the workplace in order to fulfil their family commitments. However, interviewees raised the important role of technology (such as electronic communication) in affording women the opportunity to execute their work duties without being physically present in the work space. Women and their employers are or could be making use of technological means to satisfy the needs of the organisation as well as women who have family commitments. In some cases organisations are functioning by focusing on outputs rather than on time spent physically in the workplace, but in many cases this shift needs to be made to accommodate more women. According to them, this kind of arrangement is easier to implement at senior levels. At lower levels of the organisation women often have to be physically present in order to do her job (e.g. working on a production line). This makes women vulnerable in the recruiting process as their role as child bearers is seen as an inability to be physically present in the workplace at all times. Confirming the notion of a gender-blind meritocracy as a strategy adopted in his company, a male CEO pointed out that:

Our strategy is more to retain competence and that is kind of gender-blind. We want to retain people that we believe can add value to the company...particularly the ones we have invested in.

This contrasted with a female HR Director's view that:

> *A good scientist does take time for maternity leave. But it doesn't have to be for fourteen years. You can work on flexitime for fourteen years but you remain a scientist. So there is no either/or, you find this in-between space.*
>
> *- Female HR Director*

In their responses, the interviewees also came up with possible strategies for retaining women in the sector. To illustrate, a senior woman at an SOE felt that women needed to be retained in the company by accommodating for their needs. In other words, women should not leave because the SET environment has not accommodated for their particular physical or social needs. Instead, the SET environment needs to change to accommodate for these needs. According to her:

> *It should be a requirement that when a woman is appointed in a particular position, we need to ensure that we have protective clothing which includes making the working environment conducive for them. They shouldn't leave because conditions are not conducive, they should leave because they are incapable of doing the job, not because of the masculine environment looking after only men's needs.*
>
> *- Senior woman at an SOE*

Similarly, a male executive at an SOE believed that the industry needs to accommodate for women's physical needs. For instance, he felt that it is problematic that women do not have separate change rooms or separate ablution facilities at train control centres and that these issues needed to be dealt with effectively. When the SET environment only caters for the needs of men, women have few options but to assimilate into this masculine culture, or to leave.

Gender discrimination, abuse and masculine culture

Some female employees in the SET industry felt that women left the industry because of experiences of gender discrimination, sexual harassment and abuse by male employees.

They reported feeling that they were often not treated like professionals but were instead judged on their physical appearance. For example, one commented:

> *It's not nice for a woman to work in production. Often people don't take you seriously and in a factory environment, men will whistle at women. Once I was wearing a short pants because it was so hot (and you couldn't see my pants because of the long coat) and when it came to me washing off my boots, this one guy was lying down and trying to see what I was wearing underneath my coat.*
>
> - *Senior female*

Another added:

> *Women exit because one is reliant on a network (who you know, who you play golf with, drink in pubs with). I refuse to compromise. The organization tried to make me play golf by paying for it but I don't enjoy it and I don't do it anymore. Many deals are made on the golf course and in pubs and as a woman if you are excluded from these events you do not make the same deals as your male colleagues and you are told that you are not performing. Eventually you give up and leave.*
>
> - Female IT division manager at an SOE

Moreover, Black women also spoke about how they felt discriminated against on the basis of race as well as gender and how this made them feel invisible in the workplace. A comment by senior female at a JSE registered company illustrates:

> *I went to one of the more progressive mills, it was like stepping back in time, the white managers would not even greet me and I am not talking about ten or twenty years ago; this was 1999. It was like being on another planet and so how can you talk about even respect for other cultures or race or gender or anything when they do not see you, you do not exist ...*

Another confirmed this view:

> *I got such uphill from the guys who were applying for the job and they basically implied that they would make my life an absolute misery if I got it ... and it was because I was a woman but it was also because I was a young Indian woman that they would be reporting to.*
>
> - Senior female at a JSE registered company

This was complicated by white women's perceptions that gender becomes subjugated by race in order for 'race quotas' to be filled.

Furthermore, the respondents in this study also cited the fact that women are not given a chance to prove themselves in the workplace as tasks of significance are given only to men as a reason for the low retention of women in the SET sector. According to them, a related reason is the fact that women are also 'protected' from potentially harmful situations and places by not involving them in fieldwork, shift work or placing them in positions where there are other women:

> *... but there seemed to be no advancement for them because they were put on a site or just sort of left one side, but I also suppose it was for their own protection because there were so few of them, but I do think there are people who are interested but they seem to end up doing engineer consulting work and not fieldwork.*
>
> - Senior female at a JSE registered company

Lastly, while some senior women felt comfortable with assimilating into the masculine culture of the SET industry, others felt that this male-dominated environment often left women employees feeling marginalised and silenced. Two interview comments illustrate: On one hand, a senior woman in one of the companies commented:

> *You find these companies that are run predominantly by white males that they are not open to give opportunities to engineers out there who have a brilliant mind and can actually meet some of their requirements. Its even more difficult for women including black and white women to actually make inroads or penetrate that block.*
>
> - Female general manager at an SOE

The respondents also identified financial rewards and marginalisation of scientists as reasons for their low retention in the SET sector.

4.3.2.2 Low financial rewards and the marginalisation of scientists

A number of interviewees in this study perceived the SET sector, particularly engineering companies, as not a preferred industry or industry of choice because, according to them, it is not a very lucrative industry to be in. An example they gave related to the fact that sometimes engineers struggle to get their fees accepted and so they gravitate to other industries. This retention problem is blamed on the market forces operating in the industry. This challenge is not differentiated for men or women, but may be a factor that also affects women being retained in SET.

Similarly, according to the respondents, engineers are often marginalized and undermined in terms of their status and credibility. They identified two forms that this marginalization takes: Race and globalisation; and poor rewards and recognition for work. To illustrate, firstly, white people feel they are marginalized by the process of transformation where PDIs with no qualifications are put into positions (especially in government) that took someone 20 or 30 years to advance into. This causes men and women to move away from the industry or emigrate. Compared to the past South Africans are welcome everywhere and there are many international opportunities. Secondly, people are not recognized for their efforts in an industry that demands high intellectual capacity and input. This causes men and women to move away to so-called softer targets where their intelligence is recognized. Softer targets are often defined as the financial services sector or 'business'. In order to recruit more young people into the SET sector, the sciences need to be sold as exciting and socially relevant particularly to young girls.

Linked to the above is the impact of national polices targeting employment equity in various sectors. The participants observed that women often move around companies because they are in high demand for companies seeking to meet their employment equity targets. To illustrate, a female executive in a SOE observed:

> *... people keep on poaching them, each and everyone out there is trying to push their numbers so they are under pressure because of the few numbers that we have so we experience huge problems". Investing in women does not ensure that they will be retained in the organization: "You will recruit a woman, take her overseas to overseas training courses and all that, when she comes back she leaves, somebody else attracts her, they give her a higher salary because you have to pay a premium all the time when you are a female.*

The last category of factors examined in this study are related to the reasons for the poor or lack of advancement of women in SET companies. These are examined next.

4.3.3 Factors that inhibit the advancement of women in SET sector

Literature reviewed in Section 2 of this report suggests that very few women make it to the top of the ladder in the SET, including in those which have made some strides in recruiting high numbers of women. Thus, this study also sought to examine the factors that inhibit women's advancement or promotion within the SET sector.

Limited advancement opportunities for women

Women interviewed in this study felt that there were limited opportunities for them to advance, particularly those working in SET fields like construction and others seen as particularly masculine and suitable for men. One woman explained:

> *But I feel in our industry it is very difficult for a woman ... you have all the tools, you do all the work and you are still overlooked and they know you are very important to the company, but they are still not going to go that extra mile to say we have got a female director or something, it is like they are saying 'No, not in our industry'* "
>
> -Senior female at a JSE registered company).

According to the respondents, even when women do advance and excel in the SET sector they are not respected in the same way as men are as, "*Men do respect men more and they don't like having a woman as their boss*" (Senior female at a JSE registered company).

The respondents also felt that advancement opportunities can also depend on how physically able women are perceived to be for a certain job. Many of the interviewees spoke about women not being able to advance to positions where safety is an issue or where a woman's physical make-up is regarded as unsuitable or inadequate for performing certain duties such as holding a heavy welding gun in a manufacturing workshop.

Other reasons identified related to gender inequality and sexist tendencies amng the men in particular. For example, a female executive at an SOE noted:

> *And then the other challenge maybe with the males if they have to report to a senior person who is female they also tend some of them to experience a problem because they are saying oh you know it is very difficult for them to accept that things are changing to the direction whereby females can also take up top positions and supervisory positions and they can be superior to them so sometimes it becomes very difficult to accept that. Whereas if you put a male leader or a male supervisor then they just run around you know they are eager to deliver whereas if it is a female they just adopt a slow attitude.*

4.3.3.1 The new glass ceiling

On one hand, some women and men spoke about the lack of opportunities for women to advance in the SET industry, others were positive about the possibilities for women to excel within the sector. A senior woman at a JSE listed company noted that:

> *You know, if you really believe in yourself and your own capabilities and the things that you can do you will be successful. There is no reason at all why you cannot be successful.*

Such possibilities, however, were seen as possible for women who are competent and who deliver good work. In some companies women were said to have been given fast-tracked career paths to increase representativity in terms of gender and race. In addition, the respondents also identified the presence of senior women that serve as role models, and

policies for the advancement of women as factors that facilitated the advancement of women in the sector. However, drawing on the notion of meritocracy referred to earlier, women also spoke of advancement being based on individual characteristics such as drive and ambition. For example, a male CEO of a private company reported that he did not believe that the lack of advancement of women in the SET sector is due to a lack of opportunities. Rather, for him, this was do not make use of the opportunities that are offered to them.

On the other hand, even though some of the women believed that there were opportunities for them to advance and ultimately break through the glass ceiling they identified a new one which was reversing these advances, particularly at the position of CEO or managing director. For example, a senior woman at a JSE listed company declared:

> *I would agree women do leave the industry because their growth prospects are hampered. They can only reach one level and not beyond that and that is why if you look at the large industries in the country today there are very few women CEOs that actually run large corporations, they are executive directors and they can run the company but they don't.*

Family responsibilities versus work

Again, family responsibility and its burden on women in our society emerged as a reason for the poor advancement of women in the SET sector. The women in the study spoke about foregoing opportunities for advancement in their organizations due to family commitments even when these organizations were willing to promote them. A senior woman at a JSE listed company remarked:

> *I feel almost like a let down for not wanting to go further but I need to put my needs, my family's needs first, but if it wasn't for my children and let's say I wanted to progress I am still confident [my company] would support me.*

Higher positions can involve shift work or require a woman to work extra and flexible, as well as be mobile, things that women often feel they cannot do due to family commitments. Some women ascribe the stagnation of their careers to the life phase that they are in:

And I think it is great for people to want different things, we are all in different places, if I didn't have children, if I wasn't married I would consider going into Africa it will be an exciting opportunity and there are endless opportunities for engineers in Africa so where I am right now ...

Senior women at a JSE registered company

Single women without children are seen as more fortunate as they can take the same kinds of opportunities in SET that men do.

Women's PDI status

Another view which emerged from the interviews was that women were leaving the SET sector because of their own complacency due to their 'previously disadvantaged individuals (PDI) status and are establishing bad track records. For example, a female interviewee in a senior executive position at an SOE warned that women were becoming complacent as they became more popular to appoint due to their PDI status. According to her, women's attitudes were becoming careless in terms of their work which she described as:

> *...a recipe for disaster because at the end of the day you are just digging your own grave. No one would want you and you must also think about your track record that you have made because people will talk, they will say oh sorry.*

She added:

If they can show that they are good and they can perform then they should get promotion but as I said they disappear before they can have impact. So I think there will be advancement for them if they could just stick around longer and not go looking elsewhere.

- Senior female at JSE listed company

This interviewee stated, however, that we should perceive women being head-hunted and moving from one company to another within South Africa in a better light than the current exodus of young scientists from South Africa.

4.3.3.2 Sexual harassment in the workplace

The respondents in this study also felt that women viewed as 'attractive' tend to face more challenges in the male dominated workplace of the SET industry than other women. This type of discourse, utilized by a female HR Group Services Manager of a major private company, suggests that professional women who are considered to be 'attractive' would not necessarily be taken seriously in terms of their competencies and capabilities in the SET industry. She observed:

We have just promoted a female engineer to an industrial engineer and she both internal and external customers are going to have to put up with her and she is a hugely attractive girl so it is going to be very interesting.

Another senior woman from an SOE added:

Remember you are entering an arena which men think is theirs so when you step in you have got to prove to them that you know what you are doing and as a result of that I have had to learn a lot of things to cope ... I always look for something that has not been pointed out and that makes you confident and it also shows them that you know, you see, you look at the loopholes and you deserve to be there.

In addition to identifying barriers to the recruitment, retention and advancement of women in SET, the respondents in this study also identified strategies for addressing them. A few of these are listed below.

Strategies for improving the recruitment, retention and advancement of women SET industry

Part of the in-depth interview with senior staff at the 38 companies focused on the strategies aimed at, or that can be adopted to attract, keep and advance women in SET industries. Workplace policies were identified as a possible strategy to achieve this. Across the 21 organisations that participated in the study, 15 of the 38 interviewees affirmed that their organisation had a gender or equity policy or some type of non-discrimination policy. 14 interviewees reported that their organisation had gender specific targets, did head counts or tracked equity in terms of race and gender. In addition, 15 interviews confirmed that their companies had policies aimed at combating sexual harassment. 12 interviewees said that they did not have a gender policy, but what they called a "people policy", perhaps capturing those companies and senior managers who subscribed to a gender-blind discourse in dealing with the employment of women.

The reported strategies that organisations use to support the implementation of these policies are presented in figure 5 below:

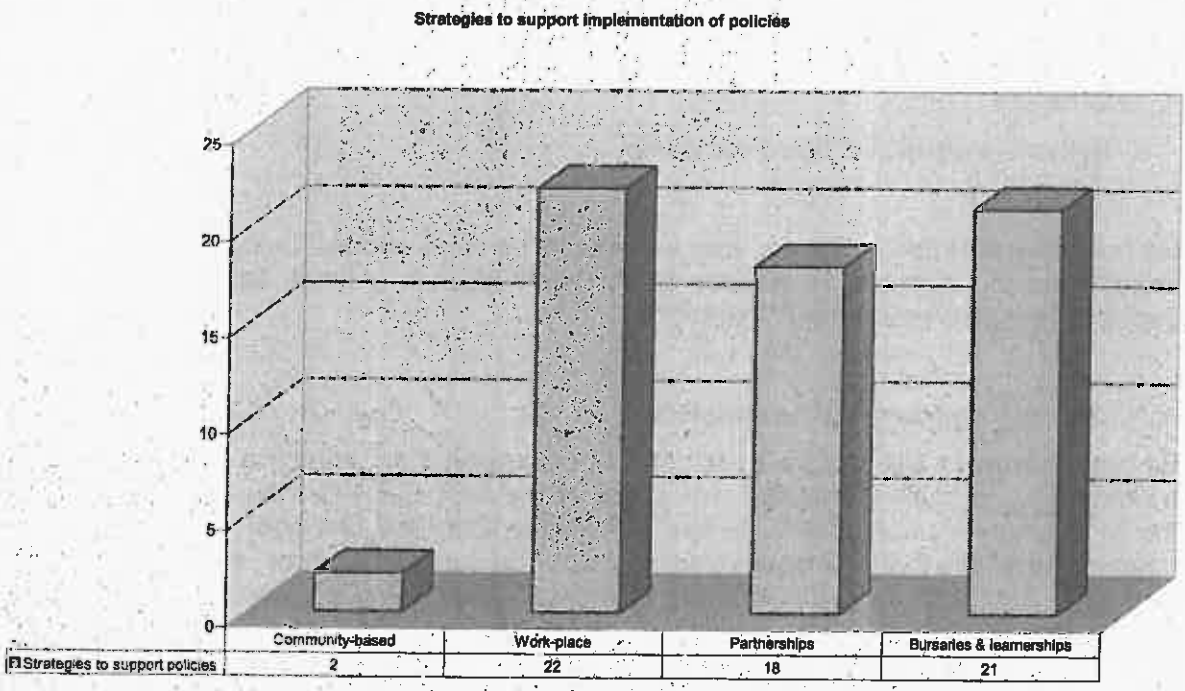


***Figure 5** Strategies that companies use to support the implementation of policies*

The interviewees identified the national policy framework, community-based intervention, workplace policies, partnerships and bursaries and learnerships as some of the strategies that are and can be used to recruit, retain and promote women's participation in the SET sector. With regard to policy interventions, the participants felt that while the national policy framework was forcing companies to recruit a diverse workforce, these were not translating into the retention of women in SET companies. The reasons given for this included the masculine image of the sector and the marginalisation of women, particularly black women therein. An HR Executive's comment aptly captured this view:

> *... with the BEE charters who is going to be forcing industries to look more on women, predominantly black women. I mean if you could find a black woman engineer I think you would pay the earth to have her in your organization because of the points allocated to something like that so I think companies are going to be forced if they don't have the culture already they will be forced to adopt that culture.*

In addition, workplace policies that target women were also identified as necessary strategies for addressing the problem. According to the participants, generally, the workplace policies in their companies did not specifically address gender issues. Following the gender-blind discourse referred to above, both men and women did not regard them as important, especially at SMMEs. One of the female interviews at an SMME stated that there were "*No real issues that women have that require them to get special treatment*". For some of those that reported having a gender policy, incorporating issues for women into a gender policy is constructed around women as child-bearers (so policies are concerned with such issues as maternity leave benefits). The more substantive issues around gender inequality and harassment of women in the workplace are not addressed.

Interviewees at SMMEs perceive having policies like sexual harassment policies to be linked to the size of a company and so because they see themselves as 'small' they do not see it as necessary to have these kinds of policies in place. One interviewee (senior male) at an SMME said that they "would go to what the labour laws say" if sexual harassment did take place. One male CEO of a private company stated that the company did not have a sexual

harassment policy, but that these matters were dealt with as a contravention of the company's code of conditions of service.

There appeared to be a lack of female mentors in private companies. This implies that male seniors often mentor young women entering the industry. A male CEO confirmed that:

> *For the young ladies in the company, we have relatively few people we can choose from to be mentors and unfortunately we don't have senior enough or experienced enough women to act as mentors.*

However, the participants also observed that having policies, however good they may be, cannot be expected to solve the problem of low participation of women in the SET sector. As one female engineer noted, it a positive organisational culture that significantly contributes to improving the participation of women in any company, and particularly SET companies. For her when women feel "accepted, acknowledged and recognized" that they will be retained in the SET industry. For example, commenting on her success in her own company she elaborated:

> *I am part of the company, people know me, people recognize me and I don't feel alienated and on my own. I have male colleagues that I can go to and say you know this is the situation and how would you deal with it so I have got those structures and I have got the acceptance and recognition and I don't know how you would instil that if it is not there.*

Adding to this, a female HES manager described how this had worked for her in her company:

> *When I was very ill with my baby and this company went to great lengths to accommodate me with my leave and my sick leave and all the things they did and I will always remember what the refinery manager said, he said "if we assist her now we will retain her, if we don't assist her we would lose her" and it was the same words he used when I went to university to do my honours ... he had this whole approach "if we do little favours for people, little things to make them happier, more comfortable, outside of a policy we will retain people" and I think this has been more our strategy as opposed to making everything policy.*

According to a female executive interviewee, the solution is to ensure a working environment that is conducive, very welcoming and enabling, but high salaries and top positions remain the best way to attract women.

In addition, participants in this study, particularly those from private companies highlighted the use of flexi-time as an ameliorative strategy for women's successful participation in SET industry. According to them, flexi-time makes it easier for women with family commitments to be retained by the organisation. This works on an output model (i.e. you are judged by the work you deliver and not on the time you spend in the office). Other ways of accommodating women include hiring them in half-day jobs, although benefits are cut accordingly.

Following the trends in the literature reviewed in Section 2 of this report, while many of the women in the study lamented the low participation of women in the sector, particularly their retention and advancement into higher positions, some also cautioned against advancing women too quickly in the organisation. In particular senior women in SOEs generally felt that advancing women too quickly could be counter-productive for both the employee as well as the company. This type of fast-tracking just to meet gender equity targets at the top was seen as setting the female employee up for failure. According to a senior manager in the IT division of an SOE:

There is a drive to put women into management positions and so they can't become specialists if they want to. Its too rigid; people should be placed where their interest lies.

A senior woman added:

In our haste to empower women, and this could relate to affirmative action in terms of race as well, people who have all the professional qualifications have sped through the ranks at such a pace that sometimes they are set up for failure, where they might have benefited from a slightly slower path to development.

What these women proposed instead were specific programmes targeting women and taking them through the various levels of the company so that they can learn its operation before they are expected to lead/manage it. An HR manager advised:

I think whilst we need specific programmes for women and we need to focus on that we also need now to start taking care of the ageing workforce, unfortunately it is white male mostly, we need to start appreciating the value those people still have to enhance skills development for our people because that is where the knowledge is.

According to these ageing but otherwise knowledgeable and experienced employees could be called upon to train and mentor younger employees generally, but women in particular.

Again affirming the gender-blind discourse adopted by many in this study, a female manager director of technology added:

Gender representativity is a world-wide problem in engineering so when it comes to the sector in South Africa I don't think we should ever need to feel that we must force numbers for the sake of gender representation because we ourselves could be very irresponsible when we do that because we could be forcing another kind of discrimination between male and female ... of course I want to see more women with the right reasons where those women themselves must support ... our youth needs to participate in the SET sector not just women.

This would suggest the need for gender sensitivity training in the sector and particularly gender mainstreaming, where companies adopt a gender approach equity approach to all its programs, including recruitment, retention and advancement.

Some interviewees felt that there needs to be a national strategy for the SET sector. This strategy should be focused on retaining women in the specific Science, Engineering and Technology industries through a quota system. In other words, the strategy needs to clearly indicate the number of women needed in each sector to balance the playing fields. SET industries would then have **a** framework from which to develop their employment equity strategies in the workplace.

Summary and Conclusion

In this section the findings from the three data sets are integrated into broad themes to provide a holistic picture of the gaps in the participation of women in industrial SET and the reasons for them. The first theme can be broadly identified as the **discourses of difference between men and women** as a reason for the low participation of women in the SET sector. In this discourse, both men and women in the study constructed women as different from men on three levels: First, the participants in the study saw women as emotionally different as they are regarded as 'softer', 'feminine', more emotional and bringing a more empathic understanding to the SET industry. Second, women are constructed as different on a

cognitive level. They tend to think holistically and deeper consideration goes into the decisions they make. Thirdly, they are constructed as different on a biological level. They are physically weak and fragile and cannot participate in tasks that are considered heavy or unsafe, many of which are a significant aspect of the SET sector (e.g., engineering, construction and others). There are also contradictions in what women say about themselves. They construct themselves as different to men, say that this difference is necessary as they bring new attributes to the workplace, but at the same time that they want to be equal. Women are often cast in supportive roles for men in the workplace which mirrors the typical role that women play in the home.

These discourses serve to essentialise gender by claiming fixed, unified and opposed male and female natures (Wajcman, 1991:9). In industrial SET this assertion focuses on the inherent difference between men and women to elucidate their differences in the sector and by inference, their participation. This interpretation concurs with the literature in Section 2 that highlights constructions of gender differences as one of the main factors that force women out of SET. However, the participants also acknowledged that women are not a homogeneous group and the reasons for their participation or non-participation in the SET sector will also differ. As illustrated by the findings from the questionnaire completed by women in industrial SET, there is a considerable degree of diversity in terms of the specific experiences of individual women across SET workplaces (e.g., social class, age, race, position in company). This suggests that a 'one size fits all' solution will not successful improve the participation of women in the sector.

At a macro-level, however, similarities do exist with variations being more apparent in terms of magnitude, severity and impact on the women involved. From a national policy perspective the nuanced nature of this reality, though important, is not of primary concern. Of particular interest is the need to address the existing gender imbalances in the SET sector of South Africa through a systematic process that ensures women's full participation in and benefit from the SET sector. This is examined in the section below.

Linked to the discourses above is the second theme or reason for the poor participation of women the SET sector: the **masculine image of science**. In line with the notion of hegemonic masculinities described in Section 2, and the fact that SET is regarded as the domain of men, women often feel that they do not fit into a male-dominated culture as the benchmark for a successful scientist is a man and also that women must change in some way to match the role of the male scientist. Associated with this masculine image of science is the gendered dichotomy: men are machine-focused, rational and abstract thinkers while women are people-focused, emotionally connected, concrete thinkers. This view works to exclude women from SET as the dichotomy communicates to women who aspire to a successful career in SET and the men who support that idea and work towards achieving that they are not being authentic to their genders. Although research shows that both of these types of thinking are required in SET fields men continue to dominate. More research needs to be conducted about the relationship between continued male dominance as well as the masculine images of technology and how they are sustained.

The third theme in the findings is related to the **gender-blind policies and strategies** that were said to be adopted by organisations and individuals in them in terms of recruitment, retention and advancement opportunities. This is the notion that women's increased participation must be a natural evolution rather than a targeted policy approach. There seems to be a belief that it is not policy that will change women's participation in the SET industry; it is a natural evolution as more women enter the sector. Also, the perception exists that women should not be advanced too quickly as they will experience demands beyond their capability and eventually they will burnt out. What these positions fail to take into account, however, is that women do not often sustain long-term careers in the sector. In this

research, as in previous studies commissioned by DST, males and females say that scientists often exit the SET sector for more lucrative career paths in other sectors within the country or internationally.

However, like other studies reviewed in this report and elsewhere, findings in this study suggest that women also leave due to gender-based obstacles such as discrimination, harassment, exclusion and family commitments. The construction sector seems to be a particularly harsh environment for women. International studies also show that the participation of both men and women in science and technology is declining. Added to this problem, is the trend of women exiting the SET sector and the seeming reluctance of the sector not to do anything about it. The results from the in-depth interviews show that women, especially in private and JSE-listed companies, tend to exit the organisation to begin their own business/consulting practices. These women are in the ideal position to act as entrepreneurs and should be supported by funders and government to ensure their success. This might be one way of increasing women's participation in industrial SET.

Increasing women's participation in the SET industry should not be left to natural evolution. The European report on science and technology indicators (2003) examined a number of studies that make it clear that gender equality will never occur if left to "natural redress". The report states that "It is clear that 'simply waiting one's turn' is not an option for today's women. Moreover, merely condoning a short wait would also be a patronising attitude towards the question of women's participation in science" (p. 265).

The fourth theme identified as inhibiting the participation of women in the SET sector is **gender inequality** between men and women. According to the participants in this study men and women in industrial SET are unequal in a number of ways. Firstly, there was a perception that men and women receive different remuneration for the work of the same value and on the same level. This perception is supported by the theory of human capital that asserts that inequality in career success is a result of differences in men's and women's human capital. Salary inequalities between men and women are also a consequence of human capital (Igbaria & Chidambaram, 2004). Secondly, some women feel that they are not taken as seriously as men. This is often raised when women talk of having to work harder than men to prove themselves. Women's competence to practice science is sometimes questioned by men and their confidence may suffer as a result. As reported in the literature this lack of confidence may lead to attrition as well as restricting the development of women in the profession. Thirdly, there is a difference between men and women in how much access they have to networking opportunities. Women are often excluded as networking typically revolves around activities such as golf and drinking in pubs after hours, a time when women are taking care of family commitments. These networking opportunities are perceived by women to be of great importance in doing business and some blame their lack of performance, and departure from the SET sector on the frustration they feel in not being able to network to the same extent as their male colleagues. This concurs with the literature discussed in Section 1 about engineering as a homo-social performance where career progression for men, especially in the engineering field, is based on involvement in successful projects and membership of networks of contacts and mentors (Melström, 1995). Most women who initially lack the hands-on experience and confidence, despite their competence, do not experience the thrill and obsession of their male counterparts (McIlwee & Robinson, 1992; Mellström, 1995). Women do not belong to the 'club' and are greeted with hostility by many male engineers; they lose out on their careers and it is not surprising that many women engineers opt to leave the profession.

Lastly, participants in this study identified a **new glass ceiling** that women cannot break through. The new glass ceiling relates to the highest position in the organisation. Thus, women feel that they are able to reach management and even executive management and board of director level, but are very seldom appointed to head a company as CEO or

managing director. The findings from the gender representativity survey support the observation by the research participants that women are well-represented at the lower levels of industrial SET companies, but not at the level of chairperson of the board, CEO, board of directors and executive management. Other research (Blau & Ferber, 1989) has also suggested that great returns on investment are primarily received by white males as opposed to women and 'minority' groups irrespective of educational level, skills and work effort, a claim that is particularly relevant to South Africa.

Other factors that inhibit the participation of women in industrial SET are related to systems, both in the companies themselves, but also in national structures as well. For example, inadequate record keeping on women in industrial SET was identified as an inhibiting factor in this study. As Maria Ramos observed in the South African Women in Corporate Leadership Census (2004), measurement is an essential component of establishing and planning for the progression towards gender equity. South Africa's National Policy Framework for Women's Empowerment and Gender Equality prepared by the Office of the Status of Women in 2000 also specifies the key institutional processes, role players, key partners, and mechanisms required to achieve gender equality in both the public and the private sectors of the South African economy. It seems, however, that these national objectives are not being integrated into the strategic management plans of all organisations in the industrial SET sector. For example, the responses to the gender representativity survey uncovered the lack of adequate record-keeping by some companies of initiatives that increase women's participation in the sector. Some responses received ('information not available' or 'no precise record of this') show that companies do not track essential indicators of how they are increasing women's participation. In addition, the women and men who were interviewed tended not to view the lack of policies (such as gender and sexual harassment policies) and strategies focused on retaining women in their organisation in a very serious light.

The majority of responsibility for increasing women's participation in industrial SET, in the perception of the research participants, seems to be located with national government. For example, among participants in this study, one discourse revolved around the function of quotas, (i.e. government needs to formulate policy and put quotas in place to ensure an increase in women's participation). Another discourse is about perceived inequality in roles regarding responsibility. This discourse came from SOEs who complained that the bulk of the pressure to ensure equity, especially in science, engineering and technology, is on their shoulders due to them being an organ of the state. According to SOEs there is no national strategy in place that compels all role-players to contribute equally. They see themselves as having to take the leadership role to achieve government's objectives of gender equality in the workplace.

So, what ameliorative strategies can be adopted by national structures as well as companies and other organisations to increase the recruitment, retention and advancement of women in the SET sector? Section 5 below examines this question.

5 SECTION 5:

RECOMMENDATIONS FOR INCREASING THE PARTICIPATION OF WOMEN IN THE SET INDUSTRY

Recommendations to increase, strengthen and consolidate the participation of women in the SET industry include aspects that need to be addressed by industry, national government, funders and universities. Throughout the report, evidence confirms a growing consensus that the basis of a sound economy is integrally linked to the development of a good talent pool of human resources to be drawn from the science, engineering and technology sectors. The policy value of the former is of direct relevance to South Africa's research and development strategy which recognises the need for a new generation of scientists within the broader development of human capital and transformation in the science, engineering and technology sector. Such a transformation calls for a well-balanced human resource development plan in which girls and women are targeted, nurtured and developed in the transition to a knowledge-based economy. Of equal importance is the Additionally, the media could be used effectively by these entities to showcase more inclusive images of what it means to be a scientist, and what a good scientist entails. The media's role in this respect is also related to positive role models of women in science and industry. NACI's recent publication, *Changing Perceptions of Women in Science, Engineering and Technology* is an important publication that could be used as tool to popularize the fields of science, engineering and technology through other media and forums.

Global consensus indicates four major aspects that are central to the advancement of women in the SET sectors, as evidenced from the four major world conferences on women held by the United Nations[4]:

- education and training in SET;
- ability to use SET to improve their living conditions;
- ability to develop SET or to become scientists and technologists and the ability to participate in decision-making processes and structures or in directing the development and application of SET, including the setting of priorities; and finally
- elimination of the negative impacts, particularly of the new technologies such as biotechnology, information and communication technology, on women.

Responding in part to the above factors, and to close the gap between policy and practice, based on the empirical evidence outlined in previous sections of this report, some key recommendations follow that offer some guidance to respond to the mismatch between policy and practice. The following areas of immediate concern are industry, national government, universities and funding.

Recommendations for industry

Industry plays a crucial role in developing the potential of women in science through research, development and innovation. Industry in the broad sense is a key mover in the research and development sector and can be important to:

Create a work environment where innovation can flourish, where women can develop their careers according to their life-cycles and where they are measured by their

[4]Achmad, S. and Hermawati, W. *Gender in Science: The Case of Indonesia and the Regional Secretariat for Gender, Science and Technology in Southeast Asia and the Pacific*. Paper to the UNESCO Asia-Pacific Conference on Science for the 21st Century, 1-5 December, 1998, University of New South Wales, Sydney, Australia.

output instead of the hours they spend in the office. This might include technological solutions and infrastructures that accommodate a woman's need for flexibility regarding work hours and specific work activities such as disproportionate travelling.

Implement flexi-time arrangements for women across all SET industrial sectors as equal access to these arrangements does not currently exist. Flexi-time should also be considered for men, where necessary, so that there is gender equity in terms of child-rearing and nurturing responsibilities in the development of healthy parenting and child development. The gendered dimension of labour time and responsibilities, especially within the SET sector renders women vulnerable to policies that may be hostile to their maternal responsibilities. Public sector-specific reforms and state action to encourage change in employer attitudes toward social issues affecting women (e.g. child-rearing and flexible working hours that support the development of parenthood) could impact positively on the participation of women in the SET sector. If and when women are on maternity leave and return to the industry after a few years, industry should develop and have in place specific programmes that accommodate women who return to SET after a period at home with childcare responsibilities.

Develop and provide policies that maintain a work-life balance (in agreement with current South African labour laws). This would include maternity and paternity leave, child-care facilities and family responsibility leave especially for caring for sick family members. In the context of HIV/AIDS, and other terminal diseases (such as cancer which affects a large percentage of the population) the burden of responsibility often falls on women to care for the ill and aged. These responsibilities usually fall on women and girls, irrespective of whether they have careers, and can be attributed to the patriarchal basis of our society where the task of nurture and care-giving is assigned to women.

Refrain from treating women as though they are a homogenous group. Given the fact that women have diverse histories, experiences and educational backgrounds, their lives are shaped variously by a range of factors. This would mean that not all women in the sector (or outside the sector) may be disadvantaged. Given the historical legacy of apartheid and the triple oppression of black women in particular, and despite strides in political representation of black women, the SET sector (particularly in industry) reflects an under-representation of black women. Important differences may exist in terms of the needs and priorities for women from different racial, socio-economic, and age groups and across SET sectors that industry should continuously evaluated and monitor.

Create a work environment that allows women to explore and develop their interests in technical fields without feeling pressured to accept management positions for the sake of representation. Shop-floor learning and informal research within the work environment could help to renew and update the knowledge base of women. Such top-up and bridging courses could be also used as evaluatory tools in a performance management system that reinforces the career pathing of women within the sector. The monitoring of recruitment, retention and advancement of women in the organisation according to specific targets could be strengthened by in-house training programmes. Another concrete strategy to achieve this within the work environment is to assign younger and/junior staff to role models or champions within the workforce (who part of their job description) would ensure mentoring of the younger/junior member. Equity principles in line with the equity act should govern the selection, recruitment and appointment of women into the sector that takes into account the specific to the needs of the sector, the representation of women in that sector, and the development of a capacity and skills in the sector. Equity procedures should also be the basis for fair wage and salary practices for both women and men, ensuring equal pay for equal work across genders.

Provide alternative networking opportunities for women that are not linked to activities that males traditionally use to do business such as playing golf and/or meeting in pubs after

hours. The latter are traditional masculinist and often gender-biased zones of social bonding in the work environment that exclude women. If alternatives are to be created that provide networking opportunities for women, women should be consulted within the SET sector for their opinions on appropriate opportunities that will value their own development in the broader context of the industry within which they work.

Record statistics or other data from initiatives that support and encourage women internally to the organisation or externally such as entrepreneurial development programmes, procurement practices and/or industry-specific social development projects. Use this information to determine whether the organisation is on target for increasing the participation of women in industrial SET. Monitor the exit of women from the organisation or SET sector and use the information gained from feedback exercises to improve retention strategies.

Develop and arrange partnerships with schools, tertiary education and private institutions that will encourage girls to enter the SET sector. Such partnerships may include internships, fellowships, role models, mentors, speakers and supporting events such as the *Take a Girl-child to Work Day*. The sector should ideally contribute to scientific communication that popularizes science as a viable and attractive career option through strategic partnerships.

Recommendations for national government

It is the case that the bulk of the burden will fall on the State and government departments and select agencies to ensure that the policy framework is conducive and promising for women entering the SET sector. Some of the following recommendations address specific aspects and areas requiring interventions to:

Support the unique position that women are in as entrepreneurs when they choose to leave formal employment and establish small businesses or become consultants. Specifically government could:

Provide public funds to match private sources of finance;

Provide financial support for researchers (especially women) at universities who want to test and possibly patent innovative ideas before they are placed in the public domain;

Gather sex-disaggregated statistics on entrepreneurs in industrial SET including details of who applies for and takes patents to be conducted in partnership with HE researchers by commissioning research on women entrepreneurs in research and development to determine the factors (structural or otherwise) that limit their participation in industrial SET. The collection, analysis and publication of statistics that define and identify industrial researchers as a category and disaggregate these statistics by sex are crucial to ensure a clear picture of the demographic change(s) within the SET sector. In conjunction with State Research Councils and HE institutions, commission studies that examine women in industrial SET and the policies and practices of companies to determine progress in the sector. This information should be disseminated as widely as possible and should be used in the planning and revision of national policies.

Develop a national strategy for increasing women's participation in industrial SET at all levels of the organisation conducted in partnership with the ministries of Science and Technology, Trade and Industry, Minerals and Energy, Education and Labour.

Ensure that legislation is in place that addresses discrimination on the basis of sex and continually review the legislation to ascertain whether it is working or not. Such legislation may facilitate the creation of an environment that supports women in industrial SET such as revising tax laws based on the breadwinner/homemaker model (where necessary) and offer

subsidising care for children or elders that is often a woman's responsibility. Government should specifically address the issues of equal pay for equal work. Any legislation should that has to be developed should be conducted in partnership with the relevant and directly relevant government departments (such as the Departments Science and Technology; Trade and Industry; Minerals and Energy; Education and Labour) even though such legislation may be led by the Science and Technology Department.

Continue to debunk stereotypical views of women as well as of people of colour in terms of their ability to perform science. More inclusive images of the "good scientist" need to be broadcast to the general population that challenge social conditioning through gender and traditional beliefs about women. Initiatives may include gender awareness campaigns and equality training. While it is the role of government to ensure perceptions change, such campaigns should be conducted in conjunction with relevant ministries (Science and Technology, Education, Minerals and Energy, Trade and Industry, Labour), non-governmental organisations, schools, HE institutions and the media. Part of the strategy could be the organisation of conferences, forums and networking opportunities for women in the SET industry, not necessarily about SET but about gender and women's issues with clear objectives in terms of what the aim is.

Support initiatives such as the *Take a Girl-child to Work Day* especially where women are in the minority like the SET sector, done in conjunction with core ministries that have a stake in the SET sector.

Benchmark support for women in industrial SET nationally using existing structures such as CEDAW and frameworks such as the GPF, and internationally with entities such as the Helsinki Group and Accord. Good practice should be adopted and publicised wherever possible.

Recognition by policy-makers and implementors that women are a homogenous group. Because of the various differences across race, age, class, women enter the SET sector through a different set of experiences that will demonstrate either their positions of privilege or disadvantage. It is necessary for policymakers to understand that the SET sector should prioritise women's participation, entry and retention to ensure diversity in terms of race and class. Important differences may exist in terms of the needs and priorities for women from different racial, socio-economic, and age groups and across SET sectors. Policy needs to address each stage of the woman's lives.

Recommendations for educational and research institutions

A number of possibilities exist within the high school and post-schooling system to strengthen the role of women in mainstream science and technology and to highlight the importance of women's technical knowledge. Some of the following could be prioritised by:

providing compulsory courses in business skills to all under-graduate SET students as part of their broad curriculum.

providing facilities for students who want to test innovative ideas before they enter the workplace through sponsorships and partnerships with industry stakeholders..

research that surveys HE and the vocational sectors to determine whether mentoring schemes for women in SET-based education, training and employment exist, and if so, the extent to which such schemes are working positively for women's entry into the SET sectors. Such research should also draw on examples of best practice for men and women, which could be applied in industry and the broader education sector. Research that could be initiated jointly by the Research Councils of the State, Deans of Science, Engineering and Education Faculties at universities could interrogate the gender issues (such as gender biases, for example) inherent in curriculum design of SET courses to help identify factors in

the curriculum that discourage girls and women from entering the SET field. In partnership with non governmental organisations, HE institutions could research and advise on the formulation and implementation national policy on SET within schools and HE institutions, as well as suggest ideas arising out of the research to develop monitor and evaluate programmes for advancing women in SET. Research that is required should also offer a disaggregation of statistics that provide a discipline breakdown of the SET fields and the levels of seniority of women within the work environment, their employment status (whether part-time, casual, permanent etc.).

Recommendations for funders of entrepreneurial projects

Policy points in this category highlight the business case for gender diversity in science, engineering and technology. The policy implication is that the social value of women's participation in the SET sector is underpinned by economic and fiscal conditions that necessitate financing and funding for the sector. In the policy context, this essentially means that there is an economic value for gender diversity in the SET sector. In conjunction with the relevant Ministries (Science and Technology, Education, Minerals and Energy, Trade and Industry, Labour) and private institutions, the following should take place:

Monitor applications and winners of tender bids by sex.

Benchmark the number of women supported with other institutions that provide financial support to entrepreneurs.

Ensure gender equity of forums where decisions are made about funding in the SET sectors.

Be pro-active in encouraging applications from women entrepreneurs and women who want to establish part-time businesses.

Facilitate the establishment of companies by women who have had a period of work interruption.

Identify and/or promote networking opportunities and mentoring schemes amongst women entrepreneurs or business networks.

Figure 6 below presents these recommendations grouped into major areas that should be addressed by the role-players and stakeholders who are able to increase women's participation in industrial SET.

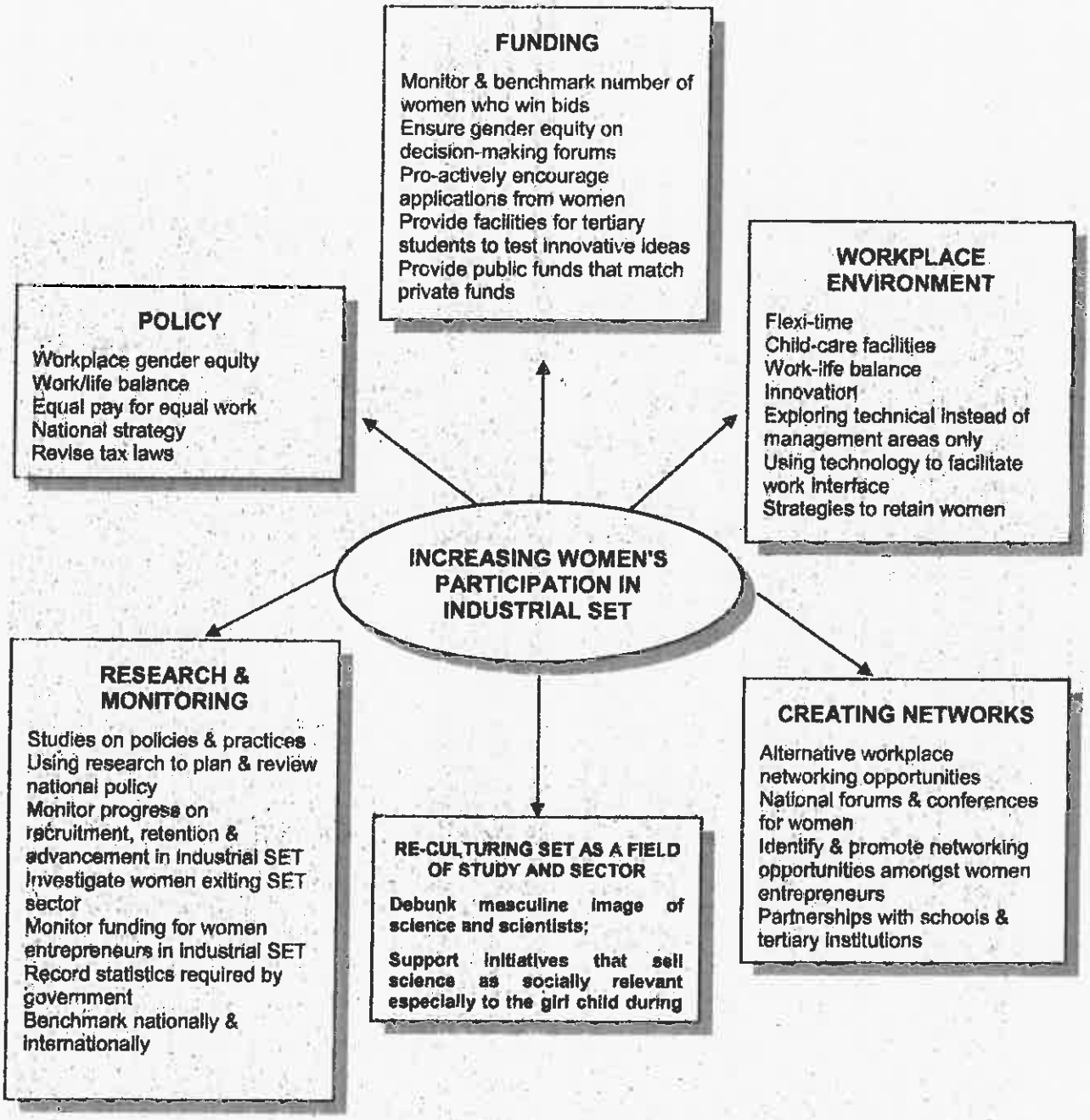


Figure 6 A schematic representation of recommendations to increase women's participation in industrial SET in South Africa

6 CONCLUSION

The aim of this report was to present findings from one of the research projects undertaken by the Gender and Development Unit of the HSRC on behalf of the DST in preparation for policy formulation to address the lack of participation of women in the South African SET sector. Many studies, as evidenced in the literature review document and highlight the inequalities women face in the science, engineering, and technology fields. Barriers that have disadvantaged women point to the historical and cultural aspects that have socially excluded women from receiving education and training to take advantage of economic opportunities. The historic agricultural and industrial revolutions resulted in women toiling the fields and men entering industry, with the added burden of women tasked with child-rearing. Another barrier is the idea and belief that men are better suited to skilled labour and are better equipped to manage advanced technologies than are women. Inspite of the achievements of women in science, engineering and technology, women's and men's role within an outside the mainstream of science and technology requires change. Despite progress, many gaps, barriers and inequalities persist. Clearly urgent action is necessary to mobilise women as a neglected reservoir of talent into the SET sector Action on several fronts is required that strengthen the role of women in mainstream science and technology, as well as an appreciation of the knowledge that women bring to these fields. Research suggests and debunks the myth that women are technologically inefficient.

As highlighted, the aim of the research was to determine factors contributing to or inhibiting women's participation in the SET sector of South Africa. The current situation with regards to gender representativity in the participating companies demonstrates that women in these companies are under-represented and especially so at the highest, most senior levels of the organisation. Perceptions about women's participation show that although more women are entering the SET sector, science continues to maintain its masculine image and all the negative connotations that accompany this image, showing men as *the* leaders and innovators in science, as well as the *gatekeepers* of the professions. Recommendations for changes that will assist in increasing women's recruitment, retention and advancement in the industrial SET sector include debunking the masculine image of science (the central perception that 'science' is a masculine field of expertise), examining ways in which women's life-cycle needs can be accommodated in the work environment, increasing funding for women in the sciences, especially for those who become entrepreneurs and creating networks amongst scientists that do not rely on activities that men traditionally use to do business.

Overall the political importance of this research is that it will lead to policy changes that transform the and diversify the workforce to develop a new cohort of skills and leadership in the SET sector; and to curb poverty in the country by improving access to technology that develops economic resources for women as a disadvantaged group to pursue careers in SET.

It is therefore important in the light of the challenges that women face in the SET sector that government has taken the initiative to formulate a gender equity policy that addresses women's lack of participation across the SET sector, from school to the workplace. Furthermore, it is crucial to monitor and evaluate the policy's impact on women's participation. For example, although SOEs have risen to the challenge of compliance with gender equity requirements, an important challenge remains for departments such as DST and DTI to bring private and JSE listed companies to comply.

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8 APPENDIX A: Questionnaire

9 APPENDIX B: In-depth interview guide

10 APPENDIX C: Balanced score-card methodology

Background

Like many governments around the world, the South African government, has adopted the Balanced Scorecard approach as a tool for, among other things, evaluating and monitoring various aspects of social transformation in the country. Indeed, the Department of Trade and Industry (DTI) issued the Balanced Scorecard as one of the Codes of Good Practice towards the end of 2004, and, requested various industry sectors to use this flexible framework to draw up their BEE Charters. To date, a number of such Charters have been developed for the various sectors of the South African Economy (e.g. the Transport sector, the Tourism sector, the Agricultural sector, etc).

Although the DTI's Codes of Good Practice were designed with Black Economic Empowerment in mind, it is apparent that the same methodological framework can be used to assess women's participation in various sectors of the South African economy. Development of the Balanced Scorecard presented below was based on a detailed review of both local and international (notably from the UK) literature available on websites and government publications. It is useful to highlight the fact that, internationally, the Balanced Scorecard came into focus in the early 1990s, thus coinciding with the birth of a new democratic dispensation in South Africa.

In time, and to its credit, the South African government seized the opportunity presented by this development in the area of performance measurement and management, and adopted this approach in its development of the '*Broad-based Black Economic Empowerment Framework*', published by the DTI towards the end of 2004. Section 12 of the Broad-based BEE Act of 2003 makes provision for the development of transformation charters for the various sectors of the South African economy. Section 9 of the same act also makes provision for the development of what are called Codes of Good Practice. The first draft of the Codes of Good Practice was released by the DTI in December 2004, and, includes the DTI Generic Scorecard.

In developing the Balanced Scorecard for Women in the SET sector presented in this document, the DTI Generic Scorecard was used as a guide. In many ways, the challenges faced by the government with regards to BEE, are quite similar to the challenges faced with regards to the empowerment of women in the SET sector. Thus, drawing on the existing tools used to foster BEE is not without reasonable justification.

What is a Balanced Scorecard?

Prior to the development and introduction of Balanced Scorecards into the management processes of companies and government departments around the world in the early 1990s, management theories stressed financial performance above other measures of success. Developers of the Balanced Scorecard felt that this approach did not give an accurate picture of how well specific organizations were performing with regards to the overall goals set out in their strategic plans. Thus, they created a methodology that included a number of non-financial measures, in order to produce a more 'balanced' picture – hence the name 'Balanced Scorecard'. An examination of Code of Good Practice #000 published by the DTI, as well as several other Balanced Score Cards (e.g. the Transport Sector BEE Scorecard, the Tourism Sector BEE Balanced Scorecard), as well as presentations made by the Deputy Director General (Enterprise and Industry Development Division) of the DTI was instructive in terms of clarifying our understanding of the major INDICATORS of a sound Balanced Scorecard, which we deduced to be:

Ownership – Voting rights and economic interests associated with equity holding. Voting rights afford the rights to determine strategic and operational policies, while economic interests afford women in the company to rebuild and accumulate wealth.

Management – Control of economic activities and resources: power to determine policies as well as the direction of economic activities and resources. This indicator can be sub-divided into: 'Board of Director' level, and 'Executive Management level'.

Employment Equity – Mechanisms used to achieve gender equity in the workplace. This includes strategies for promoting the elimination of unfair gender discrimination in the workplace, as well as implementing affirmative action in order to achieve equitable gender representation in all occupational categories and levels in the work place.

Skills Development – Development of core competencies among women in order to facilitate their integration into the mainstream of the economy.

Preferential Procurement – Strategies for measuring the widening of women's access to the company as a market for their products (e.g. a manufacturing firm may have in place a policy of preferential outsourcing of its marketing, advertising and recruitment functions to agencies owned and run by women or companies in which women are active players.

Enterprise Development – Strategies for assisting and accelerating the development of operational and financial capacity of entrepreneurial enterprises owned by women.

Residual factor – includes any residual factors such as social development initiatives, community development, industry-specific initiatives, etc.

Weightings. All Balanced Scorecards involve a process of **weighting**, whereby the relative importance of the various indicators is determined. Similarly, sub-indicators are appropriately weighted. This issue requires a consensus to be reached with all stakeholders in this project. The research team proposes the weights indicated in the balanced scorecard shown in this document, but, we are open to suggestions regarding this matter.

Scoring. All properly constructed Balanced Scorecards involve the calculation of final rating score, usually out of 100. The sample scorecard presented in this document illustrates how the final rating score is determined. However, the final score is dependent upon the final weights to be agreed upon by the stakeholders through a consultative process. It is envisaged that each company will be appropriately scored, after which data within the various sectors identified will be aggregated to obtain an indication of how the various companies and sectors within SET fair relative to each other.

Usefulness. The last sentence in the preceding section on scoring makes the usefulness of the Balanced Scorecard methodology apparent. The results from this component of the study can be useful in terms of identifying transformation targets for companies and sectors within the SET sector, an output that could be of tremendous benefit in terms of the on-going policy formulation and implementation processes with the Department of Industry and Technology in South Africa.

Table 1 shows the proposed Balanced Score card for Women in Industry study. Table 2 shows a Model Balanced Scorecard, complete with ***illustrative*** data.

Table 1. Balanced scorecard for women in the SET sector of South Africa

CATEGORY OF INDICATORS	WEIGHTING	SUBWEIGHTING	INDICATORS (i.e. data to be collected from each entity) NB.1: All data to be collected, broken down by previous racial groups NB.2: For skills development, preferential procurement, enterprise development, and residual factors – ALL % should be for the previous financial year
OWNERSHIP			___% share of direct shareholding by women ___% share of indirect shareholding by women NB: Direct shareholding = employee share schemes; Indirect shareholding = ownership by women outside the organisation
MANAGEMENT			___% of women in the Board of Directors ___% of women in Executive Management
EMPLOYMENT EQUITY			___% of women in Middle Management ___% of women supervisors ___% of women highly skilled/professional category ___% of women junior professional category ___Women as a % of Total Staff ___ Presence/absence of gender equity policy
SKILLS DEVELOPMENT			___% of payroll spent on skills development on all employees ___% of payroll spent on skills development aimed at developing women's skills ___Number of learner ships as a % of total employees ___ Number of women learner ships as a % of Total learners
PREFERENTIAL PROCUREMENT			___% spent on Women Empowerment Companies /individuals as a % of Total procurement
ENTERPRISE DEVELOPMENT			___% of post-tax profits spent on women's entrepreneurial development ___% of employee time contributed to enterprise development ___% of twinning initiatives facilitated for

			women-owned SMMEs, as a % of the Total revenue of the company/organization
RESIDUAL FACTOR (Social Development and Industry-Specific Initiatives)			___% post tax-profits spent on education, community programmes, job creation, training, health, conservation, community tourism and marketing activities to develop participation of women ___% of new recruits with no prior work experience
TOTAL	100%	100%	

Table 2. Model balanced scorecard for women in the SET sector of South Africa

CATEGORY OF INDICATORS	WEIGHTING	TARGET	ACTUAL LEVEL	CONVERSION PROCESS	SCORE
OWNERSHIP	5%	50%	1.5%	1.5%/50%X5%	0.15
MANAGEMENT	10%	50%	2.5%	2.5%/50%X10%	0.50
EMPLOYMENT EQUITY	20%	50%	15%	15%/50%X20%	6
SKILLS DEVELOPMENT	20%	50%	38%	38%/50%X20%	15.2
PREFERENTIAL PROCUREMENT	10%	50%	13%	13%/50X10%	2.6
ENTERPRISE DEVELOPMENT	5%	50%	30%	30%/50%X5%	3
RESIDUAL FACTOR (Social Development and Industry-Specific Initiatives)	20%	50%	40%	40%/50%X20	16
TOTAL	100%				43.45

WE Score > 65 = Good WE Score > 40 = Satisfactory WE Score <40 = Limited

11 Appendix E: Tables of findings

Table 3 Demographic characteristics of respondents to questionnaire (N=90)

Variable	%	Variable	%
Marital Status		*Company type*	
Single	37.8%	Private	34.4%
Married	43.3%	State-owned	45.6%
Living with partner	8.9%	JSE-listed	11.1%
Separated/divorced/widowed	10%	SMME	8.9%
Race		*Number of children currently living at home*	
African/Black	35.6%	None	41.1%
Coloured	3.3%	One	13.3%
Indian	12.2%	Two to three	42.2%
White	46.7%	Four to five	3.3%
Other	2.2%		
Home language		*Position in company*	
Afrikaans	33.3%	Executive management	1.1%
English	25.6%	Senior management	4.4%
IsiZulu	6.7%	Junior management	16.7%
IsiXhosa	8.9%	Supervisory level	10.0%
SeSotho	5.6%	Skilled professional	58.9%
SePedi	6.7%	Trainee/Internship	4.4%
SeTswana	6.7%	Other – Junior	3.3%
IsiNdebele	1.1%		
Other	2.2%		
		Cost to company	
IsiZulu & SeTswana	1.1%	Less than R100 000	6.7%
English & Afrikaans	1.1%	R100 001 – R150 000	37.8%
English & German	1.1%	R150 001 – R200 000	21.1%
		R200 001 – R250 000	11.1%
Top 3 reasons for work interruptions		R250 001 – R300 000	11.1%
Maternity leave	60.0%	R300 001 – R350 000	2.2%
Study leave	12.5%	R350 001 – R400 000	5.6%
Child-rearing	5.0%	R400 001 – R450 000	3.3%
		R450 001 – R 500 000	1.1%
Age			
20-24 years	11.4%		
25-34 years	63.6%		
35-55 years	25.0%		

Table 4 Women's ratings of their experiences in various SET companies (n=90)

Work environment	**Disagree**	**Neutral**	**Agree**
Working conditions take into account that I am a woman	32.9%	28.0%	39.0%
Current position in the company is quite challenging	17.0%	17.0%	65.9%
The working environment is quite stressful	25.6%	13.3%	61.1%
Women find themselves without the necessary instruments to perform duties	71.9%	12.4%	15.7%
Working environment more suitable for men than women	64.4%	8.9%	26.7%
Women deal with obstacles that men don't have to	29.2%	18.0%	52.8%

Remuneration and promotion opportunities	**Disagree**	**Neutral**	**Agree**
Sufficiently rewarded for my efforts at work	42.5%	23.0%	34.5%
Men are often more easily promoted than women	29.8%	20.2%	50.0%
Male colleagues earn more than women at the same level	26.0%	10.0%	64.0%
Men in SET sectors have more opportunities and advantages than women	25.6%	17.4%	57.0%
Other people more easily promoted than Black women	45.8%	18.1%	36.1%

Feedback on work performance	**Disagree**	**Neutral**	**Agree**
Regularly given a formal performance evaluation	25.0%	8.0%	67.0%
Regular informal feedback on my work	32.2%	7.8%	60.0%

Gender relations in the workplace	**Disagree**	**Neutral**	**Agree**
I feel comfortable working with my male colleagues	1.1%	3.3%	95.6%

My male colleagues feel comfortable working with me	2.4%	5.9%	91.8%
Not taken seriously by male colleagues	59.6%	13.5%	27.0%
Men are taken more seriously during meetings	43.4%	20.5%	36.1%

Mentorship & career development	**Disagree**	**Neutral**	**Agree**
Given the resources and training necessary to do work	27.0%	19.1%	53.9%
Adequate opportunities for professional development	38.9%	14.4%	46.7%
Given work assignments that demonstrate capabilities	20.7%	17.2%	62.1%
'Coach' at work who helps address the technical issues	42.2%	14.5%	43.3%
Mentor in organization	51.2%	16.3%	32.6%
Excellent career advancement opportunities at company	42.9%	19.0%	38.1%
Success in career should come before any other considerations	34.1%	12.9%	52.9%

Implications of a career in SET for family life	**Disagree**	**Neutral**	**Agree**
Family life suffers due to work relate responsibilities	66.7%	22.6%	10.7%
Family life suffers due to work related travelling	78.9%	10.5%	10.5%
Often expected to work overtime	46.9%	12.3%	40.7%

Experiences in the SET industry	**Disagree**	**Neutral**	**Agree**
Constantly need to prove myself because I am a woman	38.2%	18.0%	43.8%
As a woman, I sometimes feel marginalised in my industry	29.3%	22.0%	48.8%

I am not taken seriously in my industry	41.2%	21.2%	37.6%
Experienced many difficulties, challenges entering SET	60.5%	9.3%	30.2%
Women should be encouraged more to enter SET sector	4.5%	10.1%	85.4%
Black women should be encouraged to enter SET sector	8.1%	10.8%	81.1%
Excellent career advancement opportunities in SET sector	14.1%	14.1%	71.8%

Race & gender in the work environment	**Disagree**	**Neutral**	**Agree**
Need to prove myself because I am a Black woman	34.0%	17.0%	48.9%
Feel marginalised in my industry as a Black woman	23.9%	23.9%	52.2%
Black women often have to deal with obstacles that others don't have to	27.1%	25.0%	47.9%
Black women find themselves without the necessary instruments to perform duties	72.9%	12.5%	14.6%

Table 5 Women's experiences of the SET industry according to position in the company (n=90)

Work environment	**Disagree**	**Neutral**	**Agree**
Current position in the company is quite challenging			
Management	15.0%	5.0%	80.0%
Non-management	17.9%	20.9%	61.2%
Working conditions take into account that I am a woman			
Management	41.2%	23.5%	35.3%
Non-management	29.7%	29.7%	40.6%
The working environment is quite stressful			
Management	20.0%	10.0%	70.0%
Non-management	27.5%	13.0%	59.4%
Women find themselves without the necessary instruments to perform duties			
Management	80.0%	15.0%	5.0%
Non-management	69.1%	11.8%	19.1%
Working environment more suitable for men than women			
Management	70.0%	5.0%	25.0%
Non-management	62.3%	10.1%	27.5%
Women deal with obstacles that men don't have to			
Management	35.0%	5.0%	60.0%
Non-management	27.9%	22.1%	50.0%

Remuneration & promotion opportunities	**Disagree**	**Neutral**	**Agree**
Sufficiently rewarded for my efforts at work			

Management	25.0%	35.0%	40.0%
Non-management	48.5%	18.2%	33.3%
Men are often more easily promoted than women			
Management	57.9%	15.8%	26.3%
Non-management	20.3%	21.9%	57.8%
Men in SET sectors have more opportunities and advantages than women			
Management	33.3%	11.1%	55.6%
Non-management	22.4%	19.4%	58.2%
Other people more easily promoted than Black women			
Management	52.9%	23.5%	23.5%
Non-management	44.4%	14.8%	40.7%
Male colleagues earn more than women at the same level			
Management	25.0%	16.7%	58.3%
Non-management	24.3%	8.1%	67.6%

Feedback on work performance	**Disagree**	**Neutral**	**Agree**
Regularly given a formal performance evaluation			
Management	10.0%	10.0%	80%
Non-management	29.9%	7.5%	62.7%
Regular informal feedback on my work			
Management	20.0%	0%	80.0%
Non-management	36.2%	10.1%	53.6%

Gender relations in the workplace	Disagree	Neutral	Agree
I feel comfortable working with my male colleagues			
Management	0.0%	0.0%	100.0%
Non-management	1.4%	4.3%	94.2%
My male colleagues feel comfortable working with me			
Management	0.0%	5.0%	95.0%
Non-management	3.1%	6.2%	90.8%
Not taken seriously by male colleagues			
Management	80.1%	10.0%	10.0%
Non-management	52.9%	14.7%	32.4%
Men are taken more seriously during meetings			
Management	70.0%	5.0%	25.0%
Non-management	33.9%	25.8%	40.3%

Mentorship & career development	Disagree	Neutral	Agree
Given the resources and training necessary to do work			
Management	15.0%	20.0%	65.0%
Non-management	30.9%	19.1%	50.0%
Adequate opportunities for professional development			
Management	25.0%	20.0%	55.0%
Non-management	42.0%	13.0%	44.9%
Given work assignments that demonstrate capabilities			
Management	15.8%	5.3%	78.9%

Non-management	22.4%	20.9%	56.7%
'Coach' at work who helps address the technical issues			
Management	38.9%	5.6%	55.6%
Non-management	43.8%	17.2%	39.1%
Mentor in organization			
Management	38.9%	5.6%	55.6%
Non-management	56.9%	16.9%	26.2%
Excellent career advancement opportunities at company			
Management	35.0%	20.0%	45.0%
Non-management	44.4%	19.0%	36.5%
Success in career should come before any other considerations			
Management	55.6%	16.7%	27.8%
Non-management	28.8%	12.1%	59.1%

Implications of a career in SET for family life	**Disagree**	**Neutral**	**Agree**
Family life suffers due to work relate responsibilities			
Management	45.0%	40.0%	15.0%
Non-management	73.0%	17.5%	9.5%
Family life suffers due to work related travelling			
Management	66.7%	16.7%	16.7%
Non-management	82.5%	8.8%	8.8%
Often expected to work overtime			
Management	41.2%	17.6%	41.2%

Non-management	47.6%	11.1%	41.3%
Race & gender in the work environment	**Disagree**	**Neutral**	**Agree**
Need to prove myself because I am a Black woman			
Management	57.1%	14.3%	28.6%
Non-management	25.0%	18.8%	56.3%
Feel marginalised in my industry as a Black woman			
Management	42.9%	14.3%	42.9%
Non-management	12.9%	29.0%	58.1%
Black women often have to deal with obstacles that others don't have to			
Management	28.6%	21.4%	50.0%
Non-management	27.3%	27.3%	45.5%
Black women find themselves without the necessary instruments to perform duties			
Management	85.7%	7.1%	7.1%
Non-management	66.7%	15.2%	18.2%

Experiences in the SET industry	**Disagree**	**Neutral**	**Agree**
Excellent career advancement opportunities in SET sector			
Management	10.0%	15.0%	75.0%
Non-management	15.6%	14.1%	70.3%
Constantly need to prove myself because I am a woman			
Management	55.0%	5.0%	40.0%
Non-management	33.8%	22.1%	44.1%

As a woman, I sometimes feel marginalised in my industry			
Management	45.0%	15.0%	40.0%
Non-management	23.0%	24.6%	52.5%
I am not taken seriously in my industry			
Management	50.0%	20.0%	30.0%
Non-management	37.5%	21.9%	40.6%
Black women should be encouraged to enter SET sector			
Management	5.3%	10.5%	84.2%
Non-management	9.3%	11.1%	79.6%
Experienced many difficulties, challenges entering SET			
Management	65.0%	10.1%	25.0%
Non-management	58.5%	9.2%	32.3%
Women should be encouraged more to enter SET sector			
Management	5.0%	5.0%	90.0%
Non-management	4.4%	11.8%	83.8%

Table 6 Women's experiences of the SET industry according to age group (n=90)

Work environment	Disagree	Neutral	Agree
Current position in the company is quite challeriging			
20-24 years	10.0%	20.0%	70.0%
25-34 years	21.4%	16.1%	62.5%
35-55 years	10.0%	20.0%	70.0%
Working conditions take into account that I am a woman			
20-24 years	20.0%	10.0%	70.0%
25-34 years	38.8%	30.6%	30.6%
35-55 years	28.6%	28.6%	42.9%
The working environment is quite stressful			
20-24 years	40.0%	10.0%	50.0%
25-34 years	25.0%	14.3%	60.7%
35-55 years	22.7%	13.6%	63.6%
Women find themselves without the necessary instruments to perform duties			
20-24 years	60.0%	30.0%	10.0%
25-34 years	70.9%	12.7%	16.4%
35-55 years	77.3%	4.5%	18.2%
Working environment more suitable for men than women			
20-24 years	40.0%	30.0%	30.0%
25-34 years	66.1%	5.4%	28.6%
35-55 years	72.7%	9.1%	18.2%
Women deal with obstacles that men don't have to			
20-24 years	40.0%	30.0%	30.0%

25-34 years	27.3%	18.2%	54.5%
35-55 years	27.3%	13.6%	59.1%

Remuneration & promotion opportunities	**Disagree**	**Neutral**	**Agree**
Sufficiently rewarded for my efforts at work			
20-24 years	33.3%	0.0%	66.7%
25-34 years	42.6%	25.9%	31.5%
35-55 years	40.9%	27.3%	31.8%
Men are often more easily promoted than women			
20-24 years	37.5%	25.0%	37.5%
25-34 years	38.5%	17.3%	44.2%
35-55 years	9.1%	27.3%	63.6%
Other people more easily promoted than Black women			
20-24 years	66.7%	0.0%	33.3%
25-34 years	47.6%	23.8%	28.6%
35-55 years	36.8%	15.8%	47.4%
Male colleagues earn more than women at the same level			
20-24 years	60.0%	20.0%	20.0%
25-34 years	26.7%	10.0%	63.3%
35-55 years	15.4%	7.7%	76.9%

Feedback on work performance	**Disagree**	**Neutral**	**Agree**

Regularly given a formal performance evaluation			
20-24 years	22.2%	11.0%	66.7%
25-34 years	25.5%	7.3%	67.3%
35-55 years	27.3%	9.1%	63.6%
Regular informal feedback on my work			
20-24 years	20.0%	10.0%	70.0%
25-34 years	39.3%	8.9%	51.8%
35-55 years	22.7%	4.5%	72.7%

Mentorship & career development	**Disagree**	**Neutral**	**Agree**
Given the resources and training necessary to do work			
20-24 years	10.0%	0.0%	90.0%
25-34 years	15.0%	5.0%	80%
35-55 years	31.8%	18.2%	50.0%
Adequate opportunities for professional development			
20-24 years	20.0%	20.0%	60.0%
25-34 years	46.4%	10.7%	42.9%
35-55 years	27.3%	22.7%	50.0%
Given work assignments that demonstrate capabilities			
20-24 years	0.0%	22.2%	77.8%
25-34 years	29.6%	18.5%	51.9%
35-55 years	9.1%	13.6%	77.3%
'Coach' at work who helps address the technical issues			

20-24 years	0.0%	33.3%	66.7%
25-34 years	44.2%	13.5%	42.3%
35-55 years	55.0%	10.0%	35.0%
Mentor in organization			
20-24 years	30.0%	40.0%	30.0%
25-34 years	56.6%	5.7%	37.7%
35-55 years	47.6%	33.3%	19.0%
Excellent career advancement opportunities at company			
20-24 years	30.0%	20.0%	50.0%
25-34 years	40.4%	21.2%	38.5%
35-55 years	55.0%	15.0%	30.0%
Success in career should come before any other considerations			
20-24 years	11.1%	33.3%	55.6%
25-34 years	37.0%	7.4%	55.6%
35-55 years	40.0%	20.0%	40.0%

Implications of a career in SET for family life	**Disagree**	**Neutral**	**Agree**
Family life suffers due to work relate responsibilities			
20-24 years	75.0%	25.0%	0.0%
25-34 years	70.4%	18.5%	11.1%
35-55 years	55.0%	30.0%	15.0%
Family life suffers due to work related travelling			
20-24 years	83.3%	0.0%	16.7%
25-34 years	76.0%	12.0%	12.0%

35-55 years	83.3%	11.1%	5.6%
Often expected to work overtime			
20-24 years	80.0%	0.0%	20.0%
25-34 years	38.8%	18.4%	42.9%
35-55 years	50.0%	5.0%	45.0%

Experiences in the SET Industry	**Disagree**	**Neutral**	**Agree**
Excellent career advancement opportunities in SET sector			
20-24 years	12.5%	0.0%	87.5%
25-34 years	13.0%	13.0%	74.1%
35-55 years	14.3%	19.0%	66.7%
Constantly need to prove myself because I am a woman			
20-24 years	50.0%	10.0%	40.0%
25-34 years	40.0%	20.0%	40.0%
35-55 years	27.3%	18.2%	54.5%
As a woman, I sometimes feel marginalised in my industry			
20-24 years	28.6%	42.9%	28.6%
25-34 years	28.3%	20.8%	50.9%
35-55 years	35.0%	20.0%	45.0%
I am not taken seriously in my industry			
20-24 years	55.6%	11.1%	33.3%
25-34 years	38.5%	25.0%	36.5%
35-55 years	40.9%	18.2%	40.9%
Women should be encouraged more to enter SET sector			

20-24 years	10.0%	20.0%	17.0%
25-34 years	3.6%	9.1%	87.3%
35-55 years	4.5%	9.1%	86.4%
Men in SET sectors have more opportunities and advantages than women			
20-24 years	50.0%	10.0%	40.0%
25-34 years	28.3%	17.0%	54.7%
35-55 years	9.5%	23.8%	66.7%
Men are taken more seriously during meetings			
20-24 years	50.0%	10.0%	40.0%
25-34 years	42.3%	23.1%	34.6%
35-55 years	42.1%	21.1%	36.8%
Experienced many difficulties, challenges entering SET			
20-24 years	77.8%	0.0%	22.2%
25-34 years	54.7%	15.1%	30.2%
35-55 years	63.6%	0.0%	36.4%
Black women should be encouraged to enter SET sector			
20-24 years	20.0%	10.0%	70.0%
25-34 years	4.3%	12.8%	83.0%
35-55 years	13.3%	6.7%	80.0%

Gender relations in the workplace	**Disagree**	**Neutral**	**Agree**
I feel comfortable working with my male colleagues			
20-24 years	0.0%	0.0%	100%
25-34 years	1.8%	5.4%	92.9%

35-55 years	0.0%	0.0%	100.0%
My male colleagues feel comfortable working with me			
20-24 years	0.0%	0.0%	100%
25-34 years	3.8%	5.8%	90.4%
35-55 years	0.0%	9.1%	90.9%
Not taken seriously by male colleagues			
20-24 years	60.0%	20.0%	20.0%
25-34 years	60.0%	10.9%	29.1%
35-55 years	54.5%	18.2%	27.3%

Race & gender in the work environment	**Disagree**	**Neutral**	**Agree**
Black women find themselves without the necessary instruments to perform duties			
20-24 years	57.1%	28.6%	14.3%
25-34 years	72.7%	12.1%	15.2%
35-55 years	87.5%	0.0%	12.5%
Black women often have to deal with obstacles that others don't have to			
20-24 years	33.3%	33.3%	33.3%
25-34 years	29.4%	26.5%	44.1%
35-55 years	12.5%	12.5%	75.0%
Need to prove myself because I am a Black woman			
20-24 years	42.9%	0.0%	57.1%
25-34 years	34.4%	18.8%	46.9%

35-55 years	25.0%	25.0%	50.0%
Feel marginalised in my industry as a Black woman			
20-24 years	25.0%	50.0%	25.0%
25-34 years	24.2%	21.2%	54.5%
35-55 years	22.2%	22.2%	55.6%

Table 7 Women's experiences according to type of SET Industry company (n=90)

Work environment	**Disagree**	**Neutral**	**Agree**
Current position in the company is quite challenging			
Private	12.9%	12.9%	74.2%
SOE	22.0%	19.5%	58.5%
JSE	12.5%	12.5%	75.0%
SMME	12.5%	25.0%	62.5%
Working conditions take into account that I am a woman			
Private	41.4%	24.1%	34.5%
SOE	32.4%	24.3%	43.2%
JSE	22.2%	55.6%	22.2%
SMME	14.3%	28.6%	57.1%
The working environment is quite stressful			
Private	19.4%	16.1%	64.5%
SOE	36.6%	12.2%	51.2%
JSE	10.0%	0.0%	90.0%
SMME	12.5%	25.0%	62.5%

Women find themselves without the necessary instruments to perform duties			
Private	80.0%	10.0%	10.0%
SOE	73.2%	9.8%	17.1%
JSE	40.0%	20.0%	40.0%
SMME	75.0%	25.0%	0.0%
Working environment more suitable for men than women			
Private	61.3%	3.2%	35.5%
SOE	75.6%	9.8%	14.6%
JSE	50.0%	10.0%	40.0%
SMME	37.5%	25.0%	37.5%
Women deal with obstacles that men don't have to			
Private	25.8%	12.9%	61.3%
SOE	42.5%	22.5%	35.0%
JSE	0.0%	20.0%	80.0%
SMME	12.5%	12.5%	75.0%

Remuneration & promotion opportunities	**Disagree**	**Neutral**	**Agree**
Sufficiently rewarded for my efforts at work			
Private	44.8%	17.2%	37.9%
SOE	39.0%	26.8%	34.1%
JSE	55.6%	33.3%	11.1%
SMME	37.5%	12.5%	50.0%
Men are often more easily promoted than women			

Private	25.0%	14.3%	60.7%
SOE	33.3%	28.2%	38.5%
JSE	10.0%	0.0%	90.0%
SMME	57.1%	28.6%	14.3%
Men in SET sectors have more opportunities and advantages than women			
Private	26.7%	16.7%	56.7%
SOE	31.6%	23.7%	44.7%
JSE	0.0%	0.0%	100.0%
SMME	25.0%	12.5%	62.5%
Male colleagues earn more than women at the same level			
Private	17.6%	0.0%	82.4%
SOE	39.1%	21.7%	39.1%
JSE	0.0%	0.0%	100.0%
SMME	33.3%	0.0%	66.7%
Other people more easily promoted than Black women			
Private	40.0%	24.0%	36.0%
SOE	55.9%	14.7%	29.4%
JSE	11.1%	22.2%	66.7%
SMME	75.0%	0.0%	25.0%

Feedback on work performance	**Disagree**	**Neutral**	**Agree**
Regularly given a formal performance evaluation			
Private	29.0%	9.7%	61.3%
SOE	22.5%	5.0%	72.5%

JSE	20.0%	20.0%	60.0%
SMME	28.6%	0.0%	71.4%
Regular informal feedback on my work			
Private	25.8%	9.7%	64.5%
SOE	31.7%	7.3%	61.0%
JSE	50.0%	10.0%	40.0%
SMME	37.5%	0.0%	62.5%

Mentorship & career development	**Disagree**	**Neutral**	**Agree**
Given the resources and training necessary to do work			
Private	23.3%	60.0%	33.7%
SOE	22.0%	24.4%	53.7%
JSE	60.0%	10.0%	30.0%
SMME	25.0%	12.5%	62.5%
Adequate opportunities for professional development			
Private	41.9%	12.9%	45.2%
SOE	43.9%	17.1%	39.0%
JSE	30.0%	0.0%	70.0%
SMME	12.5%	25.0%	65.5%
Given work assignments that demonstrate capabilities			
Private	20.7%	10.3%	69.0%
SOE	26.8%	22.0%	51.2%
JSE	10.0%	20.0%	70.0%
SMME	0.0%	14.3%	85.7%

'Coach' at work who helps address the technical issues			
Private	46.7%	6.7%	46.7%
SOE	33.3%	25.0%	41.7%
JSE	60.0%	0.0%	40.0%
SMME	42.9%	14.3%	42.9%
Mentor in organization			
Private	48.4%	19.4%	32.3%
SOE	50.0%	13.2%	36.8%
JSE	60.0%	10.0%	30.0%
SMME	57.1%	28.6%	14.3%
Excellent career advancement opportunities at company			
Private	51.7%	13.8%	34.5%
SOE	43.2%	21.6%	35.1%
JSE	20.0%	30.0%	50.0%
SMME	37.5%	12.5%	50.0%
Success in career should come before any other considerations			
Private	51.7%	10.3%	37.9%
SOE	25.0%	15.0%	60.0%
JSE	20.0%	10.0%	70.0%
SMME	33.3%	16.7%	50.0%

Implications of a career in SET for family life	**Disagree**	**Neutral**	**Agree**
Family life suffers due to work relate responsibilities			
Private	74.2%	16.1%	9.7%

SOE	65.7%	20.0%	14.3%
JSE	40.0%	50.0%	10.0%
SMME	75.0%	25.0%	0.0%
Family life suffers due to work related travelling			
Private	77.8%	14.8%	7.4%
SOE	73.5%	8.8%	17.6%
JSE	100.0%	0.0%	0.0%
SMME	87.5%	12.5%	0.0%
Often expected to work overtime			
Private	37.9%	10.3%	51.7%
SOE	63.9%	8.3%	27.8%
JSE	22.2%	22.2%	55.6%
SMME	28.6%	28.6%	42.9%

Experiences in the SET industry	**Disagree**	**Neutral**	**Agree**
Excellent career advancement opportunities in SET sector			
Private	23.3%	10.0%	66.7%
SOE	5.1%	12.8%	82.1%
JSE	11.1%	33.3%	55.6%
SMME	28.6%	14.3%	57.1%
Constantly need to prove myself because I am a woman			
Private	43.3%	16.7%	40.0%
SOE	36.6%	12.2%	51.2%
JSE	30.0%	30.0%	40.0%

SMME	37.5%	37.5%	25.0%
Experienced many difficulties, challenges entering SET			
Private	75.0%	7.1%	17.9%
SOE	57.5%	10.0%	32.5%
JSE	50.0%	10.0%	40.0%
SMME	37.5%	12.5%	50.0%
As a woman, I sometimes feel marginalised in my industry			
Private	28.6%	17.9%	53.6%
SOE	38.9%	30.6%	30.6%
JSE	0.0%	10.0%	90.0%
SMME	25.0%	12.5%	62.5%
I am not taken seriously in my industry			
Private	10.0%	20.0%	70.0%
SOE	21.4%	16.1%	62.5%
JSE	21.4%	16.1%	62.5%
SMME	10.0%	20.0%	70.0%
Women should be encouraged more to enter SET sector			
Private	6.5%	9.7%	83.9%
SOE	0.0%	15.0%	85.0%
JSE	0.0%	0.0%	100.0%
SMME	25.0%	0.0%	75.0%
Black women should be encouraged to enter SET sector			
Private	7.1%	10.7%	82.1%
SOE	5.6%	13.9%	80.6%
JSE	0.0%	0.0%	100.0%

SMME	50.0%	0.0%	50.0%

Race & gender in the work environment	**Disagree**	**Neutral**	**Agree**
Feel marginalised in my industry as a Black woman			
Private	23.1%	15.4%	61.5%
SOE	28.6%	32.1%	39.3%
JSE	0.0%	0.0%	100.0%
SMME	0.0%	0.0%	100.0%
Need to prove myself because I am a Black woman			
Private	53.8%	7.7%	38.5%
SOE	27.6%	17.2%	55.2%
JSE	0.0%	66.7%	33.3%
SMME	50.0%	0.0%	50.0%
Black women often have to deal with obstacles that others don't have to			
Private	21.4%	21.4%	57.1%
SOE	31.0%	31.0%	37.9%
JSE	0.0%	0.0%	100.0%
SMME	50.0%	0.0%	50.0%
Black women find themselves without the necessary instruments to perform duties			
Private	85.7%	7.1%	7.1%
SOE	65.5%	17.2%	17.2%
JSE	66.7%	0.0%	33.3%
SMME	100.0%	0.0%	0.0%

Gender relations in the workplace	Disagree	Neutral	Agree
I feel comfortable working with my male colleagues			
Private	0.0%	3.2%	96.8%
SOE	2.4%	4.9%	92.7%
JSE	0.0%	0.0%	100.0%
SMME	0.0%	0.0%	100.0%
My male colleagues feel comfortable working with me			
Private	0.0%	9.7%	90.3%
SOE	5.4%	2.7%	91.9%
JSE	0.0%	10.0%	90.0%
SMME	0.0%	0.0%	100.0%
Men are taken more seriously during meetings			
Private	33.3%	22.2%	44.4%
SOE	55.3%	18.4%	26.3%
JSE	20.0%	20.0%	60.0%
SMME	50.0%	25.0%	25.0%
Not taken seriously by male colleagues			
Private	71.0%	6.5%	22.6%
SOE	65.0%	12.5%	22.5%
JSE	20.0%	10.0%	70.0%
SMME	37.5%	50.0%	12.5%