



UNIVERSITY OF KWAZULU-NATAL

Barriers and enablers experienced by women in senior information technology positions in South Africa

By

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Dedications

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Abstract

The under-representation of women in senior and leadership positions in the IT industry has long been an issue of concern for both organisations and governments. This has led to this topic gaining global attention, which has led to studies undertaken to understand the causes of this under-representation. In South Africa we have seen efforts such as employment equality acts by government and diversity programmes by organisations that aim to address this under-representation. This study aims to understand the barriers that women encounter in their career journeys and the enablers that helped them overcome the barriers as they persisted and advanced in IT.

This study followed a qualitative research approach using open-ended online interviews for data production using a sample of fifteen female senior IT managers. This sample consisted of Chief Information Officers (CIOs), Heads of Department, and different IT managers in their areas of specialities within IT. The results of this study showed that factors such as computer access at a young age played an important role in creating a positive attitude towards IT or computer related careers. Factors such as availability of bursaries for IT qualifications and knowledge of family members about the IT careers were most likely to increase the chances of a young woman to choose an IT career. The results also showed that young women who liked Science, Technology, Engineering, and Mathematics (STEM) subjects such as mathematics were also more likely to study IT or computer related qualifications. The IT industry career stream and the support employees received from family and organisations also played a big role in determining the persistence of women in their IT career. Furthermore, mentorship and sharing of opportunities within professional networks also contributed positively to the advancement of women in this industry. The flexibility and ability to work from home were among the highlighted benefits that encouraged women to persist. Results also showed that more women were concentrated in middle management and that the career path to the C-suite level is not clear. The understanding of barriers and enablers presented in this study will guide and inform the choices women and the societies make about this industry and better position government and organisations with understanding needed in creating an IT industry that nurtures women to success.

Keywords: IT, Women in IT, Senior positions, Career barriers, Career enablers, Social barriers, Structural barriers, Career choice, Career persistence, Career advancement, C-suite

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List of Abbreviations

ICT - Information and Communications Technology

IT - Information Technology

KZN - KwaZulu Natal

SA - South Africa

STEM - Science, Technology, Engineering and Management subjects

UKZN - University of KwaZulu-Natal

CHAPTER 1: INTRODUCTION

1.1 Background

Organisations with more women occupying senior positions are found to be more profitable (Awad et al., 2021, Post et al., 2021), more socially responsible and available, and provide much safer and increased quality of customer experiences amid many other benefits (Post et al., 2021). It is amazing to see that the number of remarkable contributions women have made in the labour force and has increased over the years. This increase has been evident throughout the world (Acharya, 2021) and noticeable due to the remarkable benefits it has brought in terms of the diversity and competitiveness of the workforce (Meela, 2018). Due to possessing various skills and passions, women are tapping into different industries (Crittenden et al., 2019). Industries that have been able to utilize the contributions of women to maximum effect, have been able to also use the leadership benefits of women from managerial positions to executive levels (Hupfer et al., 2022). However, some industries seem to be less attractive to women than others. This is apparent in the smaller concentration of women and in the slow progression and minimal representation of women in leadership positions in these industries (Kong, 2022). The Information Technology (IT) industry is one of those that have failed to attract significant numbers of women and therefore women remain under-represented in this industry (Brin, 2022).

Statistics from both public and private sectors show that there is an average of 10% of female IT executives in South Africa (SA) (Meela, 2018). According to the SA Department of Employment and Labour (DOEL, 2022b) South Africa's technology industry is largely male dominated and women still remain largely under-represented in this industry. This has led to women undertaking fewer leadership roles in IT (Masheleni, 2022). This has hindered the country's ability to potentially improve female participation in the sector and has also contributed to a lack of diversification in terms of products and services produced by this industry (Kişi, 2020). Therefore, the South African government has initiated a variety of women empowerment programs and made amendments to the current legislation, such as the promotion of the Equality and Prevention of Unfair Discrimination Act of 2000 and the Employment Equity Act of 1998 (Mula, 2014).

Though the concentration of women in the IT industry is low and progression to upper levels of the career ladder slow, it is significant that women can thrive and succeed in the IT industry because of the presence of the few that are climbing and those already at the top of the ladder. One of the barriers influencing the under-representation of women in IT are gender-stereotypical biases in the industry, which are experienced by women throughout their IT careers – from hiring departments to teams and boardrooms (Kişi, 2020).

Dennis and Aizenberg (2022) suggest that embedding of artificial intelligence (AI) in HR through AI algorithms and procedures within human resources (HR) will surpass traditional recruitment techniques and make provision for diversity increase while reducing the bias of human. This study aims to provide visibility and a better understanding of enablers and barriers experienced by senior women in their IT career journeys. The outcome therefore envisioned from this study will be to better understand the forces helping and hindering women in the IT industry as well as what influences them and how they are impacted while trying to work in IT.

South Africa has been recognised by the World Economic Forum as one of the top upward movers among the sub-Saharan African countries in terms of leadership in digital adoption and innovation (Baller et al., 2016). The report further highlights that, while these efforts are government-driven in the other African countries in sub-Sahara, in South Africa it is the business sector that provides most of the momentum. The ICT sector continues to grow from a nascent industry into one of the country's leading sources of employment and major contributor to Gross Domestic Product (GDP) (MICTSETA, 2022). However, despite the IT industry growth in South Africa, this growth has failed to attract more women into this industry and has largely neglected women since most top executive jobs are dominated by men (BusinessTech, 2022) and 70% of IT jobs overall are still held by men due to societal influences that hinder women's ability to obtain top executive positions (Crittenden et al., 2019). Countries like Ghana, India, Brazil and South Africa have been struggling to integrate female professionals into different sector's various IT related programs both in the private and the public sectors (Crittenden et al., 2019). Unlike other developing countries, South Africa has a slow-moving IT sector in terms of skills, education level and infrastructure (Crittenden et al., 2019). Despite efforts, most young females in the country do not have computer access at a young age and struggle to use IT related products and software (Kişi, 2020). This has hindered the country's ability to potentially improve female participation in the sector (Kişi, 2020).

1.2 Problem statement

Gender inequalities are rampant in the workforce when it comes to salaries, ranks and access to leadership positions (Elliott and Blithe, 2021). These inequalities are prevalent in the IT industry, hindering the increase in the proportion of women in the IT industry. Women continue to be under-represented in the IT industry in South Africa, from entry positions to top management, despite the majority of the country's population being women (Statssa, 2021). The IT industry has been traditionally associated with masculinity because of the dominance of men in this industry and therefore it has failed to attract women and has discouraged young girls from participating in this discipline (Jung et al., 2017). Ahuja (2002) also identified almost two decades ago that the IT industry has failed to attract and retain females in IT occupations. This has resulted in a lower number of women in IT industry. A majority of IT female professionals have played a limited role in the designing, developing and management of IT-related projects. Female professionals in this sector have cited the existence of stereotypes that has hindered their ability to add value to IT related products and services (Oluoch and de Keizer, 2016). IT female professionals have faced systematic challenges in their attempts to add value to IT products or services (Acharya, 2021). This has raised major concerns of competitiveness and diversification in product and service solutions delivered in this industry. Because of this perception of IT being a hostile environment for women, only a few women are able to break through to the senior to executive positions in this industry (Kişi, 2020).

1.3 Overview of literature

The following section will provide a sense of the current status of women in the IT industry in South Africa. Furthermore, the social barriers experienced by young girls when choosing IT as a career, as well as the challenges and enablers experienced by women when persisting and advancing in the IT industry are introduced.

1.3.1 South African Women in IT

South Africa currently faces a shortage of female professionals who are skilled in IT, E-Commerce and Computer Science. Comparisons between South Africa and other developing countries like Ghana, Brazil, Mexico and India show that the country has made just a 2.3 % increase in female leaders since 2014 (Crittenden et al., 2019). Unlike Mexico who had a 8.6 % increase during the same time period; Brazil and Ghana who showed a 10.6% increase since 2014 respectively; and countries like Egypt and Botswana who reported to be experiencing shortages in areas such as Accounting, Engineering and Data Management where more investment has been made in Maths and Science (Okpaluba and Budeli-Nemakonde, 2020).

This under-representation in the IT industry is irrespective of the ethnic groups, the low access to computers by young African girls is one of the barriers experienced by young girls in terms of their career choice in IT (Okpaluba and Budeli-Nemakonde, 2020).

Edmans (2018) cited a positive correlation between female executive positions in the IT industry and higher operating margins for their respective organisations and thus a greater return to shareholders. The study was based on companies who had taken measures to ensure female participation in Computer Engineering, Information System Technology and Computer Science. The lack of gender and skills diversity in the IT industry is concerning given that according to research this diversity creates diverse perspectives which increases competitiveness, innovation and productivity (Edmans, 2018).

1.3.2 Influence of Social Factors on the Career choices made by Female IT Executives

A study by Okpaluba and Budeli-Nemakonde (2020) found that even though females had lower chances to have access to computers and the Internet in most developing countries, this is due to the lack of IT infrastructure to facilitate an engagement with computer activities. The investigation also found that young females were less likely to pursue programming, gaming and Internet surfing. The final results reported differences in students' beliefs regarding computers compared to their peers if they have access to parental support. The boys showed a much more positive belief in the value of computer learning and were likely to be supported by their parents in the use of computers. This study concluded that parents' support was the most vital aspect for both boys and the girls, which suggested that the anticipations of parents expressed to their children, is a more important predictor of children's belief in the value of computer learning. Chengadu and Scheepers (2017) stated that the lack of integration does not mean women do not possess the necessary abilities or skills to perform tasks but is a sign of the stereotypes and assumptions when it comes to female IT professionals. A common problem is that the women possessing IT positions continues to decrease thereby reducing the value added by these professionals and reducing diversification of products or services (Oluoch and de Keizer, 2016). The scarcity of female IT professionals also reduces the visibility of role models available to young girls who may want to pursue IT careers or even young female IT professionals starting their careers in the IT industry. The section below discusses the challenges faced by women and the enablers for persisting in the IT career.

1.3.3 Barriers and Enabler to Women Persisting with IT Careers

A lack of role models poses a barrier at the decision-making phase of a woman's career choice. The availability of role models can encourage and steer them in one direction or the other (London, 2014). While male professionals are expected to pursue more masculine career paths such as bricklaying and Computer Engineering, the IT career may seem less attractive to women, due to work-family conflict. This may be a possible source for occupational stress as employees are required to work late in this industry (Crittenden et al., 2019). With most IT jobs employees are expected to work long hours and be ready for a work-related call whenever problems occur. The presence of role models is regarded as instrumental in directing members of the society in their career paths and set the tone for their expected behaviour in society (Kişi, 2020). The presence of role models often provides evidence of their success in different fields (Kişi, 2020). Some IT occupations require travelling, and research has shown that many female professionals are unwilling or unable to do so because of family commitments (Crittenden et al., 2019).

1.3.4 Barriers and Enablers to Women Advancing their Careers in IT

Organisational structure is among the key contributors to the success or failure of IT female professionals. These structures are normally responsible for the hierarchy found in these organisations. Competitiveness in the IT industry does not allow organisations to adjust their hierarchy to accommodate women leaders (Subramanian, 2019). These traditional hierarchies have contributed to the continuous decline of female executives in the IT industry since organisations' structures tend to hinder the progress of middle managers, who are mainly female managers, thus hampering the advancement of women holding IT leadership positions. Even though women in the technology industry hunger to learn, they still face challenges such as limited networking opportunities and lack of strong professional networks (Subramanian, 2019). One of the challenges that female workers in the sector face is a balancing act between work and family related issues. This is due to the lack of IT infrastructure that could be used to help facilitate the development of female workers in the sector and also improve participation of female employees at a young age in the sector (Erçetin and Bisaso, 2016).

1.4 Statement of Purpose

This study will focus on career barriers and enablers women in senior IT positions in South Africa had experienced throughout three different career stages. A model by Ahuja (2002) of social and structural determinants in women's career choice stage, persistence and advancement stages in IT is suggested as the

theoretical framework for the study. Access to computers will be added to the model in the “career choice” stage as the result shows that in South Africa the scarcity of computer access for young girls is one of the factors that contributes to IT not being attractive to females. This model will be used to assess the impact of structural and social factors and how they affect women in their IT career journeys. These social and structural factors affect each stage from when IT is chosen as a career, to when a female is working in the IT industry and is focused on persisting, as well as advancing, in the industry.

1.5 Research Questions

The under-representation of women in IT positions suggests that there are factors influencing women choosing to enter, remain, and advance in IT careers. The following are thus suggested as the research questions for the study.

- a) RQ1: How do social and the structural factors impact the career choices of women in IT management positions?
- b) RQ2: How do social and the structural factors impact career persistence of women in IT management positions?
- c) RQ3: How do social and the structural factors impact the career advancement of women in IT management positions?

1.6 Research Objectives

This research aims to investigate career barriers and enablers experienced by women in IT senior positions in South Africa during different career stages, in order to provide IT solutions that deliver on the needs of a diverse South African and global population. The objectives are:

- a) RO1: To investigate how social and the structural factors impact the career choice of women in IT management positions.
- b) RO2: To ascertain how social and the structural factors impact the career persistence of women in IT management positions.
- c) RO3: To identify how social and the structural factors impact the career advancement of women in IT management positions.

1.7 Overview of Methodology

Case study research was chosen as a research strategy for this study using the qualitative research approach. In-depth interview questions were used to obtain sufficient data during the data production phase. Transcripts were produced for every interview to help identify the patterns and common themes. NVivo software version 12 was then used to analyse the data and create data themes (Dalkin et al., 2021). This study used thematic analysis to classify data, using the themes created.

1.7.1 Research Design Approach

This study used an exploratory research design to present richer insights with deeper understanding of barriers and enablers to female executives holding IT positions in South Africa based on the experiences of women who have reached senior managerial positions in IT. This exploratory research study sought to gain knowledge and experiences of and perspectives on women's ability to hold top executive positions. The patterns and themes were then observed and interpreted in answering research questions.

1.7.2 Research Philosophy

For this study an interpretive research philosophy approach was used because the research questions are formulated to obtain data according to the experiences of participants in the IT industry throughout their career journeys. According to an interpretive research philosophy, participants are experts in their own experiences (Emery and Anderman, 2020). A qualitative approach was used for this study because of its ability to provide detailed interpretations, richer insights into, and better outcomes on the phenomenon (Mark and Smith, 2018). Saunders et al. (2019) argues that a qualitative research approach is based on interpretive philosophy.

1.7.3 Sampling Method

This study employed non-probability sampling. This method was chosen because the study did not have sufficient information on the state of women in IT (Vehovar et al., 2016). Due to the scarcity of participants for this study, the researcher employed a snowballing sampling method as we relied on referral from the participants (Parker et al., 2019). This sampling method was used for this study due to the actual number of female IT professional who hold key positions in the industry being unknown. Non-probability sampling method was chosen because research participants needed to be selected on specific criteria rather than at random and to be based on the issue of issue of non-generalisability as a feature of qualitative research.

1.7.4 Target Population and Sample Size

In this study, the target population were females in senior positions, from team leaders to executives, in the IT sector who are based in the Gauteng and KwaZulu-Natal provinces of South Africa. The selection criterion for research participants was women currently working for companies that are listed on the Johannesburg Stock Exchange (JSE). Since the number of women who are seniors and hold IT, executive positions is unknown, the researcher used the rule of thumb to derive the appropriate number. The rule of thumb states that, when using interviews, satiety is reached at between 20 and 30 interviews (Bazeley, 2013). The limitation for this study is a small population size. Therefore, the researcher aimed to conduct 20 interviews on the identified target population and achieved 15 interviews.

1.7.5 Study Site

The data collection was initially limited to Gauteng as the cost of travelling to interviews was a limitation. However, due to the pandemic and Covid-19 rules of social distancing the interviews were then completed via Zoom meetings. The study site was then extended to KwaZulu-Natal because some people targeted for participation had relocated during COVID-19 as most companies allowed people to work from home. However, the majority of the participants were from Gauteng, which is the province where the researcher is current residing. The City of Tshwane, Durban Metropolitan and City of Johannesburg Metropolitan municipalities were included in the study area. Gatekeeper letters were signed and sent electronically using emails.

1.7.6 Data Collection and Analysis Methods

This research employed the semi-structured interview technique because of its flexibility and the ability to provide in-depth information on the issue at hand (Kallio et al., 2016). These interviews were done via Zoom due to the limitations created by the global pandemic. These interviews were between 30 and 35 minutes long. This study employed the thematic data analysis technique. NVivo version 12 was used for this research as this software allows the researchers to analyse and organise non-numerical and unstructured data. Thematic data analysis technique is described as a data analysis method in a qualitative research approach used for discovering, analysing and reporting on themes or patterns within the data (Bazeley, 2013, Kiger and Varpio, 2020).

1.7.7 Ethical Requirements

The researcher made sure that the data collected is safe and secured at all times by ensuring that the computer storing the data was password protected. The data was only collected from the research participants whose organisations had signed the gatekeeper's letter. The data collected was used solely for

this research. The gate keeper's letter issued together with the interview questions were sent to the Humanities and Social Sciences Research Ethics Committee of the Ethics Board of the University of KwaZulu-Natal to request approval to conduct the study. Upon the approval of the request, the university committee then gave the researcher an ethical authorisation letter granting the researcher the right to conduct the interview (Protocol reference: HSSREC/00002043/2020, see Appendix 4).

1.8 Rationale and Significance

This study will add to the understanding of challenges and barriers to women's ability to advance their careers in the IT industry. This understanding may contribute towards the South African government's drive to improve representation of women in IT at executive levels and put in place measures to dissolve barriers currently preventing women in progressing in the organisations' leadership ladders. The Employment Equity Act is one of the policies and legislative measures put in place by the South Africa government (Sewchurran, 2020). The findings of this study will also be of great help to learners in high school and University students by providing them with insight and valuable information to make informed career choices. The visibility of social and structural barriers will give guidance on the existing biases to other females both in high schools and in junior positions. The visibility of social and structural barriers will articulate behaviours that female IT professionals need to adopt to advance in their career in IT. The visibility of structural and cultural enablers will assist other IT female professionals and learners with interest in IT with ideas on what could also enable them in the IT industry. The findings will also provide knowledge and insights into the situation of women in IT that could help to better equip businesses to nurture and support women in IT roles, and hence create an environment of ease and acceptance for women where they can thrive and succeed. The benefits of having a diverse workforce and the inclusion of women in IT managerial positions to develop competitive solutions highlighted in this paper will encourage managers and executive of companies to promote women to senior and decision-making positions to ensure competitive IT solutions.

1.9 Role of the Researcher

The researcher is studying her master's degree in IT. The researcher is also an employee performing a senior role as a Data Analyst Modeler in IT within the banking industry in South Africa. The researcher performed the one-to-one interviews, took handwritten notes and voice-recording and transcribed the interviews for the data analysis process. The researcher does not believe that there are IT roles that men can perform better than women. The researcher also believes that women are not given equal chances as men to be leaders, not only in IT, but in almost all professional roles. The researcher believes that if women

were given equal chances to lead in IT, the industry would see more innovations and inventions that could change how things are done and the industry can see more transformation such as diversification of products. The diverse perspectives in the top positions could lead to more healthy competition that can benefit the economy at large.

1.10 Limitations

Although the findings will provide knowledge and insights into the situation of women in IT that could help to better equip businesses to nurture and support women in IT roles, this study does not guarantee an organisation will be able to use these findings to create an environment of ease and acceptance for women where they can thrive and succeed. Women's situations are not always the same, including family conditions, the work environments, and the policies that are in place. Therefore, if something is an enabler for one woman it does not mean it will be equally effective for all women. Not all ethnic groups were represented, as none of the participants belonged to the Coloured ethnic groups. The data collection took place during the pandemic where activities like travelling was banned in the country and all participants were working from home. Therefore, responses to questions related to travelling activity might not reflect the true picture. Similarly, responses to questions associated with variables such as occupation, culture and work-family responsibilities might have been constrained due to the pandemic which found people working from home.

1.11 Organisation of the Thesis

This dissertation consists of six chapters. The first chapter is an introduction to the whole dissertation which gives the context for the topic that is being researched and the current problem that triggered a need for this study. A short introduction to the literature is presented at a high level and then further presented in detail in the second chapter. Chapter two states what literature is available in relation to the study topic. The first section in this chapter discusses the role of women and diversity in IT, the second section discusses takes a global perspective on women in IT, and the third section discusses career barriers and enablers experienced by women in IT. These are broken down into social and structural factors as they are aligned to the conceptual framework used in this study. The following sections talk about the South African context of the global phenomenon, IT education in South Africa and the role of IT in the South African workforce. The final sections present the theoretical framework of social and structural barriers experienced by female IT professionals in senior IT positions, focussing on the theory by (Ahuja, 2002). The chapter is then concluded by a summary of the chapter.

The third chapter, which is the research methodology, provides the overall design of the research. The research onion device is used to frame the methodology that was followed to produce the data needed to answer the research questions and the qualitative research approach was followed. This chapter also explains the data production and analysis. The fourth chapter, which contains the findings, presents the results that were found in this study. The fifth chapter discusses the analysis and synthesis of the analysis that was performed on the data produced during the interviews. The sixth chapter discusses the conclusions of the study and based on the current findings, the recommendations for future research is provided. It also discusses the limitations that were encountered during the study.

The following review will be based on the three pillars of the Ahuja framework, namely, career choice in IT, career persistence in IT and career advancement in IT career. These pillars will be used to guide the review and give direction to the study, including highlighting challenges faced by female workers.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This study's literature review will be based on information collected and derived from secondary sources, including academic articles, books, and journals. This information is used to facilitate the development of in-depth literature and interview questions with the help of the study's theoretical framework. Furthermore, this review will highlight women in the IT industry using a global perspective. This chapter begins with a section that discusses the role of women or the significance of diversity in IT. The second section presents literature on women in IT from a global perspective. The third section discusses the influence of structural and social factors affecting young girls and female IT professionals as they embark on and grow in their careers within the IT field. The fourth section discusses the global phenomenon within a South African context. This fourth section is broken down to two sections, namely, IT education in South Africa, and the role of IT in the workforce. The literature review will also look at available enablers that help women overcome barriers as they persist and advance within IT careers. The last section is the theoretical framework for this study.

The term "C-suite" is introduced in this literature and is used interchangeably with "executive" in this thesis. C-suite is described as a term used to signify the senior executives that are considered most important in an Organisation, by the different Chief X Officer (CXO) titles, where X stands for a certain domain e.g. sustainability, human resource, communication, data, innovation, etc., thus Chief Sustainability Officer, Chief Communications Officer, and so on (Alvarez and Svejnova, 2022).

Google Scholar was the primary source location for the literature used in this study. Academic articles, theses and books were searched using the strings "barriers in the IT industry", "Ahuja", "tech industry in South Africa", "tech industry in South Africa", "digital divide in South Africa", "inequality in South Africa", and "female executives in IT industry South Africa". Secondary sources such as articles from big tech companies were also used and a similar search was applied in the main Google page.

2.2 The Role of Women/ Diversity in IT

The participation of women in the workforce creates gender diversity. In the IT industry diverse teams perform better (Post et al., 2021) and are more innovative. Many technology, media, and telecommunications industry leaders are recognising that diverse workforces and executive teams are good for business (Hupfer et al., 2022). Women's participation in the IT workforce creates competitiveness in the IT workforce and allows women to take up leadership positions giving them voice for decision making

in this industry (Acharya, 2021). This participation also allows the diversification of products and services produced by this industry (Kışı, 2020). Organisations that have females leader are open to change and are less risk seeking (Post et al., 2021). A study was conducted to see what made organisation with females in senior management and C-suite roles perform better compared to those that did not. The results showed that (i) Organisations with females in their senior and C-suite leadership roles grew in embracing transformation at the same time decreasing risks associated with it; (ii) upon adding women to C-suite positions, organisational strategies moved from a knowledge *buying* approach associated with masculinity and a proactive approach, to knowledge *building* strategies which is more traditionally feminine and a collaborative approach; and (iii) the more effectively the new females senior managers were able to quickly find their feet into the organisations, the greater the influence they were likely offer when it came to decision making (Post et al., 2021).

However, research has shown that female leaders face challenges communicating their ideas to their male counterparts (Coston, 2020). Globally females continue to be under-represented in leadership positions, despite the research shows that companies that have female leadership continue to do much better (Kong, 2022). According to Kong (2022) “women tend to support more diversity and inclusion initiatives, as well as mentor their teams, in comparison to their counterparts in their roles, creating a better culture and work environment for all”. Kong (2022) further stated that women tend to support the employees and pick up additional responsibilities above their responsibilities, growing the value to the company that they work for and making improvement to the culture around them. She argued that if companies could recognise the contributions women are making to the tech workforce and understand what a necessity for them is to succeed, it will ultimately benefit their female employees and the companies as a whole. According to Burns (2021), female leaders are up to twice as likely to spend significant time on Diversity Equity and Inclusion (DEI) work above their formal job responsibilities; and these include additional responsibilities like those of mentorship, organising charitable programmes and the volunteer efforts in promotion of the company’s mission. The participation of women in the diversity, equity and inclusion (DEI) programmes helps companies in getting preferences as companies to work for as the study by Lenovo and Intel found that professionals now take into account company’s DEI policies and performance in their decisions about roles to pursue (Hupfer et al., 2022). Most large tech companies are releasing annual diversity reports outlining their strategies and performances (Hupfer et al., 2022).

2.3 Women in IT: A Global Perspective

Despite the growing industry attention on under-representation of women on boards of directors and in C-suite roles, research shows that little has changed when it comes to the representation of women in these positions in the US (Brin, 2022). In the US almost half (47%) of the workforce is made up of women, but they hold 28% of the leadership positions in IT (Awad et al., 2021). In 2021 57% of professional occupations were occupied by women in the workforce in the US while 26% of professional computing occupations were held by women. This source also reported that 13% of Chief Technology Officer (CTO) positions were held by women in 2020 (NCWIT, 2022). A survey on US firms found that 70% of U.S. firms responding to the survey did not have any women on their boards and that more than 54% do not have female executives in their organisations (Brin, 2022). The research by the Peterson Institute for International Economics showed firms where 30% of leaders are women have a 15% increase in profitability (a net profit margin that is more than 1 percentage point higher) compared with similar firms with no female leaders (Awad et al., 2021).

A study of 750 tech leaders where 70 were females, found that there was no ambition gap as the results showed that similar percentage of females and males – 63% and 67% respectively – reported that they were trying for promotions (Awad et al., 2021). More women cited that early promotions were crucial. Women looked at the risk that came with promotions or new roles differently compared to men. Women saw their technical skills as crucial for their career progress compared to men. Although both men and women female survey participants agreed that changing job roles was a powerful contributor for their career advancement in IT, results showed that men were more likely to change positions than women which could explain the salary inequalities by gender (Awad et al., 2021).

The current working environments in most IT department and organisations have not taken into account challenges faced by female professionals. They typically spend significantly more time, effort and resources developing female professionals who have the requisite skills to obtain C-suite roles in this sector but disregard the barriers that make this industry unaccommodating to women (Coston, 2020). The lack of diversity has decreased the number of females interested in diversifying and differentiating the approach taken in developing ITS systems. The IT industry has shown a preference for male executives with the perception of them being better leaders (Appianing and Van Eck, 2015). Brin (2022) also found that male-founded organisations are more likely to have female heading only the HR departments, rather than holding any other leadership positions in their organisation. Kong (2022) testifies to this under-representation of women in her paper where she reported that 73% of STEM workers in the US are male. Despite these gaps, the efforts are evident that women are gaining interest in STEM careers and some organisations have

implemented diversity, equality and inclusion programmes to encourage the participation of women in technology. However, the slow progress in the growth of women in this industry suggests that there is a leak in the pipeline. In the section below we observe the barriers that are experienced by women in senior IT positions.

2.4 Career Barriers and Enablers Experienced by Women in IT

The IT industry has seen a growth in the women over the years and most organisations have responded positively to the need for gender diversification in their organisations, as researches have shown that this diversification can contribute positively to the organisations (Hupfer et al., 2022). However, this growth has not been without challenges as organisations continues to report high employee turnover, and as more and more cases of gender discrimination surface and the under-representation of women in leadership positions in this industry continues (Kong, 2022). One of the most common issues reported by female tech professionals is the issue of inequality. One IT study that was done surveyed 450 IT professionals with 66% of them were identified to be women (TrustRadius, 2021). The study uncovered a number of challenges faced by women in this industry (TrustRadius, 2021). The main challenges highlighted were gender inequality issues and the barriers to promotion of women in this industry. The results showed that 78% of women in tech felt that they needed to work harder than their male colleagues to prove their worth (TrustRadius, 2021). The research reported that 72% of women mentioned that they are always outnumbered in meetings by the ratio of 2:1, while 26% of women reported being outnumbered by 5:1. The study also found that women in tech are more likely to see gender bias as one the obstacles and a barrier to promotion (TrustRadius, 2021).

The IT industry offers a variety of career paths for female professionals looking for careers in web design, software development and business analysis, to name a few. These career paths offer unlimited potential for developing quality executives (Erdag and Can, 2019). However, with the high under-representation of women in this industry this means that women are not tapping into the full potential that this industry offers, which suggests there are barriers to attract, retain and promote women in this industry (Kişi, 2020). Coston (2020) explained the existence of barriers to the development of female executives in this sector. These barriers include unfair labour discrimination and absence from key strategic decisions. Underdeveloped information systems typically do not possess diversified products, services, procedures, and management systems that can utilize the value added by female professionals. Both authors agreed that these underdeveloped information systems lack the cultural transformation needed both in society and in the workplace and that they have not capitalised on the training necessary to further the agenda of women in IT. This lack of cultural transformation both in society and in the workforce not only affects social norms

but also perceptions towards female executives currently working in this sector. Erdag and Can (2019) further stated that lack of cultural transformation in IT industry has increased stereotypes about the industry being associated with masculinity hindering promotion of women to executive positions. Ahuja (2002) suggests that there are two types of barriers that are experienced by women in their career journey in IT and these barriers are discussed in the two sections below.

2.4.1 Social Factors

The existing social norms and the imbalance of the past have restricted women in South Africa from pursuing education, training and employment (Spaull, 2013). Even though figures of women holding IT qualifications has increased in countries like Kenya, South Africa still shows a low percentage of women entering tertiary education with the aim of pursuing IT qualifications (Spaull, 2013). The Center for Women for IT, Engineering and Computer Science Report stated that the number of women holding computing occupations showed an increase in positions such as computer support specialists, computer scientists, system analysts, network and computer system administrators, and computer hardware engineers from 2018 to 2019 (NCWIT, 2021). This showed an improvement in the IT industry and have had some positive results, a lot still needs to be done to make sure women in STEM disciplines are provided equal opportunities as their male fellows. While changes in demographic in the workforce may reduce these disparities as time goes on. Coston (2020) argue that leadership roles or positions should proactively strive for gender parity on their management boards. Often organisations do not take into consideration the importance of diversifying computer related programs and hardware at a young age (Ahuja and Katila, 2004). This can include customised computing platforms suited for female workers and education programmes centered around female participation.

According to Kişi (2020), historically women and other marginalised groups have been operating under oppressive bureaucrat systems in the IT industry. These bureaucratic systems have stifled workforce diversity and prevented further skills development in this industry. This form of subjugation has led to various aspects of social thinking which has created workforce stereotypes not only in the IT industry but also in other industries such as finance and retail (Kişi,2020). Due to this fact, the US in the past 20 years has recorded a decline in women pursuing computer related qualifications such as IT and Computer Engineering while participation of women in the IT workforce has shown slow progress and extremely low representation in IT leadership positions (NCWIT, 2022). The below sub-sections discuss the variables that according to Ahuja (2002) would affect women in their IT careers.

a) Computer Access

There has been a growth in the use of ICT in South Africa among young girls and boys both at school and outside school environments (Chisango and Marongwe, 2021). The digital divide is described as "a social inequality between individuals regarding access to ICT, frequency of use of technology, and the ability to use ICT for different purposes" (Chisango and Marongwe, 2021, p. 19). This divide became more apparent in South Africa following Covid-19, which found schools and teachers turning to technology for learning. The use of ICT, such as the Internet, allows teaching and learning to continue even outside a classroom. According to Chen (2015) the use of mobile technology devices such as tablet or a cellphone can motivate, maintain conversations, and provide seamless learning experiences. Connection to the Internet, on the other hand, enables greater and reasonable use by learners. The author further stated that the digital divide is more prevalent within schools in developing countries. The capability to use ICT is a vital competency among learners and teachers since it acts as an enabler of teaching and learning (Chen, 2015). However, Chisango and Marongwe (2021, p. 151) expressed that "the digital divide is deepening where it has stopped widening." In other words, the digital divide may continue to exist even post access to ICT infrastructure if skills are not present to efficiently benefit from the ICT. The existence of ICT infrastructure does not guarantee or reflect that an individual possess the ICT skills and/or is making use of the infrastructure (Chisango and Marongwe, 2021).

Deputy Minister of Higher Education, Buti Manamela stated that a move by schools and institutions of higher learning to online teaching would disadvantage students from poor backgrounds. The minister further urged that students should not be disadvantaged and that students who have no study gadgets or access to Internet should not be treated as if they have them because of #Covid-19 (Chisango and Marongwe, 2021). The deputy minister feared that by having schools move to online learning, the digital divide would expand, as this was going to deprive learners and students from disadvantaged backgrounds of similar access to education as those from privilege backgrounds. Individuals who are most excluded from the advantages of advances in ICT are situated in rural areas in developing countries (Chisango and Marongwe, 2021).

A study on digital adoption among low-income families in India (a developing country) found that children from poorer homes will have low chances of accessing Internet data and a high rate of sharing digital devices within families. In contrast, children from high-income homes will have high chances of accessing Internet data and a high rate of personal device ownership (Bhatia et al., 2021). Computer access is directly related to the economic background and the socio-economic status of an individual. Individuals coming from families with high income are more likely to have more than one good quality digital device, while

those with coming from families with low income most probably own poor quality ICT devices that may malfunction (Van Deursen and Van Dijk, 2019). Furthermore, those from low incomes families are most likely to have limited Internet connection using a smartphone only, while those from high income families have a high chances of unlimited Internet connection using multiple ICT gadgets such as smartphones, laptops and personal computers (Tsetsi and Rains, 2017). Students with high-income parents are more likely to have both access to and use ICT at home as compared to those with parents that have low to none income (Chisango and Marongwe, 2021).

A good quality education can serve as a strong foundation for career advancement in IT, women that possess higher degrees and certificates can greatly enhance their careers in IT (Crittenden et al., 2019). Investing more in computer literacy and confidence allows young girls to grow leadership and IT capabilities which are critical to the success of female professionals looking to grow in this sector (Ahuja, 2002). However, factors such as the economic divide in South Africa will likely affect the access and adoption on ITC for young girls and women in South Africa, which will then affect the participation and advancement of women in the IT industry.

b) Work-Family Conflict

Jaga (2020) indicated that women in IT face challenges when trying to balance between family and work. Women's participation has been largely motivated by the need to showcase their work in order to be considered for managerial roles. This industry still faces workplace uncertainty and instability as a consequence of certain projects that require long working hours to complete. Sustainable work and family balance would be difficult to achieve because of the unwillingness to accommodate female workers who have to raise families. According to Anwar and Graham (2022) the Bank of Ireland has recently launched a campaign to inspire young women throughout Africa in the field of communication and technology. The campaign is aimed at inspiring young Computer Engineers, business analysts and IT specialists in the field of communication Anwar and Graham (2022). Work-family conflicts have also been found to affect an employee's work performance and working mothers are usually asked if they can cope with holding a higher position and being an active parent. Supportive networks such as spouses continue to play a key role for working mothers who are obligated to work irregular hours or night shifts (Porter et al., 2021). IT is a demanding career and may affect family life because of long working hours required by the job, constant learning of new skills and for some jobs being on stand-by to wait for an emergency.

c) Social Expectations

According to Ahuja (2002), “social expectations” are described as social factors that are entrenched in cultural values both consciously or instinctively and are seen in behavior. The author suggests that these ideals play a significant role in influencing the values and expectations one believe about themselves. In their formative years different signs are given to girls and boys by the society. Boys will be more likely to be encouraged to use computers both at school and home as compared to girls who will be less likely to be sent to computer classes (Ahuja, 2002). Vekiri and Chronaki (2008) stated that parents and peers are more likely to have views of computer use that are gender-stereotyped and different expectations of young boys and girls. A study was done to explore relations between computer experiences outside school, the perceived social support children received for using computers, self-efficacy and value beliefs about computer learning using a sample of 340 participants that were boys and girls from the Greek elementary school (Vekiri and Chronaki, 2008). This study found that, although results showed that both genders cope equally well with the IT curriculum, boys reported greater perceived support from their peers and parents to use computers and positive and higher computer self-efficacy including value beliefs compared to girls (Vekiri and Chronaki, 2008).

An ethnographic study, which was aimed at producing an understanding of the experiences of Indian female students in Computer Science and Engineering (CSE) found that boys and girls were equally exposed to computers during their middle and high school education. The study also found that families and communities did not socialize girls and steered them away from believing that math and science were associated with masculinity (Saxena, 2021).

Another study examined the ways in which young girls from under-privileged backgrounds in low-income communities exercise their independence and agency in using digital technologies and, at times, show submission with social norms when they are online (Bhatia et al., 2021). The research took place in India (Bangalore, Delhi, and Mumbai) and the 25 participants were young girls of age between 13 and 16 years. This study also found that for some families, access to social media platforms was dependent on both age and gender. Some participants reported that there were severe restrictions on what they could do or share online. The study revealed that some parents did not allow their children to have access to social media platforms. However, the results also showed that some participants had found ways to circumvent these norms by using browsers to login to their social media accounts without installing the applications (Bhatia et al., 2021). According to Bhatia et al. (2021) most participants in these low-income families believed that good girls did not go online. This coincided with Ahuja’s (2002) paper where she stated that most girls were less likely to be encouraged to use electronic devices as compared to boys. The author further stated

that the low access to electronic devices may negatively influence attitudes and that the attitudes they have about using a computer will influence women against choosing and persisting in the IT careers.

d) Informal Networks

Informal networks is considered as important in the persistence and advancement of one's career (Ahuja, 2002). These informal networks provide multiple purposes, which range from finding out information about the opportunities in organisations to socialisation in the organisational culture (Malmi and Brown, 2008). For example, these networks could provide exposure for a protégé to potential mentors. This section looks at the characteristics that directly affect women's ability to network in order to further their careers in IT (Malmi and Brown, 2008). These characteristics include interacting with different stakeholders and the use communication mediums such as blogs and social networks (Malmi and Brown, 2008).

Women have limited access to networks and contacts as a results of an industry which is predominantly dominated by men (Huxhold et al., 2020). Their study also explained how female workers have limited access to networks and contacts needed to further their career in technology orientated industries like IT and E-commerce. As a result, this industry has been predominantly geared towards male professionals. Companies in the IT industry have had challenges developing and promoting informal networks that can accommodate female workers due to their limited understanding of the challenges faced by female workers (Rogan and Reynolds, 2016). Unlike their male counterparts, female executives are required to create informal networks on their own and learn to navigate existing social networks in order to access the opportunities offered by this sector (Piggott and Pike, 2020). Informal networks in IT allows large organisations to share ideas, solve existing industry or work related programs and provide technical expertise (Piggott and Pike, 2020).

Communication between executives in these networks reveals a high level of trust that is built throughout the career of those particular professionals (Okpaluba and Budeli-Nemakonde, 2020). Furthermore, constant communication between executives allows managers to navigate organisation success ladders easily and through relationships that they have established with professionals and industry leaders (Chavare and Kasmi, 2017). Understanding how informal networks operate in the ICT sector is essential since it can assist managers to identify the strengths and weaknesses of their own systems. Huxhold et al. (2020) identified two methods by which informal networks can be used to develop, advance and facilitate the development of soft skills needed to navigate the IT industry. IT practitioners and specialists must stay up to date with trends in the industry in order to improve soft skills such as communication, team skills, time management and business tech liaison (Chavare and Kasmi, 2017). Without these skills, it is unlikely that

female executives will be able to further their careers in the IT industry. Chavare and Kasmi (2017) also suggest that seeking other certifications and business functions will enhance the skills and experience for female workers in the industry (Briggs, 2017).

2.4.2 Structural Barriers

The ICT sector has been witnessing an increase in women executives, mostly in smaller organisations and start-ups founded by women (Shetty, 2017, Post et al., 2021). Despite some transformation, there are not enough women in high levels of IT in organisations (Shetty, 2017). This is a result of the organisational “glass ceiling” that has consistently and further explained that low rate of appointment of female leaders in ICT companies. To see change, there needs to be a commitment to reach the goals set out when a need for transformation is identified in the department. Companies that have increased the number of women in executive and leadership roles have shown a boost in both performance and revenue (Shetty, 2017). Kong (2022) also found that tech organisations with leaders also tend to increase productivity by creating an environment where everyone feels valued, supported and is encouraged through their support of the DEI programs and embracing transformation. Companies tend to be more open to change and less risk taking after female leaders have joined. This study suggests that the more companies became appreciative of change and higher level of risk aversion, large returns on investments were seen for their organisations (Post et al., 2021).

South Africa appears to have had a masculine bias to their recruitment and retention policies. Strategies used to recruit and retain employees appear to hinder women from staying in companies or entering altogether (Dugard, 2015). Companies affected by the legislation proposed by the government have seen pressure that required them to comply with policies that have been put in place or face fines and penalties. Dugard (2015) stated that there has been stereotypical discourse where women hold the perception that being feminine is incompatible with working in the IT environment. The author further speaks to the belief that long working hours are acceptable for men only. Female professionals on the other hand have ‘controlled’ access to time and often there is a predetermination of how their time should be used. Women who work long hours are by default deemed as neglecting their duties in their homes (Briggs, 2017).

Companies often struggle to attract and retain top female employees (Hupfer et al., 2022). Ahuja (2002) describes structural factors as organisational structural barriers that hinder women’s progress in the IT industry. Table 2.1 below shows a concept matrix that has been created for this study showing barriers and enablers experienced by women as they choose to pursue, persist and advance in IT. This matrix shows barriers and enablers identified by different authors throughout the thesis. The concept matrix is followed by sub-sections in which each structural factor is discussed.

a) Occupational Culture

The perceptions young girls have about the occupational culture will play a huge role in young girls' decisions whether to pursue IT careers and young IT female professionals' decisions whether they want to persist in IT careers or not (Ahuja, 2002). The IT setting at universities might find students working late night on IT projects assuming that this is a reflection of the work industry when they start their careers in IT (Ahuja, 2002). In some cultures female students as compared to males may even be advised against pursuing IT courses because of the beliefs that they might need to work late at night on projects and assignment and raise safety concerns (Ahuja, 2002). This lack of cultural transformation not only affects social norms but also perceptions towards women in society (Appianing and Van Eck, 2015). Even though more people in both developed and developing countries are showing signs of social transformation, there is still a resistance towards gender equality. This suggests that education and social awareness programs – not only in urban but also in rural areas – can result in increased cultural transformation which can indirectly affect the IT industry (Ahuja, 2002). The lack of women holding high-level executive roles and the hesitance of women to promote themselves, has limited the ability of female workers to network and find new contacts (Huxhold et al., 2020). This inequality in growth opportunities is a result of a shortage of skilled women in the technology professions. By providing more growth opportunities, including career advancement programmes, companies can make progress by ensuring that more women have equitable representation in the technological workforce (Hamann and Bertels, 2018). However, according to Appianing and Van Eck (2015), the reason for women's struggles in the IT industry is the lack of cultural transformation both in society and in the workplace.

b) Lack of Role Models

The inclusion of women in the IT workforce will increase the percentage of women given the opportunities and benefit the accompany in terms of inclusion and diversity while also increasing available role models and potential mentors in the organisations for the benefit of early-career female employees (Okpaluba and Budeli-Nemakonde, 2020). The presence of role models at the early career phase for young women can be very instrumental in helping women choose IT as a career (Ahuja, 2002). The author further suggests that the role models provide indication that a successful future in terms of career in the field of IT. The lack of well known successful female IT role models influences the views of the society on the profession (Motaung, 2019). A study by Ingraham (2022) on individual obesity and weight loss initiatives found that drives for weight loss reflected gender specific ways related to family responsibility, where results showed that women stated that they felt like “role model” failures if they did not lose weight, while men worried about premature death and leaving their families behind. These results showed that the women were more likely to care about what kind of role models they are to other people compared to men.

According to Motaung (2019), 66% of females in South Africa view the field of IT as unfriendly with great emphasis on task-oriented characteristics, functional, procedural and abstract. Thus they perceive IT as mainly concerned with writing codes and building hardware devices. The presence of role models can help individuals make right and informed choices regarding choosing an IT career. Female role models in IT environments are rarely discussed; and therefore female college students who like IT become loose courage, since they cannot relate with other females already in this field. However, the situation has changed for the better over the years, since there are now more powerful female role models in this IT industry than there were a previous decade (Meela, 2018).

The presence of role models can help the individuals starting their career in IT navigate the industry more easily while providing career guidance and sharing knowledge about the field. The presence of role models, and exposure and access to other women in the industry also provide courage to persist in IT careers (Del Carpio and Guadalupe, 2022). The more women in leadership positions are celebrated, the more visibility will be provided to other women in the IT industry and to those who still want to join the industry (Hupfer et al., 2022).

c) Lack of mentorship

According to Meela (2018) mentors are more experienced individuals in a specific field who provide inexperienced or less experienced individuals with support functions that will enhance their career growth and assist the less experienced individual to establish a role in the organisation. While Ahuja (2002) describes a mentor as a senior, experienced manager who can relate well to a junior employee with less work experience and helps juniors in their personal development for the combined benefit of the individual and that of the company the employee is working for. The under-representation of women and their low representation in leadership positions in the IT industry has raised concerns for mentorship support available for young girls and women in the IT industry (Porter et al., 2021).

Reverse mentoring is another form of mentoring that is known to increase retention of Gen Y employees and affords senior executives the opportunity and satisfaction of sharing knowledge with the next generation (Nigam, 2021). Reverse mentoring is an initiative where older executives are mentored by younger employees by pairing them on topics such as social media, latest technology, and current trends (Tiwari et al., 2019). Although mentoring is considered as the most valuable career growth way for new employees, research has proved that only twenty percent of companies provide proper mentoring programmes (Nigam, 2021). Even though mentorship has been identified as crucial in the career development and advancement of employees (Porter et al., 2021), many organisations have not

implemented mentorship programmes for their organisations which would have increased knowledge sharing and career development coaching for starting out careers in specific fields (Nigam, 2021) .

Ahuja (2002) suggested that women face more gender related personal and institutional barriers in obtaining mentors compared to men. The author suggested that with the higher levels of under-representation of women in IT, the lack of mentorship in the IT industry which is a result of limited numbers of female leaders in this industry will most likely affect the persistence and advancement of women in the IT industry. Presence of mentors will assist in career guidance, understanding the barriers and share in common experiences has led to women to succeeding when it comes to surviving in the field (Motaung, 2019). Informal or formal mentorship arrangements provide a supportive structure and the lack of these has resulted in the gender gap widening.

d) Organisational or Institutional Structures

One of the structural forces at the workplace that will affect women's professional career is institutional structure (Ahuja, 2002). The author states that this construct is one of the contributors to the under-representation of women in top management. Recent competitive forces in the IT industry such as globalisation and flattening of the organisational structure may have also contributed to the continuous decrease in the number of women in the IT industry by serving as an impediment for women in the industry. Flattened organisation structures tend to remove middle managers, who according to Ahuja (2002) are mainly female managers, thus hampering the advancement of women in IT leadership positions. Some occupations may require a lot of travelling, which women are mainly perceived as unwilling or unable to do, because of family commitments (Ahuja,2002).

A study by Holck (2018), which explored the structural embeddedness of organisational diversity, held that self-managing projects and decentralised teams were more effective than old Organisational forms of rule-controlled command and order of formal systems. The study found that decentralisation allowed full ownership, accountability and discretion in task performance, which resulted in more engagement, participation and transformation in teams. This study also showed that management's rights and duties remained largely left intact, which emphasized bureaucratic top-down relations. The combination of formal bureaucratic power and disjointed team based approach was found to introduce room for unclear lines of authority. Subsequently, some employees reported to experience having limited accountability leading to a double structure of formal administration and informal "elite peers" and that this structure was limited. This study found that there were organisational structural factors that produced unhappiness and exacerbated

unequal opportunity structures. The results also showed that the implementation of some structures presented the opportunities to disregard minority employees' sense competency and feeling capable as majority norms and power hierarchy cast them in supported and dependent roles, and therefore hindering promotion opportunities presented to minority groups based on racial and gender inequalities (Holck, 2018).

2.5 The South African Context of the Global Phenomenon

According to the Department of Employment and Labour of South Africa, South African men account for the majority of the country's economically active group with 55.3 %, while women make up 44.7% (DOEL, 2022b). This is despite the country's largest population group being women (Statssa, 2021). According to Media, Information and Communication Technologies Sector Education and Training Authority (MICTSETA) the ICT sector is made up of:

- Advertising
- Film and Electronic Media
- Electronics
- Information Technology
- Telecommunications

The MICT sector is “currently made up of just over **21,000** companies spread across the five sub-sectors (allocated to the MICTSETA through the SARS registration process).”

Sub-Sector	Advertising	Film and Electronic Media	Electronics	Information Technology	Telecommunications
Employer base	12%	12%	13%	50%	15%

Table 2.2: Summary of sub-sector's employment contribution. Source: (MICTSETA, 2022)

According to MICTSETA, this sector is one of the positive contributors to the country's GDP and has been cited as one of the contributing sectors to employment (MICTSETA, 2022). And as seen in Table 2.2, the IT sub-sector is a major contributor to employment in this sector.

2.5.1 IT Education in South Africa

In South Africa computer studies are only offered at high school level and these subjects are offered as optional. Due to learners not being familiarized with computers and computer education, the department is seeing only lower levels of enrolments of females in Computer studies, and IT graduates remain low for women (Motaung, 2019). Motaung also reported that teachers who act as careers advisers for their learners have a strong influence on the career choices of their learners, which has further increased gender imbalances in IT. The author elaborated that these teachers were more likely to encourage young girls towards traditional careers due to their own limited perspectives, societal biases with limited information on the IT professions. Klawe et al. (2009) assessed the role and progression of women in IT from the period 1995 to 2005. This investigation highlighted how the number of young women looking to obtain an ICT related qualification has declined due the influence of role models, teachers, and social and structural factors.

The first formal technology education in South Africa was in 2005 (Heymans, 2007). The study of the implementation of technology education in secondary schools in the urban areas of the Free State province was done to determine how successful the introduction of Technology Education (in Secondary Schools in the Free State Province urban areas) was. The study found that a only a low percentage of teachers felt that the implementation of technology education was successful and that schools were ready for the implementation (Heymans, 2007). This study also revealed that a high percentage of teachers felt that the subject Technology Education does have a place in the Further Education and Training sector. In the conclusion of the study the author suggested that a need exists for specialised trained teachers, appropriate equipment and physical facilities to implement Technology Education. This was also highlighted by Janak (2019) in the study of technology teachers' perspective on the technology curriculum in South Africa. Despite the widespread reforms by the new democratic government of South Africa to transform the country's education system and redress the apartheid inequalities, technology education is still facing challenges such as contextual constraints, unqualified teachers, inadequate training of teachers, lack of resources and different interpretations of the technology curriculum (Janak, 2019). The author also mentioned that South Africa uses a universal school curriculum for diverse school contexts and highlighted that the education system is complex and disadvantaged in many parts of South Africa thus working against the technology education. Janak (2019) further stated that schools range from private to public schools, rural to urban schools; underprivileged and under-resourced schools to privileged and extremely technological schools; schools with unqualified and under-qualified, untrained and under-trained teachers to highly qualified and trained teachers".

A conducive climate for early STEM education for young women plays a crucial role in developing tech professionals in the future (Stephenson et al., 2022). Primary and secondary schools encourage opportunities in tech-based curricular and co-curricular activities and encourage participation in tech competitions at early age (Nair, 2022). Women pursuing STEM careers in Sub-Saharan Africa make up 28%, which is below the global average of 30%. However, South Africa is leading when it comes to producing more female ICT graduates as the country has the majority of female ICT graduates in the Sub-Saharan Africa at 38%. These results show positive progress for the country (Molele, 2021).

In the section below the role of IT in the South African workforce is discussed.

2.5.2 The Role of IT in the South African Workforce

Statistics from both public and private sectors show that there is an average of 10% of female IT executives South Africa (SA) (Meela, 2018). In South Africa the demand of female professionals in the IT industry has increased due to social and political pressures and companies' need for more professionals that can manage network systems, programming language and cyber-security (Crittenden et al., 2019). According to BusinessTech (2022) growing technologies such as artificial intelligence and automation are rapidly changing the business landscape, and cyber security and cloud migration are more urgent than ever. However, the number of professionals available in this area are limited and employers are struggling to fill the IT skills gap, with demand exceeding supply. The most sought-after IT skills in the country include Java developers, cloud-related skills, data engineers, and DevOps engineers. The shortage of skills in the IT industry is a result of the dynamic nature of the industry that keeps demanding new skills that are hard to address and it is never ending (Lotriet et al., 2010). The IT skills shortage in South Africa has been acknowledged by government, training providers and private companies (Meela, 2018). The Career Junction's "Information Technology Job Report" found that poor skills availability was a major contributing factor towards South Africa's IT industry struggling to compete globally (BusinessTech, 2022). Figure 2.1 below shows that from 2011 to 2016 the representation of women in IT executive roles was an average of only 10%.

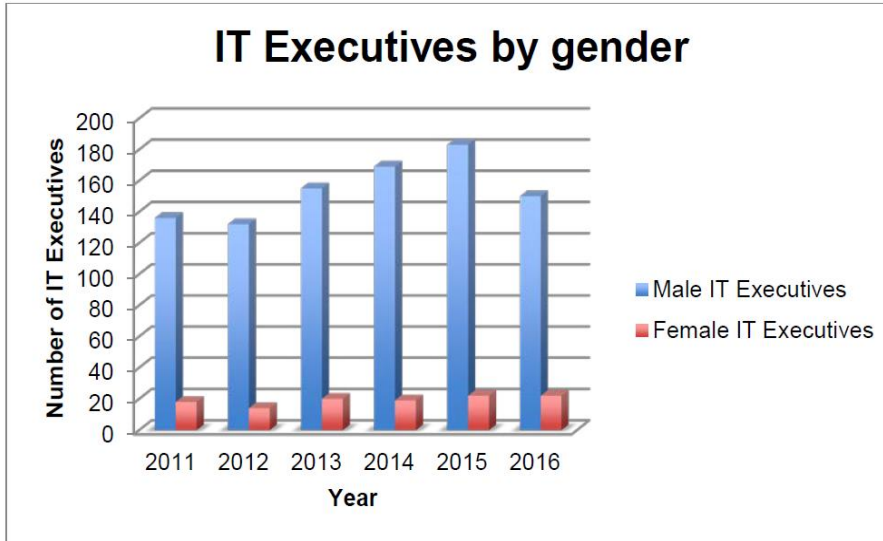


Figure 2.1: South African female IT Executives by gender (Meela, 2018, p10)

According to the 22nd Commission for Employment Equity, in 2021 the Information and Communication sector made up 3.4% of the total South African workforce, while the highest was Wholesale and Retail Trade, Repair of Motor Vehicles and Motorcycles and the lowest was Real Estate Activities with 0.3% (DOEL, 2022b). According to Statista (2022) the country’s population composition by ethnic groups is: African (79.3%) constituting the majority of the country’s population, followed by Whites (9%), then Coloureds at (8.9%) and lastly Indians (2.8%) (Statista, 2022). However, as shown in Table 2.3 below, the highest population group in the Information and Communication sector across top management was Whites at (62.2%) which is not in line with the country’s population concentration. This is a reflection of the racial inequalities in the South African workforce in the context of IT. Table 2.3 also shows that the representation of Indians (the smallest ethnic group in the country at 2.8% of the country’s population) in top management in this sector is 13%, which is nearly equal to that of Africans (14.1%) which is the country’s largest population group at 79.3%. These figures are indicators of the degree of racial imbalances in this country.

	African	Coloured	Indian	White	Foreign
Top Management	14.1 %	6.2 %	13 %	62.2 %	4 %
Senior Management	18.5 %	8.3 %	14.1 %	54.2 %	5 %

Table. 2.3: Summary of Information and Communication sector’s employment contribution by race

Source: (DOEL, 2022a)

	Men	Women
Top Management	72.8	27.2
Senior Management	64.2	35.8

Table 2.4: Summary of Information and Communication sector’s employment contribution by gender

Source: (DOEL, 2022a)

Table 2.4 shows that women were under-represented in both senior and top management despite females being the larger population in the country. This points out gender inequalities and imbalances within the IT workforce. This male dominance has deprived females executive and professionals of the opportunity to add value to IT products and services (Imburgia et al., 2021). This is shown by the preponderance of IT hardware and software related to male products such as sports computer games and mobile application (Molele, 2021).

2.6 A Theoretical Framework of Social and Structural Barriers Experienced by Female IT Professionals in Senior IT Positions

This study uses a model of factors influencing women’s professional careers in IT. Ahuja (2002) proposed a stage-model of barriers faced by women that affect their entry and performance in the field. This model was built upon the series of career stages that were initially presented by Ragins and Sundstrom (1989). The model observes effects of these barriers by using three dependent variables namely career choice, career persistence and career advancement in IT careers. These dependent variables represent the three IT career stages that female professionals are likely to experience during their IT careers. Each career stage and transition represents a set of opportunities and obstacles female professionals will encounter when trying to attain a higher position in organisations, and these opportunities build upon the previous ones. Ahuja (2002) represented these variables as external factors that could create and cause barriers for female workers. The author categorised these obstacles into social and structural factors that will affect each career stages as shown below in Figure 2.2.

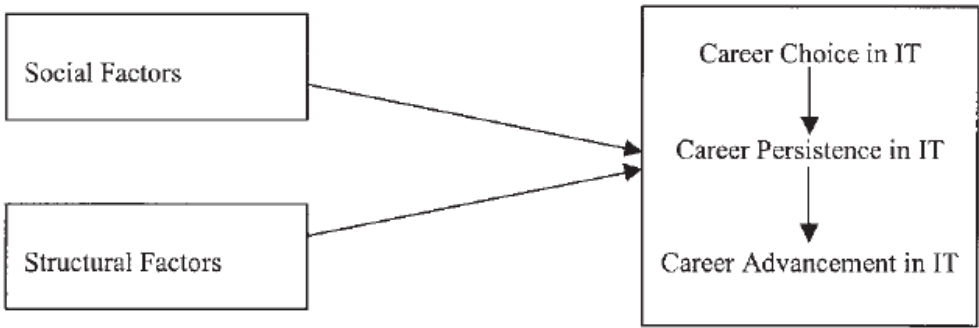


Figure 2:2 Social and structural determinants of women’s careers in IT Source: Ahuja (2002:4)

According to literature, women in IT experience a number of social and structural barriers throughout the three IT career stages of career choice, career persistence and career advancement. Some have, however, overcome these barriers and persisted and advanced to senior IT positions. Ahuja (2002) articulated the different challenges faced by female workers and professionals in the IT sector. Social factors are social and cultural biases that combine the internal view that women have of themselves (self-expectations) and the external view of women (e.g., stereotyping) that is held by society as a whole. Structural factors speak to the opportunities associated with organisational structures that will work to limit and hinder the progress of a female in IT careers.

Furthermore, the proposed framework implies three basic research phases are necessary to answer the conceptual, empirical and analytic questions. Ahuja (2002) further noted that the IT industry fails to attract young girls to pursue this career and that women either leave the IT profession or experience barriers when trying to progress in the IT sector. The findings suggested that the theoretical model could also be used to further explore the challenges women face at various career stages in the IT field and that understanding these variables can also be used by stakeholders to create positive and productive relationships with female employees. According to the World Inequality Lab, South Africa is the most unequal country in the world and the richest 10% of the population own more than 85% of household wealth, while over half the population have more liabilities than assets (Sguazzin, 2021). Recent research on the digital divide in South Africa has also indicated that the great digital divide in South Africa is due to unequal access to computers created by the inequality and economic divide in this country (Tsetsi and Rains, 2017, Chisango and Marongwe, 2021). Ahuja (2002) suggested that computer training played a major role in computer attitude which then influenced choices of young girls in terms of pursuing computer or IT related studies. A decision

was then taken by the researcher to add computer access as one of the variables to be explored as part of the conceptual framework. According to Ahuja (2002) computer access will affect computer training, as computer training depends on access to computers. For the purpose of the study an extended model shown in Figure 2.3 below with an additional social factor will be used to in this research.

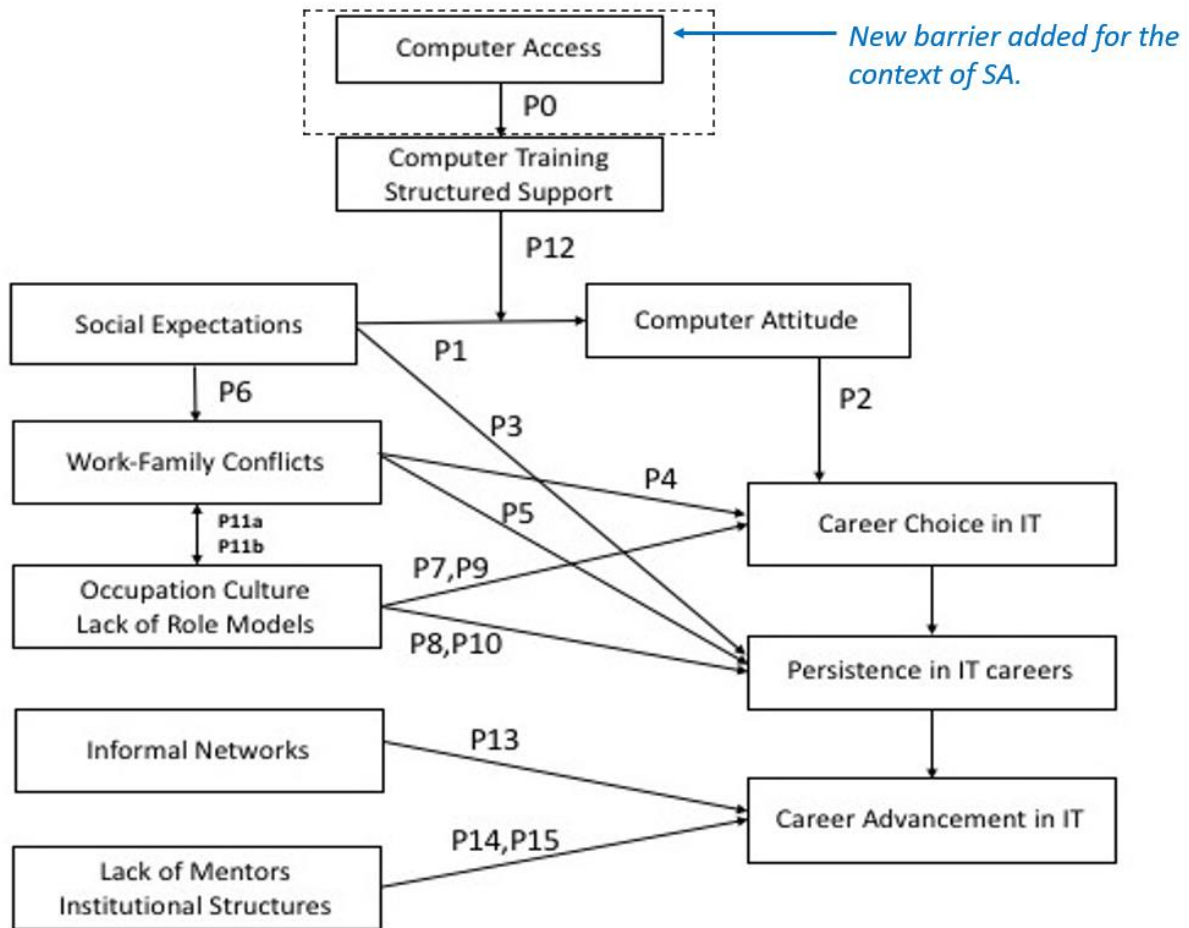


Figure 2:3 An extended model of social and structural determinants of women's career choice, persistence and advancement in IT
Source: Ahuja (2002:4)

London (2014) stated that the framework sets the foundation for combining human resource and IT management. The nature of the framework allows the researcher to uncover factors that may have been historically neglected by societies, organisations and individuals, which makes it ideal for this study (London, 2014). Subramanian (2019) examined the potential difference in leadership style by male and female leaders of the IT industry. The first variable is career choice, which focuses on choices made during tertiary education and entry level jobs. Kişi (2020) used the model to investigate how female programmers are treated by their fellow professionals during their early career development in different work

environments, projects, and how their managers overcome these challenges. The author also looked at how these projects could be managed in order to add value to the process while adding principles of managing different problems related to information systems. In this study this model will be used to understand career barriers experienced by women in senior IT positions and the possible enablers that helped them overcome these barriers. The model in Figure 2.3, containing the proposed dependent variables and factors influencing them will frame and guide the research.

2.6.1 Career choice in IT

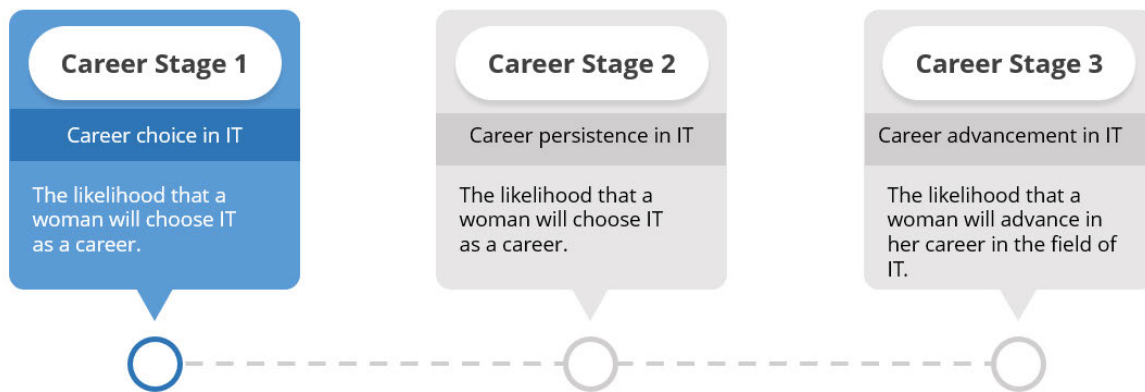


Figure 2.4: Career choice in IT stage Source: Created for this study. Career stages definitions source: Ahuja (2002).

As shown in Figure 2.4 above the first variable, “Career choice in IT” becomes the first career stage, which is described as the likelihood that young girls will choose an IT career. The proposition for this study (P0 in Figure 2.3) is that lack of computer access will negatively affect computer literacy of a young girl and, as a result, her lack of computer training will create a negative influence towards her computer attitude (P12). Ahuja (2002) also stated that when growing up boys and girls are given different signals, i.e., boys will most likely be sent to computer classes compared to girls in some societies. These factors are imprinted on women at a young age, consciously or unconsciously, and reflected in the behaviour of women. These expectations can also manifest in individual decision-making learned from teachers and other role models during the early stages of career development. An example of the factors includes attitudes towards computer-based qualifications and perceptions of a career in this sector. These cultural beliefs establish gender differences in attitudes regarding computers (P1). The author further suggested that higher levels of

computer anxiety among women can lead to lower self-efficacy, thus increasing their computer avoidance and steering young girls away from choosing computer related careers (P2).

Below are the list of propositions suggested by Ahuja (2002) that will affect a woman in her career choice in IT.

Proposition 1: Social expectations will negatively influence attitudes towards computers and their use in women.

Proposition 2: Attitudes formed regarding computers and their use will negatively influence the choice of IT as a career in women.

Proposition 4: Work–family conflict will negatively influence the choice of IT as a career in women.

Proposition 6: Female IT workers will experience higher levels of work-family conflict than male IT workers.

Proposition 7: The perception of occupational culture will negatively influence women’s choice of IT as a career.

Proposition 9: A lack of role models will negatively influence women’s choice of IT as a career.

Proposition 11a: The relationship between social and structural barriers at career choice stage is likely to be recursive.

Proposition 12: Computer training and structured support will reduce the negative effect of social expectations on attitudes towards computers in women.

Ahuja (2002) suggested that the incompatibility of the work and life domains may result in work-family conflicts. The author suggests that the perception that young women have about the work in the IT industry will negatively influence their career choices in IT (P4). The model also proposed that women who have family and children will experience the work–family conflict more compared to men in the IT industry (P6). The nature of the “occupational-culture” rampant in the IT world in universities and colleges is associated with extraordinarily long hours, late nights and “highly focused, almost obsessive behavior”, e.g., hackers who are seen as bright and creative. This may result in school girls perceiving computer work as a “male field which is inhospitable to women” (P7). The presence of role models suggest that women can make a successful career out of IT. However, the IT industry is male dominated with minimal representation of women in senior IT positions reaching the C-suite (Brin, 2022). This will negatively affect the career choice in IT by women (P9).

2.6.2 Career persistence in IT

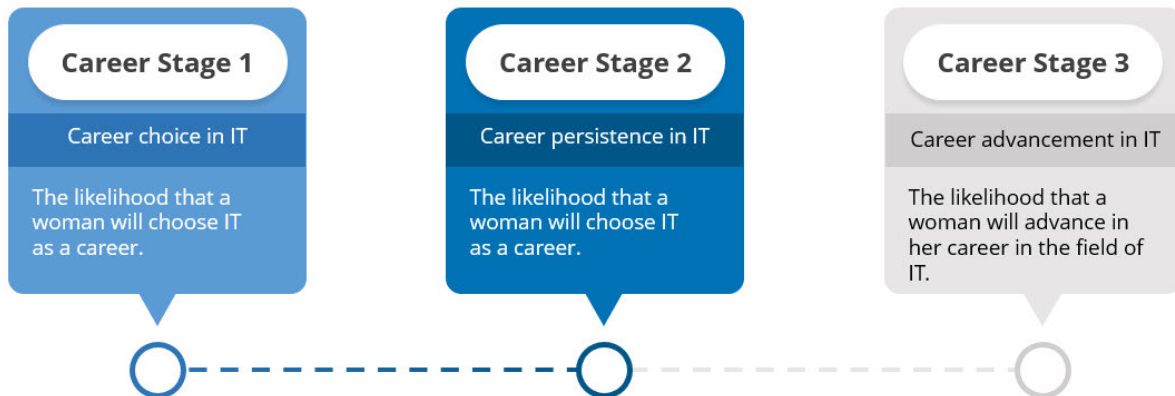


Figure 2.5: Career persistence in IT stage.

Source: created for this study. Career stages definitions source: Ahuja (2002).

Below are the list of propositions suggested by Ahuja (2002) that will affect a women in her career persistence in IT as shown in Figure 2.5 above.

Proposition 3: Social expectations will negatively influence women's persistence in IT careers.

Proposition 5: Work-family conflict will negatively influence women's persistence in IT careers.

Proposition 8: The perception of occupational culture will negatively influence women's' persistence in IT careers.

Proposition 10: A lack of role models will negatively influence women's persistence in IT careers.

Proposition 11b: The relationship between social and structural barriers at career persistence stage is likely to be recursive.

If a woman finds a way to overcome barriers that may have stopped her from choosing an IT career, she may still find that these factors continue to hamper her persistence in this career and career persistence in IT as the likelihood that a woman will not drop out of a workforce (Ahuja, 2002). As the woman persists in the IT career the anxiety that may have developed at a young age from negative attitudes formed towards computers due to insufficient computer training may negatively affect performance and persistence in the IT profession (P3). Work-family conflict has been negatively linked with several organisational outcomes, including job-satisfaction. Organisational commitment and distress on the job will likely result in high turnover in IT related jobs (P5). The presence of role models may also facilitate a higher understanding of work-family conflict issues, further helping to retain women in the workplace. However, due to the low

availability of role models the author proposed that the lack of role models will most likely negatively influence career persistence (P10).

2.6.3 Career advancement in IT

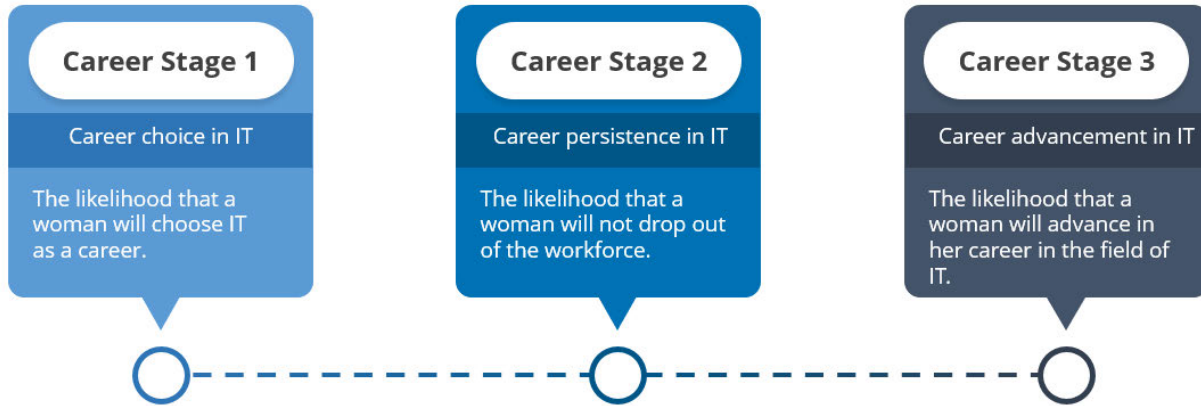


Figure 2.6: Career advancement stage in IT.
Source: Created for this study. Career stages definitions source: Ahuja (2002).

Figure 2.6 shows the last dependent variable which is career advancement stage in IT, which Ahuja (2002) describes as the likelihood that a woman will advance in her career in the field of IT. This is the higher career stage where women are assumed to have worked a number of years and gained experience in the field of IT and they are now ready for promotions. Igbaria and Baroudi (1995) examined gender differences in career advancement in the career field and found that that the advancement of women compared to men is more restricted in this field. The informal networks which serve several purposes, ranging from obtaining information regarding opportunities in the organisations to socialisation in the organisational culture is primarily made up of men, and recruiters rely on these networks for referrals (Eagly and Carli, 2018). The author proposed this to be a limitation to the advancement of women in the IT industry as the assumption that they will miss these opportunities since they are not part of informal networks in the organisations (Ahuja, 2002). Lack of mentorship is one of the reasons the IT field is not developing and advancing enough women to the higher ranks. The author suggests that this will act as a barrier for women to advance in the IT industry (P14). Structural factors in organisations, such as globalisation may serve as impediments to advancement of women in the IT industry (P15). As many firms become global, promotional paths require an international assignment for which many women are not considered. The author further suggests that this may be due to the perception of male managers that women will not be accepted in this role rather than women's refusal of international assignments.

Below are the list of propositions suggested by Ahuja (2002) that will affect a women in her career advancement in IT.

Proposition 13: During the career advancement stage, a lack of female-friendly informal networks will negatively influence women's advancement in the field of IT.

Proposition 14: A lack of mentors will negatively influence women's career advancement in the field of IT.

Proposition 15: Institutional structures will negatively influence women's career advancement in the field of IT.

For this study the model will be used to assess the influence of barriers and enablers experienced by women in IT senior positions across different career stages. The model will assist in understanding what has helped or hindered senior IT female managers as they progress to the C-suite.

2.7 Summary

Even though policies have been put in place, the lived realities and spaces where policies have been implemented continue to remain unchanged, gender imbalances in various spheres of society continue to be a thorn that pricks at the very fabric of the IT industry South Africa. It is, therefore, critical to continuously engage with and problematise the perpetual challenges that are a result of gender injustices, in order to realise a space that does not use gender as a marker for inclusion and exclusion in contemporary technologically advanced society. In addition, the emphasis on categories such as socioeconomic, race and language differences must be taken into consideration as they have the ability to impede gender equality in the workplace. In the next chapter the research methodology that was adopted for this study is detailed.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The following chapter discusses the study's research methodology in detail. The purpose of this research is to understand the barriers and enablers experienced by women in IT senior positions in South Africa. The arrangement of this chapter presents a framework of the study methodology using the "research onion" approach to design the research suggested by Saunders et al. (2019) shown in Figure 3 below. This is used to frame the research methodology that was followed to produce the data needed to answer the research questions. The research onion outlines the steps followed by researchers when formulating an effective research methodology.

In order to address the research objectives of this study, the researcher had to answer the research questions for this study. Answering these questions is dependent on the data production, and on the analysis of the data. As depicted in Figure 3 below, the data collection and data analysis stages are the inner core of the onion. The nature of the research questions and the data required to answer them, are dependent on the approach taken to the problem. This is best explained by starting at the most external, philosophical layer of the onion and describing the research process used by discussing the decisions taken at each step (or layer) until the inner core of the onion is reached. The first layer is the research philosophy, which determines the philosophical underpinning of the study. The second layer is then the research approach that is chosen which is appropriate for the research philosophy which forms the foundation for the study. The third layer is made up of three steps the research design, which is represented by the peach circles in Figure 3 of the research onion. These steps are methodological choice, strategy(ies) and the time horizon.

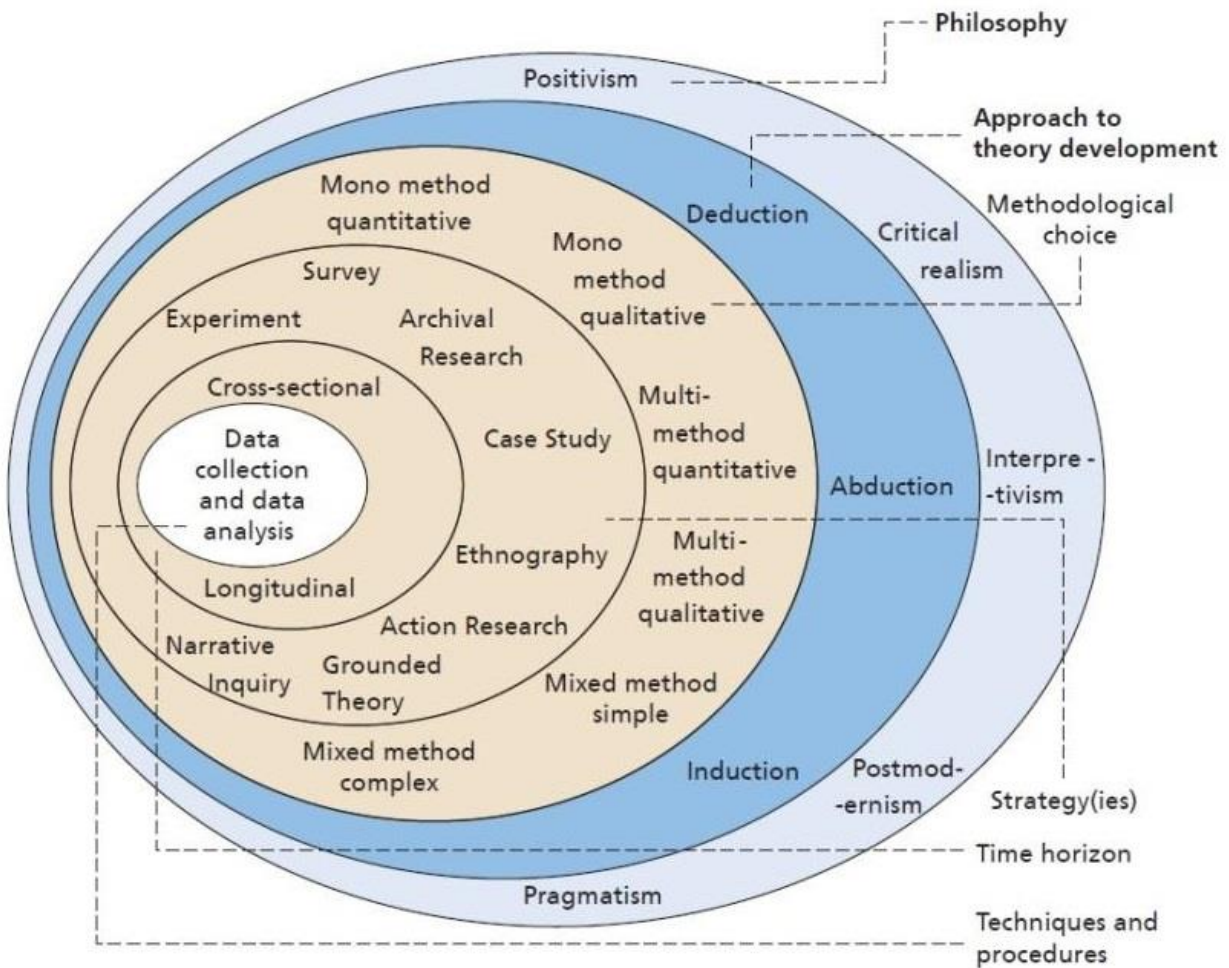


Figure 3: The research onion Source: Saunders et al., 2019: p.19

3.2 Research Philosophy

Saunders et al. (2019) explains research philosophy as a system of beliefs and assumptions about the development of knowledge. The interpretive research philosophy approaches participants as experts in their own experiences, seeking their own concepts and insights (Emery and Anderman, 2020). For this study an interpretive research philosophy approach was used because the research questions were formulated to obtain data based on the experiences of women in the IT industry throughout their career journeys. A qualitative approach was used for this study because of its ability to provide comprehensive, detailed interpretations, richer insights and better results about the phenomenon under study using interviews to determine the enablers and barriers experienced by women in IT managerial positions in South Africa (Mark and Smith, 2018).

Though mutually independent, both epistemology and ontology represent a study of knowledge with distinct focuses on “understanding”. Ontology is the study of reality or the science of being, its classification and nature of existence while epistemology focuses on knowledge, its validity and use (Lehrer, 2018).

Epistemology describes assumptions about knowledge, what constitutes acceptable, valid and legitimate knowledge, and how we can communicate knowledge to others (Saunders et al., 2019), while ontology refers to assumptions about the nature of reality (Saunders et al., 2019). It is essential to understand the ontology and epistemology of a study before developing a research design framework, as the validity of the study guides its contribution to knowledge. Mapping the data to theory through the philosophical perspectives increases the study’s validity (Rolfe, 2006). This study adopted the interpretive ontological perspective as it looked at the reality and experience of women in the IT industry, which is a phenomenon that is socially constructed.

3.3 Approach to Theory Development

There are two approaches to theory development, the deductive approach and the inductive approach (Hayes et al., 2010). The inductive approach, commonly known in inductive reasoning, starts with the observations; theories are then proposed towards the end of the research as a result of observations. Inductive research is described as the exploration of patterns from observation and the formulation of explanation theories for those patterns through a series of hypotheses (Hayes et al., 2010). Conversely, the deductive approach aims at understanding existing theory about the phenomenon and then testing these existing theories (Hayes et al., 2010).

This study used a combination of these two approaches. Initially, this study used a deductive approach as the researcher had taken the theory about the phenomenon and created questions to specifically see if those issues were present. The aim was to see which factors affect women in IT senior positions as per the available theory or literature. The inductive approach was then used to identify other aspects in the data that the theory might not explain. One of the enablers that was found as part of the inductive part of the process was the availability of bursaries for female participation in IT related careers. A substantial number of females who ended up in IT careers did so through the availability of bursaries. This made access to bursaries one of the possible variables that could be tested in future as a factor affecting career choice in IT in the context of South Africa.

3.4 Methodological Choice

There are two categories of methodological choice that the researcher can use, namely, mono-methodological or multiple-methodological choice (Saunders et al., 2012). Mono method is the use of a single data collection technique used in conjunction with a corresponding analysis procedure (Saunders et al., 2012). Multi method uses multiple collection techniques that are either quantitative or qualitative with only one analysis procedure and can have either numerical or non-numerical analytics (Saunders et al., 2012). This study used a mono-methodology. This study adopted a qualitative research approach during the data production process. This approach seeks a deeper understanding of the context of the research problem as well as of the responses of a particular sample to the existing research problem (Chengadu and Scheepers, 2017). This approach allows the researcher to produce data through interviews using open-ended questions and is guided by a theoretical framing, i.e., the conceptual model that is used in this study.

An exploratory research design was used in this study to provide richer insights and a deeper understanding of enablers and barriers to female executives holding IT positions in South Africa, based on the experiences of women who have reached senior managerial positions in IT. This exploratory research study sought to gain knowledge, experiences and perspectives on women's ability to hold top positions in the C-suite. The researcher then looked for patterns and themes to make observations and interpretations in order to answer the study research questions. Furthermore, exploratory research is useful since the investigation tried to gain familiarity with an existing phenomenon in the IT sector and to acquire new insight into the research problem (Chavare and Kasmi, 2017).

3.4.1 Rationale for Research Approach

This approach was chosen because the interviews were going to assist in explaining, obtaining better understanding, and exploring research participants' opinions, behaviour, and experiences of the phenomenon. Interview questions open-ended to allow for in-depth information to be collected. Thus, the qualitative method was the most applicable approach for this research topic, as it allowed the researcher to best answer the research question. The research objectives would be achieved through exploring the individual cases of different participants in terms of their experiences.

3.4.2 Research Context

The literature on benefits of having women in senior or leader level is less than the literature on barriers experienced by females in the IT industry. Past studies have not highlighted the role of female workers in the generation of ideas, the management of IT related projects, and aligning their career objectives with

their respective IT departments (Botella et al., 2019). However, the body of literature has grown substantially since the inception of this study (Brin, 2022, Kong, 2022). It is unclear how these female IT professionals handle these challenges during their involvement in IT. In order to obtain the best possible results a pragmatic research approach was used. This approach encouraged participants to state ideas clearly and to focus on practical effects of actions. The reason for choosing this philosophy is that it allowed the researcher to combine different theories and perspectives in order to answer the research questions. Due to the scarcity of participants this study, a snowballing sampling method was used. In this sampling method participants refer the researchers to other participants in their networks who have similar characteristics i.e women in IT industry and working as senior managers (Parker et al., 2019).

3.5 Research Strategies

The case study is a research approach mostly commonly used in qualitative research. It provides the ability to perform a rigorous study about a person, a group of people or a unit, which is aimed at generalising over numerous units (Mfinanga et al., 2019). A case study is a comprehensive description of an individual case and its analysis, i.e., the characterisation of the case and the events, as well as a description of the discovery process of these features, that is, the process of research itself (Mfinanga et al., 2019). The case study was selected because of its appropriateness to the study. In this study the participants were asked about their experiences and feelings in order to answer the research questions. The instrument used for this study is the interview. There are two types of case studies in qualitative research, namely, single case study and multiple case study (Mfinanga et al., 2019). The single case study is the most basic form of case-oriented research and focusses on a single case. It is used to get insight into an issue or refine theory. A multiple case study focusses on one issue of concern and different cases (in this case participants) that are being studied, and explores differences within and between cases (Mfinanga et al., 2019). The multiple case approach was used in this study since the research studied the experiences of 15 different participants (cases) to try and understand the individual experiences of the participants.

Case studies offer a number of advantages. According to Mfinanga et al. (2019), a case study may offer greater knowledge and context about a particular phenomenon. Readers of a case study may obtain natural generalisations from personal experience. In other words, people can share and understand others' social experience. A case study provides a holistic understanding and always refers to a social context. A case study does not involve any alterations, experiments or manipulated social settings. The disadvantage of the case study is that general, theoretical (context-independent) knowledge is more valuable than concrete and practical (context-dependent) knowledge and that it is impossible to then generalize on the basis of an

individual case. Therefore, the case study cannot contribute to scientific development (Mfinanga et al., 2019).

This approach was selected because the study sought to explore different cases of women, specifically in IT senior management roles. This methodology is appropriate as it allowed the researcher to use the inclusion criteria for the specific targeted incidences of this phenomenon, i.e., women who meet these criteria – a specific, identifiable group. For analysis the case study was also appropriate for this study as it gave more insight into the study. The criteria did not require that participants have IT qualifications, as they spoke to their cases. More insights were obtained as they spoke to transitioning from other careers and the reasons why they ended up in IT. The analysis also provided rich insights around pathways different women may take to come to IT since not all of them were required to have started in IT.

3.6 Time Horizons

The study period is between 2015 July and 2022 July. Because the researcher was working, the research was paused for two years when the researcher was starting her family and the researcher also did not study in 2021. The research proposal was approved on 9 November 2018 and the formal study took place from 2019 until July 2022 when the study was completed.

3.7 Data Production Methods

Interviews were used by researcher to collect data from the participants. These interviews were semi-structured because of the flexibility of their structure, including the ability to provide in-depth information as regards the issue at hand. Semi-structured interviews were chosen because they do not limit the number of responses that a participant can give (Chavare and Kasmi, 2017). The interviews consisted of two sections: the first section included the background and profile of the employee, and the second section contained the actual interview questions.

The interviews were done only via Zoom, MS Teams and Google Meet, and were recorded by the researcher for interpretation and analysis after each interview was completed. Since the number of women who hold positions in the IT C-suite is unknown, the population cannot be precisely determined. The researcher therefore used the rule of thumb to derive the appropriate number. The rule of thumb states that when conducting interviews, saturation is reached between 20 and 30 interviews (Vasileiou et al., 2018). However, due to the scarcity of participants, only 15 interviews were done on the identified target population.

Virtual Interviews

The participants were sent interview meeting invitations two weeks before the scheduled date for each interview. The body of the meeting invitation email reiterated what the study was about, to give detailed context. During interviews the participants were asked to give consent for recording to aid data collection and were asked to sign consent letter attached in Appendix 1: Consent Letter. Upon consent, interviews were then recorded to save time of the researcher to write notes. Where Microsoft Teams was used, the researcher also generated automatic transcripts as the interviews were taking place. Zoom and Google Meet interviews were only recorded as these two systems did not allow for the automatic generation of transcripts. The transcripts generated using MS Teams were thoroughly reviewed and, where there were inconsistencies between the transcript and the recording, the researcher made alterations to ensure the transcripts contained the correct responses from participants. The rest of the audio-recorded interviews were later transcribed for purposes of analysis.

Process of Developing the Interview Questions

An alignment matrix tool was used to formalise a relationship between an attribute and an activity (Leal-Ramírez et al., 2022), furthermore the alignment matrix provides a clear map of the data and themes that need to be looked for in the data in order to be able to determine if the data exists from the interviews to answer the research questions. The alignment matrix was also created for this study to guide the data production method (see Appendix 2: Alignment Matrix). There were three research questions in this study.

The first column of the alignment matrix contained the research questions, the second column contained the type of factor influencing the specific career stage being studied in the first specific research question. The third column consisted of the actual factor affecting a specific career stage while the last column contained the interview question that is asked to understand the influence of the factor in that specific career stage. The alignment matrix tool made it easy to ensure that the data production is accurate, and also allowed for easy analysis during the data analysis. Research questions were built using the model by Ahuja (2002), for each variables there was a research question based on the effect the variable may have on a woman's career in each career stage. The researcher created nodes using column C (Appendix 2) which were variables or factors affecting a woman in each career stage. For each career stage, there were questions asked using the model by Ahuja which guided interms of which factors are likely to affect each career stage. The interview questions in column D were related to the nodes (variables that are being tested for each career stage). The responses were coded (grouped according to the variables they are associated with) in

the respective nodes which made the analysis easy. Detailed interview questions can be found in Appendix 3: Interview Schedule.

Description of the Interview Questions

The interviews consisted of three sections. The first section consisted of questions related to the first career stage which is “Career Choice in IT”. These questions spoke to the early years of participants when they were growing up, the people they lived with, the kind of schools they attended, computer access and computer attitude. This section concluded with questions that spoke to when they were at university making a career choice. The overall purpose of these questions was to test the influence of the factors in column C of the alignment matrix on the career choices in IT that participants made.

The second section consisted of questions that spoke to the second career stage which is “Career Persistence in IT”. These questions in this section spoke to the influence of the factors on the persistence of women in their IT careers. The third section consisted of questions that spoke to the third career stage which is “Career Advancement in IT”. These questions in this section spoke to the influence of the factors in the advancement of women in their IT career. During each section the relationship between different factors were also cross examined to gain more understanding on the influence factors can have on one another. All of the relationships between the variables were taken from the conceptual framework (Figure 2.3 which had relationships already defined) for this study.

Pilot Testing of Research Instruments

A pilot test in interviews is defined as a pre-test version of the interviews before conducting the actual study used to establish validity and reliability of qualitative data. (Gani et al., 2020).

The pilot study was done on two colleagues of the researcher. The pilot study assisted the researcher to pick up errors. The errors included ambiguity and unclear research questions. In addition, the pilot study revealed that the researcher had missed a variable and had no research question talking to this variable. This lapse was found during the analysis of the pilot samples. When the researcher realised there was no data collected to test this specific factor, she was then able to correct the alignment matrix and make sure that all factors had questions speaking to them.

The pilot interview and the actual study interview used the same interview schedule. (Refer to Appendix 3: Interview Questions). Once errors were fixed, the researcher was able to re-do the pilot which worked as expected this time and the interview schedule was then finalised for the main research study.

Administration of the Research Instruments

Once all the participants were identified, the researcher also obtained the email addresses of those who were willing to participate. The emails were initially sent to all participants requesting time slots in their diaries at their convenience and enquiring about their preferred tool between MS Teams, Google Meet and Zoom. Interviews were then scheduled with the potential study participants. A total of 16 interviews took place. However, only 15 could be used for the study, as mentioned above in Section 3.5. All the interviews were personally administered by the researcher.

3.8 Data Analysis Methods

Thematic analysis was used for this study. Thematic analysis is the process of using themes to show patterns of qualitative data. This method is often used to make sense of seemingly unrelated information and material (Kiger and Varpio, 2020). Furthermore, the study used NVivo 12 Pro to analyse data and create themes. NVivo is a computer software used to analyse qualitative data. This research tool can be used for different types of qualitative data such as text, videos, images, audio files, emails, spreadsheets and web content (O'Leary et al., 2018, Hall et al., 2021). This software allows the researcher to classify, sort, and structure data in order to examine relationships between variables, and can assist in gaining richer insights from qualitative data. This software imports, organises, and explores data from a variety of data sources. This information can either primary or secondary (O'Leary et al., 2018).

The results were interpreted with caution using computer-based software to depict the interview records to ensure that rich and insightful knowledge was obtained from the data produced from interviews and that all the necessary data was collected. Using NVivo allowed for easier categorisation and theming of the data through the nodes creation refer to Appendix 6: NVivo Code Report Letter, coding and grouping related responses or sections of the data in themes to ensure that relationships between variables were correctly identified.

3.9 Issues of Trustworthiness

Quantitative research assumes the data is fixed and is concerned with measurements and quantifying results, while qualitative research is concerned with obtaining an understanding of the phenomenon being investigated (Omona, 2013). Quality plays an important role in assuring data integrity and valid study results. Qualitative research methods use qualitative terms to define and measure the quality by the level to which the findings are considered trustworthy (Bowen, 2005).

For this study, trustworthiness will be used to ensure a degree of confidence in data produced and ensure that data production methods are used by the researcher to interpret data well and ensure the quality in this study. Trustworthiness in qualitative studies is ensured using four principles namely, credibility, transferability, confirmability and dependability (Gunawan, 2015, Korstjens and Moser, 2018).

Credibility

This principle is similar to internal validity in quantitative research and is concerned with the aspect of the value of truth (Korstjens and Moser, 2018). The strategy that was used to ensure credibility of this study is persistent observation, that is, identifying those characteristics and elements that are most related to the problem or issue under study, on which the study focusses on. Careful attention was paid to responses to research questions, and research questions were made as clear as possible in order for participants to understand and answer correctly. Thorough analysis was done on the samples to ensure that the most relevant information was captured.

Transferability

Transferability involves the extent to which findings of the investigation can be transferred to other studies or similar settings. Authors further stated that the findings of the investigation must be clear (Korstjens and Moser, 2018). Transferability concerns the aspect of applicability. The research population and objectives of the study were clearly stated to ensure the readers understood what the study was about and to understand the applicability of the study. The data production and presentation was articulated with the findings to assist the readers to understand the context while enabling readers to use and relate the findings to their own contexts.

Confirmability

Confirmability concerns the aspect of neutrality (Korstjens and Moser, 2018). One needs to secure the intersubjectivity of the data. Confirmability requires the researchers to provide clear evidence that corroborates the findings of the study. The interpretation was based on the researcher's own particular preferences and viewpoints but was grounded and supported in the data and literature.

Dependability

Dependability provides evidence that if the study was replicated, similar results or findings would reappear (Korstjens and Moser, 2018). Dependability includes the aspect of consistency. The conceptual model that was used had proposed hypothesis which were used to compare the findings during the analysis chapter to confirm if the results were in line. Though there were consistencies in most findings, some findings showed

inconsistency with the proposed hypothesis. This was expected as the model used was developed in 2002 and much has since evolved in the dynamics of women in IT. In addition, due to cultural and economic variances, the South African context is not the same as the country (outside South Africa), the data from which serves as the basis for Ahuja's model.

3.10 Limitations

The empirical results reported in the study's literature review have shown that the investigation should consider some limitations in light of this information and the Covid-19 pandemic. The main limitation to this study was travelling, which was prohibited in South Africa due to the pandemic and lockdown regulations. Interviews were done virtually as the researcher could not travel to participants. Factors such as body languages and facial expressions were therefore not recorded for participants, and thus their moods and feelings could not be included in the research results.

3.11 Sampling and Sampling Technique

This section discusses the sampling method and technique that were used for this study.

The potential participants were chosen based according to the following criteria:

- Participants were expected to be females currently fulfilling the role within senior management or executive within the IT industry who are involved in decision making in their organisations.
- Participants were expected to be South African citizens by birth.
- Participating institutions were required to be listed on the JSE.

Sampling

Sampling is a process of selecting representatives of a subset of the population of interest in a research study (Wiśniowski et al., 2020). There are two main distinct sampling methods, namely, probability sampling and non-probability sampling (Wiśniowski et al., 2020). Probability sampling is the process of obtaining samples from a population using random selection, where every population have a guaranteed probability of inclusion. In contrast, non-probability sampling involves some form of non-random selection of elements into the sample for which inclusion probabilities are unknown and populations are selected based on inclusion criteria for the study (Wiśniowski et al., 2020). In this study a non-probability sampling method was used to ensure that only participants who are senior female managers or executives in the IT industry were included for this study.

Sampling Technique

In this study the snowballing sampling technique was used. This technique begins by identifying a few participants that match the selection criteria for consideration in the study; afterwards the selected participants are requested to recommend others who also meet the criteria (Parker et al., 2019). Because the researcher is also a female in the IT industry, the researcher started by identifying other participants in her organisation that met the research criteria, and they were invited to participate in the study. Participants were then asked to recommend others that met the criteria which then lead to more organisations that participated. Some participants referred the researcher to other participants with whom they stated they worked with in previous companies, or who were in their professional networks. Some participants were also referred by HR departments of the organisations that had agreed to participate in the study. Potential participants who had left the industry and those whose organisations had not signed the gatekeeper letters were excluded from the study.

The study contained a sample of 15 participants. Initially 20 potential participants were identified for the study and they agreed to participate. However, only 16 interviews actually took place and one of the recording file was corrupted. The four interviews that did not take place was due the difficulty in finding time in the diaries of some participants who were very senior executives. The researcher would have preferred using a larger sample size; however, the global Covid-19 pandemic deprived the researcher of the desired sample frame. In most companies, employees were working online and only few people were in the offices, which made it difficult to contact them. Most of the contact details that were provided during referrals by colleagues were office numbers which were not going through. Some that were going through led to organisations' switchboards which also did not have personal information like emails. Many efforts were made to obtain much bigger sample but the attempts were futile. The larger sample size would have allowed the researcher an opportunity to obtain better unfolding of a broad and richly surfaced understanding of the phenomenon under study.

Research Context

The targeted province was initially Gauteng and that was because the researcher was based in Gauteng at the time of writing the proposal and all the participants were based in Johannesburg companies referred through snowballing. This was going to allow for logistics and easy access to organisations where participants were working. When Covid-19 started, interviews were then conducted online. When interview changed to online, the study was then extended to KZN to include one participant who had been referred through snowballing, her Organisation signed the gate keeper letter and then she participated in the study.

Participants ranged from senior managers to executives as represented below:

Job Role	No. of participants	Managerial level
Chief Information Officer	2	Executive
Head of Data	1	Head of Department
Head of Information Architecture	1	Head of Department
Information Architect	1	Senior manager
Senior Data Architect	3	Senior manager
Data Development Manager	1	Senior manager
Business Analyst/Intelligence Manager	2	Senior manager
Quality Assurance (IT Tester) Manager	1	Senior manager
Systems Support Manager	1	Senior manager
Software Development Manager	2	Senior manager
Total number of participants	15	

Table 3: Summary of participants' job positions, created for this study

3.12 Limited Access to Data

The investigator did not have access to existing company policies and implementation measures when it comes to strategies used by companies in the JSE to develop and promote female professionals in South Africa. The websites of participating institutions did not have these published for the public.

3.13 Ethical Considerations

The consent for the research was obtained by the researcher from four banks in South Africa from which the identified participants were working at the time of conducting the research. Gatekeeper letters were signed by the participating institutions. Ethical considerations, such as anonymity, were maintained during the interview by not using the names of the participants and their organisations when saving the scripts.

The ethical clearance application was completed and submitted to the Humanities and Social Science Research Ethics Committee (HSSREC), along with the gatekeepers' letter, for approval on 19 October 2020. Full approval was received from the committee on 01 February 2021 to conduct the study. Upon completing the study, the thesis document was sent for grammar editing (editor's letter attached in Appendix 5). The letter is attached as Appendix 4: Ethical Clearance Letter.

3.14 Summary

An exploratory research design was chosen to provide richer insights into the perspectives of females in senior management roles in IT. This study uses a pragmatic research approach in order to ensure a focus on the practical effects of the situations these women in leadership face (Johennesse and Chou, 2017). This study used a case study approach, with 15 participants where each participant is a unique case. The multi-case approach was used to try and understand the individual experiences as they were influenced by their previous, current, personal and professional experiences.

In conclusion, this study used the semi-structured interview technique because of its flexibility and the ability to provide us with in-depth information on the research topic. These interviews were analysed using NVivo to analyse patterns in the data and develop themes for this study.

CHAPTER 4: FINDINGS

4.1 Introduction

This chapter presents the findings of the analysis that was performed on the data produced from the participants. The interview data production instrument was used to produce data from the 15 participants who were female IT professionals in senior positions across four different large South African banks.

The codes generated in the current chapter largely follow the themes that were identified in Chapter 2 during the synthesis of literature. Provisions were also made for other codes that emerged during the analysis. The tool that was used to analyse the data was NVivo Version 12. The data analysis and findings of this study follow a combination of deductive and inductive approaches, which allow the use of the literature and hypotheses to test against data produced for this study.

The chapter begins with the demographic information of the participants, followed by the results for each research question and the summary of the chapter:

The following research questions were answered, were addressed in this study (Section 4.3):

- a) RQ1: How do social and the structural factors impact the career choices of women in IT management positions?
- b) RQ2: How do social and the structural factors impact career persistence of women in IT management positions?
- c) RQ3: How do social and the structural factors impact the career advancement of women in IT management positions?

4.2 Summary of Participant Demographics

This section contains the participants' demographic summary. The population representation of the 15 participants (refer to Table 3) is broadly in line with the composition of South Africa's population groups, except that Coloureds were not represented. This is because the choice of the participants was dependent on the use of non-probability sampling method (snowballing) which relied on referrals from other participants. Further research was done to understand if there were specific factors leading to the non-representation of Coloureds. The section below covers the representation of Coloureds in senior positions in the South African workforce across all sectors.

4.2.1 Participants' Ethnic Groups

In the South African population, the Black African population group (79.3%) constitutes the majority of the country's population followed by Whites (9%), then Coloureds (8.9%) and lastly Indians (2.8%) (Statista, 2022). In this study, the participant representation were Blacks (9), followed by Whites (4) and lastly Indians (2) as shown in Figure 4.1 below.

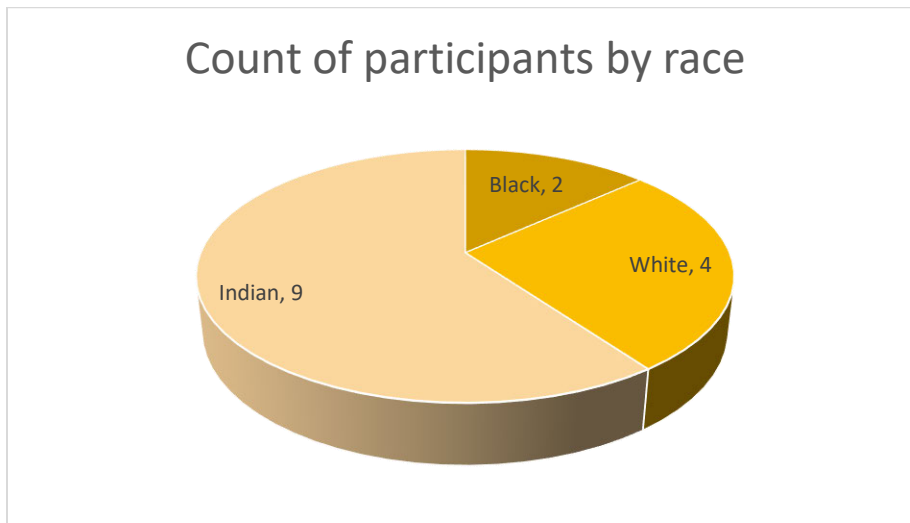


Figure 4.1: Count (out of 15) and percentage of participants per race. Created for this study

Although Lin (2021) showed that the IT industry is racially dominated by white employees this is not the case in this study. However, this could be influenced by factors specific to South Africa, such as the fact that the largest race in the country's population is Blacks. The South African government has also implemented the Employment Equity and Broad-Based Black Economic Empowerment (BBBEE) policy to ensure workforce diversity, promotion of economic development through access to financial deals and other forms of assistance in the corporate and business environments (Harris, 2017). These were accompanied by a legislative framework for the management and monitoring of the black economic empowerment policy (Harris, 2017). Regardless of the efforts to ensure diversity in the workforce, Coloured females in senior IT positions could not be found to participate in this study. The next section presents the age categorisation of participants.

4.2.1.1 Representation of Coloured Ethnic Group in the Workforce

In 2019, research done by the University of Cape Town's Graduate School of Business reported that Coloured professionals were struggling to surpass identity labels that were imposed by apartheid, which negatively affected them in the workplace resulting in difficulty to thrive at senior management level

(ColouredSA, 2019). These results were backed Employment Equity Commission report for 2017-2020, which showed that from the country’s workforce at both senior management and top management, the Coloured ethnic group was the least represented in both senior management and the C-suite occupation level despite its population not being the smallest. The 22nd Commission for Employment Equity Annual Report 2021/22 that was published by the Department of Employment and Labour (DOEL), shows the statistics of the Economically Active Population (EAP) (DOEL, 2021). The EAP includes persons between the ages 15 and 64 years, who are either employed or unemployed, but seeking employment. As shown in Figure 4.2, the Coloured ethnic group had the second largest EAP at (9.1%); however, in top management this group was the least represented as shown in Figure 4.3. In the sector of Information and Communication this ethnic group was also the least represented as shown in Table 4.3 with males 3.5% and females 2.7% at top management. The White population group lead with an excessive over-representation in top management of 63.2% in 2021 when compared to other designated groups, despite having the 2nd lowest EAP (8.8%) as shown in Figure 4.2. Figure 4.4 shows that in the sector of Information and Communication the White ethnic group was also over-represented with males at 49.7% and females at 12.9% having highest representation at this occupation level compared to the other groups. Figure 4.2 shows that the African ethnic group had the highest EAP of 79.4% but remained below whites at 17% in top management in year 2021 as shown in Figure 4.3. This ethnic group had a low representation in the sector of Information and Communication with males 8% and females 6.1% as shown in Figure 4.4.

TABLE 4: National EAP by Population and Gender Group* (**Source: Statistics South Africa, (QLFS, Quarter 3, 2021)						
MALE			FEMALE			Total
AM	African Male	43.6%	AF	African Female	35.8%	79.4%
CM	Coloured Male	5.0%	CF	Coloured Female	4.1%	9.1%
IM	Indian Male	1.8%	IF	Indian Female	0.9%	2.7%
WM	White Male	4.9%	WF	White Female	3.9%	8.8%
TOTAL		55.3%			44.7%	100.0%

Figure 4.2: EAP by Population Group and Gender for 2021 : Source : (DOEL, 2021)

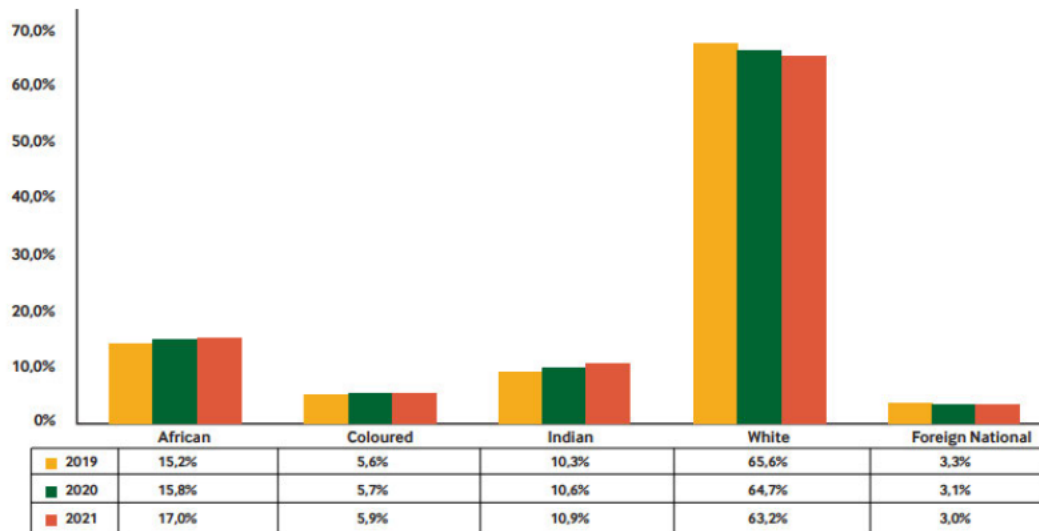


Figure 4.3: Top management by population group (all employers) - 2019 to 2021. Source : (DOEL, 2021).

Table 10: Workforce profile at the Top Management Level by Sector, Population Group and Gender											
Sector	Male				Female				Foreign National		TOTAL
	AM	CM	IM	WM	AF	CF	IF	WF	FM	FF	
EAP	43.6%	5.0%	1.8%	4.9%	35.8%	4.1%	0.9%	3.9%	n/a	n/a	100%
Accommodation and food service activities	6,8%	2,0%	4,0%	51,8%	5,4%	2,3%	2,9%	21,7%	2,5%	0,5%	100,0%
Administrative and support activities	19,0%	3,1%	6,0%	37,9%	13,0%	3,1%	3,4%	12,4%	1,5%	0,6%	100,0%
Agriculture, forestry & fishing	9,6%	3,3%	0,8%	64,4%	5,1%	2,4%	0,4%	13,4%	0,6%	0,2%	100,0%
Arts, entertainment and recreation	19,2%	4,4%	4,8%	37,5%	11,7%	2,1%	3,7%	13,7%	2,3%	0,6%	100,0%
Construction	15,6%	5,7%	5,6%	52,7%	6,5%	2,6%	3,1%	6,0%	1,8%	0,3%	100,0%
Education	10,8%	3,2%	5,9%	30,3%	8,1%	4,2%	3,6%	30,8%	2,0%	1,1%	100,0%
Electricity, gas, steam and air conditioning supply	12,1%	4,0%	8,8%	44,5%	11,3%	2,7%	3,6%	8,9%	3,7%	0,3%	100,0%
Financial and insurance activities	10,0%	2,9%	7,7%	47,7%	7,4%	2,4%	3,8%	14,3%	3,0%	0,8%	100,0%
Human health and social work activities	10,1%	2,9%	6,3%	38,9%	8,0%	3,4%	6,1%	21,1%	2,0%	1,1%	100,0%
Information and communication	8,0%	3,5%	8,4%	49,7%	6,1%	2,7%	4,6%	12,9%	3,2%	0,8%	100,0%
Manufacturing	5,7%	3,5%	10,1%	56,4%	3,8%	1,8%	3,7%	10,3%	4,2%	0,5%	100,0%
Mining and quarrying	20,8%	2,8%	3,1%	49,7%	9,0%	1,1%	1,8%	7,7%	3,8%	0,3%	100,0%
Professional, scientific and technical activities	10,1%	2,7%	4,8%	45,7%	6,5%	2,3%	4,5%	19,9%	2,6%	1,0%	100,0%
Public administration and defence; compulsory social security	42,1%	8,1%	3,7%	14,1%	20,6%	3,7%	2,6%	5,0%	0,2%	0,0%	100,0%

Figure 4.4: Workforce profile at the top management level by sector, population group and gender Source : (DOEL, 2021).

The under-representation of Coloureds in top management can be seen in the overall country's EAP and the Information and Communication sector. These results support the findings of this study which suggests that it is difficult to find female senior managers who are from the Coloured ethnic group and that has

created a limitation to this study to find a female participant in an IT senior management position from this ethnic group. Blacks had the highest EAP. However, their representation in the top management positions was below both Whites and Indians. These results also coincided with research by Cain (2021) who stated that the IT workforce is composed of almost 90% White and Asian men. The research also showed that there is a noteworthy growth of Black women enrolling and graduating in IT studies while the participation of Black men is declining. The graduation rate of White students from high school and college is immensely higher than that of Black students. Cain (2021) further stated the quality of the education was the main reason for the high dropout in IT studies. Low participation and under-representation of Blacks in the IT workforce was due to the fact that Black students are more likely to attend schools that are ill-equipped and lacking the resources that contribute to providing a quality education at the same level as White students receive. Both Cain (2021), Mariscal et al. (2019) cited the digital divide as the cause for the gender and racial inequalities in the IT industry and that affordability was the key issue in their exclusion. Cain (2021) also showed that Blacks have lower rates of home computers and Internet access compared to other ethnic groups and that they used their phones as their primary source of Internet access. While Mariscal et al. (2019) showed that beyond affordability, there were significant socio-cultural norms that restrict access for women. “Parents can directly or indirectly discourage girls to use technology during early socialization. In this way, they may shape girls’ preferences regarding their future career choices in science and technology. Without sufficient female role models outside the family, it becomes even more difficult to overcome gender stereotypes” (Mariscal et al., 2019, p. 7).

The researcher is currently working for one of the organisations (one of top 4 largest banks in SA) that participated in this study. However, the search for female IT senior managers who belonged to Coloured ethnic group in her organisation and other organisations were futile and hence there is no representation of female Coloureds in this study. She contacted IT departments and two Human Resource managers and none of them could assist. Only one male data analyst was identified but because of the gender and occupational level he could not participate in this study.

The next section presents the discussion of ethnic groups representation across different occupational levels focusing on the Coloured group which is currently not represented in this study. This section also includes literature and statistics.

4.2.1.2 Population Groups by Managerial Level

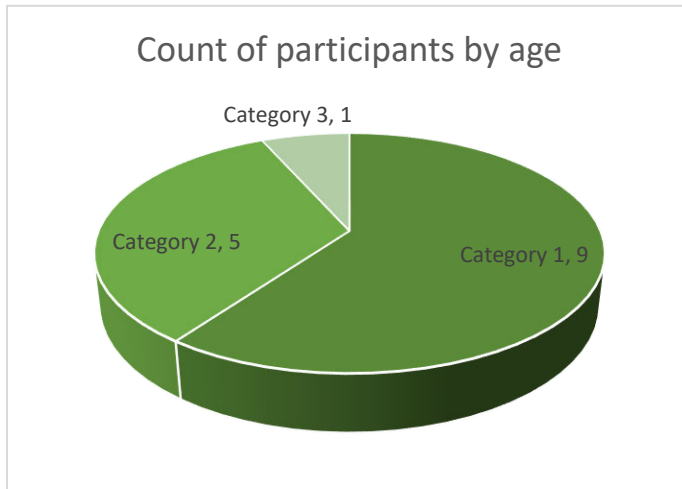
In this study the ethnic groups that had the highest representation in top management (2 CIO) were the White and Indian ethnic groups. All three ethnic groups (Blacks, Whites, and Indians) were represented in senior management as shown in Table 4.1 below. The research also showed that participants from the Black ethnic group were concentrated in middle management. These results were consistent with the statistics from Section 4.2.1.1, which showed that in South Africa in 2021 the White and Indian population groups had the highest representation in top management positions in the Information and Communication sector. The Black ethnic group was better represented in the study over all but not represented in the top management.

Participant	Race	Job Role	Occupation Level
1	Indian	Information Architect	Senior Manager
2	White	Information Architecture Head	Head of Department
3	White	Data Head	Head of Department
4	White	CIO	C-Suite
5	Black	IT Support Manager	Senior Manager
6	Indian	CIO	C-Suite
7	Black	Data Architect	Senior Manager
8	Black	Business Intelligence Manager	Senior Manager
9	Black	Test Analyst Manager	Senior Manager
10	Black	Data Development Manager	Senior Manager
11	Black	Data Architect	Senior Manager
12	Black	Application Development Manager (Java Specialist)	Senior Manager
13	White	Data Architect	Senior Manager
14	Black	Application Development Manager (Java Specialist)	Senior Manager
15	Black	Business Analyst Manager	Senior Manager

Table 4.1: Participants by gender, Job Role and Occupation Level. created for this study

4.2.2 Age of participant

As shown in Figure 4.3 below, the age of participants ranged from 31 to 67. The majority of the participants between 30 and 40 years were represented by category 1 below. The age composition shows that women of all ages are actively participating in the IT workforce. None of the participants were below 30 and only one participant was above the age of 60. The oldest participant over 60 was working on a contract for the bank providing her expertise in the data architecture space within IT. She stated that her experience included experience from abroad, in international companies.



Category 1	between 30 and 40 years	9 participants
Category 2	between 41 and 60 years	5 participants
Category 3	between 61 and 69 years	1 participant

Table 4.2: Participants age grouping categories

Figure 4.5: Number of participants per age category. Created for this study

Figure 4.5 and Table 4.2 shows the age grouping of participants per categories. The overall group of participants contained both middle and top management within IT positions. There was no direct correlation between age categories and occupation levels as both age categories 1 and 2 were represented in the C-suite level while in middle management all three age categories were represented. The following section presents the results as aligned with variables from the respective research questions.

4.3 Research Questions

The following section presents the study findings based on the coding of interviews according to the themes. The section discusses the results under the themes of the first career stage which is “Career Choice in IT”. As the node representing each factor affecting a women in each career stage and the findings that are associated with variables affecting each career stage were assigned through coding in NVivo under sub-nodes under the nodes of the career stages, sub-sections will be created to discuss variables affecting the career stage. Figure 4.6 below shows each career stage and the constructs that will affect each career stage. As shown in Figure 4.6, some constructs will affect women in more than one career stage and therefore their effects will be discussed in the respective sections where a research question for that section is discussed.

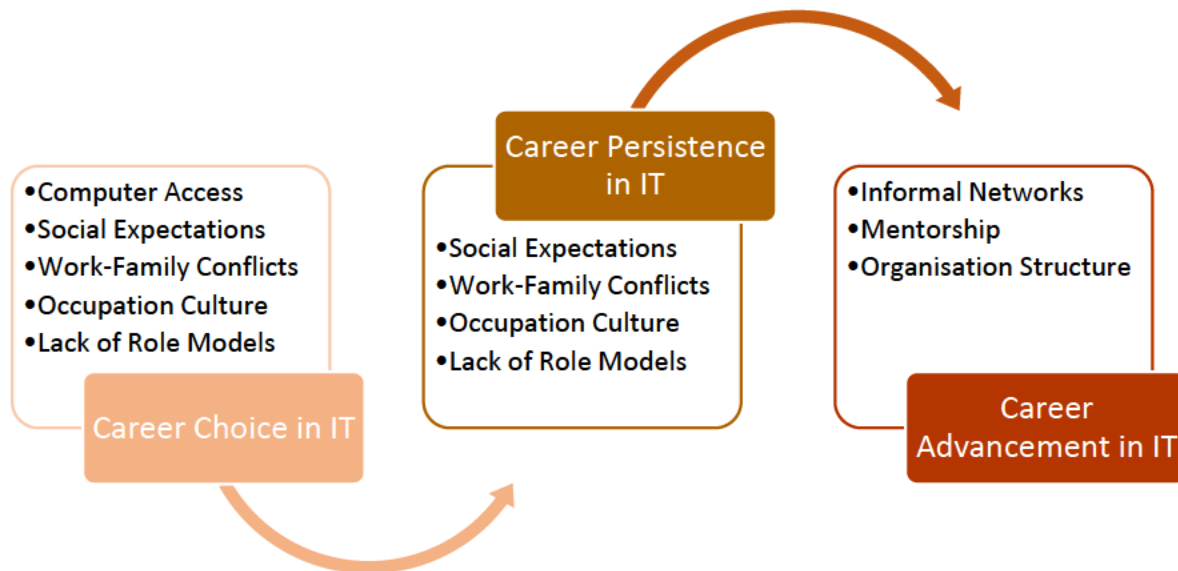


Figure 4.6: Summarized view of IT career stages and the constructs affecting each stage

4.3.1 First Career Stage: Career Choice in IT

The first research question that is aligned to the variables discussion in this section is: How do **social and structural factors** impact the **career choice** of women in IT management positions?

Factors suggested by the conceptual framework, as shown in Figure 4.6 above, that will affect the first career stage are discussed below.

a) Computer Access

Most participants (7) stated that they did not have access to computers when they were growing up, followed by both those who had access to their parent's computers (3 participants), and those that stated that they started using computers at high school during computer classes (3 participants). The smallest group was those who indicated having owned personal computers when they were growing up (2 participants).

According to (Ahuja, 2002) access to computers at a young age will increase the likelihood of young girls choosing IT as a career. In this study this was not a limitation because there were factors which lead women to choose to study IT despite not having had access at a young age but rather due to circumstances such as having the ability to do STEM subjects within the qualification. P14 said *"I had applied for medicine and others including computer science I remember some of the courses were starting to decline me, so I had to choose between what was left...the other thing I can remember was the idea of still being able to do pure maths while doing computer science and in ideal Maths being like a huge requirement, cause I knew I*

enjoyed Maths in high school and so I thought I rather choose this course". According to P14, IT was not her first career choice. But her love for mathematics made her choose IT instead of other qualifications.

The results of this study also showed that availability of scholarships for IT qualifications can positively influence women to choose IT. P10, P5 and P9 stated that they ended up in IT because of obtaining scholarships or bursaries. *"The first person I spoke to after accepting the bursary was my mother. She was happy that I was gonna study and that's all that mattered to her even though it was a strange course. My mom was happy because she know I was smart, I was going to pass."* (P10); *"... I wanted to do medicine but my application was late and there was this girl I think she was a university mentor assisting first years during registrations. She took me to this other lecture's office and they checked my statement and said I can do computer science and I also got a bursary"* (P5); and *"I did not have enough funds for radiography and then I just got an IT scholarship through my aunty's work and that's how I ended up in IT.... My grandparents were very happy about the scholarship"* (P9).

I. Impact of computer ownership on computer attitude

The two participants who stated that they owned a personal computer when they were growing up both had IT as their first choice at university. These participants had a first preference for IT compared to others who ended up in IT due to circumstances. The results also showed that access to computers can create comfort and confidence towards computers, thus creating a positive attitude towards computers. *"... having a household where I had access to computers from the age of eight or nine or ten years old, you know not being afraid that I'm gonna break a computer. My father will fix it. Is one thing that made me comfortable to say I can go into a career of IT"* (P3). One of the CIOs also shared the same *"... my dad bought me my very first PC. I think it opened up a new world... My brother and I used to always play video games together, we used to get so hooked up on the screen and my dad always mentioned that you know IT is a good career for a lot of people. And yeah, that's what attracted me to it and eventually how I chose IT"* (P6). The two participants are both in the first age category 30-39; one is a CIO while the other is a Data Head. These younger participants' situations suggest that females who had access to computers at a young age were more likely to overcome barriers and advance to highest senior positions.

II. Impact of electronic device (cell phone) on computer attitude

Another result from one participant who did not have access to a computer while growing up showed that having cellphone or other electronic device can create a positive attitude towards computers. *"When cell phones started coming out and my mom bought my older sister a cell phone,*

that was a tangible IT product for me. The idea that someone programmed the cell phone, that was more what I wanted to do... it started coming up in my mind is something I might do so that I can also create my own cell phone one day.” (P5). These results coincided with the recent study on mobile phones, gender, and female empowerment in sub-Saharan Africa, which showed that South Africa is one of the countries in Africa where ownership of mobile electronic devices is low and that cell-phones are shared among young people (Porter et al., 2020). This study was conducted in Ghana, Malawi and South Africa and showed that penetration of mobile phones in sub-Saharan Africa in 2016 was estimated at 44% and mobile Internet penetration at 28%, but ownership figures provided only a partial picture as phones are borrowed and shared widely as circumstances require, especially among young people (Porter et al., 2020).

III. Computer attitude

To test the influence of computer attitude, participants were asked about their attitude towards computers when they were growing up.

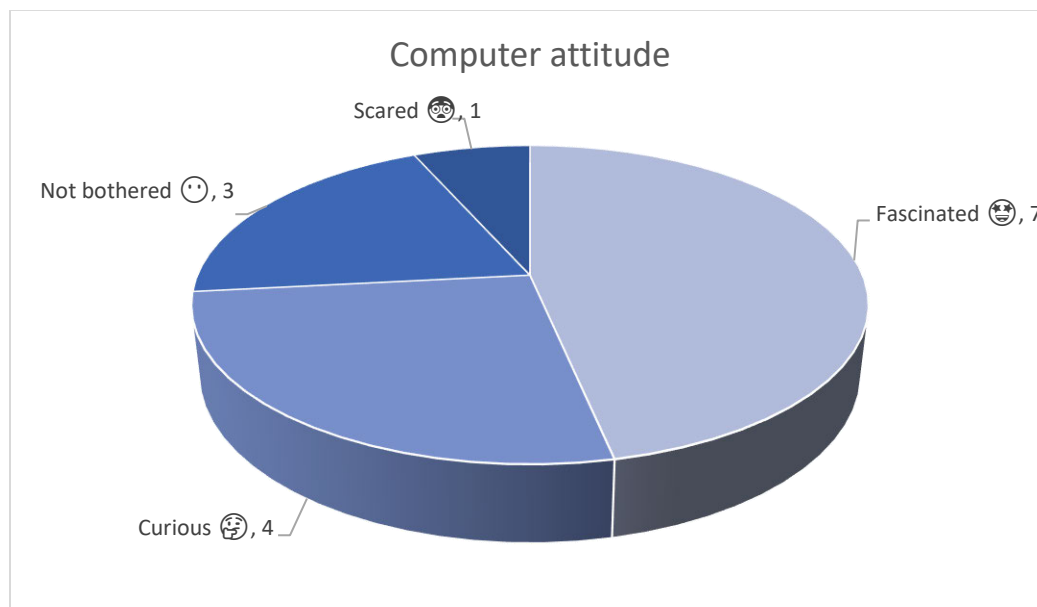


Figure 4:7: Results of participant’s computer attitude when they were growing up.

As shown in Figure 4.7 above, the majority of the participants (7) said they were fascinated by computers when they were growing up; four said they were curious about how it worked and what it does; three said they were not bothered; and one said she was scared of computers. Seven out eight participants who had access to computers when they were growing up (i.e., owned a computer or had access at school or both) said they were fascinated by computers. One participant who had access to a computer only at school said

the computers scared her. Out of the 7 that did not have access to computers when they were growing, 4 said they were curious how it worked while 3 said they were not bothered.

P8 stated: *"It's actually scared me... It was something that I saw quite far it like for a phone was easy but a computer? Yeah no it was quite far in for me until I started using it"*.

In the South African context schools are categorized into two groups public and private schools (Köhler, 2022). Public schools consist of two divisions of which the first category (previous Model C schools), also referred to as formerly historically advantaged schools, are primarily funded by parents and alumni and the general perception is that those schools offer outstanding facilities and maintain a high standard of teaching and learning activities, which amounts to best practice in education. The second category consist of the public schools that are either in less favorable socio-economic environments or in the countryside of South Africa some even lack the basic services of electricity, water, safe toilets, study material, and staff who are capable to assist the learners . Private schools are more expensive than public schools and are perceived as offering a high standard of education. They do not experience the challenges faced by public schools (Swart et al., 2022). The findings of this study showed that computer access at a young age can create positive attitude towards computers. The results also showed lack of computer access can create computer anxiety. Participant 8, who only started using computers at school, stated that she used to be scared of them. This coincides with Ahuja (2002) where she stated that lack of computer access at a young age can create anxiety. According to the results, 8 out of 15 participants had access to computers when they were growing up (at home or at school). One of these participants (P11) had received a bursary to study at a Model C school in an urban area. Otherwise, the majority of the participants did not have to access to computers when they were growing up, which could explain IT not being their first choice at university.

P11 stated: *I got into a private high school after getting a bursary. There were computer classes which we had to attend. It was exciting to be able to use a computer. But I was never fascinated when I was growng up until when I started using it. ...Uhm, and then yeah, I would even go like I'm in my friends on after. Like in the afternoons when we did not have sports we used to go to the computer center. So it was fascinating to be to play on the computer.*

The results were also compared with the results from computer access in Figure 4.1 above earlier: The results showed that the 7 participants in Figure 4.7 that said they were not bothered (3) and the ones that said they were curious (4) when asked about their computer access when they were growing up, were found to be same 7 participants that did not have computer access or exposure when they were growing up. These

results showed that lack of access to computers at a young age can either leave children curious or it can create a negative attitude towards computers. This supported Ahuja (2002)'s hypothesis when she stated that lack of computer access will create a negative attitude towards computers. While computer access can create a positive attitude as seen that with those who had computer access at home and at school showed positive attitude as the results showed that they were fascinated by computers. The results from P8 who had limited access to computers and stated that computers initially scared her, suggest that she may even have been traumatised by the subject. This supports Ahuja (2002) that no access or limited access to computers may lead to computer anxiety.

Access to bursaries at high school can increase participation in IT through positive attitude from learning about computers at private schools, while access to bursaries or scholarships for universities can increase participation of women in IT.

IV. Primary use of computers at a young age

The participants that stated that they had owned computers (P6 and P12) or had access to their parent's computers (P3, P4 and P7) were asked about what they primarily used it for. The results showed that it was mainly schoolwork, educational programs and games.

Results of this study shows that 12 participants (80% of the participants) did not end up in IT due to IT being their first preference. These results are drawn from the participants' responses where some stated that they ended up in IT because of availability of scholarships, others ended up in IT because of the love for STEM subjects while others ended up in IT because they could not get into their first choice. Only 20% ended up in IT because they had a passion to study IT.

b) Social Expectations

Ahuja (2002) describes social expectations as factors that are embedded in cultural values and reflected, consciously or unconsciously, in behaviour. She further states that societies give different signals to girls and boys in their formative years, for example, boys are encouraged and expected to use computers both at school and at home, while girls are less likely than boys to be sent to computer classes or camps. To test this construct, participants were asked about who they lived with when they were growing up and if the parent figure that raised them had any influence on their career choices in IT. The results of this study varied from those who lived with both parents and siblings as the most common answer (73%), followed by those who lived with single parents and siblings (20%), and lastly those who lived with extended families, e.g., grandparents (7%). All those who lived with single parents referred to the mother and one of the participants

reported living with both their mother and grandmother. The research showed that learners get more influence on their career choice from either their families or their teachers (Grant and Ray, 2018). In this section we look at the influence of the social expectations in their career choices. This is done by looking at their families and cultures when they were growing up to the point a career choice was made.

South Africa is a multi-cultural country (Bogopa, 2010), and in this study participants are from different races and cultures. Therefore, it was important to look at different cultural dimensions to understand if they had any influence in the career choices made in IT by participants. According to Grant and Ray (2018) the cultural beliefs among families inform decisions made about the members of the family or the family as a whole. Triandis (2004) stated that culture is “inside” the person and further argues that all psychological processes have a cultural component. To understand cultural differences, it is vital to understand cultural dimensions and therefore in this study the individualist and collectivist cultures were explored. Perceptions and behaviours of people in individualist and collectivist cultures differ (Triandis, 2004). In collectivist cultures people give priority to ingroup goals instead of personal goals. They pay more attention to norms than to attitudes. Individualistic cultures are characterized by individualism, which is the prioritization or emphasis of the individual over the entire group. People are motivated by their own viewpoints and preference in individualistic cultures and the focus is placed on personal goals, uniqueness and self-dependence (Triandis, 2004). Table 4.3 below shows the differences in the individualist and collectivist cultural beliefs.

People in Individualist Culture	People in Collectivist Culture
- Focus on content e.g., what is said	- Focus on the context e.g., how it was said (tone of voice, gestures, etc.)
- Focus on self – Independent (responsible for themselves)	- Focus on group – Interdependent within the group (responsible for the group)
- Give priority to personal goals	- Give priority to in-group goals
- See behaviour through attitude and personality	- See behavior as due to external factors, such as norms and roles, more than due to internal factors, such as attitudes and personality.
<i>Source : Triandis (2004, p. 90)</i>	

Table 4.3: Summary of individualism vs collectivism

i) Raised by single parents and grandparents

The results, as shown in Table 4.4 below, indicated that participants who were raised by single parents and grandparents did not have their career choices influenced. Participants who were raised by single parents also came across as independent as most of them reported having to look for admission at the universities alone and not discussing their career choices with parents but rather updating them on their career choices and admission statuses at the universities. The table below shows responses from participants who were raised by single parents and grandparents.

With whom did you live?	How did they feel about your career choice in IT?
Single mother (Mother)	<i>"...she were quite supportive of the move. Because it it's what I want to do right? It's my life so very supportive of me and my studies in that space." (P2).</i>
Single mother (Mother)	<i>"The first person I spoke to after accepting the bursary was my mother. She was happy that I was gonna study and that's all that mattered to her even though it was a strange course. My mom was happy because she know I was smart, I was going to pass." (P10).</i>
Single mother (Mother) and grandmother	<i>"... They did not understand what I was going to work as, probably they still do not understand but they were happy I was going to study at the university." (P5)</i>
Grandparents	<i>"I did not have enough funds for radiography and then I just got an IT scholarship through my aunty's work and that's how I ended up in IT. My grandparents were very happy about the scholarship" (P9).</i>

Table 4.4: Responses from participants staying with single parents and/or grandparents. created for this study

The results of P2 and P10 showed more independence and were more individualist; also the caregivers for both these participants were women. P5 and P9 also showed more independence were also more individualist. Neither of these groups had their career choices in IT influenced. Though we cannot claim that this data means that girls raised by single parents (mother) and grandparents will always be more independent in making career choice, this suggests that these issues may need further research.

ii) Raised by both parents and siblings

The results of this group varied based on unique aspects of individual circumstances. These unique aspects of individual circumstances were the family knowledge of computers, a role model parent in IT and perceiving economic earning in IT career as independence. The results below showed the impact of 1.) Having a family member(s) who have knowledge of computers 2.) Having a parent as a role model who

was also in the IT industry 3.) Having knowledge or perception of economic earning in IT career as providing financial independence.

1. Family knowledge of computers

Participant 1 ended in IT because of an accident that left her disabled without the use of her right arm. This accident took place right before she went to the university to start her studies on Physiotherapy. Her testimony below showed that her career choice in IT was influenced by her family as she mentioned that they suggested that she look into IT career, based on the understanding of the functionality and capabilities of computers considering her disability. It must be noted that her changes circumstances also played a role in her choice of career – she might have not ended up in IT if she had not been involved in the accident that caused her disability and the loss of the use of her arm. She states that she had already been accepted in her career choice in the medical field. P1 stated that *“I think my situation runs different, so they were just happy that I could do something.I had gotten accepted for physiotherapy and because I lost the use of my hand in an accident, I couldn't do the dissections and do some of the labs at university, so I had to think about another career choice 'cause my only career choice was to be able to go into the medical field and then my brother said look at doing something in computers and that's when I changed.”*

The response from Participant 1 shows that a family (in this case a brother) had a positive influence on her attitude towards computers. However their influence was also based upon the fact that she had been involved in an accident and could no longer do physiotherapy. The testimony of P1 shows that her parents were happy that she could do something even after being paralysed in her right arm, and therefore her family was supportive of her moving into IT as a career.

As family members become more aware of benefits of computers even if they are not computer literate, these results shows that it will have a positive impact. Therefore, some families may not be in support of females studying IT because they do not understand its benefits or what IT careers entail. Results also show that participants in the urban and certain income brackets seem to have had more career exposures to different careers from a young age, some through private schools and through having parents that had professional jobs.

2. Role model parent in IT

P 3 was inspired by her father and therefore he became her role model. Her father's success in his IT career, and being able to play games on her father's computer against her sister who had a computer made her develop enthusiasm and passion for computers.

P3: *“I followed my father's direction and went into banking and I was just naturally drawn to IT because of you know my father, you know inspiration and how he inspired me in his whole IT career. My father was senior IT executive at a bank. There was always computers from the time that I can remember, you know, very old computers. I still remember the time a computer mouse was introduced. I think he was one of the first people in South Africa that even had a computer mouse and then from very young, a LAN set up in our house. My mother had a computer; my father had a computer; my sister had a computer and we could play games against one another. So you know we did not have a lot of money growing up, but what we did have was computers. So I played computer games from a very young age”*

The hypothesis that parents influence their children through their career as seen above in P3 was also supported and observed in the results of P4 who also followed in her father's career path and chose the same. The results of P4 also shows that her dad chose for her but also positively influenced her attitude towards computers in which she ended up having career. P4 stated: *“My dad was a qualified accountant but worked in IT... I I got exposure at quite an early age I'd go with my dad to to work on a Saturday and see what he did at work and in those days. He worked on a mainframe and it was it was big round disks that they used to have to take off for the mainframe and Yeah, I got all of that exposure by showing the interests... So I I love computers. I found them interesting. Obviously I found gaming interesting somy dad chose for me. So that's how I landed up with computers and accounting.”*

3. An IT career provides financial independence

The results from the study showed that parents who believed IT was a good career were more likely to encourage their daughters to study IT. P6 stated that her first career choice was medicine but because of time to complete a medicine degree she changed and accepted an offer from the university to study Computer Science which was her second choice. The results from this participant shows that her father believed that IT was a good career. P6 stated: *“...in conversations with my dad, he always mentioned that you know IT is a good career for a lot of people. And yeah, that's what attracted me to IT... I honestly just wanted to become independent. You know, I wanted to start paying for myself and looking after myself and the medical degree was a very long journey, one that I did not want to take.... I think my dad definitely did influence my career choice and IT was my second choice on university”*.

Both P4 and P6 followed IT careers chosen for them by their fathers, and both of these participants are currently CIOs. The results from this construct also shows that most participants whose career choice in IT was influenced were influenced by their father, either by choosing for them or by working in the IT industry already, or both.

The results of the group of participants that were raised by both parents and siblings showed that this group was more collectivist. Participants in this group were not making career choices independently and most of their career choices were influenced by at least one family member. Two participants had their career choices made for them by parents (P4 and P6); P3's father was her role model so she followed his direction; while P1's brother suggested that she choose IT due to health circumstances that did not allow her to do what was her first career choice.

c) Work-family Conflict

A study on intersection of work and family roles suggested that work–family conflict arises when the demands of participation in one domain are unharmonious with the demands of participation in another domain of life and that this conflict will then affect both the quality of work and family life (Greenhaus, 1988).

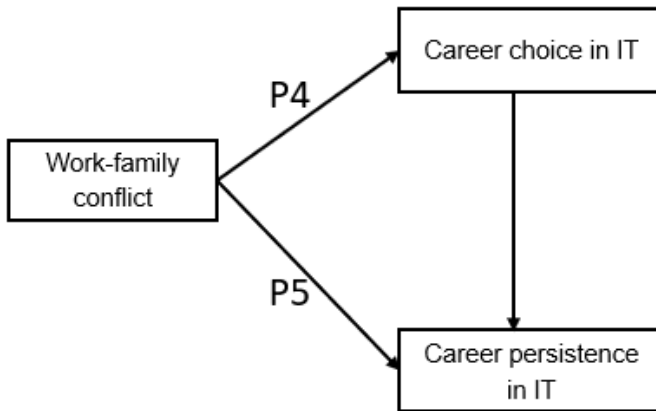


Figure 4.8: Influence of work-family conflict in women's IT career. Source:(Ahuja, 2002)

In her model Ahuja suggests that work-family conflict will affect a woman in both her career choice in IT and in her career persistence in IT stages as shown in Figure 4.8. To answer the research question, data was analysed in this section to see the impact of the work-family conflict construct on women's career choices in IT. Participants were asked if their work objectives affected their family responsibilities. All participants affirmed that at some point in their careers they were unable to balance work and family responsibilities. Most participants reported a severe work-life imbalance in their early career stages.

P1 stated: “When I started my IT career I was a programmer and I used to work till about 2:00 o'clock in the morning and to deliver on particular projects and so forth. And I had just had a baby and I had decided that I cannot do this anymore. So it was affecting my family and my responsibilities. So I decided that I couldn't work those long hours and I needed a different job”.

P15: *“I had made specific decisions in my life that my work focus will be my predominant focus but when I had met my husband who was a partner at that time. It was just impossible to balance things, the relationship there was still a lot to learn since it was my second year in the industry...I personally felt that I need to prioritise one or else I was gonna fail at both”*

These results coincided with the statement by Ahuja when she stated that many women’s early career experiences coincide with the stage in their lives when they are marrying and starting a family. At this stage in their lives, professional women are faced with trying to manage a career, a home and child-care. Additionally, women who have full personal lives may be viewed as lacking a strong commitment to their work or not being as serious about their careers as their male colleagues (Ahuja, 2002). Participant 1 stated that she had to leave software development and start working in the data space in order to balance the work demands and her family demands. This was a change in both company and job role even though she remained in the IT industry. These results were also supported by research studying reasons why women leave the IT workforce which found that more educated women are more likely to leave to take on another job while less educated women are more likely to leave the IT workforce if there are is job satisfaction (Hoonakker et al., 2006). The results of this study show that some women may leave their IT jobs for other IT jobs that are less stressful but remain in the IT industry. Therefore, in this study we conclude that this will not negatively influence women’s career choice as no findings suggests that work and family conflicts will make women leave the IT industry.

d) Occupational Culture

According to Ahuja (2002) occupational culture is one of the construct that will affect women in their career choice within IT. Ahuja stated that this construct will affect women in their career choice and career persistence stages within IT. As part of answering the first research question we examine the impact of occupational culture in women’s career choices in IT. Ahuja (2002, p.23) stated that “The occupation culture in IT in universities and colleges incorporates exceptionally long hours, late nights and ‘highly focused, almost obsessive behavior’ and that for most women, such work ethic may raise their safety concerns and conflict with family responsibilities”. To test this, participants were asked to answer the questions below: In Figure 2.3 model in Section 2.6 above, occupational culture variable is labelled as (relationship P7) to test the and in the alignment matrix Appendix 2, the following four questions (**Q1-Q4**) were asked to test the influence of occupational culture variable in the women’s career choice in IT.

P7_Q1: Are you a technical person?

P7_Q2: During your university studies, did you ever have to work at night on IT projects?

P7_Q3: Do you think the IT profession is seen by IT students as a career that demands late night hours of work?

P7_Q4: During your university practicals, did you find IT attractive as a career?

All participants stated they were technical people and that their roles required them to be technical. Most participants stated having to work at night on IT projects during university studies.

P10 stated: *"I am a technical person pertaining to what I do in my job... I do not think IT projects can make one think IT is too demanding as varsity and work are not the same thing... At school students focus on getting the degree and getting the job and not many things. After getting job that where one learns how the IT environment is... I would say it interesting and fascinating to experiment during practicals"*. P14 stated: *"... I do not think so you think of the work industry at that time... I think at the time your view is that you are just working hard and normally as a student you are willing to continue working hard as long as the reward is also like exciting, I think."* P12 stated: *Yes, it can definitely influence you to start wondering if you will have to work like this in the industry...but at the same time I do not think such instances of working late on assignment must make you think otherwise because in all subjects there are times where we had to work more and probably sleep late. I think in CompScie we had only one occasion where most probably we had to work throughout the night because but we were having big issues that particular night, but it's not like that it was a frequent thing during my studies"*. P2 stated: *"I definitely did not think it was a reflection of the work I will be doing, I just thought it was funny and cool to learn. My main goal was to understand and pass."*

Contrary to Ahuja's (2002) proposition, the results of this study showed that women who are still at university do not concern themselves too much with the occupation culture when they start working. Most women stated that they viewed it as hard work when they worked late during university practicals, while others stated that the focus at that stage was the reward of working hard which was to pass and get good marks and graduate. Therefore, for this study we conclude that that occupational culture will not negatively influence career choice in IT as none of the participants mentioned ever wanting to quit because of working late night on their IT projects, assignment or practicals. The section below discusses the lack of role models as another construct that will affect a woman during her career choice stage.

e) Lack of Role Models

According to Ahuja (2002) the lack of role models construct will affect women in their career choice and career persistence stages within IT. As part of answering the first research question we examine the impact of lack of role models in women's career choices in IT. She further stated that the presence of role models can be instrumental in steering women towards IT careers and that the presence of role models provides evidence that women can have successful careers in the IT field. This was supported by Marginson et al. (2013) who stated that the IT industry is one of the industries that are least attractive to women. Marginson et al. (2013) also noted that this low attraction of IT industry to young girls is apparent in to the smaller concentration of women and in the slow progression and low representation of women in leadership positions in these industries. The IT industry is one of those that have failed to attract women and therefore women remain under-represented in this industry (Marginson et al., 2013).

In this study participants were asked if they were ever exposed to any female who was pursuing tertiary studies in IT or working as an IT professional. Only P9 stated that they she knew a female who was in the industry working as an IT professional.

P9 stated: "... My biggest reason was my older sister. She was studying computer science at Unisa and I was exposed to her books because she was studying at home.... So that's when I actually like saw a book about computer science and I remember it was a C++ programming book. And there's one on computer science fundamentals and it was really interesting and intriguing to me... That's basically why computer science ended up being an option when I registered, because I had seen some of my old sister's books when she was trying to study it. Yeah, maybe like a year or two before me."

The findings for the second research question are discussed below.

4.3.2 Second Career Stage: career persistence in IT

A model by (Ahuja, 2002) of social and structural determinants of women's career choice, persistence and advancement in IT states that the second career stage "career persistence" will be affected by social and structural barriers which hinder the persistence of a female IT professional. These constructs are listed and discussed below, using the findings from the research data and a conclusion is then drawn at the end of each section.

a) Social Expectation

In the above section the social expectation construct was discussed as guided by the model created by Ahuja, which stated that social expectations will affect a women in her career choice stage and in her career

persistence stage in IT. As part of answering the first research question on impact of social and structural factors affecting a women in their career choice stage, participants were asked questions that related to the impact of social expectation construct in their career choice in IT. Therefore in this section we discuss the results based on the responses that were provided by participants when answering questions regarding the impact of social expectations in the career persistence of a women in IT. According to Ahuja (2002), women in general will display low computer aptitude which will then create computer anxiety among women, leading to lower self-efficacy, thus increasing their computer avoidance. She then went further to state that this anxiety will affect performance and persistence in the IT career.

P3 stated: *“My father was senior IT executive at a bank. There was always computers from the time that I can remember, you know, very old computers. I still remember the time a computer mouse was introduced. I think he was one of the first people in South Africa that even had a computer mouse and then from very young, a LAN set up in our house. My mother had a computer; My father had a computer; My sister had a computer and we could play games against one another. So you know we did not have a lot of money growing up, but what we did have was computers. So I played computer games from a very young age”*

P 6 stated: *“...my dad bought me in my very first PC. I think it opened up a new world... My brother and I used to always play video games together, we used to get so hooked up on the screen and my dad always mentioned that you know IT is a good career for a lot of people. And yeah, that's what attracted me to it and eventually how I chose IT”.*

Above, we discussed how this social expectation construct impacted women’s career choice in IT. We showed in the results that women who have done the aptitude tests in computers when they were going to universities both showed strong results for IT. We also showed that there are participants who had access to computers when they were young and none of them indicated computer anxiety. The results also showed that all participants who had access to computers at a young age actually had a positive attitude towards computers and contrary to Ahuja the results also showed that those who had access to computers had positive attitude and high computer efficacy since they chose a career in IT and was able to persist and advance in the IT career.

b) Work-family conflict

In the above section work-family conflict construct was discussed as guided by the model created by Ahuja, which stated that work-family conflict will affect a women in her career choice stage and in her career persistence stage in IT. As part of answering the first research question on impact of social and structural

factors affecting a women in their career choice stage, participants were asked questions that related to the impact of work-family conflict construct in their career *choice* in IT. Therefore in this section we discuss the results based on the responses that were provided by participants when answering questions regarding the impact of work-family conflict in the career *persistence* of a woman in IT. The result showed that work-family conflicts exist and can play a significant role in a woman's decision to persist in IT or not. All women stated that they have had imbalances in their work and family objectives at some point in their careers within IT. The results showed that though the IT industry is demanding, what makes it more difficult are factors such as poor planning, unrealistic deadlines and lack of project management.

P14 stated: *“One of the times I remember a lot of people had left the team and I was the only developer left from the team, so it went from about a team of four developers to just only being me.... So I did feel like I had to prioritise work objectives over family objectives ... even if I was on leave trying to spend time with my family. They would call me and tell me this code is failing. This test is not working. How do we fix this? Because I was the only person with the information at that time.”*

P11 stated: *For me planning is key, if the project is not planned correctly chances are it won't be success in terms of quality or delivery on time. Planning helps us understand dependencies, understand the effort required and check the resource allocation and possible how long it will take to complete the task/project. When the planning is done correctly the time allocation can be done correctly and there won't be unnecessary frustrations at work or anyone needing to work till midnight and affecting the family time.”*

The results also showed that the work environment also plays a huge part as it will affect the balance. The work-life balance, which results in work-family conflict, is affected by factors such as the type of work one does; the environment one is working in; traveling (if one's work requires one to travel within or outside countries); the team one is part of; as well as personal circumstances, such as work or family support. The results in Table 4.5 below shows that participants in software development stream face more work-family conflict due to the nature of the work they do. The results also showed that the level of work-family conflicts decrease in the executive level (CIOs) even though they are also in the software development stream. Both these participants reported having a balance in their work and family responsibilities. P4 also showed that communication methods can play a role as she stated that she had communicated with her family that they should text her for anything but only call her when there was an emergency when she is at work, while P6 stated that she would sacrifice in her personal life at that point in time if she has to, to ensure a balance. The participants who worked in data stream also stated that they were able to balance their work and family

objectives. P5 who is the IT support manager, stated that she had to change her job (environment) but look for another similar job in a different environment.

Participant	Quote	IT career	Level of Conflict
P1	<i>"When I started my IT career I was a programmer and I used to work till about 2:00 o'clock in the morning and to deliver on particular projects and so forth. And I had just had a baby and I had decided that I cannot do this anymore. So it was affecting my family and my responsibilities. So I decided that I couldn't work those long hours and I needed a different job".</i>	Software Development	High
P2	<i>"Better now...IT is a bit more flexible, and I think we've been enabled with the mobility strategy of working from home to allow for that flexibility, which we wouldn't potentially have if we were still full time in the office.</i>	Information Architecture Head	Medium
P3	<i>"I have to be honest. For me it's very low, but I've made specific decisions in my life that my work focus will be my predominant focus and what I mean by that is I'm not married and I do not have children. So for me you know I'm of the opinion that you know they say women have all of the choices, but that means it's a choice and I've made the choice for career. "</i>	Data Head	Low
P 4	<i>"I have established a communication method with my family they know that during the day they are only supposed to text me and call me if it's an emergency because I do not want to be disturbed when I am at work "</i>	Software Development Stream (CIO)	Low

P 5	<i>"...I even had to change my previous job, my job requires does require me to answer calls after hours as I provide system support....I do travel sometimes when I have to go and train other people in other regions..."</i>	IT Support Manager	Medium
P 6	<i>"IT is one of those industries that do not shut down. It's not a normal eight to five job, but what I can say is that it's what you make of it and there's certain things that I would sacrifice in my personal life in order to support my work life and vice versa."</i>	Software Development Stream (CIO)	Low
P 7	<i>"I would say that I am able to balance work and family and that's simple because my family understand the work that I do and at work they know I have family, I always try to make sure the two do not interfere with each other"</i>	Data Architecture	Low
P8	<i>"I'm trying to balance as much as I can. ummmh sometime I do and and it varies. It depends on the season. Sometimes you would find that is there is a bit more to do at work and I end up compromising family vice versa but I try to be deliberate about getting a balance.....No answering calls after hours. Look , the person that I'm reporting to always makes it a point that we don't have that."</i>	Business Intelligence Manager	Medium
P9	<i>"I wouldn't necessarily say I can balance work and family time....Even though I live alone I still find that my work responsibilities overlap to my family time where I sometime have to work after hours."</i>	Test Analyst Manager	Medium

P 10	<i>"In a period of 6 years that I have been working, I have been able to raise my family and progress at work. I have had two kids while working and promoted a number of times so I would say my work did not affect my family responsibilities. I make time for both my personal life and professional life... it depends on the company you work for, the employer and how you manage your time."</i>	Data Development Manager	Low
P11	<i>"I would say in between, because a proper balance would be I work then I'm not when I am off and when I'm done. You know, when you close your laptop and then you carry on with life, but it doesn't happen like that. You know even when I'm with kids again thinking about work. Yes, maybe that random WhatsApp sometimes open the laptop quickly just to OK you know what? Let me do this before I forget type things. So definitely the balance is not where it should be now it's not there honestly."</i>	Senior Data Architect	Medium
P12	<i>"I am still trying to find balance....I do answer calls after hours but It is only if I'm on standby, so we do use a schedule for that. So whoever is on standby for that day can be called up. But other than that, no. After hours if I'm not on support, not me. I don't remember getting calls."</i>	Software Development stream	High
P13	<i>"Definitely sometimes my work does affect my family responsibilities not so much now, but early in my career for two years my children never ate anything but take aways"</i>	Data Architecture	Medium

P 14	<p><i>“I was the only developer left from the team, so it went from about a team of four developers to just only being me.... So I did feel like I had to prioritise work objectives over family objectives ... even if I was on leave trying to spend time with my family. They would call me and tell me this code is failing. This test is not working. How do we fix this? Because I was the only person with the information at that time...I had to work after hours even on weekends.”.</i></p>	Software development	High
P 15	<p><i>“My current role doesn't require me to answer calls after work and I do not travel. I would I am balancing both quite well”</i></p>	Business Analyst Manager	Low

Table 4.5: Responses from participants with regards to work-family conflicts, created for this study

Most participants reported an intensity of work-family conflict in the early stages of their career. Results also showed that most women did software-development related jobs in their early career stages and ended up changing because of the demanding work hours that created their work-life imbalance. It is usually in their early career stages, but as they grew in their IT careers, they found ways to work around the conflicts and balance work and family demands. In the early career stages of women in IT, a number of women reported working unregulated and unstable hours and experiencing more imbalance in these early stages because it could be that there is more to learn, or is it the environments or available IT entry level jobs (Table 4.5, P1) and P15 below.

P15: *“I had made specific decisions in my life that my work focus will be my predominant focus but when I had met my husband who was a partner at that time, it was just impossible to balance things, the relationship there was still a lot to learn since it was my second year in the industry... personally felt that I need to prioritise one or else I was gonna fail at both”*

The results showed that the work-family conflict still exists even in senior positions. However, it is mostly in special seasonal cases (during software deployment to the production or live environment) that are associated with their roles. The results of employees with support systems at home and office showed a

good balance of work and family responsibilities (Table 4.5, P14). In a study to explore what employees wanted and why, results found that employees at the exploration stage (in their early stages of work or in first job roles) stated that participants mentioned they would like to think of themselves as trying out the workplace. They were curious of what the future held for them and that interesting jobs motivated them (Low et al., 2016). Another study found that employees in this stage were less likely to value job security and were likely to have higher perceptions of employability and lower perceptions of job insecurity and therefore changed jobs more easily.

Table 4.6 shows a summary of the results from this study. This summary also incorporates the results from Table 4.5 above. The analysis shows that participants (3) in the software development stream reported high work-life conflicts and (2 CIOs) in the executive stage reported current conflict level being low from previously being high in their early career development stages in this stream; those in business and data related roles reported low work-life conflicts; and those in IT support roles reported high work-life conflicts. The low commitment in the establishment stage together with the high work-life conflicts will more likely cause women to leave software development, considering that at this stage employees are still exploring.

Work-family conflicts	Career
High	Software Development
Low	Business Roles
Low	Data Related Roles
Medium	IT Support roles
High => Low	CIOs

Table 4:6: Work-family conflicts levels associated with Career roles. created for this study

Work-Family Conflicts in the Software Development Stream

Most women mentioned that they either did software development at the start of their career and soon after left it because of hectic working hours where they sometimes worked over-time and even on weekends on system deployments or changes in production (live organisation system environment). This was highlighted as one of the things that creates imbalances in their homes. Software deployments and production changes need to take place after hours to prevent disruptions during business hours and the system is required to be taken down before the changes can be applied to the production environment (P 14). Some tasks related to the software development role requires one to work after hours, for instance, decommissioning a system to a new technology and system deployments or changes in production (P6, P12 and P14). Though this

happens after hours, the women noted that they could plan for releases or deployments since it is usually something that is known and scheduled in advance. These results also concurred with (Begel and Simon, 2008) who in their study showed that Software Engineering teams saw higher employee turnover. This study also found that job dissatisfaction was one of the most important confirmed reasons for the high voluntary turnover.

While some seemed able to achieve a work-family balance, others have different results. *“I was a programmer and I used to work till about two o'clock in the morning and to deliver on particular projects and so forth. And I had just had a baby and I had decided that I cannot do this anymore. So it was affecting my family and my responsibilities. So I decided that I couldn't work those long hours and I needed a different job”* (P1). Another response from the development environment coincided with P1's when P14 noted that *“One of the times I remember a lot of people had left the team and I was the only developer left from the team, so it went from about a team of four developers to just only being me.... So I did feel like I had to prioritize work objectives over family objectives ... even if I was on leave trying to spend time with my family. They would call me and tell me this code is failing. This test is not working. How do we fix this? Because I was the only person with the information at that time.”*. Though a significant number of women have changed from working in a software development stream, most of them have stated that the imbalance was more prevalent at that phase of their careers, *“I remember for two full years my children ate takeaways because I was unable to cook for them because of the work demands.”* (P13).

The CIOs (“high” career point), report lower work-family conflict . This is because as they grow in these roles, they master a routine to balance their work and family responsibilities and also the ability to delegate work to other senior subordinates in their teams. Both participants who are CIOs stated that they are able to balance work and family demands. P6 stated that *“There are times where you have to work more. And then there's other times where you have to spend more time with your family. It's really up to how you balance it...I work with a team that is quite matured and fully functional, everybody knows what is expected from them and I have the 2IC second in charge who I work well with.”* P4 stated that: *“I would say that I am able to balance work and family in short however it also depend on what is important and when you can drop something because it's like anything in life, you juggling all of the terms. So it's deciding which one of the balls that are in the air at the moment you can drop. That's not going to break up so and who's around you that can pick that ball up and who can run with it so that you do not necessarily have to worry about it or can you come back to that ball later and pick it up because it it's not going to break.”* Both P4 and P6 also concurred with other participants that during their senior management roles their work-family conflicts were higher.

c) Occupation Culture

Ahuja (2002) stated that this construct will affect women in their career persistence stage within IT. According to the results there were cases where occupation culture existed as a barrier affecting the women's likelihood to continue in the IT. These results were mainly associated with the job role and the career growth level of a woman. Some women reported having changed the roles from software development and software technical testing role but remaining within the IT field in much softer skills such as Data and Information roles or Business Analyst Managers. There were, however, some participants that maintained that the culture was manageable even within the software development streams. Participants stated that they went into data because of the availability of positions in that stream and also because data teams were working closely with the development team *"when I heard there was a position in the data team I just applied"* (P11); while P9 stated that *"at least with data I was still going to do SQL and query data bases which I was willing to as long as I was no longer writing code in Java or C#"*.

The two participants who are CIOs are employees who worked within software development as developers and persisted and advanced to the level CIO. The CIO roles are associated with high pressure and demands. One has to constantly adapt to changes in the industry and the latest technology innovations and discoveries. The results also showed that employees who remained in the software development stream were more likely to grow to the Chief Information Officer (CIO), which is the top level within the IT industry and male dominated. The CIO role has been associated with significant pressure, reflecting the constantly changing role expectations, advent of new technologies, as well as significant changes in the environment that firms reside in (Haffke et al., 2016). Kenton (2021) describes a CIO as a high-ranking executive responsible for managing and successfully implementing the information and computer technology systems of a company and further states that a CIO must be agile, responding quickly to trends, changes, and the needs of the organisation, its people, and those it serves. Participants (P1, P5, P7, P9, P10 and P14) indicated having left the software stream and mentioned high pressure in this stream as one of the factors that led them to change from this stream. The demands of the objectives of this role might be unappealing to women considering also the fact that by the time women advance in their career is also the same time some women might be growing their families which might end up creating imbalances in their lives. Therefore the likelihood of occupational culture negatively affecting career persistence is high.

A popular trend that seemed to be motivational for women to persist in IT was the flexibility of the IT industry. *"...being allowed to work from home has allowed us to have some kind of balance as well and I think at first it was a challenge because now you do not really have definite working hours. You might find*

yourself working until 8 or 10. But not that it becoming a new normal I think we have adjusted quite well and we are getting the best out of it both work-wise and family wise,” P15 stated. *“I think one of the things I like is working from home really, I can spend more time with my children, I am able to assist with homework while I am doing my work as long as I am not in meetings but”* (P5). While working from home can improve work-life balance as it affords one the opportunity to be available for your family at home while also working on your work tasks (Wolor et al., 2021). When work is balanced within a worker's life, they can manage their work and home lives effectively (Wolor et al., 2021).

There were women who made mention of the ability to work from home: Some women mentioned that being introverted and having to interact less face-to-face in the IT career was one of the things that positively influenced their choice to persist in IT career. *“... I've also seen it with my staff. So you know in general IT people are notoriously introverted, so they like to work from home. But it's also that freedom to be able to do what you want when you want as long as you get the job done. So you know it is a large amount of trust...”* (P4); while P12 stated that *“However, you know your own character plays a role, so I am you introverted, so I prefer to work by myself. Very early I knew that whatever stream that I was gonna take, it did not require me to interact with a lot of people up, so being able to work from home allows me to focus on my work.”* These results correlated with the study of the impact of personality on technology use that suggests that introverts may prefer online technology interaction and may become heavy Internet users because of the opportunity for social interactions that may not be available in face-to-face environments (Phillips and Shipps, 2022).

The Internet allows the introvert to have more time to think before responding and thus may allow them an opportunity to recreate themselves as more of an extrovert (Phillips and Shipps, 2022) . All participants stated that their roles do not require them to do international travel at this point. This, however, can be affected by the Covid-19 protocols that have put restrictions on travel (Covid-19 protocol travel restrictions which were based on the lockdown levels). There were a few participants, however, who stated that at some point in their careers they had been required to travel but did not note anything around that being a barrier in their career persistence. *“Yes, there are times when we need to travel to see certain companies or see certain people but not now during the lockdown.”* (P6) while P5 stated that *“travelling is part of the job ... I do travel sometimes when I have to go and train other people in other regions.”*

d) Lack of Role Models

When answering the previous research question, we showed that lack of role models will make IT professions unattractive to young girls and we also showed that the presence of a role model could influence

them positively into choosing IT as a career. In her model, Ahuja (2002) stated that lack of role models will again negatively influence women in their career persistence stage within IT careers. The presence of female role models in the IT industry provides evidence that a successful career is possible for women in the IT field (Ahuja, 2002). By default women self-select themselves into careers in which they observe other women, thus further intensifying the gender-based stereotyping of professions (Ahuja, 2002).

In this study participants were asked if they had role models or not. Figure 4.9 below shows the results. Thirty-three per cent of participants responded that they did not have role models, while 67% stated that they had role models. Of the 67% who had role models, some mentioned that their role models were people they once reported to, such as former or current managers, CIOs, or Chief Technology Officers (CTOs). Others mentioned women who are in general senior leadership positions while some of the women participants, mentioned women who are doing exceptionally well in their careers, e.g., one of them was the current Standard Bank CIO.

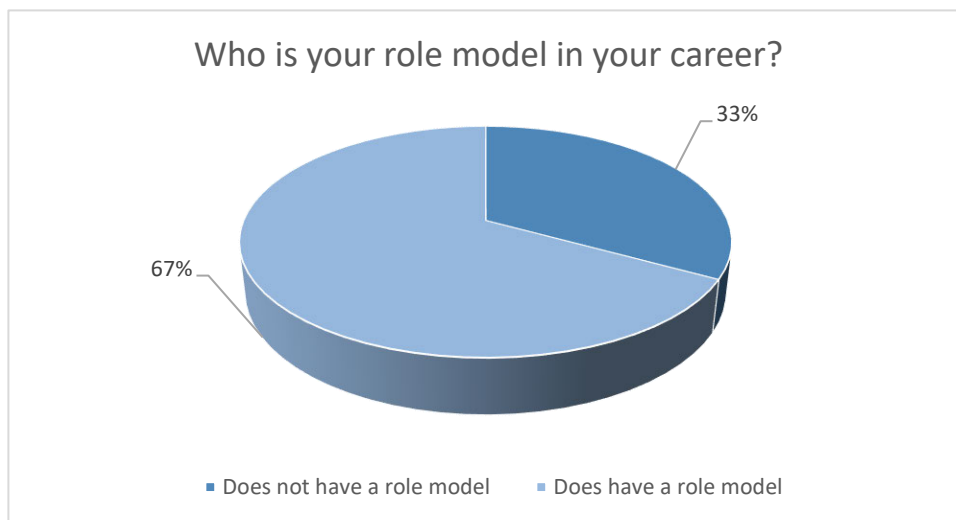


Figure 4:9: Results showing the relationship between participants and role models.

Table 4.7 below shows responses from participants when they were asked who their role models were. The results also show that people they first reported to when they started working were more likely to be seen as a role model to them throughout their IT career. In the table below we see that a number of participants noted their role models as people they worked with in the IT industry – either people they reported to (P11, P1, and P3) or people who have senior positions in their organisations within IT (P2, 6, 7, and 12). Others mentioned female leaders from international companies such as Facebook’s COO (P 9). Yet others stated

that they did not have anyone specific or had role models outside IT. One of the CIOs mentioned her mom as her role model and that she admired her hard work raising her and working hard to get where she is even though she did not finish school and being able to raise a daughter that later became a CIO (P4).

Participant	Who is your role model?
P1	<i>"I think **** our Head of Information Architecture would be one of my role models because I really I really admire her thinking and how she does things and there was another manager **** that worked with **** and I that I really also looked up to her."</i>
P2	<i>"I've got a couple of role models, both male and female, but I think the female that comes to mind for me is probably when I first moved into IT. My leader at the time she had come from Investec and I just think she was such an amazing person. She had such a way of supporting you and growing. She allowed you to fail but supported you as well. You know when you had to deal with the consequences of that failure."</i>
P3	<i>"Actually I do have role models here at FNB... **** is one of the people I admire a lot. **** is also one of the people I admire a lot that I have traits that I would like to have myself. **** is another person that I have the most respectful, so I won't say there's one role model. But I do think I'm very fortunate that out that I'm surrounded by many good people that have so many traits and characteristics that I can learn from."</i>
P4	<i>"My mom and my aunt so my mum because regardless of what's happened to her as she was growing up and she did not finish school, she made a success out of her career. And so for me if you got that as a role model because of your hard work will get you where you want to be.... My aunt she became an attorney at the age of 56. Um so that says to me that no matter how old I was when I wanted something regardless of what I want to do, if I put my mind to it, anything is possible."</i>
P5	<i>"I wouldn't say I have this person per say, as my role model. But there are the women that I can look at and say they are role models. Women that I've looked at and I I aspire to be like them."</i>
P6	<i>"There was a CIO when I started as a graduate. Her name was ****. She was a female CIO. The first I had ever met and she really inspired me, you know, because she was this little petite lady. But when she spoke about it, made so much sense and she knew how to speak to a big audience, and how to gain their trust. You know how to lead a team, and I always when I started in FNB thought one day, I want to be like that lady because when I started, I was very shy."</i>
P7	<i>"My Acting CIO, she is also female I absolutely adore her wisdom and confidence."</i>
P8	<i>"In my career I look up to a couple of people come and for me it's not specific like I do not have exact names so I try to to listen to a lot of webinars, data, webinars."</i>

P8	<i>In my career I I look up to a couple of people and for me it's not a specific person like I don't have exact names so I try to listen to a lot of webinars, data webinars. ...And a lot of the times I see that there's like, for example, women in leadership...</i>
P9	<i>"It's probably ****, Facebook COO. I just finished one of her books. Yeah, I think just how she has structured her life and she really inspires me as a woman in high leadership positions who is doing a good job."</i>
P10	<i>"I didn't know anyone who was in IT before or studying IT, remember I am from the rural. I still wouldn't say I have a role model no not at the moment"</i>
P11	<i>"There is a lady I worked for actually worked under her at Rand Merchant Bank in 2009 in 2010, and just since then she has been my role model career wise."</i>
P12	<i>"...there are few women that I've been fortunate to engage with in the IT space, and so there's a ***** Chief Information Officer at RMB. She is definitely my role model..."</i>
P13	<i>"I do not have one"</i>
P14	<i>"My role model is not within IT."</i>
P15	<i>"So I think I don't have a specific person to say they are my role model in my career. But I do look at, uh, people that hold higher positions IT positions you know, or specialist in in this field. And you know, uh, aspire to be like them and learn how they got that far in their career."</i>

Table 4.7: Responses from participants on role models. created for this study

Women who are already in the IT industry are more likely to have role models in the IT industry than those still at school. This is because in the results of this study we have their seniors or executives as their role models, while results showed that women still at school do not have many role models due to limited or no exposure to women already in the IT industry.

4.3.3 Third Career Stage: Career advancement in IT

A model by (Ahuja, 2002) of social and structural determinants of women’s career choice, persistence and advancement in IT states that the third career stage “career advancement” will be affected by social and structural barriers that hinder the advancement of a female IT professional, such as informal networks, lack of mentors and institutional structures. These constructs are listed and discussed below, using the findings from the research data and a conclusion is then drawn at the end of each section. The career advancement stage is after several years of work experience where the individuals are considered ready for higher

positions (Ahuja, 2002). However, at this stage a woman will come across a social barrier, namely, a lack of participation in informal networks, and two structural barriers, namely, a lack of mentoring opportunities for women in the IT field and structural forces at work within organisations.

a) Informal Networks

According to Ahuja (2002), informal networks can serve a number of purposes – from obtaining information to regarding opportunities in the organisation, to socialisation in the organisational culture. Therefore, participants were asked if they attend work social events and if they have ever been introduced to a work social event or met an opportunity through a work social event. The majority of the participants (thirteen participants) stated that they do attend the work social events, two participants stated “Not if I can help it” and one participant stated that she doesn’t attend them. Some participants stated that at least one or two of their previous line managers are within their professional career network. This means that employees were most likely to keep good networking relationship with their managers even when they are no longer working together and that these relationship were most likely to be beneficial at a later stage. According to the results, participants acknowledge and understand the importance of work social events for networking, *“Like one thing I might have learned is that networking is very important. Those events are for networking, basically.”* (P9).

Table 4.8 below shows the responses of participants when they were asked if they attend informal networks and if they have benefited from them. Only five out of 15 participants mentioned that they had benefited from these informal networks in terms of meeting a mentor or being introduced to an opportunity during these events. All participants highlighted that they believe that informal networks were one of the large contributors to career growth for discussing opportunities or mentorships. Some participants stated that they believed that informal network events tend to largely benefit male counterparts as they usually take place late outside work hours, which are often uncomfortable and inconvenient times for women due to their family responsibilities and children (P11 and P8). Some participants commended these work social events for networking and building stronger relationships because of the event settings which allowed them to be free and engage differently as compared to when they are in the office (P15 and P9), while one participant stated that the socialisation with one colleague during the work year-end function helped her improve work relationship with that colleague (P5).

Participant	Quote on work social event
P1	<i>"Yeah, I actually like work social events. I feel sad that it's all online due to the pandemic. I'm a people's person, so I really like doing things with people."</i>
P2	<i>"Yes I do attend work events, but I cant remember meeting a mentor or being introduced to an opportunity...no I wouldn't say so"</i>
P3	<i>"I also think that you know these informal structures also happen at work. So for example, you might be having coffee, or you might walk past somebody and you hear people are talking about a problem... You said "Oh, hold on. I know something about that. Can I get involved?" I put up my hand, can I help? And in that way you know you're exposed to new issues, new challenges, new people, and they recognize you."</i>
P4	<i>"Yes I attend work social events...I have been introduced to an oppoortunity in a social event. These events are very important that it's provide you with network opportunities and networking is in important for career growths....."</i>
P5	<i>"You get to see a different side of a person, they loosen up I am not sure whether it because of the alcohol influence or is it just the environment that changes mood. But I do have someone where our work relationship actually improved after we had a nice chat at the year ends event over drinks...from that function we never ever had issues again at work."</i>
P6	<i>"... Yes I attend work social events and conferences if they count...The bank do send us to leadership conferences every now and then sometimes just as attendee or sometimes as a speaker especially for internal conferences..., I've met quite a few people in both conferences and work social events...Hum that that later became mentors... " ... Yes, I think my current John Smith. When I was given the opportunity or the offer for a CIO. He was the first person that I spoke to a man. He was actually the first person that hired me into BCD Bank as a graduate. He was a development manager at the time and I was a graduate and throughout my whole career he's always been somebody that I went back to for career advice. So when I got this offer. There were so many things going through my mind, UM and yeah, we went for coffee and he spoke UM, courage to me. You can say be he reminded me of how far I had come off of how difficult the journey had been and he reaffirmed that even though it's a bigger role, you know that it's not impossible and that he'll be there to guide so...."</i>
P7	<i>"No, I don't attend work social events"</i>
P8	<i>"... I think the ones they normally have at work benefit largely the youngsters and maybe male colleagues. I do not go If I can help it really all I want is to go home and spend time with my family instead."</i>
P9	<i>"You know it funny because I never used to go to these, but then I realised that I miss things, you hear people talk on corridors about things that went down at the event and you like I missed that then I realised that actually these are for networking I started going and I met whole lot of people."</i>
P10	<i>"Yes I do attend work social events, I have not been introduced to an opportunity or met a mentor through a work social event. "</i>

P11	<i>"It's not like I do not like these events per se but their setting just doesn't work for me, these events happen during the week and late at night till about midnight which affect my home routine. I still need to get home cook, bath children and put them to bed, etc. I do go but my heart is usually not there I honestly do not benefit much as I leave early to catch-up with my normal routines... also for safety concerns regarding driving at night"</i>
P12	<i>"I do attend social events..... actually the current role that I've got into it was proposed to me during a work event before I actually applied for it."</i>
P13	<i>"I prefer the conferences... that kind of stuff... international conferences. And the people you meet there might be your contact from all over the world. If you got your international conferences... and in fact my job (ABC company) is a direct result of meeting a director of (ABC company) at a conference in Ireland."</i>
P14	<i>"Before COVID yes I used to attend work social events but I have not been introduced to an opportunity even though the networking has always going to be beneficial in some ways in my career growth"</i>
P15	<i>"They are good, you get to know your colleagues better in more relaxed settings therefore growing relationships"</i>

Table 4.8: Responses from participants on informal networks, created for this study

Results also showed that some senior participants and executive were more likely to be sent to conferences by their organisations. These conferences included leadership conferences and conferences where participants were included as guests (P6 and P13). These appeared to be more formalized settings are had higher chances for sharing opportunities which resulted in new job opportunities (P13). Conferences are one of the common places where participants reported having been presented with an opportunity or even met mentors or created networks. Younger participants expressed more enthusiasm than much older participants. Results also showed that much younger participants were interested in good times, getting to know people better and socialising while older participants were interested in networking and discussing opportunities. Some participants stated that their organisations have now turned to online work-social events due to the pandemic and some participants stated that they do not like online events as it is difficult to meet new people via online events and they do not provide socialising or interactive platforms but only presentations by pre-planned speakers (P1). P3 stated that she believed informal networking also happen all the time at work, when you get to engage with people that give you an opportunity to interact and build network for sharing ideas and information with others. Most participants stated that there is at least one or two of their previous line manager within their professional network. This means that employees were most likely to keep good networking relationship with their managers even when they are no longer working together and that these relationships were most likely to be beneficial at a later stage (P6).

b) Mentorship

Eight out of fifteen participants (P1, P2, P3, P4, P6, P12, P13 and P15) stated that they either have a mentor or have had a mentor at some point in their career in their IT career, while seven out of 15 of the participants reported not having been exposed to a mentor. Some participants reported having mentors from university through mentorship programmes for first years at their universities. From the majority that have mentors, some stated that it is through mentorship programmes that are organised by their organisations. Some participants mentioned that they do not receive career guidance from anyone, and they do not have anyone playing a role of a mentor in their career both within IT and outside IT. The role and the importance of a mentor is a well understood one. When participants were asked if they believed that mentorship was important for career advancement all of them said yes. Mentors play a significant role in career guidance and support. One participant stated that she had regrets about not having a mentor, *“No, I’ve never had, which I think that’s the biggest mistake I made.”* (P5 – IT Support Manager).

When asked if mentorship was important in their career guidance in order to persist in IT, all participants responded positively, some because of the benefits they received from mentorship; others because of the knowledge and the understanding of mentorship as a subject. *“It plays a critical role for me. Without mentorship whether formal or informal. It helps you navigate. You know, in certain areas as you’re growing your career, it helps you think about things differently... So, it’s critical. I think it’s totally vital that you have a mentor who is always there for you, to guide you”* (P2). *“I definitely think so. IT is a very high pressured and stressful job. It’s easy to lose your path. It’s easy to not believe in yourself. It’s easy to give up and think this is not for me I can’t do it, but I’ve come across so many strong women and men in my career and without their mentorship. I do not think I would have gotten this far as I did my own career”* (P6).

The results also show that participants sometimes felt that they were not being taken serious when they were asking for mentorship. *“There was this one time I asked one lady to be my mentor and she laughed at me and left me without replying”* (P7). These results corresponded with the article by MentoringComplete (2019) (an organisation that provides mentoring solutions to organisations), which stated that more mentees have reported that they do not feel that their mentors take them serious and they wanted to be serious during mentorship sessions (MentoringComplete, 2019). Results also showed that employees have tried to reach out to seniors requesting mentorship and were ignored. *“There was a time I reached out to a female Chief Data Officer and it’s so funny because though I’ve reached out I had never been given me a time or space to say OK we can chat. So I find it very difficult. Honestly, in this industry to find a women mentor that can then hold your hand and say OK, fine, let me help you, you know... It’s very difficult. I’ve found comfort*

in male people actually that are in data that would then ...you know?... wouldn't mind to share and say OK, fine let's do this. But again with male people you do not want to be too close, you do not want ...you want to get what you can get quickly, and then move out. But with females it is hard... really” (P8).

P10 (Data Development Manager) and P14 (Java Development Manager) mentioned that they use Google to research more about areas of interests within the IT industry while P7 (Data Architect) and P8 (Business Intelligence Manager) said they are not getting any career guidance when they request input. Participants were also asked if they are currently providing mentorship or would like to mentor juniors if given a chance. A total of ten out of 15 employees stated that they are currently providing mentorship to others, either through graduates programmes within their organisations or outside the work environment. *“I was once involved in mentoring programmes and encouragement in my area to young people. Telling them about bursary opportunities available for them in the IT industry,”* P15 stated. *“I did provide mentorship until a few months ago. I had interns I was looking after when they were still in a graduate programme,”* P7 stated. *“I do also have a friend within the same stream who actually started a mentorship programme. The programme is assisting females who are in the IT streams from varsity,it actually makes a huge difference once you get those who are still coming up in their career and those who have experience, into one room... to have a conversation.”* P2 stated. Other participants stated that they are not mentoring anyone but were willing to. *“Not at the moment, but I'm happy if I can”* (P1).

Below is the third and final construct that will affect the advancement of a women in their career in IT, namely, structural forces at work within organisations.

c) Organisational Structure

Ahuja (2002) describes organisational structure as one of the factors that will serve as barriers for women to advance in their careers within IT. She further discussed that competitive forces such as globalisation and the flattening of organisational structures may have served as impediments to the number of opportunities for women in certain industries including IT. Women are perceived to be family oriented and unwilling to travel and, as firms becomes global, promotion paths may require international assignments, which women are not usually considered for (Ahuja, 2002). An increase in the number of organisations flattening their structures and thus eliminating middle managers, has also raised concern regarding promotion opportunities that are available to women (Ahuja, 2002). To test the impact of organisational structures in the career advancement of women, participants were asked about their organisational structures, promotion opportunities in their workplace, and if their roles required them to do any international travel.

Participants noted that their organisational structures were either hybrid or hierarchical, or a combination. All participants stated that their organisations had middle managers as well as executive management. When participants were asked if their roles required them to do international travel or responsibilities that may affect their home routine, all participants reported that they are not required to travel at this stage. However, this could have as a result of the current pandemic and the Covid-19 regulations. Few employees, especially very seniors have, however, reported that they have travelled in the past as part of their work responsibilities, but stated that it was not explicitly stated that they were required to travel and that it was not something that was happening too often. On the aspect of travelling, the institutional structures did not appear to have a significant impact in the choice to advance in IT.

Most participant (87%) mentioned that they were part of the middle management structures within their organisations. Even though the number of women employed by the organisations have increased in the IT industry, the women remain extremely under-represented in the executive roles within the organisations (Meela, 2018). Taylor (2020) stated that women in male-dominated industries, specifically in the technology industry, have a complicated path to senior management roles. Taylor (2020) further stated that women are challenged to advance from middle management roles, arguing that countless women managers were stuck in the “frozen middle”. The findings from this study showed the consistency in concentration of women in middle management (13 participants) and under-representation of women in top management (only 2 CIOs).

When women were asked if their organisation’s structures offered any growth opportunities, a majority of participants stated that organisations were not doing enough to ensure the organisational structures presented them with growth opportunities. Most participants criticised the organisational structures as one of the barriers that makes it impossible to advance to executive levels due to limited promotion opportunities. *“I do have a dream of being a CIO or a Chief Data Officer but with the current structure I do not even know what career path I can take to get there. I do not know what’s the next level for me after this stage”* (P11). *“I personally believe that they are a bit limited. I think they do not really get to get the best out of people”*(P15). There were, however, some participants that stated that they did not think the structure was blocking women to advance in any way though they could not say that it had any direct influence on the promotion opportunities presented to them (P3, P4, and P6). Some participants argued that advancement was strongly dependent on the value that one adds to the environment and that it took growth and constantly proving oneself in the current structures (P1, P2 and P13).

A majority of participants (87%) are in middle management roles while (13%) are in top management. For this study we showed that all participants do not do international travel because of the pandemic even

though a few indicated travelled previously. Because of the presence of middle managers in the organisational structures, according to this study this construct does not create a barrier for women to advance within IT careers as Ahuja (2002) stated. Therefore, contrary to Ahuja's proposition, the results in this study show that, both in terms of perceptions about women being unable to travel as well as the creation of flat structures, this construct will not prevent women from advancing in careers within IT.

4.4 Summary

Women are affected by both social and structural barriers within their IT career journeys across three career stages, namely, career choice in IT, career persistence in IT and career advancement in IT. Some barriers are more predominant than others. These barriers are impacted by factors such as income brackets and backgrounds of families and IT career streams. The participants who either came from poor or rural backgrounds indicated having limited or no access to computers when they were growing up. The results of the study showed that prior computer exposure and access have a noticeable impact on the women's attitudes towards choosing IT as a career. Few participants had access to computers when growing up and most of the women did not have a positive attitude towards computers and were less likely to choose IT as career choice. The results showed that the IT product development stream that included software development roles had the highest turnover, as participants reported having left this stream due to the demanding hours that were clashing with their home routines. The software development stream was also seen as the one most likely to lead to executive roles such as CIO. These results showed that the reason so many few women are executives in the IT industry is because they normally chose to leave the IT mainstream which is software development and settle for soft and supporting roles such as data. The study showed that there was a gap at the organisation level when it came to promotion and retention of women in the IT industry. The results showed that it was very difficult for women to be promoted from one level to another, not to mention breaking the glass ceiling to executive positions.

In the next and final chapter, the study will be concluded by reflecting on the research and providing conclusions about the study and future research recommendations.

CHAPTER 5: ANALYSIS AND SYNTHESIS

5.1 Introduction

This chapter presents the synthesis and the findings from the results that were presented in the previous chapter. The results from this study are compared against the conceptual model and discussed, using it to observe the influence of social and structural factors in different career stages of women.

The aim of this chapter is to answer the research questions and to propose a conceptual model (Figure 5.4) based on the findings of this study. This chapter will also provide visibility to the enablers as experienced by women in IT as they were advancing in their IT careers.

5.2 The Representation of Ethnic Groups in the IT Workforce

The results showed that the Coloured ethnic group is scarce in the IT sector as this group could not be represented in this study due to inability to find potential participants from the group who fit the criteria for this study. According to the 22nd Commission for Employment Equity Annual Report 2021/22 that was published by the Department of Labour and Employment (DOEL), this group was represented in the Information and Communication Sector but had the lowest representation in top management when compared to other population groups. In this study only the White and Indian ethnic groups were represented at the C-suite level. The Black ethnic group had the highest population representation in the study but was not represented in top management. These results suggest that African female employees are concentrated in middle management in IT. These results were consistent with the statistics from section 4.2.1.1 which showed that Whites and Indians had the highest representation in top management positions in the Information and Communication Sector in South Africa in 2021, despite being the smallest population groups.

5.3 Answering Research Questions Based on the Findings

This section provides analysis and synthesis of the results from examining the influence of barriers as aligned with the research questions.

5.3.1 First Career Stage: IT Career Choice

The research question that is aligned with the factors affecting career choice in IT is: How do **social and structural factors** impact the **career choice** of women in IT management positions?

Computer Access

The results of this study showed that women can end up in an IT career either through studying an IT qualification at university after high school or from getting employment in the IT departments of organisations. P2 and P8 stated that they did not study IT but ended in IT after applying for IT roles in teams they had been exposed to in their organisations. These results showed that exposure to an IT team or department and understanding what the role entailed played a critical role in getting a role on an IT team, while having a positive computer attitude at a young age can steer women towards computer related qualifications. The findings of this study showed that computer access at a young age can create positive attitude towards computers. The results also showed that despite not having early access to computer some young girls had curiosity of how the computers worked while the result of one participant that started learning about computers at school for the first time experienced anxiety. While having access to computers at a young age does have a positive influence on entering IT, the lack of access does not necessarily limit others because there are other factors such as availability of scholarships and bursaries. Girls who loved STEM subjects in high schools were encouraged to do computer or IT related subjects despite not having had exposure to IT at a young age.

Social Expectations

This social expectation construct is influenced by the culture, knowledge of computer related careers and economic background of the family. The results of this study showed that the type of culture the participant comes from plays a vital role in terms of the social expectation that both the society and the women will have. For participants P2, P4, P9, and P10, who were from more individualistic cultures, their cultures did not have an influence. These are the participants who were females raised by single mothers or grandparents. In this study some participants were associated with a culture of individualism; results showed that the participants in this group are more likely to overcome the cultural beliefs about IT as they are more independent of their families' influences. The second group comprised those who were raised by both parents and siblings. The results showed that these participants were more likely to have their career choice influenced by social expectations. The results of this group varied based on unique aspects of individual circumstances. These unique aspects of individual circumstances were the family members' knowledge of computers (P1), a role model parent in IT (P3), having parents making their career choice for them (P6) and perceiving earnings in an IT career as economic independence (P6). None of the participants with both parents mentioned university funds being one of the concerns. P3 and P1 mentioned that their parents sent them to do aptitude tests. Aptitude tests are not only expensive (TSM, 2021) but they were not very popular as only two participants mentioned having done them and both these participants were from wealthy families with both parents who were professionals. Both P1 and P3 stated that they did the aptitude

test, and their tests came out strong for IT. These results also showed that aptitude test results can positively influence career choice in IT if the results show an aptitude for IT. Therefore, social expectations were found for this study to be a barrier that will increase the likelihood of women not choosing IT. However, the presence of enablers such as cultural factors allowed some participants to make choices independent of their societies. These enablers include perceived economic earnings in IT careers by parents, having a family member in an IT career, and aptitude tests that showed an aptitude for IT.

Occupational Culture

Contrary to Ahuja's proposition, the results of this study showed that women who are still at university do not concern themselves too much with the occupational culture of the industry they will be entering. Most women stated that they viewed it as hard work when they worked late during university practicals, while others stated that their focus at that stage was to pass and get good marks and graduate, which would be the reward for working hard. Therefore, for this study we conclude that occupational culture will not negatively influence career choice in IT as none of the participants mentioned ever wanting to quit because of working late nights on their IT projects, assignment, or practicals. A lack of role models remains an issue for young girls. Only P9 had exposure as a young girl to a female who was already in the IT industry pursuing tertiary studies in IT. Therefore, for this study we conclude that the exposure of young girls to females in the IT industry or computer related tertiary studies can have a positive influence on young girl in making their career choices in IT.

Lack of Role Models

The results of this study showed that there is a lack of visible female IT role models for female learners or students. In this study only P9 had exposure to a female who was pursuing tertiary studies towards IT. Similar results were documented in a paper where a study was done with 1000 American consumers. Each person was asked to name a female tech leader and 91.7% said they could not while only 8.3% said they could give a name. Of those 8.3 who said they could name a female tech leader only 4% provided a name of a female IT leader and one-quarter of them named Siri and Alexa, which are virtual assistants, not actual people (Houser, 2019). Only P9 had a sister who was pursuing BSc Computer Science at the university while she was still in high school. The results showed discussed in the previous chapter showed that P9 whose exposure to her sister, who was already pursuing tertiary studies in Computer Science, had a positive influence on her career choice in IT as she learnt about this qualification from her sister and had it as one of her choices when she was applying to the university. The analysis of this study shows that the existence of barriers for young women when they are choosing a career is still prevalent in this industry. However, there are also enablers that help young girls overcome these barriers and choose IT careers.

5.3.2 Second Career Stage: IT Career Persistence

The research question that is aligned with the factors affecting career choice in IT is: How do **social and the structural factors** impact the **career persistence** of women in IT management positions?

The theoretical framework's construct "career persistence in IT" is influenced by social and structural factors that affect women's decisions to choose IT as a career. As depicted in Figure 5.1 there are factors that affect a woman after she starts working in an IT role. Their impact will determine if the woman persists in the IT industry. Factors such as support both from home and at work played a huge role. Participants who received support from their families with regard to their work were more likely to thrive and succeed in any IT role without negatively affecting the balance between their work and family responsibilities. Funnel (Figure 5.1) was created to summarize the enablers that participants identified which helped them overcome the barriers in the IT industry from the point where they choose a career in IT to where they have persisted and even grown to specialization roles. These were noted by the establishment of communication between their families, for instance, one participant stated that her family knew that during the day they were allowed to text and call her only in emergencies to make sure they did not disturb her during work hours. Another participant stated that even in times where she worked odd hours and was unable to meet her normal routine, her husband was always available to take care of other commitments for her, e.g., fetching children from school when she could not make it. This allowed participants to participate in tasks at the capacity required by their jobs without having to stress about family commitments.

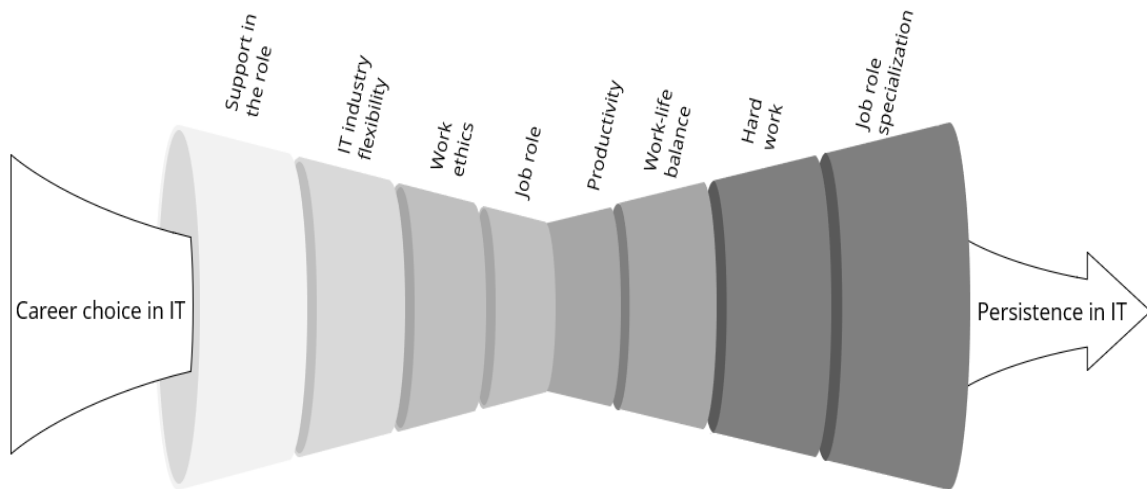


Figure 5.1: Career persistence funnel Source: Created for this study

Work-family Conflict

The results of this study show that this factor will negatively influence a woman's persistence in her IT career. While most women reported that they were mostly in teams where the rest of their team mates were male, some participants reported that they felt supported in the team as females. Some even mentioned that they built formidable relationships that were even beneficial at a later stage. Even after having changed teams they remained in contact and would recommend each other for jobs because of the admiration for each other's work quality. One participant reported that she felt that she needed to prove herself and resorted to working ten times harder. This concurred with the results of one of the recent "Women in Tech" reports by TrustRadius (2021) which found that 78% of women in IT felt that they had to work harder than their male coworkers to prove their worth. These results show that even though hostility may exist, there is a way to survive them, which is working hard and just proving that you can do the job regardless of gender.

Most women who joined the IT industry from universities stated that they started in the software development stream and then changed to IT product development support streams, for instance, data related roles. This was because of unstable working hours that clashed with their family responsibilities. These women ended up in middle management roles like Information Architecture, Data Architecture or Data Development Managers, while those who had aspirations to persist in the software development stream and had support persisted and grew to software development managers and even CIOs.

Occupational Culture

The flexibility of the IT industry, such as working from home, was recorded as one of the enablers for women to persist in IT, as it afforded participants a good work-life balance. These results agree with the study by Wolor et al. (2021) which also showed the results of employees reporting a balance between work and family life from working from home. As depicted in Figure 6.2 below, results of this study showed that women changed their roles as they advanced in their career, some to more specialised roles, while others changed streams completely (Wolor et al., 2021). However, some remain in the IT product development stream, i.e., software development, and advanced to CIO positions. This diagram also shows that in the C-suite level only the Software Development Managers have progressed to the CIO roles. The two streams that were popular are product development (i.e., the software development stream, which contained roles like Software Development Managers or CIOs) and the IT support stream (i.e., data roles like Business Intelligence Managers, Data Heads, Information Architecture or Data Architecture). A number of participants reported starting in the software development stream but later changing to the data support stream due to factors such as odd hours in the software development roles. The majority of the participants are concentrated in middle management roles and some have stated that they do not see a possible growth

path that will allow them to acquire CIO roles. There were some participants who stated that they would like to grow from middle management to Chief Data Officers in data support stream, but also noted that the career path to this role was not clearly understood. Therefore, occupational culture will negatively influence the persistence of young women in IT.

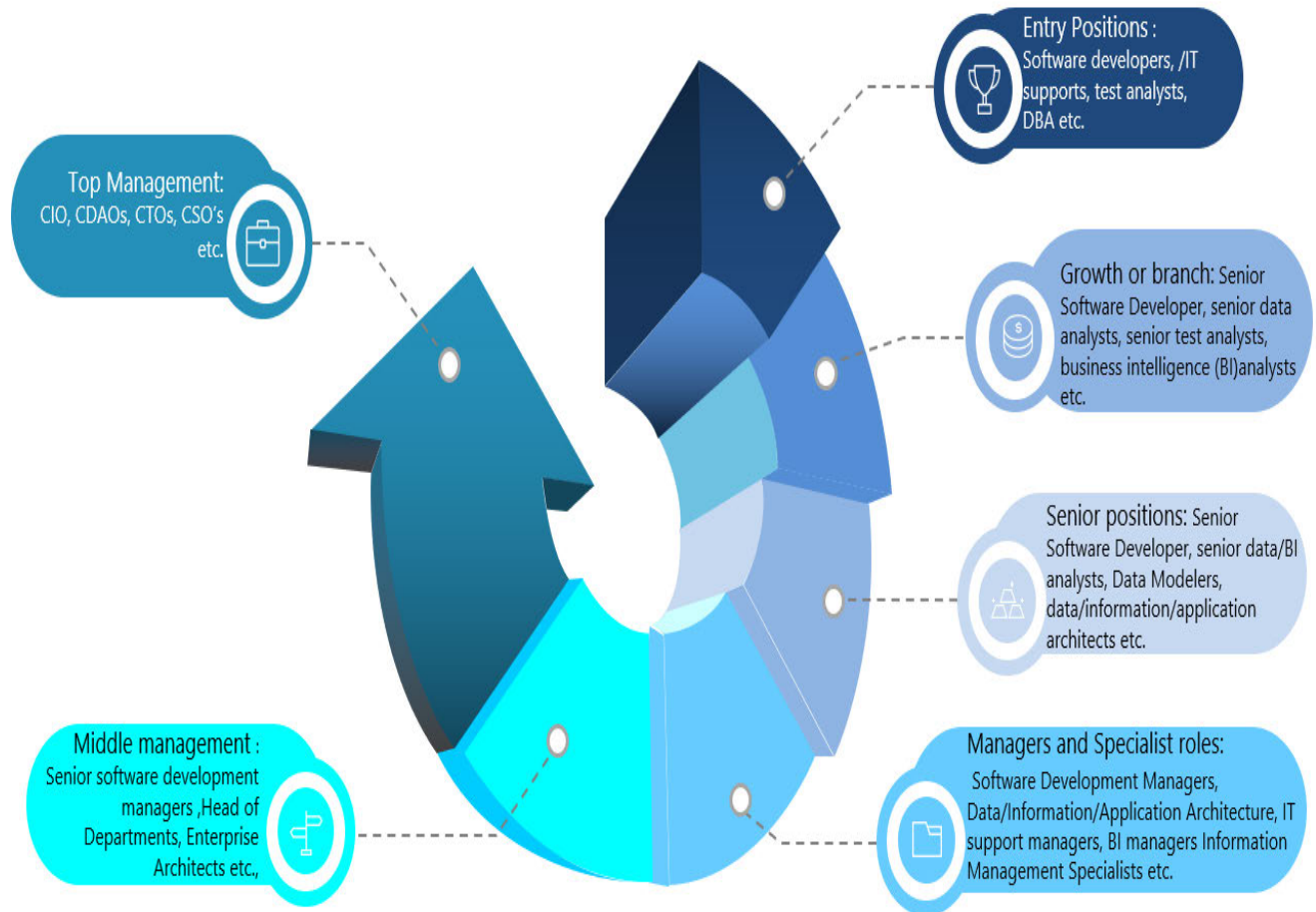


Figure 5.2: Career growth in the IT stream. Source: Created for this study

Lack of Role Models

There were, however, cases of participants who reported feeling hostility and inferior in teams dominated by men and without access to role models to assist them with work. In this study we found that lack of role models was persistent even after the young girl had overcome the barriers of choosing an IT career without role models. They still found this issue even in the workforce. Under-representation of women in IT senior positions and at the C-suite level meant that women had less access to these industry leaders. However,

there were enablers such as the fact that women reported having some of their managers as their role models or leaders in their organisations within the same industry. A lack of role models is one of the discouraging factors which also creates misperceptions about the IT industry.

Recent statistics show a positive development in the current situation in South Africa regarding the under-representation of women in IT. South Africa is leading in producing the highest share of female graduates in Sub-Saharan Africa, at 32%, and an even higher percentage of female ICT graduates, at 38% (Africa.com, 2021). South Africa is reportedly producing more ICT graduates in the Sub-Saharan countries, which means an increase of IT female professionals in the workforce. All these will change the narrative and contribute positively to this societal and global problem. With the increase in IT graduates, there will be more IT professionals and therefore an increase in role models and potentially the IT industry will become more attractive to young girls. In the absence of many role models for women in the IT industry, women might continue to associate this industry with masculinity and therefore this factor remains an issue of concern that might negatively affect persistence in this industry.

5.3.3 Third Career Stage: IT Career Advancement

The research question that is aligned with the factors affecting career choice in IT is: How do **social and the structural factors** impact the **career advancement** of women in IT management positions?

Informal Networks

Conferences and year-end functions were the top two areas where participants reported getting opportunities to build networks for their careers, though the study did show that not all women were benefitting from the conferences since organisations paid for the few top or senior managers to attend these. When it came to social events like year-end functions where everyone was invited, the results of this study showed that 12 out of the 15 participants attended the work social event, even though some may have expressed not being happy with the settings, e.g., year-end functions events taking place at night. Some participants stated that their organisations have turned to online functions due to the pandemic. Some participants reported that they were not happy (“sad”) with these as they limited their chances to socialise and meet new people. A study by Marcus et al. (2021) showed that companies were also turning to online events due to cheapness. However, these did not serve the purpose of socialisation. The results showed that women were benefitting from the work social events and 5 out of 15 of the participants stated that they had been introduced to an opportunity through these events. Some also mentioned building strong relationships with colleagues. Therefore, for this study we show that, contrary to Ahuja (2002)’s proposition, some women do benefit from the work social events and they do help them advance in their career, although the

majority still do not benefit as much due to the nature of these events as stated above (late night events, only senior or top management being sent to conferences and online events). Therefore, we found this variable will be a barrier for women advancing in their career within the IT field.

Lack of Mentors

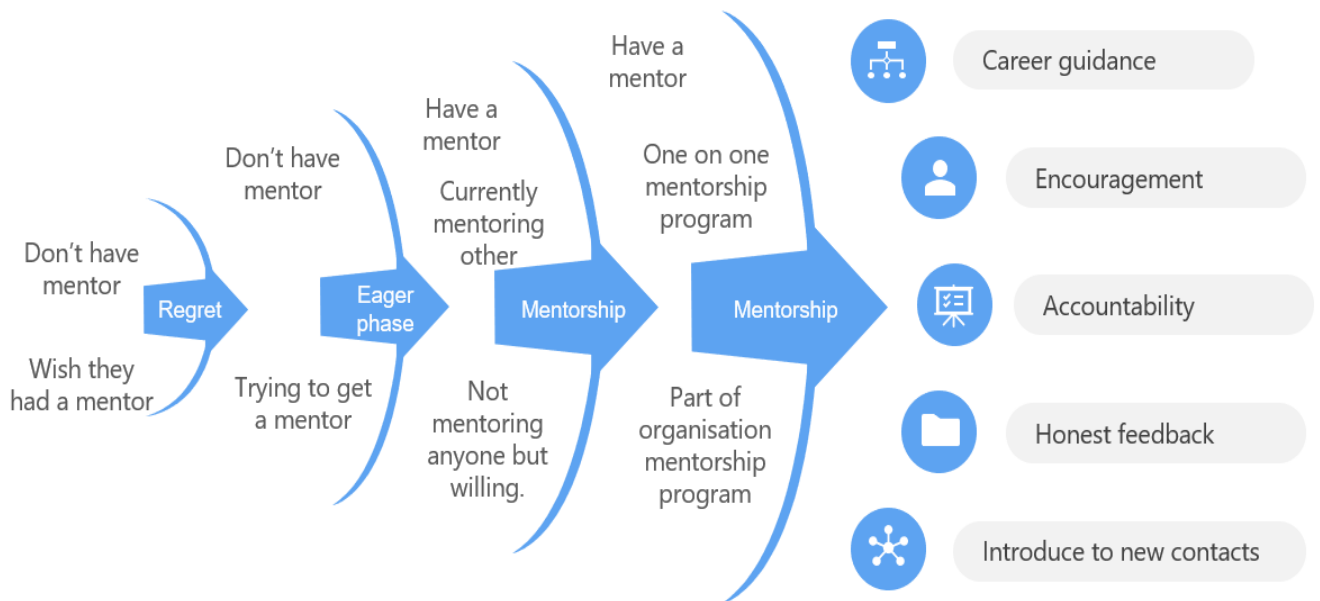


Figure 5.3: Mentorship evolving process Source: Created for this study

Figure 5.3 is a summary of the results that are discussed below. The results showed that mentorship is vital for one to succeed in the IT industry and the presence of a mentor has a positive effect on a career of an IT women. A majority of women are benefiting from having a mentor as results showed that the majority of women have mentors. Among these women who have benefitted from having mentors are those who reported having been introduced to an opportunity by mentors or having built formidable relationships that were beneficial in career guidance and knowledge sharing. However, the results also showed that there were participants who did not have mentors. Some had tried to get mentors but failed as they stated that their emails or requests to senior potential mentors seemed to have gone to a dark hole without any response. One participant who reported not having a mentor and had never tried to look for one, stated that she regretted this and wished she had a mentor.

In a study on what employees needs and why, it was reported that employees stated that they believed that it was vital for their organisations to provide them mentorship and guidance (Low et al., 2016). The results of this study also showed that some of the organisations are making an effort to help their employees get mentors as they have created mentorship programmes with a network of senior managers who are willing to mentor the juniors. These efforts are highly likely to yield positive results of more women growing towards senior management position through career guidance and sharing of knowledge and opportunities. The results also showed that when women cannot find female mentors, they tend to use male mentors. P8 and two other older participants (P2 and P13) stated that their mentors were male.

The two older women stated that when they started working in the IT industry there were no females other than them in their teams for the longest time. Some women mentioned that they did not have formal mentors but they reported that at least one woman who was their senior showed an interest in them and helped them as they grew in their career path. So, there was a form of support from other senior females even if it was not within the agreed parameters of a mentorship programme. Of all the factors mentioned in the study, mentoring was considered one of the most critical factors that could assist in overcoming the barriers in the IT field while at the same time assisting women to develop a wider network with their mentor's mentors. Yet the lack of mentor remains a barrier due to insufficient mentors available.

Organisational Structure

Ahuja (2002) describes organisational structure as one of the factors that will serve as a barrier for women to advance in their careers within IT. She further discussed that competitive forces such as globalisation and the flattening of organisational structures may have served as impediments to the number of opportunities for women in certain industries including IT. Women are perceived to be family oriented and unwilling to travel. As firms becomes global, promotion paths may require international assignments, for which women are not usually considered (Ahuja, 2002). An increase in the number of organisations flattening their structures, thus eliminating middle managers, has also raised concern regarding promotion opportunities that are available to women (Ahuja, 2002). To test the impact of organisational structures in the career advancement of women, participants were asked about their organisations' structures, promotion opportunities in their workplace and if their roles required them to do any international travel.

Participants noted that their organisational structures were either hybrid, hierarchical or a combination of the two. All participants stated that their organisations had middle managers as well as executive management. When participants were asked if their roles required them to do international travels or

responsibilities that may affect their home routine, all participants reported that they are not required to travel at this stage. It is noted that this could have been also affected by the current pandemic and the Covid-19 regulations. However, a few employees, especially very seniors, have reported that they had travelled in the past as part of their work responsibilities, but reported that it was not explicitly stated that they were required to travel and that it was not something that happened too often. On the aspect of travelling, the institutional structures did not appear to have a significant impact on the choice to advance in IT.

Most participants (13 out of 15) mentioned that they were part of the middle management structures within their organisations. Even though the number of women employed by organisations have increased in the IT industry, women remain extremely under-represented in the executive roles within the organisations (Meela, 2018). Taylor (2020) stated that women in male-dominated industries, specifically in the technology industry, have a complicated path to senior management roles. Taylor (2020) further stated that women are challenged to advance from middle management roles, arguing that countless women managers were stuck in the “frozen middle”. The findings from this study showed the consistency in the concentration of women in middle management (13 participants) and under-representation of women in top management (only 2 CIOs).

When women were asked if their organisations’ structures offered any growth opportunities, a majority of participants stated that organisations were not doing enough to ensure the organisational structures presented them with growth opportunities. Most participants criticised the organisational structures as one of the barriers that makes it impossible to advance to executive levels due to low promotion opportunities. *“I do have a dream of being a CIO or a Chief Data Officer but with the current structure I do not even know what career path I can take to get there. I do not know what’s the next level for me after this stage”* (P11). *“I personally believe that they are a bit limited. I think they do not really get to get the best out of people”* (P15). Conversely, there were some participants who stated that they did not think the structure was blocking women to advance in any way, though they could not say that it had any direct influence on the promotion opportunities presented to them (P3, P4, and P6). Some participants argued that advancement was strongly dependent on the value that one adds to the environment and that it took growth and constantly proving oneself in the current structures (P1, P2 and P13).

The findings of this study showed that all participants did not do international travel because of the pandemic even though a few indicated having travelled previously. With regards to organisation structures all employees were from organisations with structures that had middle management (some said their organisations had the hybrid structures which is a combination of flat and hierarchal, while some said it’s

called hierarchal structures. None of the participants said it was pure flat structures as their organisations had middle managers. Therefore in this study we conclude that this construct does not create a barrier for women to advance within IT careers as Ahuja (2002) stated. In terms of perception about women being unable to travel as well as the creation of flat structures, the results from this study contradict the proposition by Ahuja. There were no findings that suggested that organisational structure prevented women from advancing in careers within IT. However, due to the pandemic, which came with the banning of all travel, this variable could not be tested effectively. Therefore, it will not be excluded as a barrier. Rather a more focussed study on the impact of organisational structure is recommended.

5.4 Updated Conceptual Model Based on the Results of This Study

The results of this study showed that most of the barriers identified still exist across all three career stages as shown in Figure 5.4 overleaf. Work-family conflicts relationships (P4, P11a and P11b) did not come as barriers in this study at a career stage where the women are choosing the career in IT. The P4 relationship line was therefore in dash line to represent weak or no impact. But these barriers were prevalent after they had already started working trying to persist in the industry. Something that was highlighted was the fact that some participants were starting families at this stage, so work demands, and family demands were sometimes incompatible, especially since both the dimensions need an investment of time. Work-family conflict also did not have any impact on the occupation culture and vice versa, the relationships (P11a) and (P11b) were therefore represented as dash lines. Occupational culture, relationship (P7) also did not affect women in their career choice as they all said that during their university times, they did not think much about the occupation culture and therefore it did not influence them negatively. These participants mentioned that even though they did work at night on IT projects or assignments they did not associate that with the occupational culture of the IT industry that would be making them work at night or not shut down. Instead, they said they viewed it as hard work when they were working late on assignments or projects; that they were willing to work hard; and that their focus at that stage was to pass and graduate. The model was then updated by removing P7 as a factor affecting career choice in IT. The model by Ahuja (2002) is over two decades old and the South African IT industry has seen both socio-economic and organisational culture changes which explains the results of this study (Crittenden et al., 2019, Meela, 2018).

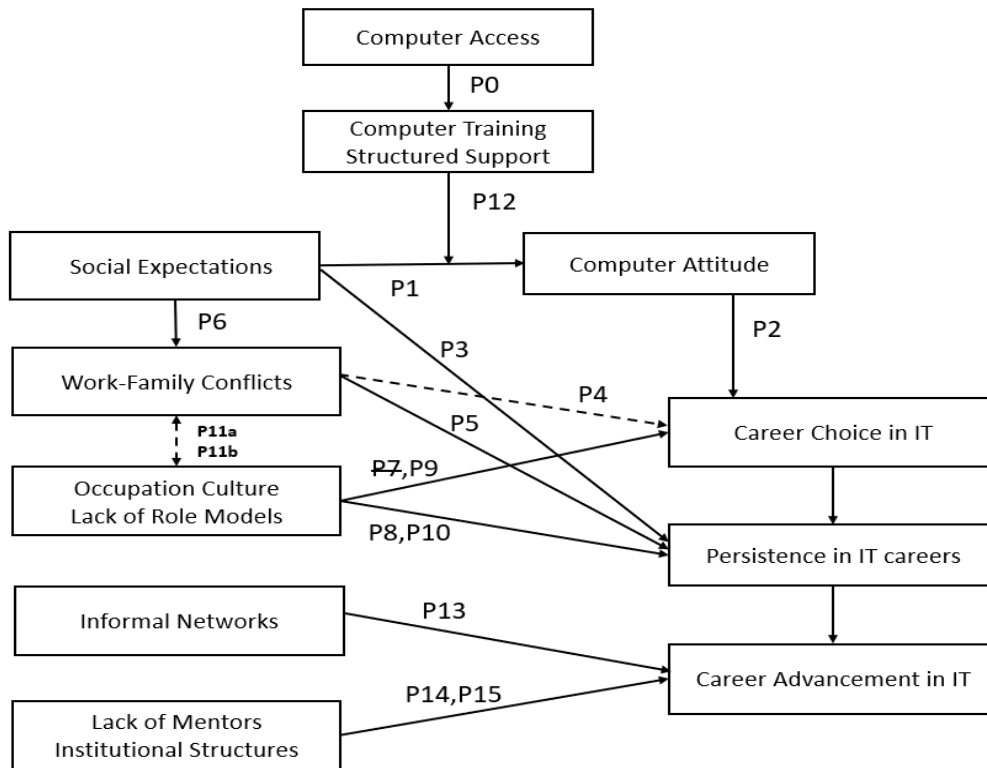


Figure 5.4 An updated model of social and structural determinants of women's career choice, persistence and advancement in IT. Source: Ahuja (2002:4)

5.5 Summary

This chapter presented the analysis and the synthesis of the data produced in this study. The IT career of a women will be affected by several barriers in the three different career stages. However, there are also enablers present for each career stage that allows a woman to persist and advance to the next career stage. In this study we found that some factors will not affect a woman in certain stages. The results of this study showed that early access to computers can create passion and confidence around computers which increase the likelihood of young girls to choose IT as a career. The results of the study also showed that only few young girls have access to computers at a young age in South Africa. The result also showed that there are more bursaries and scholarships available to students who enroll in IT or computer related studies which is one of the positive contributors to the participation of females in IT or computer related studies. Young girls who studied STEM studies were more likely to end up studying IT or computer related studies. Social expectations may negatively or positively affect a woman in their career choice in IT. The results showed that some family members discouraged young pursuing of IT while other family encouraged towards IT based on their knowledge of the IT career and industry. The results of this study also showed that even disabled women can succeed in the IT career. The exceptional results of participant who uses one hand who

is climbing the ladder of success in the IT field in one of the largest banks in South Africa is a result that shows that IT is the industry without limitations.

The results of this study occupation culture will not negatively affect a career choice in IT stage which was contrary to Ahuja' (2002)'s model. Lack of role models continues to raise serious concern as only one participant during her career choice stage who knew someone who was female or already working in the industry. The under-representation of women in IT and senior to C-suite is negatively affecting the participation of females in IT as this creates an assumption that IT is not an industry for women. Though work-family conflict remains present barriers according to the results of this study, the results also showed that support from both family and in the office may work as enablers that can help women persist and advance in IT. The flexibility of the IT industry, such as working from home, was noted by many participants as one of the career enablers that allowed women to persist and persevere in IT while creating a balanced family and work life.

Work conferences and year end functions were stated as popular places where the participants reported meeting mentors and being informed of other opportunities during informal sessions. Some participants also reported not attending year-end functions as they tend to be during the week after hours and conflicting with family responsibilities. While results also showed that only the much senior to C-suites were most likely to be sent by their organisations to the conferences some stated international conferences. The effect of Covid 19 had negatively affected organisations interms of year end functions since the hosting of large events was banned to prevent the spread of the virus. The results of this study showed that more women were benefiting from having mentors for career guidance, some participants stated that their organisations have programs to provide mentorship and career coaching support. Many participants stated that their Organisational structures did not present them with enough growth opportunities. Some stated the career paths to take were not clear if one need to get to C-suite. There was a change in the model in factors affecting the career choice in IT based on the results for the study. While factors affecting career persistence and advancement remained the same. The chapter below discusses the conclusion and the recommendations derived from this study.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The study was conducted by interviewing females in IT senior positions and top management in South Africa to understand the barriers they faced in their career across the different career stages. The aim of this study was to provide visibility to career barriers and enablers experienced by women in IT industry as they climb the career ladder in South Africa. The study also aimed to encourage participation and retention of females in IT industry. This study used a model of social and structural determinants of women's career choice, persistence and advancement in IT to observe the effects of these barriers by using three dependent variables namely career choice, career persistence and career advancement in IT careers. The data collected from interviews highlighted several barriers that were presented and discussed in chapters four and five. This chapter will discuss the conclusions that were drawn based on the qualitative results and discuss limitations that were encountered during the study. The study is concluded by making recommendations for future research.

6.2 Research Questions: Concluding Remarks

This section presents conclusions for the study based on the research questions and objectives. For each research questions (RQ's) that was answered, the concluding research objective was detailed:

- a) RQ1: How do social and the structural factors impact the career choices of women in IT management positions?
 - b) RQ2: How do social and the structural factors impact career persistence of women in IT management positions?
 - c) RQ3: How do social and the structural factors impact the career advancement of women in IT management positions?
-
- I. RO1: To investigate how social and the structural factors impact the career choice of women in IT management positions.
 - II. RO2: To ascertain how social and the structural factors impact the career persistence of women in IT management positions.
 - III. RO3: To identify how social and the structural factors impact the career advancement of women in IT management positions.

6.2.1 RQ1: Career Barriers and Enablers Experienced by Women in the Career Choice Stage: Concluding Remarks

Early access to computers can lead to a positive attitude towards computers which then plays a critical role in influencing women in choosing IT qualifications. However, in the absence of computer access at a young age, factors such as availability of bursaries for IT related qualifications and the knowledge that IT qualifications contain STEM subjects such as mathematics can have a positive influence on young girls in choosing IT careers. Early access to computers may help individuals become confident in IT careers due to comfort and confidence that comes from early exposure to computers. More understanding among families of what IT careers entail may lead more family members to influencing young girls to choose IT.

Families where participants were raised by single parents or grandparents were more likely to make independent and uninfluenced IT career choices, as in this study participants raised by single parents or grandmothers showed that their career choices were less influenced by family members compared to participants from families with both parents and siblings.

The results of this study showed that working late night on IT projects during university does not give the impression of a career that is not appealing to women but instead that students focus on passing the course and graduating at that stage. It was therefore found not to be a negative influence on women in IT.

A lack of female role models remains an issue in the IT industry. Only one participant out of 15 had exposure as a young girl to females in the industry or pursuing tertiary studies in computer related studies that had a positive influence on a young girl when making her career choice in IT.

The section below presents concluding remarks for the second research question.

6.2.2 RQ2: Career Barriers and Enablers Experienced by Women in the Career Persistence Stage: Concluding Remarks

All participants reported a degree of imbalance between their work and family objectives at some point in their careers. However, participants also reported that the imbalance was affected by factors such as job roles, projects and whether an employee received enough support at home as a working person and also at work as employees. High levels of work-family conflicts were recorded in job roles such as software development. These were also especially high in cases where an employee was starting a family at the same time. P1 stated that she even had to change her job as a developer to a role as a data specialist because of

the odd hours that she had to work while she was nursing her small baby. Therefore work-family conflict will negatively influence a women's career persistence in IT.

The results of this study showed that women who were already in the IT industry had higher chances of having role models compared to those who are not in the industry. This was because when they start working, they gain exposure to women in their organisations some in management and some in leadership roles, e.g., C-suites. The results of this study also showed that most women had their managers or previous managers or their organisation executives as role models in the IT industry, though there were those who mentioned leaders from top international companies as their role models.

The results of this study showed that a lot of women reported having flexible jobs in IT, which allowed them to also work from home. The cases of working from home were even higher because of COVID-19. Many participants stated that working from home and the flexibility in IT jobs were among the things they enjoyed about their jobs. Therefore occupational culture will not negatively influence a woman in IT.

6.2.3 RQ3: Career Barriers and Enablers Experienced by Women in the Career Advancement Stage: Concluding Remarks

Mentorship is important for career guidance and support. However the results did not show how a lack of mentorship can limit the advancement of women in the IT careers. Lack of mentors does mean an absence of career guidance in the careers of junior females, which might result in self-doubt and making mistakes which would have been avoided if there had been a mentor. The results of this study show that despite not having had mentors in their careers, senior managers and those in C-suite positions are willing to mentor the juniors, which means the organisation needs to be a bridge between junior employees who needs mentors and seniors who are willing to provide mentorship services.

Informal networks are important for sharing of opportunities between employees. These socialising events tend to happen late. Employees reported that their standard function is the year-end function, which happens during the week after work and goes on till late, which then affects their schedule as it conflicts with their family responsibilities. Therefore, some employees do not even go because of that and because of safety concerns of driving home late at night. Much younger and single employees benefit from the functions that take place late at night. These functions then do not become effective when it comes to socialising and sharing of opportunities. The conferences, like leadership conferences, are the ones that seems more effective. However, only limited categories of employees get sent to these, e.g., much senior employees and those in the C-suite level. Though the participants stated that the organisations were not blocking them

from succeeding and advancing in their IT careers, results also showed that some participants felt that the organisations were not doing enough to make sure that women were promoted to C-suite positions. Participants stated that they did not think enough promotion opportunities were given to women. Most women believe that organisations were not doing enough to address this under-representation of women in IT leadership positions.

6.3 Limitations

The researcher currently works as a senior IT professional in a bank. Due to the nature of the snowballing sampling method that was used, the research relied on referrals to other employees who had similar characteristics and as a result participants were from the similar industry which is banking. The participating organisations were the four major South African banks.

Because all participants were from the banking sector, and because the banking sector focusses on the software development component of the IT industry and not on the hardware side, only the software side of the IT industry where no hardware is created or sold was represented from the entire IT industry landscape. These results therefore exclude the view from the IT hardware products components, which is a limitation of the study.

The sample did not contain any representation of the Coloured population group. Though there were no remarks that any results were associated with a specific race, it is still worth noting that not including all races means that our sample was not a true representation of the country's population.

The data collection took place during the times of the Covid pandemic where travel was restricted in South Africa. Therefore only one interview took place face to face. The absence of non-verbal communications such as facial expressions and communication was sometimes a problem due to network problems. One participant was not willing to use either MS Teams or Zoom and the researcher had to use Google Meet in order to make sure the interview took place.

The theoretical framework was based on a model of social and structural determinants of women's career choice, persistence and advancement in IT which was developed by Ahuja and it is two decades old. Though it is still relevant, there were variables which had weak effects based on how things have changed from the ways of living, how kids are now raised, societal beliefs and lives that are lived now based on the availability of technology. For some parts the model is too generic. Factors such as economic and geographic backgrounds are not considered in this model while the results shows that these factors play a significant

role. Therefore, the model had limitations and it needs to be updated to factor in how things have changed since it was constructed two decades ago.

6.4 Recommendations

It is recommended that organisations release their Diversity, Equality and Inclusion (DEI) policies and results to the public. This will hold them accountable and provide transparency, which will encourage organisations to embrace diversity and to put efforts into ensuring that their organisations remain committed to diversifying. Also, the research shows that candidates are more likely to apply for positions if they can see the organisations' DEI policies.

It is recommended that the government build computer laboratories in schools. Young girls need to be given enough exposure to computing at schools through integrating computing into the basic syllabus. Considering the 4th Industrial Revolution of machine learning, computing should be treated as the second language. This is a plea also to parents to do their part in order to enhance the young girls' attitude towards IT and encourage them to study IT.

Organisations who are looking at attracting more females to the IT industry need to start giving more scholarships for IT students as this research shows that availability of scholarships can make IT careers more attractive to students who are smart with financial needs. These organisations need to be more proactive and visit high schools and tell them about IT bursaries available in their organisations.

Organisations needs to start creating mentorship programmes where senior employees in specific departments can be paired with junior employees. Another option is to have a page on the organisation's website where senior employees willing to mentor can go and add their details so juniors can find them.

Junior employees should take ownership of their career growth and reach out to more senior employees and ask them to be their mentors as in this study we found that senior managers are willing to mentor other juniors, however not all organisations have mentorship programmes in place, which is why juniors should not be afraid to reach out to seniors and ask them to mentor them.

Organisations need to look more at having year-end functions during the day and maybe on Saturdays to ensure that employees are not compromising their time with families and that these events do not conflict with family responsibilities. Having functions on weeknights also compromises safety for employees as

they reported that some year-end functions end around midnight and in some of these functions alcohol is served and consumed.

Organisations need to be intentional about their diversity and inclusion in top management. Having diversity and inclusion policies is not enough; organisations need to offer more senior and top management positions for their female employees. Media companies and telecommunication entities should actively cover women leaders in IT to ensure that young girls and other women in junior IT positions know that IT is a career that has women who are thriving in IT.

Women are entering a broader range of IT specialisations. Less common, or less well-known, C-suite roles like Chief Data and Analytics Officer (CDAO) need to be made more popular, like CIOs, to support the data stream within IT that more women appear to enter. The industry needs to start accommodating women in these executive positions, considering things like the fact that women are raising children. Women bring great diversity of perspectives. Even in the IT industry the perspective women bring when looking at issues is very important. Their multi-faceted perspective is vital for the diversity of the IT industry.

6.5 Recommendations for Further Studies

The validation of this study could be implemented using a similar approach which is a qualitative study but this time with a much larger sample. Factors such as more independence that was shown by those participants who stayed with single parents and grandparents compared to those who stayed with both parents and siblings when they were choosing a career choice in IT needs to be validated by testing a larger sample.

The earliest cause of the under-representation of women in IT is the difficulty in attracting women to the IT careers, which according to the results of this study is caused by low computer access and inaccessible IT education at schools and hence low computer attitudes. In the first Fourth Industrial Revolution (4IR) Digital Economy Summit that was held in South Africa in 2019, President Cyril Ramaphosa spoke of the Industry 4.0 as an opportunity for South Africa to harness R5-trillion in value – approximately the size of South Africa's current GDP – over the next decade. The president also went on to state that this was the opportunity for businesses to unlock economic potential (Shivdasani, 2019). Considering the country's status in terms of low rates of computer access in South Africa, high rates of poverty, lack of infrastructure, lack of access to technology and high costs of data, the researcher recommends a study of the South Africa's readiness for 4IR based on the current digital inequalities and economic divides: Will the country benefit from 4IR or will it increase the inequality among the population?

6.6 Summary

The under-representation of women in IT remains an issue of critical concern and is notable across all three career stages. Efforts to close the gender gap of women's under-representation in IT should be directed equally at all career stages. In order to address the under-representation of women in the IT industry, the government, the entire education system and organisations should not see this as an isolated issue for women or the IT industry as it affects all. This is the issue that affects the future of the South African economy.

With the recent drives and programmes on diversity, equality and inclusion together with the mentoring and coaching efforts from organisations; there are hopes for brighter prospects for women in future. There is still more to be done by organisations and government to ensure these inequalities and barriers are lifted. The researcher believes that with the few that have broken through the glass ceiling, there is hope for the rest of the women considering or already persisting in IT. The fact that there are those few women in IT executive positions should be taken as a positive thing, and a reminder that it is not impossible for a woman to acquire such a position.

This study provided visibility to some of the women who are thriving in the IT industry and their unique experiences as they navigated their IT career. The barriers they faced and the enablers that helped them overcome these barriers. This study answered all the research questions that were listed and addressed the corresponding research objectives that were noted. The findings from the literature were consistent with the findings of this study which, in the researcher's opinion equates to a successful research project.

“Recognize and embrace your uniqueness...Being a Black woman, being a woman in general, on a team of all men, means that you are going to have a unique voice. It's important to embrace that.”

Erin Teague

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Appendix 1: Consent Letter

UKZN HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE (HSSREC)

APPLICATION FOR ETHICS APPROVAL

For research with human participants

Information Sheet and Consent to Participate in Research

Date: 2020\10\09

Greetings,

My name is Pretty Shange from KwaZulu-Natal Province, UKZN (Westville campus) School of Management Information Technology and Governance, contact :062 525 7752 and 079 838 7752 email : 208528082@stu.ukzn.ac.za and mdimaxulu@gmail.com;

You are being invited to consider participating in a study that involves research in topic: Barriers and enablers experienced by Women in senior IT positions in South Africa. The aim and purpose of this research is to understand the career barriers and enablers that women in the IT senior positions experience throughout their career journey and address the factors that are associated with each of these barriers and enablers, this will be done by looking at three career stages of a woman which are Career Choice, Career Persistence and the Career advancement in IT, and each factors associated with each career stage to observe their influence in the IT career of a woman. The study is expected to include between 15-20 participants, the data will be conducted using interviews electronically through skype meetings. It will involve setting up skype meetings and inviting the participants to join the skype meetings and then answer all the research questions. The interviews will also be recorded. The duration if you choose to participate and remain in the study is expected to be 25 minutes at most for each interview. The study is funded by the researcher who is completing her master's degree.

The study will present no direct risks and will provide no direct benefits to participants; however, the overall study aims to provide visibility and a better understanding of enablers and barriers experienced by senior

All data, both electronic and hard copy, will be securely stored during the study and archived for 5 years. After this time, all data will be destroyed.

If you have any questions or concerns about participating in the study, please contact me or my research supervisor at the numbers listed above.

Sincerely

CONSENT TO PARTICIPATE

I (Name)_____ have been informed about the study entitled Barriers and enablers experienced by Women in senior IT positions in South Africa by Pretty Shange.

I understand the purpose and procedures of the study to investigate Barriers and enablers experienced by Women in senior IT positions in South Africa.

I have been given an opportunity to ask questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at 0625257752.

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus

Govan Mbeki Building

Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604557 - Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za

Additional consent, where applicable

I hereby provide consent to:

Audio-record my interview / focus group discussion YES / NO

Signature of Participant

Date

Appendix 2: Alignment Matrix

Research Question (A)	Factor (B)	Variable or relationship P) ©	Interview Questions (D)
1. How do social and structural factors impact women in IT management positions', career choice?	Structural	a) computer training structure support	a) Where did you go to school? What type of school was it public school, private school)? And did you have any exposure to computers at school? Or computer training ?
	Structural	b) computer access-> computer training	b) Did you have access to computers outside the school environment when growing up e.g. at home, at a community centre etc. computer access-> computer training?
		c) computer training structure support	c) When and where did you learn about using computers?
		d) Computer access	d) Did you have a personal computer when you were growing up? Did you have limit access to the computer at home or unlimited? What did you primarily use it for?
	Social	e) Social expectations P3	e) Who did you live with when you were growing up? Did they influence your thinking, was your IT career choice influenced? By who? How did your family members feel about your career choice?
	Social	f) computer attitudes	f) What was your attitude towards computers when you were growing up? Access to computers when growing up. computer attitudes)

		g) how does P12 influence P1	g) To what extent did learning about using computers influence the attitudes you had about computers due to the opinions of others in your social environment?
		h) Career choice P2/ P4	h) What made you choose the IT career? What role did your attitude to computers play in your decision to choose an IT career (P2)?
		i) Career choice	i) What is it about an IT career that attracted you to choose IT as a career?
		j) Lack of role models	j) When you were a learner, were you ever exposed to anyone who was at Tertiary pursuing IT or in the industry working as an IT female professional? Who did you discuss your career choice with before enrolling in IT/computer science studies?
			Note_RQ :Question on occupational culture impact on career choice and lack of mentors impact on career choice
			To what extent do you feel that the social expectations influenced your career choice in IT? (P1)
			To what extent do you feel that the computer attitude influenced your career choice in IT? (P2)
			To what extent do you feel that the work-family conflict influenced your career choice in IT? (P4)
			To what extent do you feel that the social expectations influenced your work-family conflicts? (P6)
			To what extent do you feel that the occupation culture influenced your career choice in IT? (P7)
			To what extent do you feel that the lack of role models influenced your career choice in IT? (P9)
			To what extent do you feel that the occupation culture influenced your work-family conflict? (P11b)

			To what extent do you feel that the social expectations played a role in how computer training influenced your computer attitude? (P12)
2. How do social and structural factors impact women in IT management positions', career persistence?	Social	a) Work-family conflict -> occupational culture (P11a)	a) Do you think your work objectives affects your family responsibilities? Does your work requires you to put in additional after hours of work ? Does that course an imbalance at home? Does your role requires you to travel or answer calls after hours?
	Social	b) Work-family conflict	b) Are you able to balance-work and family responsibilities? How do you go about doing that? Support from family in your role as a career woman)
	Structural	c) Lack of role models	c) Who is your role-model in your career? Do you think mentorship is important in your career gaudience for your persistence in IT? Who gives you the career gaudience, what is his/her gender?
	Structural	d) Occupational culture (work at night,long hours)	d) Do you feel that your perception about occupation culture influences your choice of persistence in IT?
	Structural	e) Occupational culture	e) Are you a technical person? During your university studies, did you ever have to work at night on IT projects ? Do you think IT proffession is seen to IT students as a career that demands late night hours of work? During your university practicals, did you find IT attractive as a career proffession?
			To what extent do you feel that the social expectations influenced your persistence in IT career? (P3)
			To what extent do you feel that the work-family conflict influenced your persistence in IT career? (P5)

			To what extent do you feel that the occupation culture influenced your persistence in IT career? (P8)
			To what extent do you feel that the lack of role models influenced your persistence in IT? (P10)
3. How do social and structural factors impact women in IT management positions', career advancement?	Social	a) Informal networks	a) Do you attend work social events? Have you ever been introduced to an opportunity through a work social event?
	Social	b) Informal networks >> Mentoring	b) Have you ever met a mentor or someone who later introduced you to an opportunity through a social event?
	Structural	c) Lack of mentorship	c) Have you had a mentor throughout your IT career as an employee? If yes, how did this mentor influence your career development? How experienced is or was this mentor compared to you? How did you find this mentor? Was your relationship formal or informal? Gender of your mentor?
	Structural	d) Lack of mentorship	d) Are you mentoring anyone? Have you assisted your mentee in terms of career advancement
	Structural	e) Institutional structures	e) What is your organisation structure? Is it a flat structure or not? Do you have middle managers at your work?
	Structural	f) Institutional structures	f) Do you think the structure of your organisation have any direct influence on the promotion opportunities presented to women in your organisation?
	Structural	g) Institutional structures	g) Does your role requires you to do international travels or responsibilities that may affect your home routines?
			To what extent do you feel that the informal networks influenced your career advancement in IT? (P13)

			To what extent do you feel that the lack of mentors influenced your career advancement in IT? (P14)
			To what extent do you feel that the institutional structures influenced your career advancement in IT? (P15)

Appendix 3: Interview Schedule

Interview schedule

Date:

Start Time for the interview:

End Time for the interview:

Person name:

Place of employment:

Official title:

Venue/ channel used for interview:

Thank you for signing the informed consent letter.

This interview will consist of a list of research questions that have been formulated to collect the data necessary for this study. Please answer based on your experience.

There are 3 sections to the interview which relate to career choice, career persistence and career advancement.

The first section of the interview deals with factors which may have impacted your career choice:

There are 18 questions in this section

1. Where did you go to school? What type of school was it, a public school, private school? And did you have any exposure to computers at school? Or computer training?
2. Did you have access to computers outside the school environment when growing up e.g. at home, at a community centre etc.
3. When and where did you learn about using computers?
4. Did you have a personal computer when you were growing up?
5. Did you have limited access to the computer at home or unlimited?
6. What did you primarily use it for?
7. e) Who did you live with when you were growing up?
8. Did they influence your thinking about computers, or your IT career choice?
9. Who influenced your career choice?
10. How did your family members feel about your career choice?
11. When you were a learner, were you ever exposed to anyone who was studying or working as an IT female professional?
 - a. Who did you discuss your career choice with before enrolling in IT/computer science studies?
12. What was your attitude towards computers when you were growing up?
13. To what extent did learning about using computers influence the attitudes you had about computers, as influenced by others in your social environment?
14. What made you choose an IT career and what role did your attitude to computers play in your decision to choose an IT career?
15. What is it about an IT career that attracted you to choose IT as a career?
16. what her career path has been to reach her current position?
17. Do you think your work objectives affect your family responsibilities?

18. To what extent do you feel that the social expectations influenced your work-family conflicts?

The second section of the interview deals with factors which may have impacted your career persistence: There are 17 questions in this section

1. How does work-family conflict influence your work?
2. Do you think having (or not having) a role model, played a role in you remaining in IT?
3. Can you explain why you think this?
4. Does your work require you to put in additional hours of work after normal work hours?
5. Does your role require you to travel or answer calls after hours?
6. Does that cause an imbalance at home?
7. Are you able to balance-work and family responsibilities?
8. How do you go about doing that? (Do you have Support from family in your role as a career woman?).
9. To what extent do you feel that the work-family conflict influenced your persistence in IT career?
10. Who is your role-model in your career?
11. Do you think mentorship is important in your career guidance for your persistence in IT?
12. Who gives you the career guidance, what is their gender?
13. Are you a technical person?
14. During your university studies, did you ever have to work at night on IT projects?
15. Do you think IT profession is seen to IT students as a career that demands late night hours of work?
16. During your university practical's, did you find IT attractive as a career profession?
17. Do you feel that your perception about occupation culture i.e. the culture in the IT industry, influenced your choice of persistence in IT?

The third section of the interview deals with factors which may have impacted your career advancement in IT: There are 12 questions in this section

1. Do you attend work-related social events?
2. Have you ever been introduced to an opportunity through a work/ or social event in general even if it was not work related?
3. Have you ever met a mentor or someone who later introduced you to an opportunity through a social event?
4. Have you had a mentor throughout your IT career as an employee?
5. If yes, how did this mentor influence your career development?
 - a. How experienced is or was this mentor compared to you?
 - b. How did you find this mentor?
 - c. Was your relationship formal or informal?
 - d. Gender of your mentor?
6. if not mentored.... Do you think this has had any effect on your career journey?
7. What is your organisational structure? Is it a flat structure or not? Do you have middle managers at your work?

8. Do you think the structure of your organisation has any direct influence on the promotion opportunities presented to women in your organisation?

Your participation in the study is very much appreciated.

Appendix 4: Ethical Clearance Letter



01 February 2021

Miss Ngenzeni Pretty Shange (208528082)
School Of Man Info Tech & Gov
Westville Campus

Dear Miss Shange,

Protocol reference number: HSSREC/00002043/2020
Project title: Barriers and enablers experienced by Women in senior IT positions in South Africa
Degree: Masters

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 19 October 2020 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted FULL APPROVAL.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

This approval is valid until 01 February 2022.

To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

All research conducted during the COVID-19 period must adhere to the national and UKZN guidelines.

HSSREC is registered with the South African National Research Ethics Council (REC-040414-040).

Yours sincerely,



Professor Dipane Hlalele (Chair)

/dd

Humanities and Social Sciences Research Ethics Committee

Postal Address: Private Bag X54001, Durban, 4000, South Africa

Telephone: +27 (0)31 260 8350/4557/3587 Email: hssrec@ukzn.ac.za Website: <http://research.ukzn.ac.za/Research-Ethics>

Founding Campuses:  Edgewood  Howard College  Medical School  Pietermaritzburg  Westville

INSPIRING GREATNESS

Appendix 5: Editors Letter

DEBRA PRIMO PUBLISHING SERVICES

EDITING, PROOF READING, PROJECT MANAGEMENT

Email: debra.primo@rocketmail.com

Mobile: +27 71 886 0444

20 July 2022

TO WHOM IT MAY CONCERN

I, DEBRA CARDINE PRIMO, hereby confirm that I have edited the Master's thesis, "Barriers and Enablers Experienced by Women in Senior IT Positions in South Africa" by Pretty Shange.

I further confirm that I have not changed the meaning of her text in any way.

Your faithfully,

A solid black rectangular box used to redact the signature of Debra Primo.

Debra Primo.

Appendix 6: NVivo Code Report Letter

Name	Codes	Reference
Masters Research Interview Data Manager P10.doc	15	21
Masters Research interview Information Architect P1	19	34
Transcript_CIO_P6	17	36
Transcript Automation Test Manager P9	15	43
Transcript Development Manager P12	21	42
Transcript Head of Architecture P2	18	41
Transcript Manual Business and Information Systems Architect P7	16	27
Transcript Senior Data Architect P13	17	37
Transcript Senior Application Dev Manager P14	16	36
Transcript Senior Systems and Business Analyst Manager P15	20	40
Transcript Support Analyst Manager P5	15	21
Transcript_CIO_P4	19	60
Transcript_Data Architect P11	15	31
Transcript_Data Head P3	20	33
Transcript_Data manager P8	20	58

Screenshot 1: Count of codes per participant

Name	Files	Referen
Career Advancement in IT	0	0
Career Choice in IT	10	17
Computer Access	15	40
Computer Attitude	15	26
Computer Training & Structured Support	13	25
Access to IT bursary	1	1
Computer Studies in High School	1	2
CTraining (P12) influenced CAttitude (PA)	10	15
Lack of Role Models	15	23
Role models outside IT	4	4
Occupational Culture	14	24
Social Expectations	15	42
It it plays a critical role pretty for me.~00~14~17.610 --- 00~14~22.150	1	1
Other	2	6
Availability of the bursary	3	4
Choosing IT Career over family	1	1
Introverts nature	1	1
Mathematics	2	3
Mentorship and coaching programme	5	8
Sorrounding Influence	8	12
Persistence in IT Careers	2	3

Screenshot 2: Coding of Career choice in IT Themes.

Nodes						
Search Project						
Name	Files	Referen	Created	Created		
Career Advancement in IT	0	0	2022/0	NP		
Career Choice in IT	10	17	2022/0	NP		
It it plays a critical role pretty for me.~~00~14~17.610 --- 00~14~22.150	1	1	2022/0	NP		
Other	2	6	2022/0	NP		
Persistence in IT Careers	2	3	2022/0	NP		
Lack of Role Models	14	30	2022/0	NP		
Occupational Culture	12	18	2022/0	NP		
Flexibility of IT industry	2	2	2022/0	NP		
Work-Family Conflict	15	34	2022/0	NP		
Work-family conflict & occupation culture	15	40	2022/0	NP		
Family Support interns of work	6	6	2022/0	NP		

Screenshot 3: Coding of Career persistence in IT Themes.

Nodes						
Search Project						
Name	Files	Referen	Created	Created		
Career Advancement in IT	0	0	2022/0			
Informal Networks	15	40	2022/0			
Conferences	1	1	2022/0			
Institutional Structures	15	46	2022/0			
Lack of Mentors	15	69	2022/0			
Ignored or refusal to mentor	2	3	2022/0			
Not mentoring but willing	3	3	2022/0			
Providing mentorship to another	10	11	2022/0			
Career Choice in IT	10	17	2022/0			
It it plays a critical role pretty for me.~~00~14~17.610 --- 00~14~22.150	1	1	2022/0			
Other	2	6	2022/0			
Persistence in IT Careers	2	3	2022/0			

Screenshot 4: Coding of Career Advancement in IT Themes.