AN INVESTIGATION OF FACTORS THAT HINDER AND SUPPORT THE CAREER PROGRESSION OF SOUTH AFRICAN BLACK FEMALE RESEARCHERS WITHIN A RESEARCH AND DEVELOPMENT (R&D) ENVIRONMENT

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Contents

ABSTRACT

The challenges women face in progressing to senior ranking positions are widely acknowledged and have been investigated in numerous studies, both in South Africa and abroad. The present study sought to contribute to this body of knowledge by identifying factors that hinder, as well as support specifically black South African female researchers in progressing to senior ranking positions within a Research and Development or scientific organisation.

Research and Development (R&D) organisations within the Science, Engineering and Technology (SET) sector, as is the case in most South African organisations, have seen an increase in the employment of female researchers, particularly at lower ranking positions. However, there seem to be factors that continually hinder black South African female researchers from being appointed into senior ranks, despite clear growth and development strategies and processes, training and development opportunities and increasing organisational support that is meant to bring about greater gender equity at the senior levels. As such, it proved imperative to undertake this study not only to understand the factors that support or hinder the progress of black South African women researchers into senior ranking positions, but also to ensure that organisations develop responsive and supportive interventions that facilitate the advancement of this cohort of researchers.

A quantitative approach to addressing the research question was utilised. Following a literature review to identify both individual and organisational/structural level factors that have been shown to either support or hinder the career success of woman, an online questionnaire was developed and distributed to all the female researchers (of all race groups, career levels and age groups) employed in a South African R&D organisation (n=104). Data was obtained from a convenient sample of them (n=41). It was noted though that at the time the data was collected there were no black South African females employed in the highest scientific/researcher rank of the organisation.

Whilst the organisation seems to deploy resources equally to all its' employees, black South African women continue to be under represented at the top ranks in the organisation.

Arguably, R&D organisations seem to perpetuate a masculine culture that makes it increasingly difficult for women in general to progress to higher ranking positions. It seems that the situation is being further exasperated by career advancement requirements that do not take into account the different roles that women typically need to fulfil at work and at home, nor that support work-life balance for them. It was apparent that the organisation did provide them with organisational and supervisory support and that they are found to be loyal to the organisation, however, women particularly black South African researchers still fail to progress to senior ranking positions in the organisation.

Organisations struggle to achieve gender equity at the senior ranking positions, and hopefully the present study will provide some insight into factors that negatively affect the career advancement of female equity candidates in the organisation, while also providing insight into factors that have proven to facilitate this process. The outcomes of the present study would potentially lead to more structured frameworks and strategic female development programmes that ensure that black female South African researchers do indeed advance through the different ranks and achieve the highest ranks within the SET sector of the economy.

CHAPTER 1: INTRODUCTION

The legacy of the apartheid regime has left South Africa with a distorted and skewed labour market. Access to education, managerial and professional employment opportunities have historically been based on race and gender considerations and is one reason for the widespread distortion in the demographic representation of employees prevalent in most South African organisations (Thomas & Jain, 2004). The advent of democratisation and the implementation of redress measures have led to some advances in bringing about racial and gender diversity in the South African workplace, however, the numbers are still far from being desirable (Littrell & Nkomo, 2005). Moreover, "...gender equality as measured by comparable decision-making power, equal opportunity for education and advancement, equal participation and status in all walks of human endeavours remains a challenge in South Africa and that level of equality has seemingly not yet been achieved." (Lopez-Claros & Zahidi, 2005, p.2).

Despite Employment Equity and Affirmative Action legislation being promulgated in South Africa, the continued under-representation of women in senior ranking positions is of great concern. Few women are being promoted to senior management and executive levels. In one study it was reported that female representation in senior management and executive levels were 22.5% and 30.2%, respectively (2012-2013 Commission for Employment Equity Annual Report). Table 1 summarises the leadership gender distribution currently reported in the South African workplace.

Table 1.

Gender distribution in SA workplace leadership

Level: Top Management		
Gender	2002	2012
Male	86.20%	80.20%
Female	13.70%	19.80%
Level: Senior management		
Gender	2002	2012
Male	78.50%	69.20%
Female	21.60%	30.10%

Source: Commission for Employment Equity Annual Report (2003)

Despite the efforts that have been made to attract females into Science, Engineering and Technology (SET) disciplines and the small advances that have been made in this regard, men continue to dominate these disciplines, especially at the senior levels (AAUW, 2010). The dearth of female researchers/scientists within Research and Development (R&D) organisations are even more apparent. One often hears about limits being placed on a women's recognition of achievement and difficulties that exist at all stages and phases of their scientific careers. This is anecdotal, but arguably contributes to the continuing under-representation of women, most significantly so of South African (SA) black female researchers in this sector. Etzkowitz, Kemelgor and Uzzi (2000) suggests that significant advances have been achieved in attracting women towards SET disciplines, however they attest to the fact that there is a continuing disproportionate lack of gender and race representation at the senior levels within SET professions.

The post-1994 South African government implemented progressive legislation that is meant to eliminate unfair discrimination and promote equity in the workplace, as well as specifically addressing the low representation of women in organisations and within leadership positions. Using the CSIR as one case-study of an organisation that operates within the SET sector, it can be seen that whilst there has been an increase in the number of black female SA researchers into junior management positions, they fail to progress to senior management ranks and pinpointing the causes of the under representation of females and more so remedying this situation, has proven challenging (See Figure 1). It is acknowledged that this is only one organisation in the SET sector, but it can be argued that

it does represent the typical situation one would encounter within this sector of the economy.

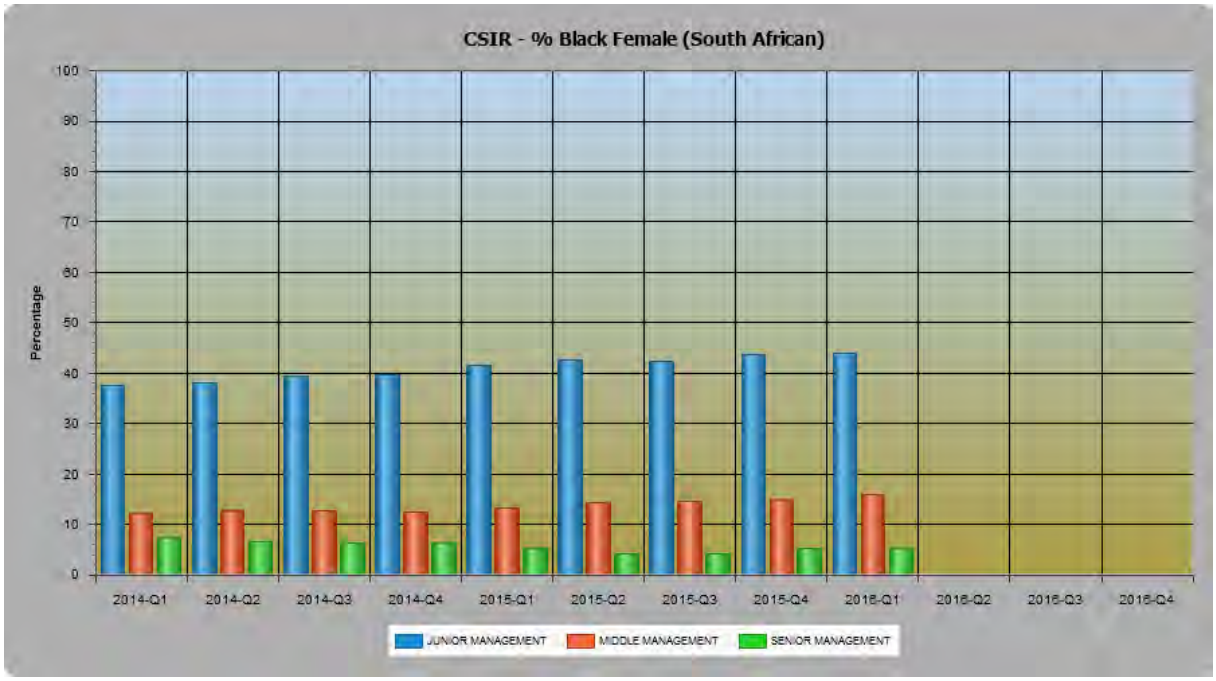

Figure 1: Distribution of black female South African researchers in management positions at the CSIR

It has been suggested that black females have in the past, and are currently still, facing a dual challenge that is characterised by both race and gender discrimination in attaining top management positions in South Africa (Booysen, 1999). The legislative and social redress efforts meant to bring about greater gender and race representation has led to more white women achieving higher levels of career mobility than in the past, also more so than compared to black women. It is therefore readily apparent that it is important to better understand the career progression of SA black women researchers within South African R&D organisations and that more needs to be done to begin to address the current situation.

Given the background presented above, the aim of the current study was to identify and investigate factors that both hinder and support the progress of black South African female researchers to senior ranking position within R&D organisations, with the purpose to addressing and hopefully improving the current situation.

CHAPTER 2: THE SCIENCE ENGINEERING TECHNOLOGY (SET) CONTEXT

In this chapter a brief background to the Science, Engineering and Technology (SET) sector, the role of Research Councils and Research and Development (R&D) organisations that function within this sector, are provided. This would hopefully provide some understanding of the context and the particular challenges that are being experienced within this important sector of the economy.

2.1 Research Councils

Research councils were established by the South African government to play a catalytic role in establishing a strong and diverse Science Engineering Technology (SET) base for the country (Scholes, Anderson, Kenyon, Napier, Ngoepe, Van Wilgen & Weaver., 2008). The inception of research councils have played a major role in undertaking directed research and development activities that foster industrial and scientific development and they contribute to both the improved quality of life of South Africans and stimulate socio-economic growth for the country. In South Africa the research councils include: Council for Scientific & Industrial Research (CSIR), Medical Research Council (MRC), Agricultural Research Council (ARC), Council for GeoScience, Mintek and the Human Sciences Research Council (HSRC).

The research councils undertake research that contributes to fostering industrial development, including technology development and transfer; new sector development or start-ups; piloting productivity and waste minimisation and strategic initiatives; and building national capability, including support to service delivery, policy development and information management (Scholes et al., 2008). Much like universities and other Higher Education (HE) institutions, research councils differ from profit-oriented organisations in terms of their mission and strategic objectives (Riordan, 2007). They have similar bureaucratic structures with clear hierarchical structures; a myriad of policies, rules and procedures that ensure efficiency and productivity, whilst training people to do specific highly specialised jobs (Shackleton, 2007). For these reasons they are in terms of institutional culture, more akin to universities. This is relevant in as much as universities in South Africa are faced with similar challenges and reflect similar patterns of female

(under)representation, particularly of black female academics. What is learnt here would arguably also be relevant in that context.

2.2 The special case of Black Women

Given its past, South Africa is faced with serious challenges in terms of redress and bringing about social justice. Arguably, even more so when it comes to gender equity and addressing gender based inequality. In South Africa, black women refer to a generic collective term for African, Indian and Coloured women.

This generic black group of women are considered to be previously disadvantaged given the severe constraints they experienced under the apartheid regime and are part of the definition of so-called designated groups, as defined in the legislation meant to bring about redress and social justice. Legislation (Affirmative Action and Employment Equity) acknowledges that black, particularly African black females are the worst affected group and they have and continue to experience the greatest levels of inequity and therefore need to be put first when it comes to bringing about redress and social justice.

2.3 Career Progression

The research councils have in the past experienced high attrition rates of expertise specifically from its Research and Development (R&D) core (CSIR HR Policy, 2006). In order to address the historical challenges, research councils introduced what is called a career ladder programme and it is meant to address the general inability to retain highly talented and trained employees on a research career path, as well as the lack of a meaningful reward and recognition provided for researchers employed by them.

The objectives of the career ladder programme, as implemented within the research councils, was to facilitate the process of career development; provide a more dynamic and effective recognition and reward system that recognises the development, contribution and performance of staff; provide greater flexibility and transparency in Human Resource (HR) processes so that all staff members will be able to see clearly how and why they were placed in their current positions. The process aims to ensure that staff knows what they need to do to advance their careers and to ensure consistency in the grading and rewarding

of staff (CSIR HR Policy, 2006). The career ladder has five levels that take into account a number of different factors and that provides a path for a researcher to progress in their career. Figure 2 graphically represents the career ladder growth path.

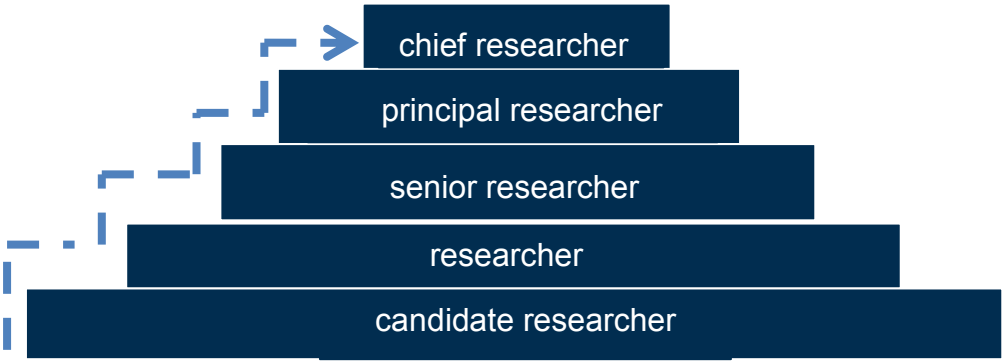

Figure 2: R&D Career Ladder growth path

The progression from candidate to chief researcher represents a progression in several dimensions, including a transition from following to leading; from working in a small domain of knowledge to working in a complex set of intersecting domains; from a network of colleagues only within the research council to an international network of collaborators; from only answering research questions posed by others to developing one's own research questions to designing new research projects to address these questions; and going from local impact to international impact. Table 2 further summarises the different levels and provides descriptions of the proficiencies that are required at every level.

Table 2.

Career ladder level descriptors

Career Level	Level	Description
Candidate researchers	C1 – C2	Trainee researchers that work under the supervision of more senior researchers
Researchers	C3 – C4	Researchers who are competent professionals and work independently within a given field
Senior researchers	D1 – D2	Seasoned researchers with a track record in R&D, and are able to guide others and lead projects
Principal researchers	D3 – D4	Specialists that have sustained a track record that has led to widespread recognition within their field, and who are able to lead a portfolio of R&D projects, often integrating approaches across several fields of research or disciplines
Chief researchers	E1 – E2	Principal researchers whose sustained track record in several fields of R&D has led to international peer recognition

An evaluation and point system is utilised in the career ladder evaluation process. The input evaluation criteria on the career ladder are:

- R&D qualifications
- Leadership and the ability to provide strategic direction to R&D activities.

The output evaluation criteria on the career ladder are:

- Knowledge generation and dissemination
- Human capital development
- Impact
- Attracting funding for R&D

It is a combination of these factors and the point system which is used to assign points to each of these, that determines the eligibility of an individual for promotion. These factors and the points awarded are considered by an appointed panel that assesses the evidence through a rigorous process and ultimately determines the promotion of researchers to higher rankings on the career ladder.

CHAPTER 3: LITERATURE REVIEW

Several factors have been identified in previous studies that hinder and also support the career success of females, as defined in terms of their advancement within organisations. In this chapter a review and discussion of the relevant literature is provided.

3.1 Career Success

Career success is defined as the positive psychological or work-related outcomes or achievements one has accumulated as a result's of one's work experiences (Judge, Cable, Boudreau & Bretz, 1995, as cited in Riordan, 2007).

Callanan (2003) described career success as having both subjective and objective components, where objective success is typically measured by observable career accomplishments such as salary, promotions achieved and position in an organisation. People do not only define success in objective terms (as described above), but also in terms of a subjective appraisal of what they have achieved. Subjective success is difficult to measure though, as it is a personal appraisal process of how successful an individual feels about the progress of their career. Therefore, subjective success is concerned with the individual's perception of job satisfaction and career progress (Callanan, 2003). Sturges (1999) indicated that perceptions of subjective success included achieving high level of competence; obtaining a sense of personal achievement from work; receiving recognition for work performed; exercising influence at work; enjoying work; acting with integrity; and successfully balancing home and work life (as cited in Riordan, 2007).

3.2 Factors that support career success

Career success has often been attributed to hard-work, intelligence, ambition and career vision, in addition to having attained qualifications, skills and experience. This next section seeks to review some of the 1) individual; and 2) organisational structural variables that facilitate career success.

3.2.1 Individual variables that support career success

Riordan (2007) points out that several individual variables facilitate career success and these include career behaviours in which individuals engaged, either formally or informally. Individual level variables that support career success include motivation, work centrality, self-efficacy and coaching and mentorship.

3.2.1.1 Motivation

Latham and Pinder (2005) defined motivation as a set of energetic forces that originate both within and beyond an individual's being, to initiate work-related behaviour and to determine its' form, direction, intensity, and duration. London and Noe (1997) defined career motivation as a multi-dimensional concept that was organised into three domains, namely 1) career resilience, 2) career insight and 3) career identity. Career resilience is the ability to cope with changing or challenging circumstances and to adapt accordingly. Career insight is self-knowledge about one's ability to use the knowledge to further one's career. Career identity is the extent to which an individual defined him or herself by work (London & Noe, 1997). Greater levels of motivation, as described above, are related with higher levels of career success given that they are all focused on propelling an individual forward in their career.

3.2.1.2 Work Centrality

Work centrality is defined as the concept concerned with the relative importance of work in an individual's life at a particular point in time (Meaning of Work (MOW), 1987, as cited in Riordan, 2007). As such, work centrality is defined as a general belief about the value of working in one's life (MOW, 1987, as cited in Riordan, 2007). To be successful in one's work, it would need to be important so that one would expend the required time, energy and focus on it. This construct is therefore believed to be positively related with career success.

3.2.1.3 Self-efficacy

Bandura (1997) defined self-efficacy as the belief in one's ability to be successful at a task or in reaching a pre-determined goal. It is therefore described as an individual's perceived capability of producing particular outcomes as a consequence of particular actions, formed through performance accomplishments (performing a task oneself), vicarious learning

(watching someone else perform a task), verbal persuasion (being encouraged to attempt task performance) and emotional arousal such as reducing anxiety about performing a task (Bandura, 1997). Performance, such as career success in this case, is a function of motivation, ability and belief that one can succeed. To achieve success all of these are required. Being able to succeed but not believing one will, is for most debilitating.

3.2.1.4 Coaching and mentorship

Mentorship is a relationship in which a mentor supports the professional and personal development of another by sharing their experiences, influence or expertise in support of the mentee's development (Driscoll, Parkes, Tilley-Lubbs, Brill & Bannister, 2009). Coaching and mentorship between and amongst different racial and gender groups provides an opportunity to develop relationships based on the direct transfer of skills, experiences and expertise and engagement opportunities, which if fully embraced can be insightful for all involved, whilst minimising the hierarchical and power relationships. This is done through a collaborative process that is defined as a social inquiry practice that promotes learning (Lattuca & Creamer, as cited in Driscoll et al., 2009). The direct transfer of skills and guidance under a more experienced researcher affords an opportunity for black South African women researchers to hone and harness their knowledge, skills and expertise required in senior ranking positions. Professional identity formation is primarily driven by an intellectual and emotional socialisation into a dominant culture (Driscoll et al., 2009).

For the reasons described above, in recent years the leadership of research councils have implemented formal mentoring programmes as a way to help junior women and minority groups to attain tenured researcher status (Driscoll et al., 2009). The role that mentors play in the development of protégés include social support, friendship, counselling, vocational assistance, sponsorship, career coaching, and being a positive role model (Kram, as cited in Scandura, 1997).

3.2.2 Structural variables that facilitate career success

Structural variables are specific organisational and societal structures that serve as a basis of opportunity from which subjective and objective success are pursued (Riordan, 2007). Structural variables that have been shown in previous studies to facilitate and/or support

career success include career development support, supportive leadership structures and the provision of educational opportunities.

3.2.2.1 Career Development Support

Career development support refers to support that is provided by the organisation in order to assist and facilitate an individual's development. As such, if there is a perceived lack of support this is often related to decreased work commitment, lack of commitment to the organisation and decreased morale. The inverse though is also true and produces positive results, not only for the individual but the organisation as well.

3.2.2.2 Supportive leadership structures

Despite the existence of legislation, policies and processes, line managers most often are the ones that have the authority to make the final judgement on a number of factors that facilitate a subordinate's progression into higher ranking positions. As such, the quality of the on-going dyadic leader-subordinate relationship is crucial to a researcher's success. Maintaining a good working relationship with one's line-manager is considered to be crucial for researchers to progress within the R&D environment (Etzkopwitz et al., 2003).

Good working relationships with supervisors or managers provide access to learning and leadership opportunities. Skills are most often acquired through exposure and experience, which not only ensures that black women scientists are equipped with leadership skills but it affords them an opportunity to influence and direct strategic objectives. The development of black women and having them take up senior positions paves the way for other women to gain entry into leadership roles as a result of the trust and confidence that women earn and when others see they can do an equally good job as men.

3.2.2.3 Education opportunities

Level of education remains an important basis for entry into specialised and management positions, and plays a preparatory role for women in their ability and capability to hold leadership roles. Being afforded opportunities to take up leadership positions begins with access to education. As such women are increasingly realising that appropriate and adequate qualifications and focussed training are vital in successfully advancing to senior

management positions (Mathur-Helm, 2006). Education provides the foundation for knowledge and skills, which if coupled with relevant and extensive work experience results in the development of expertise. It is noted that expertise is not only acquired through formal training and being placed on leadership development programmes, but also through attending short courses and other less formal channels, such as participating in key projects.

3.3 Factors that hinder career progression

Despite the increased entry of females into the SET sector, opposition to their full participation in R&D organisations continue (Etzkowitz et al., 2003) and gender discrimination remains a persistent reality (Bakari, 2014). To break through what is often referred to as the glass ceiling requires a precise understanding of the organisational climate in which women researchers find themselves, as well as the subtle and overt barriers women face in their advancement. Implicit male or masculine standards of behaviour permeate scientific environments and create invisible barriers that exclude the majority of women from senior management positions (Federal Glass Ceiling Commission, 1995).

The following section seeks to review some of the challenges that women face within organisations, consequently often resulting in their failure to progress to senior ranking positions. The barriers or variables that have been shown to hinder the career success of woman can be categorised, similarly to the factors that support career success, into both individual and structural variables. Individual variables that hinder career success include the lack of work-based networks; lack of mentorship; certain behavioural traits; and tokenism. Structural variables that hinder career success include organisational culture; social identity; work life balance demands; the socialisation of genders; patriarchy and role of culture; and skills transfer in terms of transformation processes.

3.3.1 Individual variables that hinder career success

3.3.1.1 Lack of work-based networks

At the core of research councils is the ability for researchers to build strong social and professional networks through forging appropriate, external alliances that have influence and allow one access to scarce resources (Shackleton, 2007). These work-based networks contribute and aid individuals to become a world class researcher (Scholes et al., 2008).

However, a women's reproductive prime typically coincides with roughly the same period in their career where they are expected to travel for postdoctoral opportunities, teaching and student support, resulting in their inability to build their networks in the crucial phase of their careers (Shackleton, 2007).

A predominately male environment and masculine organisational culture has required convergence towards a male/masculine way of doing things, which often calls for the participation in activities outside of traditional working hours. Due to the predominately white masculine culture prevalent in R&D organisations, the activities typically include hunting, golfing, braais (barbeques) or dinners amongst other things. Black woman researchers who have not been socialised in this manner or yet developed confidence to hold their own amongst these men, experience these activities, if they are even included, as intimidating, uncomfortable and somewhat peculiar. The informal support structures and social gatherings provide information, encouragement and an opportunity to learn from peers and role models in unpressured settings (Etzkowitz et al., 2003), which are important for career progression. As such, the current reality of social networks as practised in these organisations remain one of the biggest challenges as an inability to access these networks can be detrimental to career advancement (Meyerson & Fletcher, 1999).

3.3.1.2 Lack of mentorship

The overall picture within R&D organisations presents a prevailing organisational culture that provides inadequate direction and mentoring for women, thereby further eroding their self- confidence (Etzkowitz et al., 2003). Some researchers have blamed the existence of the so-called old boys' network as it has enabled men in the lower ranks to have friends in the upper echelons of organisations (Elacqua et al., 2009). The informal manner in which mentorship relationships are built also makes them less available to women (Anderson, 2005). Etzkowitz et al. (2003) alludes to that fact that even when men do not get ideal support from supervisors, interactions among seasoned male researchers provides sufficient connection, feedback and information to boost their self-confidence.

3.3.1.3 Behavioural traits

Differences in social orientation usually inform people's responses to situations (Hako, 2012). Organisations in the SET sector are still dominated by a white masculine culture, where competence and leadership are predicated on traits stereotypically associated with men that include being tough, aggressive and decisive (Meyerson & Fletcher, 1999). For the majority of women, particularly black women who are not socialised in this manner, these traits do not come naturally and therefore have to be learned. Women who do not get an opportunity to learn and apply these traits are often subjugated by feelings of insecurity and vulnerability. This situation further perpetuates the view held by men that women are passive, unassertive and weak (Wijk, 2005). Men that hold such perceptions would typically confine women to lower ranking positions that prevent them from working in certain areas through a concept known as glass walls, which restricts women from working in areas dominated by men (Wellington, Kropf & Gerkovich, 2003, as cited in Shackleton, 2007).

3.3.1.4 Tokenism

Ngazimbi (2006) states that the pressure placed on South African organisations to transform and bring about redress, and the lack of available black talent to do so, has led them to focus on getting the right number of black people in management, rather than focusing on the quality of the candidates they appoint. Group interaction theory indicates that women suffer in work groups when they are present in small numbers, as they are less likely to be accepted by members of the majority (Etzkowitz et al., 2003). Furthermore, due to the menial numbers, females face increased visibility and pressure to perform that negatively affect the working conditions and reduces performance (Etzkowitz et al., 2003). This, it is believed, explains the challenges in attracting and retaining black women researchers in SET careers, with few of them progressing to senior ranking positions.

The combination of the efforts and pressure to transform has given rise to tokenism, where minority members are appointed to senior ranking positions with no expectation to contribute meaningfully and significantly within their organisation (Harvey & Allard, 2012, as cited in Hako, 2012). In such cases women experience discrimination, and are seen as outsiders making it difficult to gain recognition and acknowledgement (De La Rey, 1999) and access to networks (Ngazimbi, 2006).

3.3.2 Structural variables that hinder career success

3.3.2.1 Organisational Culture

Arguably, most organisations have been created by and for men and are based on male experiences (Meyerson & Fletcher, 1999). South African research councils have found it challenging to transform a dominant white masculine culture that prevails, making it difficult for women, especially black women to progress at a satisfactory rate within these organisations. Therefore the entry of women into these pyramid-like hierarchies sees them most often occupy lower ranks, while men dominate the senior ranks (Skinner, 2005). The current situation has resulted in the unequal distribution of power, influence and decision prerogative, further emphasising the racial and gender inequalities based on white masculine mono-culture, this despite the multi-cultural work force (Shackleton, 2007). This conveys a clear message about who is granted respect and who is superior and inferior in relation to gender, race and class (Sankar, 2005).

The discrimination women experience lingers in a plethora of work practices and cultural norms that on face value appear unbiased (Meyerson & Fletcher, 1999). Women are still largely discriminated against based on their personal role and family commitments, which are seen to thwart their ability to work long hours, travel, relocate and manage employees amongst other things. It is argued that organisational policies that are meant to diversify organisations may also obstruct a women's progress into senior or influential positions (Kossek & Zonia, 1993, as cited in Hoka, 2012).

3.3.2.2 Social Identity

Social identity is an individual's self-concept, which is derived from membership of a group (2007) and it provides the basis for which we identify with the group, while anyone that does not meet the social requirements is considered an outsider. Social identification in the South African workplace has been found to be predominately based on race. Discrimination resulting from social identity is subtle, more deeply embedded and difficult to contest and resist (Walker, 1998). As such, Shackleton (2007) states that the transformation of an organisational culture is unlikely to be led by those who conformed to the preferred culture and attained hierarchical leadership positions, thus the white masculine culture will not be

changed by those that benefit from it, and this will continue to drive the slow entry of SA black women researchers in SET disciplines.

3.3.2.3 Work Life balance

Scholes et al. (2008) state that the path from a bright idea to an innovation with social impact is long and uncertain. Often, this implies that researchers are required to work outside of the traditional work hours in order to achieve results. Therefore, a choice to reduce work hours, even for a short period makes it difficult for someone to progress in the scientific disciplines (Hamel et al, 2006).

3.3.2.4 Socialisation of genders

In many societies there is a tendency to bring up males and females differently, resulting in societies steering towards different social roles, careers and personal identity for males and females (Helgensen, 1990, as cited in Hansen, 2012). Therefore, while many females achieve their educational goals and gain entry into lucrative careers, they are still expected to fulfil the primary caring role within families (Shackleton, 2007). This has meant that the majority of women are still inclined to start a family and take primary responsibility for childrearing, which requires significant time and energy that competes with that required to advance their professional careers (Hamel et al., 2006). The additional roles and responsibilities placed on woman imply added stresses on time management and prioritising of academic and personal activities (Shackleton, 2007). Woman in scientific disciplines with children report greater obstacles to career advancement and less institutional support (Hamel et al., 2006), which often results in the derailment of their careers (Riordan, 2007).

Evidence further suggests that when women take the time to focus on their family and bringing up children, their male counterparts progress in their careers and it therefore becomes extremely challenging for woman to progress in their careers at the same rate as their male counterparts (Shackleton, 2007). De La Rey (1999) supports the notion that due to childbearing and childrearing, women are unable to enjoy uninterrupted service/tenure, which is believed to also contribute to career advancement, building personal reputations and research achievements. The combination of research inputs and outputs required for one to become a world class expert in a scientific discipline and progression up the career

ladder, combined with the personal roles that women are expected to fulfil, means that research councils are far from addressing women's career advancement challenges.

The different roles that women have to fulfil whilst being employed have been addressed under factors that contribute to hindering the progress of women into senior ranking positions within R&D organisations. Farmer (1985) indicated that homemaking commitment had a significant impact on career centrality, which further impacts on career success. For this study, care giving responsibilities were taken into account as one of the variables that impact on career success.

3.3.2.5 Patriarchy and Culture

Patriarchy refers to men's dominance in the world of work, public sphere, politics and culture, continues to be reinforced through the systematic, structured, social and economic positions held by men when compared to women (Wijk, 2005). Therefore, a majority of black female researchers still adhere to the cultural ways of doing things, mainly due to their socialisation. Traditionally, black families are guided by patriarchy in the family, in that men rule families as fathers and husbands.

While this has changed somewhat, patriarchy, as perpetuated by organisations, imply that women still have a long way to go before the patriarchal authority of the husbands and fathers is eradicated (Shackleton, 2007; Wijk, 2005). Hence, black women are still expected to fulfil their role as wife or mother and allow the husband to be the provider in the house. This has often meant that black female researchers have to place their ambitions on hold in order to let the husband or significant other be the more financially successful partner in the household. It takes a confident and strong black man to support a woman that has achieved greater career success and higher earnings than him given strong traditional black cultural norms. Hence some black women researchers become complacent with the lower ranking positions in order to satisfy cultural expectations and hopefully lead a happy family life.

The Sensitivity Towards being the Target of Upward Comparison (STTUC) construct suggests that STTUC may be another factor that inhibits the career progress of women (Pheko, 2012). The theory underlying the STTUC construct suggests that the lack of progression may be as a

result of what an individual believes about themselves and perceive what significant others think and/or expect of them (Vrugt & Koenis, 2002). So much so that for females, the decision to pursue and/or advance in a chosen career may be directly influenced by other people's perceptions and views of women and would lead them to not accept an offer of promotion when the promotion would lead to the situation that the woman earns more or holds a more senior position than her husband, for instance. STTUC has been shown to be prevalent amongst woman, particularly in African cultures that are patriarchal, hold a collectivistic cultural orientation and traditional gender role orientations.

3.3.2.6 Skills transfer under the Transformation process

Transformation in South Africa has become a political imperative since 1994 and organisations are under pressure to transform (Shackleton, 2007). However, literature suggests that valuing cultural diversity should be viewed as a compelling business strategy rather than a threat (Brewis, 2002). Transformation is meant to encourage the transfer of skills and the appropriate diversity of researchers (in terms of race, gender and age). The pressure to ensure the successful attraction, growth and retention of black SET professionals in general by more senior experienced (white male) researchers, has led to resistance and sometimes volatile work relationships across the different race, gender and age groups. Whilst positive working relationships have been reported when members of the same race groups work together, experienced white male researchers at times fear the loss of their jobs to black professionals and stagnation of the careers as their black counterparts are fast tracked to senior positions. Hansen (2012) found that racial bias was often stronger than gender bias, particularly for white employees. For this reason, some argue that the legislation that calls for racial integration may actually have an adverse impact. This could potentially explain why one continues to witness volatile work relationship across races, resulting in less inclination of sharing information and resources with each other (Hansen, 2012).

Progression to senior level positions is highly dependent on the line-manager, and this sees transformation in South Africa compounded by the interplay between race and gender dynamics (Shackleton, 2007). This further reinforces the so-called glass ceiling for black woman SET professionals as they often have no or limited support to see them to senior

level positions. This could also be the reason that black woman SET professions exit the scientific discipline at a lower levels of the career ladder, as research has shown that discrimination in the workplace has negative effects, resulting in reduced productivity, employee disengagement and turnover (Hansen, 2012).

3.4 Summary

As suggested in the discussion above, there are several factors that are believed to hinder and support the career progression of black female scientists working within R&D organisations, including:

Factors that support career progression

- Supportive leadership structures
- Education opportunities
- Coaching and mentorship
- Work centrality
- Self-efficacy
- Motivation

Factors that hinder career progression

- Social Identity
- Organisational Culture
- Work Life balance
- Socialisation of genders
- Lack of work-based networks
- Lack of mentorship
- Behavioural traits
- Tokenism
- Patriarchy and Culture
- Skills transfer

Given the discussion provided above, the present study aimed to investigate factors that hinder and support the attraction, growth and retention of black woman South African researchers into senior positions within a selected R&D organisation. This given the dearth of SA black female researchers to be found in the senior ranks of R&D organisations. The factors described above were used as a starting point to design the study and better understand the phenomena.

CHAPTER 4: METHOD

The aim of the current study was to identify and investigate the factors that both hinder and support the progress of black South African female researchers to senior ranking position within R&D organisations with the purpose to addressing and hopefully improving the current situation. In the previous sections, the aim of the study was addressed by discussing the relevant literature pertaining to the constructs. In this chapter the empirical aspects of the study are presented that are meant to provide further insights and so address the aim of the study from a positivistic paradigm. This chapter further includes a discussion of the methods that was used for sampling, data collection, and data analysis.

4.1. Research Design and research approach

A descriptive (non-experimental) research design was employed in the current study. Cooper and Schindler (as cited in Hako, 2012) describe descriptive studies as having three characteristics, which include: 1) the description of a subject or its qualities; 2) an approximate proportion of a population that portrays these characteristics; and 3) the identification of relations among diverse variables.

Quantitative methods were used to collect data from participants, SET female researchers/scientists working within a R&D organisation, with regards to their perception of their growth prospects and the support they receive in terms of achieving them. A field survey approach was used to collect primary quantitative data. Quantitative research provides an understanding of relationships or differences among measured variables, as it allows the researcher to explain, predict and control different phenomenon (Leedy & Ormrod, 2001). This approach also allows one to reach more participants at lower cost and in less time, using surveys than is possible with qualitative approaches. In the current study, data was collected in terms of career ladder position, length of employment, race, level of education, and experience.

4.2. Sampling strategy

A judgement sampling or non-probability convenient sampling approach was utilised given time and cost constraints. Generalisation of the results is therefore not possible, but hopefully the results will be useful in gaining some insights and to inform future studies of this nature.

The present study was conducted within a Research and Development (R&D) organisation based in South Africa, which is considered to be one of the leading research institutions on the African Continent. The organisation employs 2,411 employees, of which 1691 are SET researchers. Of these researchers 48,3% are black South Africans and 34,6% of the SET base are South African females. It is a medium to large organisation with its head office situated in Pretoria, but with a number of regional offices throughout South Africa. The organisation has earmarked the transformation of Human Capital as one of its key strategic objectives and places a strong emphasis and support on closing gaps in SET numbers and profiles to bring about an organisation capable of performing its role in the national research and innovation.

The organisation agreed to partake in the study and woman of all races and career levels were invited to participate in the study and complete the questionnaire. In order to be included in the study, respondents needed to meet the following criteria:

- be a South African female researcher;
- be employed in the SET base of the organisation; and
- hold a position on the career ladder.

Consulting the organisation's HR database, a list of about 104 eligible participants were identified across all career ladder levels and they were invited to participate in the study. Surveys are considered an efficient way of obtaining information needed to describe people's thoughts opinions, and feelings (Zechmeister & Shaughnessy, 1992), this is especially so for a larger group of participants.

4.3. Ethics and informed consent

Permission to conduct the study was obtained from the University of Cape Town's Commerce Faculty Ethics in Research Committee. Key role players within the organisation that served as a research site were consulted and a number of processes followed in order to gain permission to conduct the study. This initially involved a meeting with the Group Executive for Human Capital, written formal requests to the Executive Directors who also needed to give written formal permission and the last stage involved a submission to the organisation's own Research Ethics committee for approval and permission to conduct the study.

The purpose of the study was fully explained to the participants in the research and a guarantee for anonymity and confidentiality of the data given. As such, there was full disclosure on the purpose of the study and participation was voluntary.

4.4. Data collection procedure

A self-administered questionnaire was developed and distributed with the aid of Qualtrics, an online survey tool. The questionnaire contained various sections and was completed anonymously. A copy of the text provided in the e-mail that was sent to respondents, the cover letter they would have seen when they opened the survey site, and the questionnaire is provided in appendices (see Appendix A, B & C).

Permission was obtained on the 28th of September 2015, after which an electronic mail containing the cover letter describing the aim of the study, describing how their responses will remain anonymous and confidential and encouraging their participation and that also included the URL to the online self-administered survey was sent from the organisation's electronic mail on the 30th of September 2015. Consequently, a second e-mail was sent to the list of potential participants as a follow-up reminder. As researchers have a high workload, a month was provided for the collection of data. After the initial e-mail weekly reminders were sent in order to encourage participation.

4.5. Development of materials

Quantitative methods were employed in an effort to enhance the understanding and maximise the insights gained from participants. Furthermore, measurement instruments used to collect quantitative primary date were chosen with reliability and validity in mind. For the results to have any credibility measures need to be designed in such a manner that the results would hopefully provide valid and reliable accounts of the attitudes and perceptions held by participants. Validity and reliability studies, based on the data collected were also conducted.

4.6. Measurement Instruments

The self-administered questionnaire designed and used by Riordan (2007) was adapted and used to collect data from female South African researchers, in order to gather their experiences within the chosen R&D organisation. Their progress on the career ladder; their goals and aspirations as researchers in this environment; their roles in their personal capacity and how this affects their professional roles; their perception of the organisation's role in their growth and development; the support provided; challenges they experienced in their roles and immediate environment; and their achievements within the R&D organisation was captured with this questionnaire. The questionnaire consisted of several sub-scales or sections that were used to measure the various constructs relevant to the aim of the present study, where provisions were made for participants to elaborate on their choice of response, for a broader understanding.

4.6.1 Career Success

Career success, which takes into account positive outcomes as a result of work experiences, was measured in both an objective and subjective manner (Riordan, 2007).

4.6.1.1 Objective career success

Objective career success was measured using only one criteria, in other words the number of promotions since joining the organisation.

Salary was not used as a measure of objective career success in this study, as career progression within the organisation is dependent on outcomes on the career ladder rather

than salary. This is in line with the criteria required for official scientific rating by the National Research Foundation (NRF) in South Africa. The NRF rating system is a key driver in the NRF's aim to build a globally competitive science system in South Africa, based primarily on the quality and impact of their research outputs over the past eight years, taking into consideration the evaluation made by local and international peers (National Research Foundation Act [Act No 23 of 1998]). The NRF rating system is described in Table 3.

Table 3.

NRF Rating system

Level	Description
A	Leading international researchers
B	Internationally acclaimed researchers
C	Established researchers
P	Prestigious Awards
Y	Promising young researchers

Source: www.nrf.ac.za

The career ladder, as with the NRF rating system, was applied in the study to determine objective success, and the criteria included:

- The highest position held by the respondent
- Highest academic qualification
- Age when the highest position held and highest academic qualification were obtained
- The number of peer-reviewed articles produced
- The value of research grants
- NRF rating
- The number of conferences attended as a guest speaker, and
- Other professional roles that respondents fulfil

4.6.1.2 Subjective career success

Subjective success was measured by assessing how respondents felt about their career (Riordan, 2007).

In this study, subjective success was measured using a four-item scale developed by Torban and Doherty (1994) as cited in Riordan (2007). The four items in the instrument asked respondents to respond to the items on a four-point and five-point Likert-type response-scale:

- Satisfaction with the success in their career
- Feelings of their significant other towards their career success
- Career success relative to their fellow colleagues
- Career success achievement relative to their life plans

4.6.1.3 Work Centrality

Work centrality is defined as a general belief about the value of work in one's life (Meaning of Work [MOW], 1987 as cited in Riordan, 2007). In this study, work centrality referred to the value that respondents place on work in general, without reference to the position they currently occupy within an organisation.

The two items used in this study (as adopted from Riordan, 2007) were sourced from the MOW International research teams study conducted in 1987 across eight countries, in order to capture value orientation toward working as a life role and a decision orientation about preferred life spheres for one's behaviour (Riordan, 2007).

Respondents were requested to:

- Assign a value from 1 (one of the least important things in my life) to 7 (one of the most important things in my life) to the meaning of work in their life;
- Distribute in order of personal importance, a total score of 100 points to various life spheres including work, family, spirituality, community and leisure activities.

- A third item that included an examination of time spent on various work related activities, as it was theorised that individuals for whom work centrality is high, are likely to spend longer hours on work related activities (Riordan, 2007).

4.6.1.4 Self-efficacy

Bandura (1977) defined self-efficacy as an individuals perceived capability of producing desired outcomes by performing certain actions, which further influenced behaviour and effort exerted towards chosen activities.

The shortened Occupational self-efficacy scale (OCCSEFF) containing eight items was used in the present study. This scale was developed by Scheyns and Von Collani (2002) to assess self-efficacy related to occupational domain (as cited in Riordan, 2007). This scale was deemed appropriate for this study, as it investigates occurrences such as work values, commitment to a professional or organisational change (Riordan, 2007).

4.6.1.5 Motivation

Pietersen and Engelbrecht's (2005) instrument was utilised for this study. The instrument accommodated individual, job and organisational elements as it was developed with a view to investigate the strategic partnership role played by senior human resource managers in organisations (Riordan, 2007). In an organisation that is rated the best amongst innovators, it was imperative to determine strategic roles as career success in an R&D organisation is related to outputs and influence in the research society.

The scale followed changes as effected by Riordan (2007), and contains 21 items which measures strategic role expectancy (whether individuals are expected to play a strategic role in the organisation); six items measuring strategic role valence (whether it is important to the individual to be regarded as a strategic decision-maker); one item measuring strategic role instrumentality (whether participants think being a strategic decision-maker led to objective success outcomes); and seven items measuring strategic role opportunity (whether participants believe they were given access to strategic opportunities and information) (Riordan, 2007, pg. 86). Examples of items include (full scale available in Appendix C)

- My manager expects me to participate in organisational strategic decisions
- Contribute to the achievement of organisational goals
- Be an active decision-maker in organisational planning

4.6.1.6 Personal circumstances and care giving responsibilities

In order to investigate the relationship between family structure and career success, five items were adopted based on the study by Schneer and Reitman (2002, as cited in Riordan, 2007).

These items were intended to ascertain the following data from participants:

- Marital status
- Number of dependent individuals for whom respondent was responsible
- Primary household income source
- Support for career development received from others

4.6.1.7 Work circumstances

In order to investigate the relationship between work circumstances and career success, Schneer and Reitman's (2002) model was adopted, where six items were adopted to ascertain education and work history data, and five items were adopted to ascertain research work circumstances of the researchers.

The following items were included:

Education and Work history

- Total length in research
- Age when highest qualification was obtained
- Highest qualification they currently possess
- Work commitments as a researcher
- Stakeholder engagement in the current role
- Allocation of time spent on work activities

Research

- Number of peer reviewed articles produced in accredited journals
- Value of funding attracted through contract work
- Researcher NRF rating
- Conference attended as invited speaker
- Other professional roles fulfilled outside of the world of research

4.6.1.8 Career Development Support

In order to investigate the relationship between career development support and career success, six items were adopted based on the study by Schneer and Reitman (2002), (Riordan, 2007). These items were intended to establish the following from the respondents:

- Support received from the supervisor/line manager towards career success
- The number of resources allocated by the organisation towards career progression
- Awareness of career ladder
- Awareness of the different ranks
- Awareness of the submission criteria and processes
- Outcome of career ladder submissions that have taken place before

4.7 Sample

A total of 104 e-mails were sent to female staff members employed in the R&D organisation and 41 completed responses were obtained, representing a response rate of 39%. This can be considered high given the low response rate often found when using online surveys.

The realised sample (n=41) is described in terms of the various demographic variables.

Table 4

Tenure (in years) in the organisation and current position

	N	Minimum	Maximum	Mean	Std. Deviation
How long have you been employed?	36	1	28	7.89	5.89
How long have you been at your current position?	31	0	9	2.97	2.18

On average, it takes researchers three years to advance to the next level on the career ladder, although the period may be shorter at the junior levels (candidate researcher level and researcher level). However, whilst the majority of the participants have been part of the organisation for a period longer than three years, they have failed to make significant progress to senior ranking positions within the organisation.

Table 5

Race demographics

	Race	Frequency	Percent	Valid Percent	Cumulative Percent
	African	15	36.6%	37.5%	37.5%
	Indian	5	12.2%	12.5%	50.0%
	White	20	48.8%	50.0%	100.0%
	N/A.	1	2.4%		
I	**Total**	41	100.0%		

For the purposes of the study, to compare black and white groups the African and Indian groups were merged to create a generic black cohort. This created a more balanced, in fact a precisely 50/50 black/white split in the sample.

Table 6

Generic black and white groupings

Race	Frequency	Percent	Valid Percent	Cumulative Percent
Black	20	48.8%	50.0%	50.0%
White	20	48.8%	50.0%	100.0%
N/A	1	2.4%		
Total	41	100.0%		

Whilst black and white female researchers are not equal distributed in the organisation, the respondents were found in equal numbers, and as such did not represent the organisation well (Figure 3 represents the spread of South African researchers in the organisation.

Figure 3: Racial distribution of researchers

Table 7

Age groupings of sample

Age Categories	Frequency	Percent	Valid Percent	Cumulative Percent
Below 35	21	51.2%	51.2%	51.2%
35 - 39	7	17.1%	17.1%	68.3%
40 - 44	8	19.5%	19.5%	87.8%
45 - 49	3	7.3%	7.3%	95.1%
55 - 60	2	4.9%	4.9%	100.0%
Total	41	100.0%	100.0%	

The majority of participants in the sample (more than 51%) were below the age of 35. This implies that the sample comprised mainly of the youth, defined in South African terms as individuals who fall under the age of 35 years. Whilst the responses received from young

researchers could be considered to be appropriate in assessing the levels of perceived support received by young researchers, this bias in the sample could mean that responses in terms of evaluating long term career growth within the R&D environment might be less valid.

4.8 Data Analysis

The quantitative data collected by means of the self-administered questionnaire was designed and distributed with the aid of Qualtrics and was analysed using the Software Package for the Social Sciences (SPSS) version 22. Factor Analyses (EFA) and SPSS's item analysis approach using Cronbach alpha were conducted to establish construct validity and reliability. Descriptive statistics were then calculated, as well as several inferential statistics employed, including t-tests and Chi-square.

CHAPTER 5: RESULTS

The reliability and construct validity of the scales used in the present study were assessed and the results of those analyses are presented here. The results obtained from the statistical procedures used to analyse the data are also summarised.

5.1. Assessing the unidimensionality of sub-scales

The validity of a scale refers to whether a construct in practice measures what it is theoretically supposed to measure and one procedure to determine a scale's construct validity is to determine if the scale has as many dimensions as would theoretically be assumed and whether the items should theoretically belong to a dimension, or hang together. If they are correlated, then it is an indication of the scale's construct validity. Factor analysis (FA) is a multivariate statistical method used to identify the dimensionality of measures and clustering variables that form superordinate groupings of variables.

Principle Component Analysis (PCA) was deemed an appropriate extraction method to demonstrate whether the sub-scales were indeed unidimensional. To determine the suitability of the data for FA the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity were consulted. KMO measures the sampling adequacy to examine the appropriateness of the data for factor analysis. Values greater than .60 indicate that factor analysis would be appropriate (Burns & Burns, 2008). Bartlett's test of sphericity (x^2) tests whether scale items correlate with each other. If Bartlett's test is non-significant, it means that the items do not correlate and therefore cannot be part of the same factor (Burns & Burns, 2008).

Only factors with eigenvalues greater than one were considered to be meaningfully interpretable, also referred to as Kaiser's criterion or rule (Kaiser, 1970; Kline, 1986). Items were considered to belong to a factor if their factor loadings on that factor were greater than .30 as this indicated a practically significant factor loading (Tabachnick & Fidell, 2007).

Further to assessing the validity of the scales, the reliability or internal consistency of the sub-scales were also assessed. The reliability of the scale refers to the accuracy with which

the scale measures what it is supposed to measure (Burns & Burns, 2008). Internal consistency was used to determine the reliability of the scales. Cronbach's alpha was used as the technique to determine reliability. Tavakol and Dennick's (2011) parameter for interpreting Cronbach's alpha was further adopted where a Cronbach alpha coefficient of .70 or above was considered to indicate satisfactory reliability. The SPSS item analysis procedure was also followed and items were assessed in terms of their corrected item-total correlations. An item-total correlation of greater than .30 was considered acceptable and where this threshold was not reached that item was removed (Leech, Barret & Morgan, 2005).

5.2 Career Success

5.2.1 Subjective Career Success

An initial PCA analysis was conducted on the data collected by means of the four items. KMO was found to be acceptable (KMO=.70 i.e. >.60) and Bartlett's test was significant (p <.01), confirming the suitability of the data for factor analysis. Only one factor with an Eigenvalue greater than 1 was found and it explained 57.6% of the variance. The Factor loadings ranged from .709 < r > .601. The factor was labelled *Subjective Career Success*.

Table 8

PCA of Subjective Career Success sub-scale

	Factor 1
I am satisfied with the success I have achieved in my career.	.785
Given your career plans, do you think your career is....	.768
If applicable, how successful does your 'significant other' feel your career has been?	.755
Compared with my colleagues, my career progress has been...	.724
Eigenvalue	2.303
% variance explained	57.6%

Extraction Method: Principal Component Analysis.

a. 1 factors extracted. 6 iterations required.

The sub-scale consisted of 4 items and an initial reliability analysis revealed a satisfactory internal consistency (Cronbach α = .74 i.e. >.70). When the corrected item-total correlations were considered, all items had acceptable item-total correlations (.52 < *r* < .70).

Based on this basket of evidence it was believed that this sub-scale had demonstrated unidimensionality and the data collected from this sub-scale was used in subsequent analyses. The descriptive statistics for Subjective Career Success is summarised in Table 9.

Table 9

Descriptive Statistics for Subjective Career Success

	N	Minimum	Maximum	Mean	Std. Deviation
Subjective Career Success	41	1.5	4.0	2.89	.571

The mean was found to be below the mid-point i.e. neutral (3) on the 5-point Likert-type response scale used. Based on this result, one could argue that the respondents in this sample, on average, were somewhat dissatisfied with their career success.

The Means for blacks and whites on Subjective Career Success (=3.0 and 2.7, respectively) were not statistically significantly different when tested with an Independent samples t-test ($p>0.05$) so there does not seem to be a particular racial bias.

5.2.2. Objective Career Success

A large percentage (95%) of the sample were unrated researchers (see Table 10). This is indicative of the level of success that is still to be realised. This is to be expected, considering that a majority of the participants are still on the junior or middle ranking in their careers and under the age of 35. As such, the NRF rating cannot be considered as one the variables that have played a role in the achievement of their career level.

Table 10

What is your current NRF rating?

	Frequency	Percent	Valid Percent	Cumulative Percent
C3	1	2.4%	2.5%	2.5%
Y2	1	2.4%	2.5%	5.0%
Not rated	**38**	**92.7%**	**95.0%**	100.0%
N/A	1	2.4%		
Total	41	100.0%		

The majority of the participants were at levels C3 to D1, indicating that a large proportion of the participants occupied upper junior to middle ranking positions within the organisation (see Table 11). The distribution of the respondents indicates a challenge that the organisation still faces when it comes to growing female researchers on the career ladder.

Table 11

Occupation Levels represented in the sample

	Frequency	Percent	Valid Percent	Cumulative Percent
N/A	1	2.4%	2.4%	2.4%
C1	4	9.8%	9.8%	12.2%
C2	2	4.9%	4.9%	17.1%
C3	**5**	**12.2%**	12.2%	29.3%
C4	**7**	**17.1%**	17.1%	46.3%
D1	**12**	**29.3%**	29.3%	75.6%
D2	4	9.8%	9.8%	85.4%
D3	4	9.8%	9.8%	95.1%
D4	1	2.4%	2.4%	97.6%
E1	1	2.4%	2.4%	100.0%
Total	41	100.0%	100.0%	

It was observed that more white females occupied the more senior levels in the organisation. However, a Chi-square test revealed that the association between being black or white, and the various occupation levels was not statistically significant ($p>0.05$).

A 50/50 split of the researchers were reported in terms of having had an opportunity to present at conferences as invited speakers and not (see Table 12). This is consistent with the samples average level on the career ladder, where it is not a requirement to attend conferences as an invited speaker. The fact that some have had the opportunity so early on in their careers shows that the opportunity is available, which is also consistent with the indication of supervisory and organisational support.

Table 12

Conferences attended as an invited speaker

	Frequency	Percent	Valid Percent	Cumulative Percent
None	**20**	**48.8%**	48.8%	48.8%
Less than 10	**17**	**41.5%**	41.5%	90.2%
10 – 25	3	7.3%	7.3%	97.6%
More than 50	1	2.4%	2.4%	100.0%
Total	41	100.0%	100.0%	

One of the requirements for growing on the career ladder takes into account the educational qualification. The fact that the majority of the participants were at the lower ranks of the career ladder correlates with the finding that less than half of them had a postgraduate (M&D) qualification, and would therefore have been expected. However, for an organisation that places significance on educational qualification, it is a challenge for the organisation that the majority of the participants are without a postgraduate qualification (see Table 13).

Table 13

Highest qualification

	Frequency	Percent	Valid Percent	Cumulative Percent
National Diploma	5	12.2%	12.2%	12.2%
B Tech	6	14.6%	14.6%	26.8%
Degree	6	14.6%	14.6%	41.5%
Honours	5	12.2%	12.2%	**53.7%**
Masters	10	24.4%	24.4%	78.0%
PhD	6	14.6%	14.6%	92.7%
Post-doc	3	7.3%	7.3%	100.0%
Total	41	100.0%	100.0%	

Close to equal numbers of whites and blacks held postgraduate qualifications, in other words Masters and PhD degrees. A Chi-square test revealed that there was no significant ($p>0.05$) association between being black or white, and the various educational levels.

At junior level, funding attraction is not an area of focus, however, the fact that majority of the participants have attracted some funding for themselves and for the business unit displays incredible achievement and progress in terms of the careers within an R&D environment.

Table 14

Value of funding attracted for project work since joining the organisation

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than R10000	4	9.8%	10.8%	10.8%
R10000 - R49000	1	2.4%	2.7%	13.5%
R50000 - R99000	1	2.4%	2.75	16.2%
R100000 - R249000	5	12.2%	13.5%	29.7%
R250000 - R1 million	6	14.6%	16.2%	45.9%
R1 million - R2 million	6	14.6%	16.2%	62.2%
More than R2 million	14	34.1%	37.8%	100.0%
N/A	4	9.8%		
Total	41	100.0%		

The nature of R&D organisations in the SET sector requires that peer reviewed articles be produced. Whilst some participants have not had the opportunity to publish, a larger percentage has published peer reviewed articles (see Table 15). Similar the previous variable, the fact that majority of the participants have published displays incredible achievement and progress in terms of the careers within an R&D environment.

Table 15

Number of peer reviewed articles in accredited journals produced

	Frequency	Percent	Valid Percent	Cumulative Percent
None	10	24.4	24.4	24.4
Less than 10	20	48.8	48.8	73.2
10 - 25	8	19.5	19.5	92.7
25 - 50	3	7.3	7.3	100.0
Total	41	100.0	100.0	

Based on the subjective and objective measures of career success described above and given the results obtained from the respondents, it was concluded that they had not yet achieved high levels of career success on any of these measures.

5.3. Work Centrality

Table 16 indicates that an overwhelming number of respondents specified that working is very important and significant in their lives (Mean=4.17, on a 5-point response scale, SD=.543). This results seems to indicate that women researchers place great belief and value as researchers in an R&D environment.

Table 16

Descriptive Statistics: Work Centrality (Item 1):

	N	Minimum	Maximum	Mean	Std. Deviation
How important and significant is working in your total life?	41	3	5	**4.17**	.543

Respondents were further requested to distribute in order of personal importance, a total score of 100 points to various life spheres including work, family, spirituality, community and leisure activities. Table 17 summarises the responses on the different facets for which participants have to fulfil different roles. Whilst it evident that different life aspects matter, work was shown to be the most important aspect of the participants' lives (Mean=38.6, SD=16.1), even higher than what the indicated in terms of the importance of their family (Mean=33.9, SD=13.8)

Table 17

Descriptive Statistics: Work Centrality (distribution of 100 points)

	N	Minimum	Maximum	Mean	Std. Deviation
My leisure (includes hobbies, sports, recreation and contacts with friends)	37	0	30	14.86	7.216
My community (includes voluntary organisations)	37	0	20	4.62	5.030
My work	37	9	70	**38.62**	16.065
My spirituality (includes religious or spiritual activities)	37	0	30	7.97	8.536
My family	37	10	70	33.92	13.801

The differences in the means for how important my family is to me, was marked and statistically significantly different for blacks and whites (t=2.564, df=34, p=0.015 i.e. <0.05).

The difference between the means for blacks and whites on the item how important work was also found to differ quite a lot, but this difference was not statistically significant (p>0.05).

Table 18

Descriptive Statistics: Work Centrality (distribution of 100 points) by race

	Race	N	Mean	Std. Deviation	Std. Error Mean
How important and significant	Black	20	4.15	.489	.109
is working in your total life?	White	20	4.20	.616	.138
My leisure (includes hobbies,	Black	18	13.61	6.818	1.607
sports, recreation and contacts with friends)	White	18	15.83	7.717	1.819
My community ((includes	Black	18	4.72	4.688	1.105
voluntary organisations)	White	18	4.50	5.618	1.324
My work	Black	18	**35.00**	14.653	3.454
	White	18	**42.72**	17.197	4.053
My spirituality (includes	Black	18	7.22	6.691	1.577
religious or spiritual activities)	White	18	8.61	10.404	2.452
My family	Black	18	**39.44***	11.743	2.768
	White	18	**28.33**	14.142	3.333

*statistically significant difference in the means on 95% confidence level

A typical work week consists of 40 hours, however an overwhelming number of participants indicated that they work between 50 and 70 hours a week i.e. way beyond the required minimum working hours. Another 20% of the sample indicated they spend more than 70 hours a week at work. This result corroborates the notion that R&D organisations still perpetuate a masculine culture that is not sensitive to the multiple roles woman fulfil as a wife, mother and worker (see Table 18).

Table 19

A seven day weeks consists of 168 hours. How many hours per week do you typically spend on work? (n=41)

	Frequency	Percent	Valid Percent	Cumulative Percent
< 50 (less than 50 hours per week)	11	26.8%	26.8%	26.8%
50 - 70 (between 50 and 70 hours per week)	**22**	**53.7%**	53.7%	80.5%
>70 (more than 70 hours per week)	8	19.5%	19.5%	100.0%
Total	41	100.0%	100.0%	

More white respondents were found in the >70 hours a week category (5 whites vs 3 blacks). However, a Chi-square test revealed that there was no significant association (p>0.05) between being black or white, and the three categorical levels of hours spent at work.

5.4 Self-efficacy

An initial PCA analysis was conducted on the seven items. KMO was found to be acceptable (=.774 i.e. >.60) and Bartlett's test significant (p < 01), which confirmed the suitability of the data for factor analysis. One factor with an eigenvalue of greater than 1 emerged. All the items met the inclusion criteria (r>.30). The factor was labelled *self-efficacy*. The factor loadings are presented in Table 20.

Table 20

PCA of data obtained with the self-efficacy sub-scale

		Factor 1
When confronted with a problem in my job, I can usually find several solutions		.871
No matter what comes my way in my job, I'm usually able to handle it		.830
Thanks to my resourcefulness, I know how to handle unforeseen situations in my job		.784
I can remain calm when facing difficulties in my job because I can rely on my abilities		.716
I meet the goals that I set for myself in my job		.702
If I am in trouble at work, I can usually think of a solution		.647
My past experiences in my job have prepared me well for my occupational future		.642
Eigenvalue	3.898	
% variance explained	55.68%	

Extraction Method: Principal Component Analysis.

The scale consisted of seven items and an initial reliability analysis revealed a satisfactory internal consistency (Cronbach α = .859 i.e. >.70). When the corrected item-total correlations were considered, all items had acceptable item-total correlations (.776 < r > .477).

Based on this basket of evidence it was believed that this sub-scale had demonstrated satisfactory unidimensionality.

The mean score obtained on the self-efficacy sub-sale (=4 on a 5-point Likert-type response scale; SD=.6) indicates that respondents had on average a high level of perceived self-efficacy, which implies that they felt they have the capability and ability required to fulfil their current roles (see Table 21). The mean scores of perceived self-efficacy for whites and blacks (=3.9 and 4.1, respectively) were not found to be significantly different based on an Independent samples t-test.

Table 21

Descriptive Statistics Self-efficacy

	N	Minimum	Maximum	Mean	Std. Deviation
Self-efficacy	41	2.86	5.00	4.07	.597

5.5. Motivation

5.5.1 Role expectancy

PCA analysis was conducted on the data collected by means of the five items. KMO was acceptable (KMO=.675 i.e. >.60) and Bartlett's test was significant (p <.01), confirming the suitability of the data for factor analysis. Only one factor with an Eigenvalue greater than 1 was found and it explained 58.47% of the variance. The factor was labelled *Role Expectancy*.

Table 22

PCA of Role Expectancy sub-scale

	Factor 1
My supervisor and line manager expect me to contribute to the achievement of business unit's goals	.892
I am expected to work on projects that contribute to the strategic goals	.889
My supervisor and line manager expect me to participate in business unit's strategic decisions	.637
Being a strategic decision-maker in the organisation determines my success as a researcher	.586
Eigenvalue	2.424
% variance explained	58.37%

Extraction Method: Principal Component Analysis.

The sub-scale consisted of four items and an initial reliability analysis revealed a satisfactory internal consistency (Cronbach α = .708 i.e. >.70). When the corrected item-total correlations were considered, all items had acceptable item-total correlations (.362 < *r* < .718).

Based on this basket of evidence it was believed that this sub-scale had demonstrated unidimensionality and the data was used in subsequent analyses.

The mean score of 3.75 obtained from the role expectancy sub-scale (on a 5-point Likert-type response scale; SD=.761) indicates that participants contribute towards the attainment of organisational goals and as such, are expected to play a role within their group and business unit, thus contributing to overall organisational goals (see Table 23)

Table 23

Descriptive Statistics: Motivation

	N	Minimum	Maximum	Mean	Std. Deviation
Role Expectancy	41	1.00	5.00	3.75	.761

5.5.2 Role opportunity

The following items were responded to on a yes/no response scale and the questions refer to role opportunities.

Table 24

Qualification Upgrade

To upgrade my qualification in order to broaden my knowledge, skills and experience…

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	32	**78.0**	80.0	80.0
No	8	19.5	20.0	100.0
Total	40	97.6	100.0	

As an R&D organisation, qualification upgrade for SET base employees remains a priority. As such almost 80% of the respondents indicated an opportunity to study further in order to broaden their skills and knowledge base, thus contributing to the fulfilment of one of the requirements for the career ladder and enhancing their ability and opportunity to move to the senior rankings. This is a positive outcome and testimony to the programmes and interventions that the organisation has put in place.

Table 25

Funding Attraction

To attract funding to the organisation through various projects…

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	**33**	**80.5**	82.5	82.5
No	7	17.1	17.5	100.0
Total	40	97.6	100.0	

As a parastatal institution the majority of the income it receives is dependent on contract research. Securing contract research is not only important to ensure income into the organisation but to also ensure the financial sustainability of the organisation. Therefore, to encourage employees to do contract R&D work, attracting funding is one of the elements that is evaluated on the career ladder. As such, it is encouraging that 82.5% of the respondents indicated that they have had an opportunity to attract funding as it indicates that they have an opportunity to fulfil one of the requirements as required by the career ladder.

Table 26

Mentoring of Emerging Researchers

To mentor emerging researchers enrolled for MSc and PhD degrees

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	**25**	**61.0**	62.5	62.5
No	15	36.6	37.5	100.0
Total	40	97.6	100.0	

As a knowledge organisation, the mentorship of young talent is a priority for the organisation to ensure knowledge sharing, knowledge generation and knowledge transfer. As such, human capital development, particularly mentorship of emerging researchers is one of the factors measured on the career ladder. It is therefore encouraging to learn that 62.5% of the respondents have had an opportunity to mentor young talent, particularly at Masters and Doctorate level. However, this also implies that 37.5 % of the respondents have not had an opportunity to meet one of the criteria that is required by the career ladder and this could be detrimental to their advancement to senior ranking positions.

Involvement and participation in strategic decisions and achievement of organisational goals are imperative for researchers. While 65.9% of the participants indicated that they were adequately informed of the organisation's strategic goals and 78% believed they contribute to the attainment of the organisational goals, an underwhelming 37.5% have had an opportunity to participate in setting organisational objectives and 40% have had an opportunity to actively make decisions that influence at organisational level. These numbers indicate that the organisation still has low women participation at decision making levels, thus indicating the lack of influence that women have in the organisation. This result is also related to the fact that the sample was so over- represented by staff in the junior ranks that are still at an early career phase. The fact that junior staff strongly feel informed, consulted and able to participate in the process is positive and testimony to the shifts that have taken place in the organisation.

5.5.3 Role Valance

There is evidence (see Appendix D) to suggest that the women that participated in the study want to play an active role in the organisation, particularly in being part of the decision makers as leaders and set its strategic direction. This would suggest that that the women that participated in the study want to play a role that is more than being a researcher in the organisation.

5.5.4 Instrumentality

The participants in the study clearly indicated that they believed in the instrumentality that exists between achieving greater levels of strategic relevance and input and being able to achieve goals in their career advancement. This link seems to have been well established in the organisation.

Table 27

Instrumentality at organisational level

Being a strategic decision maker would lead to important work outcomes in my organisation

	Frequency	Percent	Valid Percent	Cumulative Percent
True	**34**	**82.9**	85.0	85.0
False	6	14.6	15.0	100.0
Total	40	97.6	100.0	

5.6 Personal circumstances and care giving responsibilities

Whilst 24% of participants indicated that they were solely responsible for domestic commitments, the majority (56%) of the participants indicated that they receive assistance from their partners/spouses and that care giving responsibilities are shared equally (see Table 28).

Table 28

Domestic responsibilities

	Frequency	Percent	Valid Percent	Cumulative Percent
All done by me	10	24.4	24.4	24.4
More than 50% done by me	7	17.1	17.1	41.5
Shared equally with other adult family members or partner	**23**	**56.1**	56.1	97.6
All done by external help	1	2.4	2.4	100.0
Total	41	100.0	100.0	

Black females (7 vs 3), more so than white females indicated that despite being employed were solely responsible for domestic chores, while 14 white females (vs 9) indicated that the chores were equally shared. Cultural norms and stereotypes it seems remain a hindrance for working black woman (see Table 29).

Table 29

Domestic responsibilities by race

	All done by me	More than 50% done by me	Shared equally with other adult family members or partner	All done by external help	
Black	**7**	**4**	9	0	20
White	3	2	**14**	1	20
Total	10	6	23	1	40

Table 30 indicates the new roles that women are fulfilling. Whilst men were previously typically responsible for the primary income in households, the group of woman that participated in the study indicated that about half of them were equally responsible for contributing to the running of the household.

Table 30

My contribution to household

	Frequency	Percent	Valid Percent	Cumulative Percent
The only source of income	9	22.0	22.0	22.0
The primary source of income	4	9.8	9.8	31.7
The secondary sources of income	9	22.0	22.0	53.7
An equal contribution to my household	19	**46.3**	46.3	100.0
Total	41	100.0	100.0	

In South Africa it is a reality that many people have to support not only themselves and their children, but also an array of extended family members. As such, Table 31 indicates that most of the participants (78%) provide financial assistance to their extended families, in other words in addition to supporting their own household. About a third of respondents indicated that they do this on a monthly basis, which places a further ongoing financial burden on them.

Table 31

Additional household commitment

	Frequency	Percent	Valid Percent	Cumulative Percent
My family is financially dependent on me	9	22.0	22.0	22.0
I send some money home on a monthly basis	12	**29.3**	29.3	51.2
I send some money home only if required	11	26.8	26.8	78.0
I do not send any money home	9	22.0	22.0	100.0
Total	41	100.0	100.0	

Table 32 shows that male partners have become more supportive of the achievements of their female counterparts, as was though the case in the past. Whether this is a result of the general need to achieve or is as a result of the increased standard of leaving was not determined. However, more than half of the respondents in this study indicated that they always receive encouragement from significant others, which is an important factor in achieving career success.

Table 32

Encouragement received from significant other/family members to build a successful career

	Frequency	Percent	Valid Percent	Cumulative Percent
Never	1	2.4	2.4	2.4
Occasionally	9	22.0	22.0	24.4
Very Often	9	22.0	22.0	46.3
Always	**22**	**53.7**	53.7	100.0
Total	41	100.0	100.0	

Twice as many black females indicated that they were “always” encouraged by significant others to build a successful career, which is an encouraging result in this context. On the other hand twice as many white females only “occasionally” received such support. This is an interesting outcome that should be investigated further in terms of cultural differences between these groups.

Table 33

Encouragement received from significant other/family members to build a successful career by race

	Never	Occasionally	Very Often	Always	
Black	1	3	2	**14**	20
White	0	6	7	7	20
Total	1	9	9	21	40

5.7 Work circumstances

Research and Development is such that researchers have a number of outputs that need to be realised. These range from conducting research projects, producing publications, supervision, attracting and securing funding amongst other things. As such, conducting work outside working/office hours is imperative in order to ensure success. Work commitments are no different for women researchers, who also have to continuously work outside of the agreed work times. This overtime takes time away from other roles that typically have to be fulfilled by woman. Table 34 indicates that an overwhelming number of participants continually worked more hours than expected, about a third of participants on an ongoing basis or 60% of them on a project basis.

Table 34

Work Commitments

	Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
I have to continually work outside work hours	**14**	**34.1**	34.1	34.1
I work outside work hours only if the project requires	**25**	**61.0**	61.0	95.1
I do not work outside work hours	2	4.9	4.9	100.0
Total	41	100.0	100.0	

Only two black females suggested that they did not work outside of work hours (see Table 35).

Table 35

Work Commitments by race

		I have to continually work outside work hours	I work outside work hours only if the project requires	I do not work outside work hours	
	Black	6	12	2	20
	White	8	12	0	20
Total		14	24	2	40

In a parastatal organisation, some of the income is obtained through contract R&D work, thus requiring that researchers engage with clients on an ongoing basis. Just less than half of the participants indicated that they are only required to interact with clients during office hours. The fact that woman are required to attend to functions outside of regular hours one would think would have an adverse impact not only on their work-life balance, but also on their households.

Table 36

Stakeholder Engagement

	Frequency	Percent	Valid Percent	Cumulative Percent
I am required to interact with clients only during work hours	**20**	**48.8**	48.8	48.8
I am required to interact with clients outside work hours	8	19.5	19.5	68.3
I am required to interact with clients but these depend on the supervisor	6	14.6	14.6	82.9
I am not required to interact with clients at all	7	17.1	17.1	100.0
Total	41	100.0	100.0	

More black females indicated that they were required to interact with clients internally, while more white females indicated that they were required to interact with clients outside of work hours (see Table 37).

Table 37

Stakeholder engagement by racial group

	I am required to interact with clients only during work hours	I am required to interact with clients outside work hours	I am required to interact with clients but these depend on the supervisor	I am not required to interact with clients at all	
Black	**13**	1	2	4	20
White	7	7	3	3	20
Total	20	8	5	7	40

In addition to conducting research, participants indicated are also expected to play other roles within the organisation. Whilst research is the core business of the organisation, just less than half of their time on average was spent on research. Additional roles such as administration, proposal writing and management of staff were indicated as some of the other roles that participants needed to fulfil (see Table 38). The requirement to fulfil other roles takes away from the core business of doing research, resulting in the inability to produce the required outcomes that are key to being able to progress up the career ladder.

Table 38

Descriptive Statistics: Additional work roles

	N	Minimum	Maximum	Mean	Std. Deviation
Research	36	0	90	47.08	27.578
Management of staff	36	0	60	10.14	12.620
Administration	36	0	50	16.39	12.513
Proposal for potential projects	36	0	35	12.50	10.454
Meeting and entertaining clients	36	0	20	7.78	6.375
Other (please specify)	36	0	10	.56	1.992

The respondents indicated that they have opportunities to upgrade their qualification. All but 1 of the black female respondents indicated that they have the opportunity to further their studies, while of the white female group only about a half felt they have such

opportunities (see Table 39). The differential allocation of resources and support by organisations to bring about transformation seems to be indicated by these results.

Table 39

Opportunities to upgrade my qualification in order to broaden my knowledge, skills and experience by race

		Yes	No	
	Black	**19**	1	20
	White	12	7	19
Total		31	8	39

5.8. Career Development Support

5.8.1 Perceived supervisor and organisational support

Participants indicated on average, in terms of the question if they felt supported by both the organisation's structures and supervisors on the positive side of the scale (see Table 40).

Table 40

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
I feel supported by my supervisor/line manager towards my career progression.	41	1	5	3.39	1.022
The organisation has allocated a number of resources in order to assist with my career progression	41	1	5	3.32	.934

The means for Perceived Organisational Support for whites and blacks (=2.95 and =3.65, respectively) were found to be significantly different based on an Independent samples t-test (t=2.512, df=38, p=.016 <0.05). Black female respondents indicated statistically significantly higher levels of organisational support than that experienced by white respondents.

The means for blacks and whites on Perceived Supervisor Support were the same (Mean= .340) for both groups.

All respondents (97.6%), with the exception of one respondent indicated their awareness of the Career ladder process and the different ranks that one can progress to. The career ladder not only fulfils a role as a tool to manage promotions, but it also guides the researchers in terms of their development as researchers and scientists in general. The vast majority of respondents further indicated that they have successfully navigated this process and that they would do so again in the future. The organisation has further through its policies and practices been able to achieve exceptionally high levels of loyalty from this group of respondents. It seems though, that most of them feel that their achievements are not adequate to be promoted at this point and it would seem they should focus on getting these achievements in hand so that they can be promoted.

Table 41

Career Ladder awareness

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	**40**	97.6	97.6	97.6
No	1	2.4	2.4	100.0
Total	41	100.0	100.0	

Table 42

Career Ladder processes awareness

I am aware of the different processes and submission criteria

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	**38**	**92.7**	92.7	92.7
No	3	7.3	7.3	100.0
Total	41	100.0	100.0	

Table 43

Career Ladder submission

I have submitted before and promoted to the next level

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	**28**	**68.3**	68.3	68.3
No	13	31.7	31.7	100.0
Total	41	100.0	100.0	

Table 44

Career ladder submission motivation

I am motivated to submit for career ladder evaluation as I feel my achievements have been adequate.

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	**25**	**61.0**	61.0	61.0
No	16	39.0	39.0	100.0
Total	41	100.0	100.0	

CHAPTER 6: DISCUSSION

A summary of the main findings, a discussion of the results, an overview of the study's limitations and further recommendations, as well as concluding remarks are provided in this chapter.

6.1. Introduction

South African women, irrespective of their racial identity have always been in the secondary echelon of society and despite the tremendous strides that South Africa has made in the past few years in promoting and advancing women in the workplace, women are still under-represented in the workforce, particularly at the senior levels of public and private organisations (Mathur-Helm, 2006). This is even more true and the challenge exacerbated when racial challenges are included. South African organisations experience a severe shortage of black female talent and an unnerving challenge in the attraction, retention and growth of black female professionals in all sectors of the economy. Attracting and retaining black female scientists and researchers in Science, Engineering and Technology (SET) disciplines epitomises the extremity of the challenge the country is faced with went it comes to transforming its workforce.

Etzkowitz et al. (2003) alluded to the fact that there continues to be a disproportionate lack of women, and even more so black woman, in most if not all scientific and engineering disciplines, especially at the upper echelons of the professions. While there are legislative interventions in place, organisations need to balance redressing the inequalities in the workplace, while simultaneously not compromising standards of outputs and overall activity (Thomas & Jain, 2004).

Whilst organisations invest enormously towards supporting the progress of female researchers into senior positions through a number of enabling initiatives, they are found in small numbers and even more so for South African black female researchers. Thomas and Jane (2004) indicate that in order for organisations to address barriers that hinder the progress of black women, systematic discrimination has to be removed and HR processes should entail a frequent review and update of job descriptions and specifications,

monitoring of performance appraisals, review of job assignments, monitoring promotions and terminations, and monitoring staffing practices such as training and development. Brush (1991) further adds that employment and promotion policies should be revised in order to ensure that qualified women have a reasonable chance to pursue a rewarding career without having to sacrifice their personal and family lives. After all, the future of scientific disciplines depends on its ability to attract and retain talented young men and women by offering opportunities that afford success and satisfaction in both their professional and personal lives (Hamel et al., 2006). However, the assumption that gender stereotypes can be eradicated through formal systems and procedures of equal opportunities policies has been challenged extensively.

The present study aimed to investigate factors that hinder and support black woman SA researchers from progressing into senior ranking positions within a Research and Development environment. A literature review was conducted and several individual and organisational/structural level factors were identified that have in previous studies been shown to support on the one hand and hinder on the other, the career success of woman in the workplace. These factors were incorporated in an online questionnaire. One of the largest R&D organisations, arguably in South Africa and on the continent, was approached and the population of female scientists employed were targeted (N=104). Usable responses to the online questionnaire were obtained from a realised sample of 41 female scientists, half black (African, Indian and Coloured) and half white.

6.2. Factors that support career success

6.2.1 Individual variables that support career success

6.2.1.1 Coaching and mentorship

Black women normally lack access to career support from a mentor (Thomas & Hollenshead, 2001) and Thomas (1996) state that organisations continue to set numerical targets for training and development, mentoring, coaching and competence transfer that are often not realised. As such, mentorship should be recognised as an important part of service for SET staff within R&D organisations and should therefore be recognised formally through organisational structures and performance management systems.

Black female respondents, way more so than white females, indicated that they had access to supervisory support and opportunities to mentor emerging researchers that are studying towards their masters and doctoral programs, which indicates that the organisational based human resource development policies and practices are yielding results.

However, black female respondents did not indicate ongoing formal mentorship with senior skilled researchers. Therefore, there was no evidence from the study to support that there was ongoing transfer of skills, experience, expertise and engagement opportunities. As such, there remains a need for the career ladder process to creatively introduce inclusive processes, that will distinguish supervisory support from mentorship/coaching, interrogate the type of support that is provided including demographics to ensure the diversity of people mentored and an evaluation that the development of black women researchers is as a result of the mentorship.

This provides an opportunity for organisations to introduce structured mentorship/coaching programs that will ensure that quality mentorship relationships ensue and equal opportunity and access to key resources are distributed and accessible to all races, across gender groups.

6.2.1.2 Networks

When women are appointed to senior positions, they enter existing social groups with existing norms, beliefs, and assumptions that guide their interactions and relationships (Mabokela & Mawila, 2004). These interactions and relationships are referred to as social capital, which is the social ties or personal networks found among scientists in research, academic and industry communities of practice. Social ties is a key factor for stimulating scientific innovation that fosters world class research and products (Etzkowitz et al., 2003). Whilst social networks are a necessity within R&D environments, in order to pool resources, talent, provide networks and access to information that is confined to the network circle, women are expected to take charge and become fully functioning group members (Mabokela & Mawila, 2004).

The study provided some evidence that women researchers in this organisation are expected to engage with stakeholders and clients in order to ensure ongoing business and attract funding, which leads to a strengthened network for business. White women researchers indicated engagement with stakeholders more so than black women, demonstrating work commitment outside work hours in order to engage with clients and stakeholders.

Although no statistically significantly association between race and rank was found ($p>0.05$), white women researchers occupied higher positions on the career ladder than black women researchers. Some in the organisation argue irrespective of the possessed qualification and experience. Thus the increased network of clients may have benefitted white women, considering funding attraction is one of the areas assessed on the career ladder. One can also not lose sight of the societal and cultural factors that continue to govern black women thus hindering them from engaging in certain workplaces practices and disadvantaging them from career growth supporting opportunities.

6.2.1.3 Behavioural traits

The SET sector and R&D organisations are still dominated by a white masculine culture, particularly at the more senior leadership levels, where competence and leadership are still predicated on traits stereotypically associated with men that include being tough, aggressive and decisive (Meyerson & Fletcher, 1999). An overwhelming majority of respondents indicated a capability to deal with different work situations, pressure and challenging situations although some had failed to make significant progress in their careers. However, there was no evidence to suggest that behavioural traits played any role in their lack of career success in the R&D organisation.

Whilst organisational culture remains predominately white and masculine, competence, growth and leadership success were not predicated on behavioural traits. Career success within an R&D organisation still depends largely on deliverables that include the number of publications produced, conferences attended as a speaker, funding attracted and human capital development amongst other things. As such, none of the women researchers indicated any insecurity or vulnerability based on their gender nor was there evidence to

suggest that black South African women researchers failed to make significant progress because of a lack of behavioural traits.

6.2.1.4 Self-efficacy

High levels of self-efficacy were reported and these were virtually the same for black and white females (Means=4.1 and 3.9, respectively). This implies that women researchers in general perceive themselves as having the capability to produce desired outcomes (Bandura, 1977b). The majority of the respondents indicated a capability to handle different situations presented to them given the skills, ability and resourcefulness they possessed. This could be as a result of the directed supervisory and organisational support that younger researchers are privy to, and the opportunities that are afforded for women researchers in this organisation.

6.2.1.5 Motivation

High levels of role expectancy were found within the sample, which were similar for both race groups (Mean=3.6 and 3.8 on a 5-point scale for black and white, respectively). It would also seem that both white and black females experienced high levels of role valance, role opportunity and instrumentality. The R&D organisation provides opportunities for women researchers to participate in organisational strategic decisions, for which they indicated participation and capability. As such, there was no evidence to suggest that women researchers have failed to make significant progress in their careers because of lack of motivation as participants indicated great interest in their careers and even loyalty to the organisation. The study further failed to indicate that the slow progress of women researchers, particularly black South African women researchers into senior ranking positions was as a result of any lack of motivation on their part.

6.2.2 Structural variables that support career success

6.2.2.1 Supportive organisational and leadership structures

The respondents indicated that they were all, but one, aware of the career ladder, the submission criteria and the submission processes. Both black (M=1.60) and white (M=1.40) indicated that the career ladder evaluation system is an effective and objective system, as it assesses the career ladder outputs rather than an individual. As such, there was no

evidence to suggest that organisational promotional processes were evaluated along racial lines. Both black (M=3.48) and white (M=3.40) female researchers indicated that they felt supported by their supervisors and the organisation provided adequate opportunities to support them in their roles.

6.2.2.2 Education opportunities

The overwhelming majority of staff indicated that they have opportunities to upgrade their qualification. Of the 8 respondents that disagreed or indicated that they are not able to 7 of them were white females. This further supports the notion that the organisation's structures support the development of researchers through qualification upgrade.. A large proportion of respondents have not yet achieved postgraduate qualifications (M&Ds) and so having done so, have not yet directly translated to advancement opportunities. Obtaining higher level qualifications is recognised and rewarded on the career ladder as a mechanism to advance to higher ranking positions within an R&D environment. They should be encouraged to take up these opportunities and to complete these qualifications as so that they can be recognised in this way. The study could not show, however, that black females were promoted despite having achieved these qualifications.

6.3 Factors that hinder career success

6.3.1 Individual variables that hinder career success

6.3.1.1 Lack of Skills transfer

Within the R&D organisation, professional development is dependent on a number of factors that include qualifications, skills and experience. However, professional growth depends largely on, 1) the available opportunities; 2) exposure and involvement in key projects; and 3) structured mentorship. These three factors play a direct role in the acquisition of skills, building a researcher's profile and strengthening their experience. Respondents indicated involvement within business units, more so contributing to set objectives, working on projects that contribute to their career success. The study provided evidence that indicates support at supervisory and organisational level, but was not able to support that the inability of black South African women researchers to progress to senior ranking positions was, as an outcome of the non-transfer of skills.

6.3.1.2 Lack of coaching and mentorship

The career ladder is designed to not only promote employees to the next level on the ranks, but it also provides guidance to researchers on how to develop their careers. As such, mentorship and coaching from seasoned researchers becomes important. In an organisation as the one that the sample was derived from, supervisors assume the roles of manager, mentor and at times coach, and therefore play an imperative role in determining and influencing the success or lack thereof, of emerging researchers. A number of respondents indicated that they feel supported by their supervisors in their role as researchers, although a small number of black South African women researchers appear to have made any significant progress within their career at the organisation. One of the respondents indicated that:

> The career ladder as a professional development tool in itself is useful, but people in supervisory and senior roles can still form barriers to progression by withholding opportunities from individuals. The problem lies in the variety of areas of practice within the [organisation name deleted] which cannot be evaluated the same way given that the products or outcomes of our research differ. Further, exposure to contract research, proposal writing and sometimes even parliamentary grant research depends on supervisors and seniors who are often primary investigators on these projects. Junior staff, in my opinion especially Black staff can be undermined as not having the experience is equated to not having the competence to undertake work on projects or help write proposals or lead projects. This hampers development of black staff members as those things are important for progressing on the career ladder.

The statement from one respondent indicates a gap in the support that supervisors provide, and further reveals the lack of guidance that is afforded to black South African women researchers within an R&D organisation. One can deduce that it is not the lack of coaching and mentorship, but rather the available quality thereof that might be a barrier towards the growth of black South African women researchers within this organisation.

6.3.2 Structural variables that hinder career success

6.3.2.1 Transformation

Transformation is a process required and enforced by legislation and implemented by organisations in order to diversify the workforce and ensure that organisations are a

reflection of the country's demographic. Whilst it has created an opportunity for a broader range of candidates to be considered for positions, it is a double-edged sword that creates a double bind for women (Etzkowitz et al., 2003). Some argue that it modestly increases the numbers, but is also used to denigrate blacks and women and keep them down (Etzkowitz et al., 2003). The study provided sufficient evidence that women remain under represented at the highest ranks of the career ladder within this organisation, with the numbers more daunting for black woman SA researchers, who remain over represented on the lower ranks of the career ladder, and are not represented on the two most senior levels, Principal Researcher level (D4) and the Chief Researcher level (E1).

Transformation is a necessary, but not sufficient condition for the inclusion of black women in the sciences, as it has become a method of protecting R&D organisations from protests against a lack of diversity (Etzkowitz et al., 2003). This has led to organisations such as the one that participated in this study to attract black SA women at lower ranks to window dress the organisations as transforming, but fails to advance them to senior positions.

Scrutiny at senior ranks has continually shown a lack of transformation, with the findings of the present study supporting this as well. As such, transformation has to be driven through organisational culture rather than set targets, as demographic targets prohibit black SA women researchers from progressing to senior ranking positions, as they are constantly seen as numbers rather than human capital that can contribute meaningfully to the organisation.

6.3.2.2 Patriarchy and Culture

Traditional gender stereotypes held in black cultures would seem to still be prevalent when it comes to personal circumstances and being responsible for household chores. A difference in the support that black and white women researchers received from their significant others was found in the present study, with 70% of black women indicating that they always receive support from their spouses or significant others and 35% of white women indicating receipt of support from their partners. This could be as a result of change

in the roles that black women now have to play in the household, as evidenced by the study that they share domestic responsibilities and contributions in their households.

The results obtained in the current study further revealed that the majority of the black SA women researchers that participated in the study work more than a forty hour week, as prescribed by the Basic Conditions of employment Act, No 57 of 1997. Whilst the majority (65%) of the black SA women researchers that participated in the study work for more than fifty hours a week, all of them engage with the stakeholders only during working hours. Although it was not explicitly stated that this is a result of governing cultural and patriarchal rules, it was interesting that all black SA women researchers that participated in the study work more than the minimum required hours, however not engage with external clients or stakeholders outside of work hours. The study alludes that black male partners have become more supportive of their partners' careers, and cultural and patriarchal rules continue to govern, consequently affecting their ability to grow to senior ranking positions.

6.3.2.3 Social Identity

Social identities are embedded within the primary group identification of race as sources of intra-group variation, but are not extended to those outside the group. As such, members of races feel closer to each other (Booysen, 2007). Interestingly, senior researchers within the organisation remain predominantly white males, however more black SA women researchers indicated support in their role as researchers. Whilst all respondents, regardless of race, seem to possess similar qualifications, experience and skills, white SA women continue to occupy higher ranks than their black counterparts.

Thomas and Jain (2004) state that treating women as a homogenous group presents the possibility that targets for advancing women will be met by advancing the already privileged thereby denying black women access to training and traditionally inaccessible jobs. While no evidence of this was found in the present study, the organisation has continued to advance white women researchers compared with their black counterparts, regardless of the required competencies. Therefore, one can assume that social identity continues to play a role towards hindering the growth of black SA women into senior ranking positions.

6.3.2.4 Organisational Culture and Work Life balance

A number of organisations have introduced flexible work hours, maternity leave, sabbatical leave and child-care facilities, however, they still practice a demanding and long working hours performance-based organisational culture (Mathur-Helm, 2006). The research career can be demanding, especially for women researchers, who have to balance their work and personal lives. This situation is further exacerbated with progression on the career ladder as it requires research activity that is unattainable without a significant devotion of time to work activities (Hamel et al., 2006). This is further riled by the requirement to excessive work overtime required by the organisation and career prerequisites. As such, the research culture can deter women of high scientific ability with family and child rearing responsibilities from making their contribution (Etzkowitz et al., 2003). Typically, such woman may take breaks in their careers, work reduced hours, or otherwise contribute large amounts of time to caring for children and responding family needs which mean they are often left behind by their male counterparts (April et al., 2007).

The challenge remains for R&D organisations to balance labour law requirements pertaining to work hours, and operational needs that require staff to work overtime. Broader recognition for the need to balance career success and work success is needed. Black females placed greater emphasis on family, indicating that family is more important to them than their white counterparts and this needs to be accommodated and cannot be to the determinant of their career success.

6.3.2.5 Socialisation of genders

Females are still primarily responsible for household chores and responsibilities, particularly so for black females. In this sample 55% of the black female researchers were either solely responsible for domestic chores or have to do more than 50% of the domestic chores themselves (compared to 25% for white females). The results obtained in the present study support the notion that women are still expected to fulfil their domestic roles whilst pursuing their careers, which has an impact on the time committed towards their careers.

6.4 Black and White woman researchers' experiences

Several researchers have documented that women of colour encounter more barriers to professional socialisation and success in the academic workplace than do their white woman counterparts (Aguirre, 2000). However, organisations continue to treat women as a homogenous group, whilst white and black women continue to have different levels of training, job opportunities and education. "Gender in South Africa is racially and culturally segmented, as it takes on a particular apartheid-related characteristic, thus marginalising all other forms of discrimination and creating inequality among black and white women" (Mathur-Helm, 2005, p.66). Whilst there was an overwhelming indication that organisational and supervisory support are provided for all women on the career ladder, there was evidence to suggest that the support provided ranged across different race lines - statistically significantly so. White woman felt they have significantly less opportunities to gain qualifications, have less opportunities for advancement than their black female counterparts, whilst also having to work harder to retain their current positions and spending more time at work and engaged in after-hours work activities to do so.

6.5 Study limitations and recommendations

6.5.1 Study Approach

The study was focussed on the requirements for career development and progression as facilitated by the career ladder and assessed the perceptions of its success based on the requirements of the ladder and accompanying support received from supervisors, organisation and at home. Therefore, this narrowed the constructs and did not provide an opportunity to gauge on other issues that may impact on the career success of black females in SET disciplines. Future studies should include a wider array of constructs and could also be more exploratory in nature.

6.5.2 Research Design and approach

A quantitative approach was followed. It was envisioned to conduct qualitative interviews with senior black SA female researchers to broaden the study's findings and to better

understand how they were able to successfully navigate their way to the top. However, as black women were not represented on the organisation's senior most rankings none were available to do so. Future studies should endeavour to follow a mixed method approach in answering the research question. Much can be learnt from also following a qualitative approach.

6.5.3 Study Participation

The participation in the study was relatively low (about a third responded to the questionnaire) and most participants were junior staff that had not yet progressed to the senior ranking positions. In the future, greater participation in such studies should be sought and also more senior woman need to be included.

6.5.4 Practical Implications

The results obtained in the present study confirmed the notion that South African black women researchers remain under-represented at the top ranking positions of R&D organisations, as well as their inability to achieve career success. Whilst, there is evidence of support from the different organisational and leadership ranks, progress is yet to be achieved. Therefore, organisations need to implement career progression processes that are not dependent on individuals but set against deliverables and measurements that are applied in a standard and transparent manner. This includes a review of the recruitment policies and processes, which are guilty of creating the discrepancy in the career ladder levels along racial lines. Monitoring the career progression data will also assist organisations in addressing the prevalent challenge of immobility for the South African black women researchers.

6.5.5 Suggestions for Future Research

There is an appreciation that legislation and organisational policies have played a major role towards driving workplace diversity and equality. However, as much as research has been conducted to explain the under representation and immobility of South African black women to top management ranks, the situation has not changed much. The picture therefore raises questions of why it is that with the all developmental opportunities and supporting resources that black women are afforded at the organisation, they still fail to

progress to the top positions? Is it a systematic process that has been mastered by those it serves? If so, then future research needs to investigate the reasons that organisations fail to implement monitory frameworks that interrogate and disaggregate beyond the quantity of black women employed to the quality of the growth and development experiences best served by the succession planning.

7. Conclusion

Despite advances made towards the attraction and retention of South African black women researchers in R&D organisations, the glass ceiling still thrives and is nurtured through organisational culture, policies and strategies (Mathur-Helm, 2006). Whilst support programmes are an excellent way to ensure their development, they continue to have unintended consequences as they provide ammunition for devaluing black women as needing special support (Etzkowitz et al., 2003). This could be one of the factors that perpetuate the 'window dressing' notion, and the reason that black women feel supported, yet fail to make significant career progression within R&D organisations.
Therefore, organisations need to rid themselves of systems that propagate inequality between race and gender groups through a continuous identification and disruption of the oppressively gendered social practices (Shackleton, 2007).

Without government interventions and legislation, little progress would be made to redress historical workplace inequalities (Jain, 1999). However, attraction, development and progression of black women should be seen less as a governmental intervention to regulate markets but a strategic direction for organisations to ensure diversity that fosters and maximises innovation, creativity and competitiveness (AAUW, 2010). Consequently, employment and promotion policies must be revised to ensure that qualified women have a reasonable chance to pursue rewarding careers (Brush, 1991) through a creation of standardised processes that assess the role rather than the person.

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Appendix A

E-mail Message that will be distributed to Participants

To: Women Researchers

This is an invitation to participate in the research study that may potentially impact on your career growth within a South African Research and Development (R&D) environment. The influx of Black South African women into research careers has shown significant increase over the last few years, although they remain under represented at senior positions within R&D environments. I am a CSIR employee studying through UCT under the supervision of Professor Anton F. Schlechter and this study will form part of my MPhil degree for which I am currently enrolled.

I would be grateful if you would contribute by completing the anonymous questionnaire accessed via this link:
https://ucpcommerce.eu.qualtrics.com/SE/?SID=SV_3scuL32WJmEcoqp

The study was open to all women South African researchers employed within CSIR, and the results will form recommendations about Career Development within the CSIR.
I have obtained formal permission from all relevant bodies before contacting you, which include Group Executive: Human Capital, your respective Executive Directors and the CSIR Research Ethics Committee. I am aware that time is of essence in the R&D environment, but I believe your contribution of about 25 minutes to complete the questionnaire will increase an understanding in this area. Greater number will contribute to strengthened and valid results, so you are kindly requested to participate by clicking on the electronic link below.

Thank you
Nokuthula Zama

Appendix B

Questionnaire participant information sheet

Dear Participant

I am a Masters student at the University of Cape Town and have permission from the relevant authorities in the organisation to invite you to be a participant in this study. I have obtained your contact details via the organisation's database. This research has also been approved by UCT's Commerce Faculty Ethics in Research Committee and CSIR's Research Ethics Committee.

I am gathering data about the factors that hinder and support the progress of South African women researchers' progression into senior roles within the organisation. While the number at junior ranking levels of the career ladder continue to grow, these are not reflecting the picture at the most senior positions.

The data obtained will provide information about the career progress of South African women researchers within a Research and Development environment, which remains predominantly male. Only number codes will be used to ensure all participants remain anonymous and they are also free to withdraw from the study at any time without fear or prejudice. The responses remain strictly confidential but are essential to the success of the research project, hence the request for biographical details at the end of the questionnaire.

There are no known risks associated with the study. The researcher will not attempt to identify you with the responses to your questionnaire, or to name you as a participant in the study, not will facilitate anyone else doing so. By submitting the online questionnaire to researcher, you acknowledge that you are participating in this study of your own free will.
The following questionnaire has seven sections and should take about 25 minutes to complete.

I am very grateful to all who agree to participate and should you require additional information, please feel free to contact me.

Kind Regards

Nokuthula Zama (nzama@csir.co.za or 012 841 3256)

Appendix C

QUESTIONNAIRE

Section One

This section assesses where the researcher is in terms of their career.

1. How long have you been employed by the CSIR?

   _____

1. At what point in your career did you join the organisation? (entry level, junior etc.)

   _____

2. What level do you currently occupy on the career ladder?

   _____

3. How long have you occupied to the current position?

   _____

4. Have you ever submitted for evaluation on the career ladder?

   _____

5. What was the outcome?

   _____

Section Two

This section contains THREE questions about the role working in your life. Please answer the following questions.

1. How important and significant is working in your total life? (Circle any one of the scores)

1 One of the least important things in my life	2	3	4	5 One of the important things in my life

2. Assign a total of 100 points to indicate how important the following areas are in your life at the present time.

   A My leisure (includes hobbies, sports, recreation and contacts with friends)

   B My community (includes voluntary organisations)

   C My work

   D My spirituality (includes religious or spiritual activities)

   E My family

   Total (100)

3. A seven- day week consists of 168 hours.

   How many hours per week to do you typically on work related activities?

   A < 50 (less than 50 hours per week)

   B 50 – 70 (between 50 and 70 hours per week)

   C > 70 (more than 70 hours per week)

Section Three

This section contains four questions on how successful you feel about your career. Note: These scales have five response options

1. I am satisfied with the success I have achieved in my career. (Circle any one of the scores)

1 Not satisfied at all	2	3	4	5 Extremely satisfied

2. Compared with my colleagues my career progress has been (Circle any one of the scores)

1 Much less successful	2	3	4	5 Much more successful

3. If applicable, how successful does your 'significant other' feel your career has been?

1 Not successful at all	2	3	4	5 Extremely successful

4. Given your age, do you think that your career is (Circle any one of the scores)

1 Far behind schedule	2	3	4	5 Far ahead of schedule

Section Four

This section contains questions on how you feel about career development support and personal traits.

Please use the following scale to rate your responses. Write the number of your responses in the space provided after each question number.

NOTE: This scale has five response options.

1 Completely True	2	3	4	5 Not true at all

Career Development Support

1. I feel supported by my supervisor/line manager towards my career progression.
2. The organisation has allocated a number of resources in order to assist with my career progression.
3. I am aware of the Research Professionals Development Programme (Career Ladder).
4. I am aware of the different levels that one can progress to.
5. I am aware of the submission criteria and processes.
6. I have submitted before and was promoted to the next level.

   If not, kindly elaborate.

   _____

   _____

_____

_____

_____

7. I am motivated to submit for career ladder evaluation as I feel I my achievements have been adequate.

   If not, kindly elaborate.

   _____

   _____

   _____

   _____

   _____

8. This is the organisation with which I would like to grow my career.

   _____

   _____

   _____

   _____

   _____

Personality Traits

1 Completely true	2	3	4	5 Not true at all

1. If I am in trouble at work, I can usually think of something to do
2. Thanks to my resourcefulness, I know how to handle unforeseen situation in my job
3. I can remain calm when facing difficulties in my job because I can rely on my abilities
4. When I am confronted with a problem in my job, I can usually find several solutions
5. No matter what comes my way in my job, I'm usually able to handle it.
6. My past experiences in my job have prepared me well for my occupational future
7. I meet the goals that I set for myself in my job
8. I feel prepared to meet most of the demands in my job

Section Five

This section contains 21 questions about your strategic role in the organisation.

Please use the following scale to indicate your response to the following statements.

Note: This scale has five response options.

1 Strongly disagree	2 Disagree	3 Not sure	4 Agree	5 Strongly agree

STATEMENT	**RATING**
1. My supervisor and line manager expect me to participate in business unit's strategic decisions	
2. My supervisor and line manager expect me to contribute to the achievement of business unit's goals	
3. Being a strategic decision-maker in the organisation determines my success as researcher	
4. I am expected to work on projects that contribute to the strategic goals	
5. My competency as a strategic decision-maker is included in my performance appraisal	
IN MY CURRENT ROLE I HAVE THE OPPORTUNITY TO	**RATING**
1. Upgrade my qualification in order to broaden my knowledge, skills and experience	
2. Attract funding to the organisation through various projects	
3. Mentor emerging researchers enrolled for MSc and PhD degree	
4. Participate in the setting of the business unit's goals	
5. Sufficiently informed to have a holistic view of the organisation	
6. Contribute to achievement of organisational goals.	
7. Be an active decision-maker in the organisation planning.	
RESPOND TO THE FOLLOWING STATEMENTS	**RATING**
1. Being a decision maker is not important to me	
2. I feel upset when I am not informed of an important meeting.	

3. I feel proud and satisfied if I'm asked to give my opinion on strategic issues in the university	
4. It gives me a sense of self-worth if I can help my organisation reach its goals by aligning my work with the organisational strategy	
5. If I had a choice, I would not be involved in defining organisational strategy	
6. It is important to me to be an active participant in organisational planning	
7. Being a strategic decision maker would lead to important work outcomes in my organisation	

Section Six

This section contains questions about your personal circumstances. NB: Please place an X next to your answer.

1. MaritalStatus

Never Married	Married	Divorced	Widowed	Separated	Living with partner

2. Domestic responsibilities (e.g. cleaning, cooking, care giving)

All done by me	More than 50% done by me	Shared equally with other adult family members or partner	All done by external help

3. My contribution to household

The only source of income	The primary source of income	The secondary source of income	An equal contribution to my household

4. Additional household commitment

My family is financially dependent on me	I sent some money home on a monthly basis	I sent some money home only if required	I do not send any money home

5. Encouragement from significant other/family members to build a successful career

Never	Sometimes	Often	Always

Section Seven

This section contains questions about your work circumstances. NB: Please place an X next to your answer.

EDUCATION AND WORK HISTORY

1. Total length of years in research

Less than 10 years	10 – 20 years	More than 20 years

2. Age when highest position was attained

20s	30s	40s	50s	60s

3. Highest Qualification

20s	30s	40s	50s	60s

4. Work Commitments

I have to continually work outside work hours	I work outside work hours only project require	I do not work outside work hours	I have to work outside work hours but do not

5. Stakeholder Engagement

I am required to interact with clients only during work	I am required to interact with clients outside work hours	I am required to interact with clients but select these	I am not required to interact with clients at all

hours	all the time	events	

6. Assign a total of 100 points to indicate how you allocate time spent on your various work activities

Research	Management of staff	Administration	Proposal for potential projects	Entertaining clients	Other (please specify)

RESEARCH

1. Number of peer reviewed articles in accredited journals produced

None	Less than 10	10 - 25	25 - 50	More than 50

2. Value of funding attracted though project work

Less than R10 000	R 10 000 – R49 000	R50 000 – R99 000	R100 000 – R249 000	R250 000 – R 1 million	R1 million – R2 million	More than R2 million

3. NRF Rating

A1	A2	
B1	B2	B3
C1	C2	C3
P		
Y1	Y2	
L		
Not rated		

4. Conferences attended as invited speaker

None	Less than 10	10 - 25	25 – 50	More than 50

5. Please specify any other personal or professional service you fulfil, kindly specify the position, your role and time commitment

BIOGRAPHICAL DETAILS

Please complete the following. All information will remain strictly confidential.

Name of the business unit

BE	Biosciences	MSM	MDS	Meraka	DPSS	SIIU	NRE

Previous race classification *(please mark with an X)

BLACK	COLOURED	INDIAN	WHITE	N/A

Age group *(please mark with an X)

Below 35	35 - 39	40 - 44	45 - 49	50 - 54	55 - 60	Over 60

- Past research has shown that demographic variables are important factors to consider when analysing results.
- To submit this questionnaire, please read the following sentence and then return the document to the sender.

THANK YOU VERY MUCH FOR COMPLETING THIS QUESTIONNAIRE

Appendix D

Raw Data

Table 1

Participation at strategic level

To participate in the setting of business unit's strategic objectives

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	15	36.6	37.5	37.5
No	**25**	**61.0**	62.5	100.0
Total	40	97.6	100.0	

Table 2

Understanding of organisational strategic imperatives

To be sufficiently informed in order to have a holistic view of the organisation

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	**27**	**65.9**	65.9	65.9
No	14	34.1	34.1	100.0
Total	41	100.0	100.0	

Table 3

Contribution at organisational level

To contribute to the achievement of organisational goals

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	**32**	**78.0**	**78.0**	78.0
No	9	22.0	22.0	100.0
Total	41	100.0	100.0	

Table 4

Decision making opportunities

To be an active decision-maker in the organisation planning

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	16	39.0	40.0	40.0
No	**24**	**58.5**	**60.0**	100.0
Total	40	97.6	100.0	

Table 5

Decision role at organisational level

Being a decision maker is not important to me

	Frequency	Percent	Valid Percent	Cumulative Percent
True	9	22.0	22.0	22.0
False	**32**	**78.0**	78.0	100.0
Total	41	100.0	100.0	

Table 6

Satisfaction with personal strategic inputs

I feel proud and satisfied if I'm asked to give my opinion on strategic issues in the organisation

	Frequency	Percent	Valid Percent	Cumulative Percent
True	**36**	**87.8**	**87.8**	87.8
False	5	12.2	12.2	100.0
Total	41	100.0	100.0	

Table 7

Self-worth resulting from organisational participation

It gives me a sense of self-worth if I can help my organisation reach its goals by aligning my work with the organisational strategy

	Frequency	Percent	Valid Percent	Cumulative Percent
True	**40**	**97.6**	**97.6**	97.6
False	1	2.4	2.4	100.0
Total	41	100.0	100.0	

Table 8

Active participation in the organisation

It is important to me to be an active participant in the organisation

	Frequency	Percent	Valid Percent	Cumulative Percent
True	**38**	**92.7**	92.7	92.7
False	3	7.3	7.3	100.0
Total	41	100.0	100.0	