HOW WOMEN END UP IN THE INFORMATION TECHNOLOGY SECTOR: THE PERSPECTIVES OF SOUTH AFRICAN WOMEN

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ABSTRACT

The introduction identifies a gap in existing literature which explores factors impeding women's entry into the South African ICT industry without developing a unified understanding to how to address them. The study sets out to learn how women gain access to the ICT industry which has the dual aim of providing recommendations for improving access, as well as explaining the barriers to entry outlined in previous scholarship. The study approaches its subject using a framework that views career development as a dynamic series of choices that occur over the course of a career and are influenced by a variety of social, familial and personal factors. A thematic analysis of women's professional website profiles and blog entries was carried out to determine most frequently arising themes. These were found to relate to career opportunities, life interests, family influence and business interests. The study ultimately found that the emerging themes were largely consistent with previous literature on factors influencing women's decisions to enter the ICT field, except the notable theme of chance, which indicates that not all decisions were conscious.

Keywords: Women in IT, South Africa, Women in the Workplace, ICT.

INTRODUCTION

The recent Top Companies for Women Technologists report of 572,000 technologists at 76 companies found that 25.12% of technical roles in 2019 were occupied by women. This report indicates a gradual increase in the representation of women technologists at every occupational level in organizations (AnitaB.org, 2019). In South Africa, 51% of those working in the ICT sector are women but around 20% are employed in formal jobs (Malinga, 2019). The Bain and Company Gender (Dis) parity report in SA shows that 31% of South African organisations have no female representation at the senior levels (Fajardo & Erasmus, 2017). Additionally, the Businesswomen's Association of South Africa census of 2017 reports that women make up only 7% of executive directors and only 10% of CEOs (BWASA, 2017), and that these women's career advancement is gravely impacted by the problem of the gender digital divide. Women are said to face several obstacles in breaking into the IT labour force. In South Africa, women constitute only 13% of those with undergraduate degrees in engineering, science and technology, even though the country was ranked 19th out of 149 countries in the 2018 Global Gender Gap Report. Similarly, women are underrepresented in ICT and technology (2:5); maths and statistics (4:5); and engineering, manufacturing and construction (3:10), according to World Economic Forum (2018).

Research in the area of women in IT identifies several barriers, such as cultural beliefs about gender and workplace structure, as well as practices and patterns of interaction that are more advantageous for men than they are for women (Powell & Chang, 2016). Literature also suggests that individuals are more likely to hire people similar to themselves and thus female applicants may be more interested in working for companies that have more women, where they perceive they would gain better prospects for advancement or mentorship (Duke, 2017). The Grant Thornton Report (2015) indicates that the progression of women into senior leadership roles is hindered by stereotypes, such as women's homemaker role (Thornton, 2015). Motherhood is thus still considered a key obstacle to women's career advancement. Hence, Carli & Eagly's (2016) re-evaluation of the obstacles faced by women in the workplace as a maze instead of a 'glass ceiling.' This author also argues that the challenges women face as they progress in their careers is complex and snowball from stage to stage. According to Powell & Chang (2016), women entering the IT sector in South Africa confront obstacles such as, adverse stereotypes, work-family balance issues, underestimating women's contributions at work and a lack of guidance on career options.

Gorbacheva et al. (2019) argue that there is still no consensus on the factors that cause gender imbalance in the IT profession and call on researchers to come to a consensus on these factors instead of developing new frameworks to explain this phenomenon. Existing studies have identified factors contributing to low number of women in the IT sector in South Africa (Dlodlo et al., 2010; Nesaratnam et al., 2018; Pretorius et al., 2015). However, there is limited research about how women enter into the technology industry despite the barriers to entry that exist in this industry. Knowing how women gain access to the industry may help IT organisations increase access and improve conditions of entry to these identified opportunities, and in so doing could assist other women wanting to enter this industry. Therefore, the purpose of this study was to explore the opportunities used by women to enter the information communication technology (ICT) industry in South Africa in order to confirm the factors that influence women to choose the ICT as outlined in the framework.

The reader should note that although there are differences in the terms ICT and IT, this study uses these terms interchangeably because both sectors are similar industries.

LITERATURE REVIEW

Information technology has gained significance in contemporary societies since the beginning of the century and has been referred to as the 4th Industrial Revolution (Lee, 2002; Chala & Poplavska, 2017; Valdivia, 2019). Information Communication Technologies (ICTs) encompass a multifaceted and diverse set of goods, applications and services used to produce, allocate, process and transform information (Ojokoh et al., 2013). Hambuba (2010) defines ICTs as *"a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information"*. These technologies comprise the Internet, computers, broadcasting technologies such as radio and television, as well as fixed and mobile telephony (Cummings & O'Neil, 2015; Hambuba, 2010). According to O'Donnell & Sweetman (2018) the development and acceptance of ICTs have the potential to advance access to services and information or enable collective action for social justice. According to Valdivia (2019), future jobs will be driven by digitization, therefore, digital transformation is not optional but a must.

There are several barriers that prevent women from entering the ICT sector. Career barriers are classified into three categories, namely individual, organisational and societal barriers (Tharshini et al., 2016). Individual barriers refer to those that individuals directly or indirectly impose on themselves; for example, inadequate skills or lack of confidence. Organisational barriers are those that emanate from the organisational culture, working environment and policies of an organisation; such as organisational policies which are be unfavourable to women, an unsupportive organisational culture. Lastly, societal barriers include cultural norms and gender stereotyping that introduces gender limits; for example, work–family conflict as a result of multiple roles embraces women (Orser et al., 2012; Tharshini et al., 2016). These barriers include gender discrimination, stereotypes, work-life balance, lack of mentoring, conflicting roles and pay inequality (Segovia-Pérez et al., 2019; Griffiths & Moore, 2010; Sekoaila & Adebesin, 2016; Pretorius et al., 2015). These challenges are briefly discussed below.

Obstacles for Women to Enter in ICT

a) Gender discrimination and stereotypes

The ICT and digital industries raise unique obstacles for women. Traditionally, jobs related to technology and engineering have been male dominated (Kindsiko & Türk, 2017). The impact of stereotypes is most pronounced in this sector, creating barriers to women's access and putting obstacles in the way of their development (James et al., 2006; Segovia-Pérez et al., 2019). Females in these industries are viewed predominantly as females, rather than as ICT employees or engineers; this influences the types of roles they hold and their advancement within organisations by horizontal and vertical segregation of the workforce (Segovia-Pérez et al., 2019; Ojokoh et al., 2014). The study by Griffiths & Moore (2010) of women who left the UK IT industry found that sexism was one of the principal reasons for their departure. Gender roles are perpetuated early in life. Girls are often trained to follow more feminine subjects while boys are encouraged to study electronics, ICT, etc (Sekoaila & Adebesin, 2016). Thus, later in their career life, women often continue experiencing gender-based discriminations in the workplace (Sekoaila & Adebesin, 2016).

b) Working hours and work-life balance

Balancing the professional and private life in the ICT field is a very difficult factor for men and women because ICT demands and sometimes requires tight deadlines and long working hours (James et al., 2006; Pretorius et al., 2015). Although it is presumed that ICT work does not enforce strict temporal and spatial demands on the workforce compared to other traditional roles, the use of virtual workplaces and enabling mobile technologies, there is still long hour culture to deal with (Griffiths & Moore, 2010; Ojokoh et al., 2014). Traditionally, women's gender role revolves around the care of children and the home. Therefore, the competing role responsibilities are among the top reasons why women leave the IT profession (Griffiths & Moore, 2010; Major et al., 2013; Sekoaila & Adebesin, 2016).

c) Lack of role models, mentoring and networking opportunities

The lack of role models has been shown to be one of the most significant barriers women face in ICT (James et al., 2006; Ojokoh et al., 2014; Kindsiko & Türk, 2017). Strong role

models for women in ICT are required as they join the workforce and as they advance their careers (James et al., 2006). The study by Wentling & Thomas (2007) found that role models are a useful for career development. However, although the benefits of mentorship are well established, finding a mentor is a challenge for professional women in the ICT sector because; female role models are difficult to find in the IT field (Sekoaila & Adebesin, 2016; Wentling & Thomas, 2007). The lack of role models and mentors will deter women from joining technology professions and from seeking or staying in leadership positions in IT already (Cozza, 2011; Musungwini et al., 2020).

d) Organisational culture

Organisational culture has been found to be the most significant barriers to the career advancement of women (Berghi & Bielli, 2015; Griffiths & Moore, 2010; James et al., 2006). The organisational climate in many organisations in the ICT sector has been found to be hostile and ostracising which are indicative of bullying and harassment (Griffiths & Moore, 2010). Research shows that women do not feel a sense of belonging in ICT organisations because of the said 'old boy network' that exists in the industry (Du Plessis & Barkhuizen, 2015; Griffiths & Moore, 2010). According to the study by Mamba, Nesaratnam & Singh (2018), this prejudice extends to the recruitment process as traditional systems of hiring and seeking talent are still narrow and largely aimed at males, favourably white males.

Factors that Affect Girl Learners' Range of STEM Professions

Research suggests various influences that affect the choices made by the students when selecting their professions. The following section discusses the factors that affect the interest of girl learners in STEM careers.

a) Social influences

Social influence, according to Halim et al. (2018), is the influence of those nearest to a leaner, such as the influence of parents, peers, family members, teachers, role models and local communities. Social support has been described as an impact on the choice of profession and leads to a positive view of a profession (Hirschi et al., 2011; Buday et al., 2012). Boys are often provided more access to technology at home than girls from a young age even in rural communities. Therefore, girls have less hands-on experience in technology than boys even before they reach schools. In this light, boys are encouraged and have more positive attitudes towards ICTs than girls (Dlodlo, 2009). Thus, parents, friends and teachers have a role to play in in influencing girl learners 'choice of career. Existing studies show that students' self-confidence in STEM subjects improved when parents, friends and teachers stressed the significance and importance of STEM skills (Buday et al., 2012; Rabenberg, 2013). The encouragement from parents, teachers and peers that girl learners receive has a positive influence on their self-efficacy beliefs (Clarke-Midura et al., 2019).

b) Science, Technology, Engineering and Mathematics (STEM) efficacy

Cultural and social ties have an influence on the development of self-efficiency. Relationships that allow individuals to feel included result in a high degree of self-efficacy while

relationships that lead to feelings of exclusion hamper self-efficacy development and result in low self-efficacy. Therefore, self-efficacy plays a key role in building self-confidence and motivation (Maiorca et al., 2020; Avci, 2020). Studies have reported that girl learners have less faith in their mathematical abilities, although there was no difference in previous academic success with respect to boys. The low degree of self-efficacy among female STEM students and the effects of this on their success of STEM subjects have been extensively documented (Fisher et al., 2020). For example, the study by Tellhed et al. (2017) found that gender disparities in participation in STEM majors, were closely linked to the lower self-efficacy of women for STEM careers, and to a lesser degree, to the lower social aspirations of women with STEM majors graduates.

c) Activities inside and outside the classroom

Evidence demonstrates that learners who are exposed to a school curriculum and an environment that promotes active participation in STEM activities are involved in and aspire to STEM careers (Halim et al., 2018). Education and learning strategies in the school environment are therefore key to developing the skills needed in STEM-related jobs (Sahin et al., 2015). Informal STEM educational events such as visiting zoos, studying in science centres, robotics competitions museums, and interviews with STEM-related people, promote structured educational programs to inspire learners to engage in STEM-related fields (Nugent et al., 2016; Özer, & Güngör, 2017; Sahin et al., 2015). These informal STEM activities are advantageous because they allow for learning to be fun, learners gain informal mentoring, assist learners with time management, exposure to new learning opportunities, provide learners with feelings of accomplishment, encourage friendships and build confidence (Ayar, 2015; Denson et al., 2015; Roberts et al., 2018). The study by Dabney et al. (2017) showed that learners' participation in informal learning activities during high school increased the female learners' interest in STEM, especially those who did not have an initial interest in STEM.

In South Africa the Department of Basic Education (DBE) has programs such as the Dinaledi Schools Programme, which centres on providing education in mathematics and science to educators and learners at chosen high schools, and which helps to inspire young learners to take up STEM subjects. The DBE has also incorporated subjects such as coding and robots in the curricula for basic education. The goal of the robotics program is to provide a strong base for learners in STEM Engineering (DBE, 2019). Other programmes and initiatives outside of those provided by the government include, Girls4Tech, GirlEng, TechnoGirl and African Girls Can Code which inspire girl learners to take up STEM subjects and careers. Although these programmes and initiatives exist, the number of girl learners enrolling for STEM subjects at the higher education level is low. In 2017, The Minister of Basic Education reported that there were 57, 918 more girl than boy learners who sat for the matriculation exams. This points to the fact that more girls made it through the high school education system without dropping out (Child, 2018). Reports show that females made up a large share of public university enrolments between 2010 and 2016, with enrolments mainly in business and management, education and humanities and social sciences. Females made up only 46.2% of enrolments in STEM study fields (Statistics South Africa, 2015; Department of Higher Education and Training, 2019).

The obstacles and factors discussed result in males being dominant in the digital world. Thus, several frameworks that paint a clearer picture of factors contributing to a shortage of women in ICT careers are recorded in the literature. The two popular frameworks cited are by

Ahuja (2002) and Nelson & Veltri (2011). Ahuja's model focuses on women's initial choice of ICT as a career, it continues to analyse women's persistence and advancements in that career stream. Nelson & Veltri's (2011) framework, on the other hand, only focuses on the factors influencing women to choose ICT as a career. Since this study sought to investigate the opportunities used by women to enter the ICT industry, Nelson & Veltri's (2011) framework was a relevant guide for this study.

THEORETICAL FRAMEWORK

A simple interpretation of Nelson & Veltri's (2011) framework is that an attitude towards IT career development encompasses a set of decision-making procedures (Meela, 2018). In other words, women who desire to be IT professionals make decisions based on several different aspects. According to Nelson & Veltri (2011), firstly, the decision-making approach is adaptive and considers women's IT career development as a set of decisions (e.g., choosing to study IT, choosing to work in the IT sector, choosing to leave an IT career). Elements of career decision-making develop early on when a child formulates her future aspirations. These decision-making processes take place as individuals go through their career development stages of growth, exploration, establishment, maintenance, and disengagement (Nelson & Veltri (2011). Secondly, various individual differences such as interests, values, age, abilities and ethnicity can either enable or inhibit the IT career development process. Additionally, the ecological approach to career development perceives an individual and their behaviours as an intricate relationship among multiple factors that are part of an individual's life, referred to as the ecosystem. Lastly, the ecological factors are linked to five subsystems that influence human behaviour. Firstly, the *microsystem* relates to personal interactions with people in various environments such as the home, school, peer, or work setting. Secondly, the *mesosystems* include interactions between two or more microsystems, for example, the relations between an individual's home and work environments. Thirdly, the *exosystems* represent relationships between subsystems that indirectly influence one's immediate context such mass media, neighbours, friends of the family. Fourthly, the *macrosystems* describe the cultural attitudes and ideologies of the environment that one lives in. Lastly, the *chronosystem* refers to the patterns resulting from environmental events and transitions over the life course, as well as socio-historical circumstances (Bronfenbrenner, 1994).

The researchers used Nelson & Veltri's (2011) framework as a guide to answer the research question *"What are the opportunities used by women to enter the IT sector?"* The next section details the method that was employed to explore the research question.

METHODOLOGY

Design, Sampling and Data Collection

A qualitative case study design within the interpretivist paradigm was chosen to study the data gathered from profiles of women in the ICT sector in South Africa (Yin, 2014). The study of phenomena in their natural environment is key to the interpretivist philosophy (Saunders et al., 2016). In addition, interpretivists argue that it is only through subjective interpretations that reality can be fully understood. The opportunities used by women to enter the technology industry in South Africa were gathered from secondary data from the Women in Tech ZA website. The profiles were regarded as individual cases (abbreviated as CS).

Secondary data collected from the Women in Tech ZA website reflects the profiles of South African women in different seniority levels and roles within the ICT sector. To be profiled on this website, women complete an open-ended questionnaire of six questions. The questions relate to (1) their day-to-day activities, (2) how they entered the ICT space, (3) the best advise they received, (4) the advice they would give to others interested in entering the sector, (5) their motivation to get out of bed each day and (6) who they wish to be when they grow up. The questionnaires and profiles were completed and posted on the website between July 2014 and November 2018. All 77 profiles of women on the website were used in this study and were viewed as individual cases. Therefore, in the population of all women employed in the ICT sector in South Africa, a convenient sample of the women profiled on the Women in Tech ZA website was used in this study. The advantage of using this sampling method was that the profiles were easily accessible from the publicly available website (Creswell, 2007). However, this sampling method's drawback is that the findings are prone to bias because the sample may not be representative of other characteristics such as sex or age. This limits the researchers' ability to make generalisations of the findings to a wider population (Creswell, 2007).

There is a strong support for the analysis of secondary quantitative data (Dufour & Richard, 2019; Dunn et al., 2015). In the social sciences, however, secondary qualitative data analysis remains uncommon (Dufour & Richard, 2019). Although some researchers are hesitant to exploit secondary data (Boris, 2015; Mauthner & Parry, 2009; Yardley et al., 2014), the changes in the research environment now makes it popular to use, by design or otherwise, the pre-existing qualitative data (Dufour & Richard, 2019). There are several benefits to the re(analysis) of secondary qualitative data. It is more cost-effective than collecting primary data. It enables researchers to assess the reliability, validity or generalizability of existing studies. Researcher can perform new analyses using new analytical tools or an emerging theoretical framework. It allows research on hard-to-reach or vulnerable populations to be conducted without additional interference (Dufour & Richard, 2019; Sherif, 2018).

The profiles did not include demographical data, so estimates were made of this information by using the job titles, the names of the organisations, and the photographs accompanying the profiles. The researchers therefore concluded that the women worked in different organisations in South Africa and occupied different levels within their organisation. Most of the women were at the managerial level and some were entrepreneurs. This was based on the designations accompanying each profile such as Chief Officer, Head of Department, Manager and Founder, Co-Founder, respectively. From the photographs, the researchers were able to determine the race of the participants using the definition of black people provided in the Broad-Based Black Economic Empowerment Act 53 OF 2003 as amended by act 46 of 2013. Using this definition, most of the participants were Caucasian.

Ethical considerations were followed in the data collection process. This included gaining permission to use the website data from the website owner. Following the advice from Markham & Buchanan (2012) as well as (Stuhmcke et al., 2020), permission was not requested from the individual women profiled on the website because the website is publicly available. Researchers used certain measures to protect the participants in the study. The researchers heeded the advice and practices of Andalibi et al. (2017), Jones & Lynn (2018), as well as Markham (2012) of reconstructing ethical practice by rewording the direct quotations whilst preserving the sense of the original meaning to reduce the risk of identifying an individual by searching for the direct quote on the website. In addition, the analysis presents a collection of responses from the women profiled in the blog. This approach entailed focusing on the dominant themes instead of attending

to the responses of any individual features. This strategy was upheld to protect the women profiled on the blog because even though the blog is in the public domain, it does not mean that they would wish to be a focus of research study without their consent (Jones & Lynn, 2018).

Data Analysis

Thematic analysis was utilised to bring insights to a collective experience (Braun & Clarke, 2012). The responses from the profiles were copied into a word document. The first researcher thoroughly read each copy of the features. She started by open coding 15 of the 77 profiles by highlighting text and writing keywords or phrases to develop codes. Once she completed the open coding, she decided on preliminary codes. These preliminary codes were then used to code the remaining 62 profiles in Atlas.ti and new codes were added as and when she came across data that did not fit into the existing codes. She then grouped all the similar codes together to form themes. There were some codes which fell into more than one theme, and in these cases, she allocated these where she felt they most applied. The second researcher reviewed the analysis process. When both researchers agreed on the codes and themes, the first researcher ran a coding density by themes which indicated the percentage of text that was coded under the different themes. This was used as an indication of the most dominant theme. The coding density by theme was as follows: conscious choice and serendipity (60%); life interests and passion (23%); and social and family influences (17%).

FINDINGS

There were four dominant themes that emerged from the data. These were conscious choice and serendipity; life interests and passion and social and family influence;

1. Conscious choice and serendipity

This theme related to the employment opportunities that participants identified themselves or those that their employers afforded to them. Some participants indicated they entered the ICT sector by chance.

"I was in the right place at the right time and have never looked back. I started as a developer and other different positions that helped grow my experience" [CS12].

"I never thought I would be in IT because I studied visual arts! I was employed as a temp in an outsourcing company. Here I saw how my creativity worked well in IT projects and my love for projects developed from here. I then moved into consulting and then the agile community" [CS03].

"Entirely by accident after finishing my finance degree. I was then hired in an IT company" [CS 38].

Others spoke of the opportunities that were made available by their employers:

"I began my career as a stock planner. I was later moved to be an Analyst because the company had budget constraints and couldn't employ someone. I was given IT training. This gave me an overview of the industry. This is where I wanted to be" [CS 45].

"After completing my HR qualification, I was employed in an HR department. When they saw my marks for maths, they suggested I take an aptitude test for programming" [CS27].

2. Life interests and passion

The participants of this study also indicated that their passion for ICT as well as their interest in the ICT field propelled them to enter the industry.

"My passion for technology has always been there. I was often thought of as the boring girl who was always reading STEM related items. I read them because I was obsessed with a connected future which back then was only a dream" [CS55].

"I was inspired to get into the tech space because of my love and passion for technology. I also met other women in technology at hackathons and workshops and they inspired and motivated me" [CS62].

"I'm a proud geek, nerd. I was therefore very excited to be involved in something that's new and exciting in the tech space, particularly with regards to mobiles" [CS08].

Social and Family Influence

Participants (50%) spoke of the influence they received from family and society to enter the industry. This included their parents' occupations,

"As a software developer, my mother was always encouraging me to also be a developer. When I entered my teens I really wanted to build my own artificial intelligence friend. I guess, I'm the lucky one" [CS63].

"I was born in it. My dad had a software development company. I had my first computer when my dad got himself a new one" [CS28].

Other family members' interest in technology (5%),

"I helped my uncle at his tech company and that's how I got into the tech space" [CS13].

Participants referred (20%) to the influence from their peers,

"While at university I bumped into a friend at a supermarket and she told me she was studying IT and going to be a computer programmer. She said a program was able to create and calculate what's on the supermarket receipt (and that) a programmer wrote this. I subsequently qualified as a Cobol Programmer". [CS28]

"I got into the field after I spoke to a friend that was doing it yet didn't enjoy it."[CS55]

The influence from colleagues was mentioned (20%),

"I lived and worked in Silicon Valley for 7 years, which sparked my endless fascination and adoration for technology" [CS19]

"I was also inspired by a visit to the Google Campus in London a few years ago" [CS73]

Participants (5%) also mentioned the influence media has on their career decision,

"I was always reading and seeing posts about women in male-dominated sectors and I thought to myself, wow." [CS47]

DISCUSSION

The findings of this study show that, indeed, the women's decision-making approach to enter the ICT sector is deliberate as stated by Nelson & Veltri (2011). This study's findings show how the education of the participants enabled them to enter the industry either through a planned process of looking for employment. However, the findings also indicate that women's decision to enter the sector is not always a deliberate one. Some women seem to find themselves in the sector through serendipitous ways. Similar findings have been presented by Crump et al. (2007), Demaiter & Adams (2009), as well as Webb & Young (2005). In these studies, the participants mentioned specific opportunities and chance events that brought the field to their attention.

This study found that the individual characteristics of personal interests and passion in ICT from a young age were some of the factors that act as enablers of the IT career development process for the participants in this study. Snyder & Slauson (2014) and Merhout et al. (2016) also found that their participants were motivated to enter the IT sector to pursue both personal interests. Similarly, the study by the Asia Pacific Women's Information Network Center (2018) found that women were driven by passion to enter the sector. This study's finding is consistent with (2011) framework. This theme supports Nelson & Veltri's (2011) notion that various individual differences such as interests, can act as enablers for choosing a career in the IT sector. It also supports the authors' assertion that aspects of women's career decision-making arise in the early years of childhood when a child wonders what she or he may want to be one day.

The findings of the present study showed how the participants' decision to enter the sector was influenced by their home environment such as the nucleus and extended family members, peers and work environment. Having family members working in the ICT sector has been shown to be one of the factors that influence women to enter the ICT sector. Existing literature shows that parents' occupation and socioeconomic status have an influence on their children's career aspirations and choices (Ahuja et al., 2006; Appianing & Van Eck, 2015; Demaiter & Adams, 2009; Tilleczek & Lewko, 2001). The study by Shashaani (1994) shows that when girls have less traditional mothers who hold more positive attitudes towards computing, the girls are more likely to enter the ICT sector. While the studies by Araujo and Taveira (2009) and Mtemeri (2017) have shown that other family members such as aunts, uncles, cousins and grandparents influence one's career choice. The study by Shumba and Naong (2012) found that peers' influence cannot be underestimated as it was found to be influential in career choices. The present study's finding support Nelson & Veltri (2011) view on ecological factors that influence women to choose an IT career within two subsystems, namely, the *microsystem and the exosystem*, This study identified ecological factors within the *microsystem* showing the personal interactions the participants had with people in different settings such as the school, home, peers or the work setting has an impact on how they view themselves and their career development. The study also identified ecological factors within the e*xosystems* illustrating the relationship between the subsystems that indirectly impact the individual's immediate context such mass media, neighbours, friends of the family. These findings highlight the importance and influence of the microsystem and the exosystem on the participants. The ecological factors within the macrosystem and the chronosystem were not reported on by the participants. This however does not mean they did not exist. It could largely be due to the data collection method which did not allow for probing on these two subsystems.

CONCLUSION

The purpose of this study was to explore the opportunities used by women to enter the information communication technology (ICT) industry in South Africa in order to confirm previously established factors that influence women to choose the ICT field as advised by Gorbacheva et al. (2019). The findings of this study confirm that women make conscious decisions to enter the sector. However, it also found that women enter the sector through serendipitous ways. It confirmed that career decision-making to enter the sector is driven by interests and passion for ICT. Lastly, it confirmed that the personal interaction the participants had with people in school, home, work and peer environments influenced women's decisions to enter the ICT sector. By confirming the existing factors that cause gender imbalance in the IT

profession, this study expands existing knowledge on this phenomenon so that fruitful interventions could be developed to address the issue of gender imbalance in the sector.

A limitation of the study related to the data being collected from self-reports for an online profile. Participants' self-reports are influenced by social desirability and the need to ensure that the industry is not reflected in a negative light in order not to risk their employment or damage their employer's reputation. The data collection method of using profiles from the internet limited the researchers 'abilities to probe the participants on some issues. Further research could explore the experiences of women during face-to face in-depth interviews, as this will allow for further probing and richer data. In addition, quantitative methods could be used for future research to cover a larger, more diverse sample. A survey could highlight the extent to which a specific opportunity is mostly used by women to enter the sector. The views from women at non-managerial levels as well as other racial groups could also be investigated.

This study's findings have implications for parents in the home environment, organisations in the work environment and the government. Although the South African government has introduced school subjects like coding and robotics into the basic education curricula, the life orientation curricula should provide guidance to learners on STEM careers including ICT careers. The government could also encourage organisations in the ICT sector to provide more bursaries and scholarships targeted at girls to study at higher education institutions and provide these organisations with incentives for employing the girls they sponsor. This will go a long way to ensuring that girls have the study and work opportunities that assist them in gaining entry into the sector..Both parents and organisations need to expose children and employees to information about different types and uses of technology as well as people involved in the sector. This exposure will broaden children and employees' knowledge of possible careers within the ICT sector. This study is also valuable to IT organisations, as the findings could be used by these organisations as the basis for the development of their policies on the promotion of gender diversity in their organisations. IT organisations could open their vacancies up to employees within their organisations and those outside their sector and look for individuals with transferable skills. The findings of this study have shown that some women entered the sector serendipitously, having come from other sectors such as art and accounting. This would ensure that organisations do not miss out on talented individuals with an IT aptitude. By employing this strategy, IT organisations could be opening opportunities identified by women as an access point to entering the sector.

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