Evaluating the perceptions and use of Computer Assisted Career Guidance Systems in seven high schools by learners and teachers: Analysis, Synthesis and Computer effect

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Compulsory Declaration

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. Each significant contribution to, and quotation in, this dissertation for the work, or works, of other people has been attributed, and has been cited and referenced.

Signature _____ Date _____

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Dr. Hardman, Participating schools, Dude, Mellon Scholarship, thank you so much. You made this possible.

To God be the glory.

Abstract

This research is concerned with how learners perceive Computer Assisted Career Guidance Systems at schooling level in South Africa. The research is also about exploring how teachers in the high school setting use these Computer Assisted Career Guidance systems. The thesis defines Computer-Assisted Career Guidance Systems as "interactive guidance programs that an individual can operate independently to retrieve information useful for self-assessment and career exploration" (Fowkes & McWhirter, 2007, p. 388).

The digital age has provided numerous Computer Assisted Career Guidance Systems (CACGS) platforms where information can be consumed and used to make career related decisions (Fowkes & McWhirter, 2007). However, the impact and effectiveness of these CACGS has not been investigated in the South African context, particularly the perceptions of learners and teachers at high school level. This may be due to few schools, often only private schools, in South Africa having the financial and human resources to use and interpret results of learners from these CACGS. In this thesis, four Computer Assisted Career Guidance Systems that are used in high schools were evaluated by learners, and these are PACE, Mindmuzik-EAS, The Online Career Guide and JVR Strong Interest Inventory. Furthermore, the thesis evaluated how teachers used these systems in class, the expectations by parents and how their respective schools evaluate the impact of CACGS against the school's objectives.

The emergence and use of these CACGS in South African private schools provided an opportunity to research the perceptions of the impact that these technologies have on the decisions that high school leavers make. This study attempted to understand the usefulness of Computer Assisted Career Guidance Systems in high schools that have invested in these technologies. The research evaluated CACGS in seven schools with 177 learners participating and 7 school teachers/psychologists. Focusing specifically on three composite scales that measured whether learners believed that after using the CACGS they became familiar with oneself and the world of work (Analysis), if they believed that through CACGS they were able to identify potential career alternatives (Synthesis) and if they believed that interacting with the computer made a difference (Computer Effect). This thesis adopts a mixed method approach to study CACGS, using a qualitative method through interviews to get the opinion of teachers and a quantitative method through surveys to get learners' perceptions.

This study afforded rare insight into the South African high schools use of CACGS, where findings indicated a general acceptance and satisfaction of CACGS from learners. Moreover, revealing how the systems are implemented in class.

Acronyms

ANOVA – Analysis of variance

CACGS – Computer Assisted Career Guidance Systems

CIDS - Career Information Delivery Systems

GET – General Education and Training

EAS – Electronic Assessment System

L.O – Life Orientation

MANOVA – Multiple Analysis of Variance

OAQ - Occupational Alternatives Questions

SIGI - System for Interactive Guidance Information

UCT – University of Cape Town

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1. Introduction

This thesis explores how learners perceive Computer Assisted Career Guidance Systems in seven high schools that are based in Gauteng, South Africa. The research conducted for this thesis is also concerned with how schools implement these Computer Assisted Career Guidance Systems. Centered on personality trait theory and using a combination of quantitative and qualitative methods, the research looked at four Computer Assisted Career Guidance Systems and how they influenced the perceptions of learners who used them as part of Career Guidance, furthermore exploring how schools implement them.

1.1 Background and rationale

According to Maduakolam (2000), the high school and post high school period is marked by an important career decision making phase. Some learners battle with selecting career streams whilst others struggle to choose a higher learning institution or a first-time job that will lead to a satisfying long term career. Learners are also faced with the challenge of understanding different working environments that will suit their personality traits and provide an appropriate personal growth atmosphere. These decisions are made difficult by the ever evolving, complex and technology dynamic working environments. Stone and & Wang (1990) in Maduakolam (2000), argues that some high school leavers, due to pressure, determine their career choices prematurely without understanding the subject requirements, character traits or special aptitude required for the career, or knowing what training is required to fulfill the requirements of a specific field.

The use of educational technologies in the classroom has grown exponentially in the last few years (Collins & Halverson, 2009). Educational technologies have served as learning and teaching tools, simulators, resource libraries, and assessment tools (Collins & Halverson, 2010; Kristyn & Fowkes, 2007). This research focused on educational technologies that are designed for the purposes of career guidance. “Computer-assisted career guidance systems (CACGS) are interactive guidance programs that an individual can operate independently to retrieve information useful for self-assessment and career exploration” (Fowkes & McWhirter, 2007, p. 388). CACGS started to emerge as complementary resources to Career Guidance as early as the 1960s (Sampson, 1993; Kristyn & Fowkes, 2007). With the growing popularity and research into CACGS, the systems became more and more sophisticated. This entailed the inclusion of complex decision making exercises features, larger career data bases, improved software user interfaces, and refined theoretical frameworks which significantly improved the overall user experience when using CACGS (Sampson, 1993; Harris-Bowlsbey, 2013; Kristyn & Fowkes, 2007; Seeger, 1988).

Some of the well-known CACGS in the world are developed and used in North America and Europe, these include Discover, Sigi-Plus, and Prospect (Muroyama, 2002). According to the research looking into these CACGS effect on career decision-making, these technologies have been found to be effective in the process of facilitating and generating high levels of user satisfaction (Itamar Gati, 2001). There is further evidence in literature that highlights the positive effects of CAGCS on planning, career exploration, confidence in career choice and career development activity (Seeger, 1988).

However, one of the gaps in literature is that it is not clear how these CACGS have been implemented in the educational settings, specifically in high schools. Literature exists on the implementation of CACGS at the university setting with first year university students but the literature has not shown how the systems are implemented and used in the high school setting.

"Empirical evidence of institutional implementation of systems and impact of use on career planning, exploration and decision making activity is important in determining the current status of CACGS" (Seeger, 1988, p. 4). In the modern-day schooling setting, Seeger's (1988) argument is still valid, it is important to understand the current status of CACGS in high school in relation to these system's impact on career decision making. Research with intention to evaluate the effectiveness of CACGs in a systematic manner has been limited (Taber & Darrell, 1999). This phenomenon also exists in the South African context. According to Crossland (2006), there is limited career guidance research with a theoretical focus in South Africa in general. The restructuring of one of the main sources of career guidance related research in the country, the Human Science Research Council post 1994, resulted in little to no research in career guidance and counseling. Cited by Crossland (2006), Stead and Watson (1999) argued that in South Africa, during the year 1999, there were only 22 researched, reviewed and published articles on Career Guidance which may be used for the development of career guidance practice in South Africa. This number indicates the limited research on the field in general. It is then not surprising that there is no published research on the field relating to the evaluation of CACGS in South African high schools. This gap in literature, particularly on evidence that highlights the perceptions of learners in South Africa towards their school's CACGS, prompted this research. Most of the research to date has focused on learner-report of satisfaction with the popular CACGS that are used in North America and Europe. There is a need for educators, schools, systems developers and researchers to know and understand the impact of CACGS on high school learners and how these CACGS are integrated in schools, specifically in the South African context.

1.2 Problem statement

There is a need to understand how high schools use and implement CACGS and how the learners perceive the systems regarding helpfulness in making well informed career decisions. Considering the investment that schools put in these systems (software costs, updates of systems, printed reports and assessment time), it is critical to know how the primary users, the learners, perceive them and how they use them. It is also important to understand how useful the systems are from a teacher's perspective. The results of such an evaluation on usefulness of these systems can assist schools in determining whether the investment on a specific system is justified or not. It must be noted that none of the schools that participated in this research perform an annual formal evaluation of their acquired system. Which brings about the question, how do these schools know the impact and usefulness of the Computer Career Guidance Systems they have invested in?

It is against this background that an evaluation of CACGS in seven selected South African private schools was looked at in this thesis from a learner's and a teacher's perspective.

1.3 Aims and objectives

The aim of this study was to primarily gain insight into the perceptions of learners on the usefulness of CACGS in their schools. Furthermore, it was deemed necessary to obtain an understanding on how teachers use CACGS in schools, what the parent's expectations are and how the schools evaluate the impact of the systems against set school's objectives. The deliberate focus on private schools for this evaluation was guided by the need to learn best Career Guidance practices in highly rated and well-resourced high schools in South Africa. Secondary to this, I wanted to contribute towards the death of literature on Computer Assisted Career Guidance Systems in South African high schools.

1.4 Research questions

The problem statement gives rise to the following specific research questions,

Has the use of different Computer Assisted Career Guidance System:

a) improved learner's career decision-making skills?
b) clarified learner's values, interests and abilities?
c) identified satisfying occupations congruent with their values, interests and abilities of the learner?
d) helped the learner to acquire an understanding of the world of work?
e) assisted the learner to understand the personal demands of the world of work and the needs of significant others so as to make an optimal occupational choice
f) helped in formulating a systematic plan of action to implement learner's occupational choice?

Secondary to these questions, from the problem statement other broader question can be asked; how do teachers use CACGS in schools, what are the expectations from the parents after learners have completed career assessments and how do schools evaluate the impact of the systems against set school's objectives

1.5 Research design and methods

This research followed a mixed methods approach, investigating through qualitative and quantitative methods. In order to answer the questions posed, a survey with 24 questions, prepared for learners was used. The survey was adopted from the Center of Center for the Study of Technology in Counseling and Career Development as presented in their Technical Report number 6 published in 1987 (Peterson, Ryan-Jones, Sampson, Reardon, & Shahnasarian, 1987).

Participating learners (n=177) from five schools ranging from Grade 9 to Grade 12, completed the survey. The survey was made available to all learners electronically via Google Forms, and Monkey survey. The surveys were also made available for completion in printed form. Through factor analysis, the twenty-four answered questions were then combined logically to form the three higher order composite scales, Analysis, Synthesis and Computer Effect. These composite scales measured whether learners believed that after using the CACGS they became familiar with oneself and the world of work (Analysis), if they believed that through CACGS they were able to identify potential career alternatives (Synthesis) and if they believed that interacting with the computer made a difference (Computer Effect).

The CACGS that were evaluated in this thesis were, PACE Career Center, Mindmuzik-EAS, Online Career Guide and JVR Strong Interest Inventory. The systems were selected based on what the schools had already adopted as a CACGS of choice.

In evaluating the use of the CACGS by teachers, a qualitative method was used. Interviews that aimed to go in-depth about the process followed by teachers or school psychologists when using CACGS in Career Guidance were conducted. Seven schools participated in these interviews and each teacher/school psychologist provided insights on the use of a specific CACG in the school. The schools were given pseudonyms, A to G High school. Five themes emerged from these interviews. These were; Grade introduction and the aim of CACGS, the CACGS as a complementary tool, CACGS formal evaluation, the perception by parents and learners against expectations and the ease of CACGS use. The schools that participated in this research were pre-dominantly single sex schools (5), with only two co-ed schools, therefore there was no specific focus on how different genders perceived the evaluated CACGS.

1.6 Theoretical framework

Theoretically, this thesis looked at CACGS with the lens of Personality Theory as the underpinning theory of the evaluated technologies. When evaluating the different types of CACGS that were used in high schools, the different theories of personality traits enabled the researcher to look beyond the technology by exploring the underpinning personality theories for each CACGS. In this thesis, each CACG underpinning theory is discussed. The following theories are discussed for each system:

- PACE – Hollands personality theory
- Mindmuzik EAS– Jung personality theory
- The Online Career Guide – Hollands personality theory
- JVR Strong Interest Inventory– Hollands theory and Meyers-Briggs personality theory

These are theories that also inform theories of career development (Seeger, 1988).

1.7 Limitations

There are inherent limitations in the study. Learners in Grade 9 are still juniors at high school and at times not yet mature enough to understand the impact of the empirical research. Although measures were taken by teachers and the researcher to introduce the study and emphasize its importance, it cannot be ruled out that there is a possibility that some learners did not apply their minds when answering the survey questions, perhaps extra time and one on one interviews would have yielded the most accurate results in the junior grades. As alluded by some teachers, Grade 9 learners are not yet

at the stage where career decisions are important in their lives, therefore evaluating the overall impact of CACGS might be of lesser important to them.

The study sought to get an opinion on the usefulness of the following systems, PACE Career Center, Mindmuzik – Electronic Assessment System (EAS), The Online Career Guide and JVR Strong Interest Inventory from a learners' perspective. The learners that completed the surveys for this study were only exposed to one system, being the primary CACGS adopted by their particular school. Therefore, when learners evaluated the usefulness and impact of their school's primary system, they did not have a base CACGS against which to compare their school's system. The evaluation only caters for one perspective of CACGS in general. Giving participants exposure to all four systems functionalities over a period of time would have possibly yielded different perspectives as learners would have also been exposed to other CACGS.

In contrast to the study that this thesis is based on, the study eliminated gender results on the evaluation of CACGS. The elimination was based on the fact that the majority (5 out 7) of the selected schools for this study were single sex schools. Only two of the seven selected schools were co-ed schools, therefore, an accurate comparison of results based on gender would be impossible.

The study also did not take into consideration the socio-economic backgrounds of the individual learners. According Fowkes and McWhirter (2007), the socio-economic status plays a role in shaping an individual's career development and the attainment of those careers. The assumption that the majority of the learners from private schools are from affluent socio-economic backgrounds may have played a role in overlooking this factor.

1.8 Potential contribution to theory and practice

The researcher's preliminary search on Google scholar, UCT Scholar, Education e-Journals (as listed in the Bibliography) has shown that there is no academic literature that exists in South Africa on the evaluation of CACGS that are used in South African high schools. The results of this study, as guided by the proposed research questions and purpose of the study, can contribute both to the body of knowledge and practically in the technology implementation field, particularly in the South African public education sector.

The practical significance of this research is critical for the South African Department of Education, as it enters the phase of acquiring numerous technology applications to enhance the education experience in public schools. The study is also significant to the South African private schools, as it highlights whether the investments in CACGS is justified or not.

This thesis will also be critical in the future development of CACGS in the mobile technology field. "The rapid growth of web connectivity via smart phones is a technological development that makes the delivery of career guidance systems feasible in developing countries where people do not have access to computers" (Harris-Bowlsbey J. , 2013, p. 185). The results of the systems evaluations in this thesis will inform the prototype development of smart phone based CACGS as predicted by Harris-Bowlsbe (2013).

1.9 Overview and organisation

Chapter 1: The purpose of this introduction chapter is to give a background to this thesis. With this foundation, the problem statement, research question, research methods and theoretical underpinnings outline the purpose of the study.

Chapter 2: The literature review chapter looks at the related research in the CACGS evaluation field. The chapter firstly defines the concept of Career Guidance as a module covered in the Life Orientation syllabus in South Africa. Thereafter, it explores the global literature on the evaluation of specific CACGS, the underpinning theories and the methods that are used to complete evaluation.

Chapter 3: The theoretical underpinning chapter explores personality theory as an underlying theory that is used by CACGS designers. The chapter also explores the specific personality theories that are used in the development of CACGS. Holland's theory, Jung personality theory and Meyers-Briggs personality theory are all discussed in detail in this chapter.

Chapter 4: This chapter provides an overview of the methodology that was used to measure and analyse various CACGS selected for this study. The chapter highlights the measuring instruments that were used in detail, followed by the data analysis procedure, the sample of the study, how the data was collected and lastly how the data was analysed.

Chapter 5: The data analysis and findings chapter presents the findings of the study. This chapter also consists of the discussion of the results.

Chapter 6: Finally, this chapter presents the conclusions and recommendations for further research.

2. Literature review

2.1 Introduction

This chapter defines the concept of Career Guidance as a chapter in the Life Orientation syllabus. The chapter will further explore the global and local literature on the subject. It further investigates this topic looking at the local context in detail by reviewing literature and research from South Africa.

2.2 Career Guidance and the South African context

"Career guidance refers to services and activities intended to assist individuals, of any age and at any point in their lives, to make educational, training and occupational choices and to manage their careers" (The South African Qualification Authority, 2012, p. 23). Fretwell and Watts (2004) give a broader definition of Career Guidance. They define this concept as a service that encompasses of information, guidance and counseling with the intention of assisting individuals of any age group to make educational, training and occupational choices in order to manage their careers. The emergence of Information Communication Technologies (ICTs) has enabled Career Guidance services to be offered using computers. These services are offered through computer software programmes that have digitized content and the process of learning and managing a career, hence the development of the term Computer-Assisted Career Guidance Systems (CACGS).

In order to fully appreciate the analysis of CACGS systems that are discussed in this study, it is important to understand the historic and current context in which they are situated. South Africa is classified as a developing country and is rated as one of the most unequal societies in the world (De Klerk, 2012). The societal inequalities also translate to the differences in quality of education that is offered throughout the country. Whilst the South African government continues to heavily invest in public education, the resources enjoyed by learners in private schools significantly differ in quality from those in most public schools (Fiske & Ladd, 2003). This scenario is evident in the distribution and the use of ICTs in public and private schools, particularly in the Career Guidance field. The disparities in access to ICTs and quality of Career Guidance offered in public and private schools can be traced back to pre-democracy distribution and use of resources in South African schools.

Prior to 1994, the South African legislation stipulated that learners should receive a thirty-minute Career Guidance lesson on a weekly basis. However, this was not the case for disadvantaged schools under the Bantu Education systems. Post 1994, a restructuring of the schooling system took place and Career Guidance was negatively affected. The new General Education and Training (GET) curriculum resulted in the introduction of a new compulsory subject, Life Orientation (L.O). In the introduction

phase, L.O allocated six percent of the curriculum to Career Guidance. This meant Career Guidance had approximately thirty minutes every four weeks in the curriculum compared to the pre-1994 thirty-minute weekly allocation. This resulted in limited time for teachers to cover critical information during the course of the year. The consequences were that with the limited time allocated to Career Guidance, learners could not get enough information to make well informed career decisions (Crossland, The development and evaluation of a career guidance centre for historically disadvantaged learners in Zululand, South Africa, 2006).

During the introductory phase of GET, a provision for the integration of Career Guidance into other subjects was made. However, clear mechanisms for this integration were not developed nor provided to teachers. This, together with inadequate teacher training on Life Orientation, left it to teachers to decide how the integration should be done. According to a study by Van Deventer (2008), the majority of teachers for Life Orientation in the Western Cape are not fully qualified to teach the subject. This not only causes stressful situations for the teachers, but raises numerous questions from the learners and how they perceive the subject. In agreement, Crossland and Ebersohn (2003) also confirm that educators in public schools are ill-equipped to provide services to learners. In contrast, private schools in South Africa, particularly in affluent geographical areas, have dedicated and qualified Counseling departments that are focused on Career Guidance.

To offer assistance to Life Orientation teachers in public schools, the Provincial Offices of the Department of Education allocate a small group of staff members that is accountable for offering support to Life Orientation teachers. This group's mandate is to visit schools and give assistance to the teachers for the purposes of developing learning materials, administering psychometric tests and providing in-service training. Due to a limited number of employed support staff members, each member may be responsible for as many as 150 schools in one district which is not sufficient for supporting a large number of public schools (Kay and Fretwell, 2003). Provincial Offices of the Department of Education also have district teacher support centers, which include resource libraries for public school teachers. The centers stock Career Guidance materials. While assistance is offered for pupils in Grade nine to select subjects, the reality is that in many of the under resourced public schools, the subjects offered are very limited and this impacts the scope of career choices learners can get exposed to (Kay and Fretwell, 2003).

Due to limited resources for Career Guidance delivery and minimal time allocation to Career Guidance through the Life Orientation in public schools, some non-profit organizations have taken the role of

providing support resources to learners and educators. Additionally, the private sector, consisting of private companies, book publishers, counselors and psychologists offer Career Guidance resources and services for those individuals who can afford their products and services (Kay and Fretwell, 2003).

Outside the classroom and school, learners have a variety of events where they can access career related information. These events are usually in the form of career exhibitions and career talks by people working in specific fields. These are generally organized by non-government organizations, state owned enterprises and other public sector institutions. Tertiary Institutions also visit schools to provide career talks, and hold open days. Unfortunately, these events are usually more accessible to schools in urban areas.

2.3 Career Guidance and decision making at school

Career Guidance as a subject in high school is critical for making informed career choices. According to Crossland (2006), a school-based Career Guidance programme plays a significant role in assisting learners to increase their potential to earn a living, manage change and identify and make appropriate use of available opportunities (Crossland, The development and evaluation of a career guidance centre for historically disadvantaged learners in Zululand, South Africa, 2006). In the South African schooling system, learners must make initial career decisions at the end of their ninth grade. This stage of decision making is primarily focused on selecting subjects for their final three years of high school. Thereafter the next major decision making point is in the twelfth grade, where learners make decisions on career streams for higher learning institutions or opting to find working opportunities (Fretwell & Watts, 2004).

The current Life Orientation curriculum allows for Career Guidance from primary schooling to the ninth grade. The purpose of covering this topic is to assist learners with career choices, linking these to the subject selection at the end of Grade nine. Career Guidance programs are also run with Grade ten, eleven and twelve learners. At this senior level, lessons take a different format, with the intention to expose learners to different fields of work, sectors of the economy, and what is required from them to enter these fields. Learners also get exposure from sporadic career exhibitions where public and private organizations disperse career information, affording learners the opportunity to ask questions directly from professionals. There is no standard time allocated for these activities, and they vary considerably from one geographical area to another.

2.4 Computer Assisted Career Guidance Systems and Career guidance

"Computer-assisted career guidance systems (CACGS) are interactive guidance programs that an individual can operate independently to retrieve information useful for self-assessment and career exploration" (Fowkes & McWhirter, 2007, p. 388). Amongst many functionalities, these systems allow users to search through large amounts of occupational and educational information, clarify user's interests and abilities, and enhance user's abilities of making informed decisions. CACGS have been developed and used since the 1960s and are now accepted as one of the important tools for the delivery of career planning services (Harris-Bowlsbey J. , 2013). Some of the well-known CACGS that are developed and used in North America and Europe include Discover, Sigi-Plus, and Prospect (Muroyama, 2002). According to the research looking into these CACGS effect on career decision-making, these systems have been found to be effective in the process of facilitating and generating high levels of user satisfaction (Itamar Gati, 2001). The following popular systems and their features are worth mentioning:

2.4.1 System of Interactive Guidance and Information (SIGI - Plus)

Sigi-Plus as a CACGS helps high school learners clarify career options and ascertain the education levels necessary to achieve and plan for their career goals. According to the Valparint website (http://www.valparint.com/), the application was initially developed by researchers and specialists under the guidance of Dr. Martin Katz from Educational Testing Service (ETS). Later the application was then revised by Valpar International Corporation. SIGI consists of the latest information about occupations, work-related values, interests, personality types, skills, and educational programs. The application assists learners, as individuals, to explore what motivates them and matches that with work related values, personality, and interests to career and educational pathways.

Sigi is built with value based career decision making theory. The theory asserts that individuals "look for certain values in their work and that careers can be rated on the degree that they reflect these values" (Valprint, 2015, p. 3). The theory's career decision making process is based on the research that found as individuals change careers, they seldom change career values. The career values that people hold apply to numerous jobs or career paths and therefore Sigi assists by directly identifying work related values and matching these with specific career paths.

2.4.2 Prospect

In the early development of CACGS, Prospect was considered to be one the most sophisticated CACGS developed outside North America. “It is designed as a learning system, modeling a coherent decision-making process which the individual can then apply to subsequent decisions” (Watts & Kidd, 1991, p. 1). The application consists of the following nine key modules:

a. Planning Your Career: The career planning module is an introduction module. It tells learners about different career roles and career development. The module assists learners in locating which stage they are in, in terms of career planning, and gives recommendations on preferable routes to follow through the system.

b. Assessing Yourself: This module allows users to rate their interests, abilities, values, and skills. Thereafter, users are asked to use their resultant profiles in other modules of the system.

c. Searching Occupations: This function enables users to match their resultant profiles and desired occupations against the system’s occupations database.

d. Analysing Occupations: The analysis module displays more informative data or comparisons between different occupations and illustrates the relationship between occupations on map format.

e. Evaluating Your Options: The evaluation module enables learners to use a decision aid to make comparisons between occupational options against personally selected criteria.

f. Estimating Your Chances: With this functionality, learners are able to check the probability of getting into their desired occupations by requesting information from the occupations database.

g. Planning for Entry. The entry planning module gives learners entry requirements, entry methods, types of employers and insights into the competitive nature of the career stream.

h. Hunting for Jobs. This module advises and guides a learner on how to prepare letters of application, completing application forms, and preparing a curriculum vita (Watts & Kidd, 1991).

According to Watts and Kidd (1991), Prospect can be used as a stand-alone platform that does not need any additional support. Furthermore, the authors also maintain that for the system to become most effective, it must be fully integrated into careers services centers.

2.4.3 Discover

Discover is a Career Guidance and information application that assists learners in making educational decisions. The career development process that Discover follows aims to:

- "Assess interests, abilities, and job values.
- Explore occupations, majors, and schools.
- Develop a resume and conduct a job search" (Discover, 2015, p. 2).

The application has four main modules namely:

a. Self-assessment
b. Structured search of occupational alternatives
c. Presentation of occupational information and
d. Structured search of educational alternatives and presentation of educational information (Peterson, Ryan-Jones, Sampson, Reardon, & Shahnasarian, 1987)

According to ACT, the Non-profit organisation that holds the rights to the Discover application, this CACG has been decommissioned (Discover, 2015).

2.5 Computer Assisted Career Guidance Systems evaluation studies

The studies listed and summarized in this chapter highlight some of the lessons learnt from previous CAGCS studies. These studies also provide a background to the research instruments that were selected for this study as discussed in Chapter 4 of this research (Methodology). The critical studies evaluated were the following:

2.5.1 Center for the Study of Technology in Counseling and Career Development study (TR – 6)

The Florida State University Center for the Study of Technology in Counseling and Career Development is one of the leading institutes in the CACGS research field. The institute has conducted research and published more than fifty-three technical reports including those on the subject of the impact and effectiveness of CACGS in North America. The Technical Report from which this thesis drew the research instrument, "A comparison of the effectiveness of three computer assisted career guidance systems on college students career decision making", evaluated and compared the impact of Discover, Sigi and Sigi-Plus in career decision making. The results of this study highlighted that users rated all three applications positively using the three dimensions (*Analysis, Synthesis, and Computer effect)*.

In detail, the study showed that learners who acknowledged that they needed help with career guidance found the CACGS useful when the application suggested possible career paths based on the learner's interests. On the other hand, learners who already had an idea and understood the career paths they would like to pursue, where not satisfied with alternative career suggestions by the CAGCS, particularly Sigi and Discover applications, however the participants still rated these two systems positively on Computer Effect (enjoying a rewarding computer interaction) and Analysis (helping in acquiring self-knowledge and occupational knowledge) (Peterson, Ryan-Jones, Sampson, Reardon, & Shahnasarian, 1987).

The study showed that there is a correlation between perceived effectiveness of CAGCS and the learner's state of career decidedness and career identity. Learners who had high career decidedness, as measured by Occupational Alternatives Questions (see Chapter 4.1.1, page 37), differed from those who had low career decidedness on their CACGS preference. The results also showed that learners enjoyed self-exploration while using the computer as a medium of information consumption (Peterson, Ryan-Jones, Sampson, Reardon, & Shahnasarian, 1987).

The overall findings of the study indicated that the three evaluated CACGS results, when compared, did not show a significant difference with regards to their ability to encourage self-exploration, career exploration and perceived helpfulness from the learner's perspective. However, learners who evaluated Sigi-Plus rated the CACGS highly in terms of generating alternative career paths as compared to learners who evaluated Sigi and Discover (Peterson, Ryan-Jones, Sampson, Reardon, & Shahnasarian, 1987).

This thesis adopted the measuring instrument from this technical report as the key tool to evaluate each high school system by the learners. The limitation in the adoption of this tool might be that it was designed to be completed by students who have already completed high school. The participants in the technical report study were first year college Psychology students whereas this thesis evaluated CACGS from high school learners' perspective, specifically Grades 9 – 12s. Considering that the instrument might have been designed with a college student in mind, a slight modification was done to the questions, eliminating some jargon that might be understood by college students only. Despite this slight modification of the tool, the difference in maturity and exposure of participants can still play a role when looking at the end results, particularly the reactions of different sets of participants to alternative suggested careers.

2.5.2 University of Oregon study

According to a University of Oregon study titled "Evaluation of Computer-Assisted Career Guidance in Middle and Secondary Education Settings: Status, Obstacles and Suggestions" by Fowkes and McWhirter (2007), research on CACGS have mainly focused on two aspects, namely user satisfaction and/or system attractiveness, and the systems effectiveness in contributing to career related gains. Studies that have focused on user experience have indicated generally positive feedback from learners in Middle and Secondary school. In terms of career related gain, Fowkes and McWhirter (2007) argue that these technologies have demonstrated that difficulties in career decision making are significantly reduced through the use of CAGCS.

The research also highlighted that the use of CAGCS as the only career guidance intervention is not an optimal solution in Middle and Secondary schools. The study asserts that CAGCS are effective when used together with other career development interventions like career courses, group counseling or individual guidance. The research concluded that the best approach to career guidance interventions includes "a combination of written exercises, individualized interpretation and feedback, information on the world of work, modeling, and attention to building support" (Fowkes & McWhirter, 2007, p. 390). Whilst the intervention by CAGCS as a solution to schools' career guidance

proved useful, not all the above-mentioned components are covered by these technologies, hence a combination of diverse interventions is recommended.

In examining literature, the study found a weakness in the composition of participants that are part of CACGS evaluation studies. Literature examined in this study showed that out of twenty-six studies of the effectiveness of Discover as a CACGS, only sixteen of them reported on gender and ten on ethnicity information. The lack of focus on CAGCS impact with different population groups was highlighted as a weakness in the literature because it has been well documented that ethnicity, gender and socio-economic status play a role in shaping an individual's career development and the attainment of those careers.

The research suggests that when carrying out research on CACGS, some of the key outcome variables should be that the research must be:

a. theoretically driven
b. consistent with the explicit goals of the CACGS
c. developmentally appropriate
d. sensitive to the degree of change expected from the intervention, and should
e. target outcomes valued by the school administrators, staff, parents and learners

Fowkes and McWhirter (2007) research ends with a recommendation for individual researchers who are about to conduct studies in Middle schools and Secondary schools. The author's first recommendation is the establishment of strong relationships with schools that are willing to participate in the CAGCS evaluation, followed by a sense of understanding that teachers and counselors at schools face different pressures for multiple deliverables. Therefore, it is highly recommended that researchers should carefully assess how to make the proposed research beneficial to the school, the participating staff and the learners at large. The study also highlights that patience may be required, particularly in cases where schools had negative experiences when assisting university researchers (Fowkes & McWhirter, 2007).

From this study, a key lesson was applied during the data collection period in the current project. During this process, when the participating schools were selected, pre-screening was done to determine whether the CACGS used by the schools were based on a theory. This filtering criterion assisted in eliminating CACGS, particularly those that are available online, that were designed without any theoretical foundation consideration.

This research paper also helped in the process of getting permission to conduct the research at the participating schools. One of the agreements with the participating schools was that the final thesis would be made available to the school upon completion. This covered what Fowkes and McWhirter (2007) argued on targeting outcomes valued by the school administrators and staff. As the research findings from the teachers' interviews revealed, all schools that participated in this study did not have a formal CACGS evaluation method. Therefore, participating in this study opened an opportunity to have a formal evaluation that highlights how learners perceive the different systems. The recommendations of the research paper were also taken into consideration when establishing the relationships with the schools. School calendars and exam periods were taken into consideration when approaching schools.

2.5.3 Center for the Study of Technology in Counseling and Career Development (TR - 12)

Linking the evaluation of CAGCS to theory, Lents, Reardon and Sampson (1991), conduced researched on "Holland's Theory and Effective Use of Computer-Assisted Career Guidance Systems". The purpose of the study was to connect what has been learned from the history of career interventions, to the use of CAGCS as career guidance intervention tools, together with the aim of improving teachers and counselor's best use of CAGCS with different types of learners. The study highlighted that there is limited research on the subject of CACGS evaluation through theoretical lenses of personality types. Lents et al. (1991) argue that the hype generated around CACGS creates a perception that these tools are suitable and can aid learners of all personality types. The authors noted that the popularity and widespread use of CACGS in North America far outpaced the academic research that focuses in detail in the relationship between effectiveness of CAGS and personality types, hence there is a limited empirical evidence that might serve as a guide for teachers and counselors seeking more effective use of these applications.

One of the key findings of this study was that learners whose personality results are high in Social and Enterprising scores, based on Holland's theory (see Chapter 3.1, page 27), rated CACGS low on their ability to assist in acquiring self and occupational knowledge (Lentz, Reardon, & Sampson, 1991). The study concluded that Social and Enterprising personality types can benefit more from verbal career counseling than CACGS. As a recommendation, the study suggests that teachers and counselors should ensure that learners who score highly on these areas (Social and Enterprising)

should be given an opportunity to talk more about their experiences and the level at which CACGS have addressed their career concerns (Lentz, Reardon, & Sampson, 1991).

2.6 Computer Assisted Career Guidance Systems evaluation in South Africa

The researcher's preliminary search on Google scholar, UCT Scholar, Education e-Journals (as listed in the Bibliography) has shown that there is no academic literature that exists in South Africa on the evaluation of CACGS. The lack of research in this field provided an opportunity for a study that will add value to the Career Guidance body of knowledge.

2.7 Chapter summary

This chapter looked at Career Guidance as a module covered in Life Orientation in the South African school curriculum. The findings on the status of Career Guidance assisted the researcher in understanding the background of the subject and the challenges that South African schools are facing, specifically in Career Guidance. These findings also assisted in gauging how serious the Life Orientation subject is taken in South Africa schools in general, then drilling down into individual schools.

For comparison purposes, the CACGS identified in the chapter enabled the researcher to draw some comparisons in features between the CAGCS used in the USA and South Africa. Some of the important and useful outcomes of this literature include information on how similar studies were conducted and what their findings were. The study in Counseling and Career Development helped the researcher with a quantitative measuring instrument for evaluating school's CACGS by learners. The University of Oregon research on how to approach schools provided the researcher guidelines on how to conduct studies in Middle schools and Secondary schools. Additionally, the "Holland's Theory and Effective Use of Computer-Assisted Career Guidance Systems" assisted in asking critical questions on the relationship between personality types and the perceived usefulness of CACGS by learners.

Although Fowkes and McWhirter (2007) argue that ethnicity, gender and socio-economic status play a significant role in shaping an individual's career development, this study did not evaluate these factors. Overall, the literature reviewed guided this study through finding "deeper" research areas that are beyond the quantitative evaluation by learners.

3 Theoretical underpinnings

Theoretically, this study looked at CACGS using the lens of Personality traits as the underpinning theory. When examining different types of CACGS used in high schools, in this case for the purposes of making informed career decisions, the different theories of personality traits enabled the researcher to look beyond the technology used by investigating and exploring the underpinning personality theories for each CACG.

By definition, "personality is that pattern of characteristic thoughts, feelings, and behaviors that distinguishes one person from another and that persists over time and situations" (Phares, 1991, p. 4). Similarly, Barrick, Parks and Mount (2005) defines personality as a set of characteristics, patterns of thoughts, emotions and behavior that is stable over time and across different situations. Phares (1991) and Barrick et al. definitions highlight two important components of personality, distinctiveness and consistency.

The distinctiveness in the personality definition emphasizes that there is uniqueness in the pattern of every individual's thoughts, feelings and behavior. The uniqueness of traits in each individual may also extend to differing degrees of sensitivity and intelligence, but the critical factor is how each person combines these traits to make up what has been defined as a personality. The second component in the personality definition that stands out is consistency. This refers to a recognizable behavior in a person that can be seen in variety of situations over time. The recognizable pattern does not necessarily mean an identical behavior for every situation, but a detectable degree of stability over time and an illustration of consistency in many situations (Phares, 1991).

The study of personalities is very broad and it has been divided into numerous theories. In this thesis, I focus primarily on trait factor theories that relate to the development of CACGS. Traits can be defined as characteristics of an individual that can be measured using tests. Factor denotes the characteristics that are required for successful job performance (Sharf, 1997). Therefore, "trait" and "factor" combined refers to the assessment of characteristics of the person and the job. Citing Parson (1990), Maduakolam (2000) says during the process of selecting a career path or occupation, individuals must:

a. understand themselves, their attitudes, abilities, interests, ambitions, and their causes

b. know what is required to succeed in a prospective working environment. Additionally, what are the advantages, disadvantages, compensation, opportunities, and future prospects in the occupation that they are interested in.

Based on the above, trait and factor theory demonstrates the matching of the individual's traits with what is required in a specific occupation, thus solving the individual's career search problems (Maduakolam, 2000).

The underlying assumption in this theory is that people have unique patterns of abilities (traits) that can be measured and correlated with what is required to succeed in different career paths. "As the oldest and most widely used of all career development theories, trait and factor theory focuses on the match between an individual's aptitudes, achievements, interests, values, and personality and the requirements and conditions of occupations" (Maduakolam, 2000, p. 30).

Through research, it has been demonstrated that there is a relationship between predicting an individual's various life outcomes and his/her personality traits (Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007). These studies have thus shown the validity of considering personality traits above other factors in the selection of possible career choices. From the CAGCS that are used by selected private schools in South Africa for this research, the following personality trait theories have been identified as the dominant underpinning theories used in their development:

1. Holland's theory
2. Jung personality theory
3. Meyers- Briggs personality theory

3.1 Holland's theory

According to Osborn and Baggerly (2004), Holland's theory is one of the preferred theories by school career counselors. One of the reasons for the theory's popularity is its ease of use, as it matches individuals' traits with a corresponding working environment. Holland's theory argues that when a person is choosing a career, she/he looks for situations that satisfy her/his adjustive orientations. In his theory, Holland used the occupational environment as a framework for organizing and classifying knowledge about occupational choices. Holland's theory asserts that there are six personality types and these match with the six basic types of work environments namely:

a. Realistic (R) – this personality type generally enjoys learning by doing instead of classroom learning. This personality type prefers working in environments where outcomes will be tangible, sectors where technical competencies are required. Realistic personalities include careers such as technical engineers. This type may lack interpersonal skills and prefers to focus on abstract problem solving.

b. Investigative (I) – investigative personalities are observant, highly analytical, and enjoys mathematical or scientific activities. This type of personality likes to organize data, solving very complex and abstract problems. These individuals may prefer to work in environments that promote individual work. The typical careers that accommodate this type include biologists, system analysts, medical technologists etc. Investigative personalities do not place high value on leadership, thus they might avoid environments where they would be required to lead.

c. Artistic (A) – artistic personality types are people who like environments where originality and creativity is appreciated. These types view themselves as non-conforming and like flexibility. Careers that artistic personalities pursue are dramatic/liberal arts, journalism, writer etc.

d. Social (S) – this personality prefers environments where groups or teams are involved in teaching, encouraging, counseling or helping others etc. Social personalities are also concerned with the welfare and the development of others. These personality types do not like activities that are technical, involving systematic problem solving and the operation of machinery etc. Typical careers that social personalities go into include teaching, social worker etc.

e. Enterprising (E) – enterprising personality types are sociable, energetic individuals who like roles that involve the use of verbal skills to persuade others like sales. Additionally, these personalities enjoy leadership roles and dislike routine activities. Typical career paths include business public speakers, business manager/executives.

f. Conventional (C) – this type of personality prefers environments where it is required that individuals carry instructions and conform to authority. Conventional personalities enjoy activities such as record keeping, data analysis and general verbal activities. Typical careers that these personalities enjoy include accountancy, banker, secretary etc.

Holland says people who select working environments that are similar to their personality type are more likely to be satisfied and successful. This is largely based on his assertion that individuals look for environments where they can express their personal interests, personal attitudes, skills etc. This results in working environments that are populated by people with related occupational personality types.

One of the most important constructs in Holland's theory is congruence. Congruence refers to the relationship between personality and the environment. Congruence is sought by assessing the client's personality type and attempting to match it with the right occupations. The more similar the personality is to the environment, the more congruent the relationship.

3.2 Jung personality theory

"One of the most famous of personality classifications was developed by Jung, who represented personality as set of types, with four major superordinate types: extroversion, sensing versus intuitive, thinking versus feeling, and judging versus perception (Morehouse, Farley, & Youngquist, 1990, p. 231). Carl Jung's theory of personality characterizes personality types according to the person's preference of general attitude

a. Extraverted (E) vs. Introverted (I),

the person's preference of one of the two functions of perception

b. Sensing (S) vs. Intuition (N),

and the person's preference of one of the two functions of judging:

c. Thinking (T) vs. Feeling (F)

The described areas of personal preferences, as explained by Carl Jung, are dichotomies, where one bipolar dimension illustrates a different personal preference. Carl Jung furthermore proposed that individuals have a dominant characteristic out of the four functions defined above, i.e. either a dominant function of thinking or a dominant function of feeling. In addition to the functions that are described by Carl Jung, researcher Isabel Briggs Myers, asserts that there is a fourth function that influences personality types, and this is the judging-perception function (The Myers & Briggs Foundation, 2016).

d. Judging (J) vs. Perceiving (P)

Carl Jung personality functions are discussed in detail below:

a. Extraversion vs Introversion
   This function illustrates where the person's energy originates and how that energy is expressed and directed. With an extroverted personality, the source and direction of the person's energy expression is largely in the external world, whereas an introverted personality mainly expresses energy in their own internal world.

b. Sensing vs Intuition
   This function represents the method by which a person perceives information. Personalities with a strong or dominant sensing character means that person mainly believes in information he or she receives directly from the external world. In contrast, a stronger intuition inclined personality believes mainly in information he or she receives from the internal or imaginative world.

c. Thinking vs Feeling

   The thinking-feeling function demonstrates the way in which a person processes information. A person with a strong thinking characteristic, is more inclined to make decisions mainly through logic. On the other hand, a person with a dominant feeling characteristic is more likely to base decisions on emotions, i.e. making decision on what they feel they should or should not do.

d. Judging vs Perceiving

   The judging-perceiving function demonstrates how an individual implements the information he or she has processed. A personality with dominant judging character shows us a personality that is very structured in terms of organizing his or her life events and, generally, sticks to those plans. In contrast, a dominant perceiving character shows a person who is more inclined to either improvise or explore other options in life.

Carl Jung argues that different permutations of preferences in the four dichotomies above can yield different combinations of personality types, illustrating which of the two poles in each of the four dichotomies dominates in a person.

3.3 Meyers-Briggs Personality theory

Cited by Titus (2011), Schaubhut, Herk and Thomson (2009) argue that The Myers-Briggs Type Indicator (MBTI) is also one of the most used personality measures in the world. MBTI over the years has been used by organizations for candidate selection by matching personality traits to particular working environments. This theory has also been used by counselors for counseling purposes. According to MBTI theory, individuals belong to one of sixteen defined possible trait types and their characteristics:

ISTJ "DOING WHAT SHOULD BE DONE" Organizer • Compulsive Private • Trustworthy Rules 'n Regs • Practical MOST RESPONSIBLE	**ISFJ** "A HIGH SENSE OF DUTY" Amiable • Works Behind the Scenes Ready to Sacrifice • Accountable Prefers "Doing" MOST LOYAL	**INFJ** "AN INSPIRATION TO OTHERS" Reflective/Introspective Quietly Caring • Creative Linguistically Gifted • Psychic MOST CONTEMPLATIVE	**INTJ** "EVERYTHING HAS ROOM FOR IMPROVEMENT" Theory Based • Skeptical • "My Way" High Need for Competency Sees World as Chessboard MOST INDEPENDENT
ISTP "READY TO TRY ANYTHING ONCE" Very Observant • Cool and Aloof Hands-on Practicality • Unpretentious Ready for what Happens MOST PRAGMATIC	**ISFP** "SEES MUCH BUT SHARES LITTLE" Warm and Sensitive • Unassuming Short Range Planner • Good Team Member In Touch with Self and Nature MOST ARTISTIC	**INFP** "PERFORMING NOBLE SERVICE TO AID SOCIETY" Strict Personal Values Seeks Inner Order/Peace Creative • Non-Directive • Reserved MOST IDEALISTIC	**INTP** "A LOVE OF PROBLEM SOLVING" Challenges others to Think Absent-minded Professor Competency Needs • Socially Cautious MOST CONCEPTUAL
ESTP "THE ULTIMATE REALIST" Unconventional Approach • Fun Gregarious • Lives for Here and Now Good at Problem Solving MOST SPONTANEOUS	**ESFP** "YOU ONLY GO AROUND ONCE IN LIFE" Sociable • Spontaneous Loves Surprises • Cuts Red Tape Juggles Multiple Projects/Events Quip Master MOST GENEROUS	**ENFP** "GIVING LIFE AN EXTRA SQUEEZE" People Oriented • Creative Seeks Harmony • Life of Party More Starts than Finishes MOST OPTIMISTIC	**ENTP** "ONE EXCITING CHALLENGE AFTER ANOTHER" Argues Both Sides of a Point to Learn Brinksmanship • Tests the Limits Enthusiastic • New Ideas MOST INVENTIVE
ESTJ "LIFE"S ADMINISTRATORS" Order and Structure • Sociable Opinionated • Results Driven Producer • Traditional MOST HARD CHARGING	**ESFJ** "HOST AND HOSTESSES OF THE WORLD" Gracious • Good Interpersonal Skills Thoughtful • Appropriate Eager to Please MOST HARMONIZING	**ENFJ** "SMOOTH TALKING PERSUADER" Charismatic • Compassionate Possibilities for People Ignores the Unpleasant • Idealistic MOST PERSUASIVE	**ENTJ** "LIFE'S NATURAL LEADERS" Visionary • Gregarious • Argumentative Systems Planners • Take Charge Low Tolerance for Incompetency MOST COMMANDING

Figure 1: Meyer-Briggs personality types (August, 2011)

These three personality traits theories, discussed in this section, have been used in the development of the CACGS that are evaluated in this thesis. It was important to research and understand the underlying theories behind these CACGS as they inform the results that are given to learners after the career assessments have been completed.

3.4 Selected CAGCS for the study

The following systems were evaluated in this thesis; PACE Career Center, Mindmuzik EAS, The Online Career Guide, and JVR Strong Interest. The systems were selected based on what the schools had already adopted as a CACGS of choice. Additionally, all the participating schools were called prior the study to confirm whether they were using a CACGS or not, and these selected systems were found to be the most popular ones in the pool of schools that were approached.

3.4.1 PACE Career Center

According to the PACE website (http://www.pacecareers.com), from the organization perspective, PACE does not only provide accredited career guidance training for career practitioners, but it also offers a wide range of career related products and services for learners. The organization claims that through its services, it helps well over 2 000 000 youth and young adults annually with their subject and career choices (Careers, 2016).

The specific product that the organisation offers for high school learners is called PACE Career Center. The system asks learners to complete 105 career exploration questions and based on the results, it allocates a degree of interest in percentages according to the following categories:

a. Crafts
b. Health Science
c. Numerical and Financial
d. Science and Mathematics
e. Law
f. General services
g. Plants and animals
h. Performing Arts
i. Marketing and Sales
j. Engineering

k. Trades
l. Applied and Visual Art
m. Clerical Secretarial

PACE Careers is not explicit about which personality theory informs the comprehensive interest questionnaire used by the system, however from the categories in the results, it seems the questions are informed by Holland's theory. In addition to the interest questionnaire, learners are able to view a comprehensive list of career information, jobs trend data and various financial aid information throughout South Africa.

In this research, the evaluation of PACE Careers system was done by C High School and B High School learners. Additionally, school psychologists from both schools revealed how the system is used at school. The data analysis and discussion section (Chapter 5, page 49) evaluates the results in detail.

3.4.2 Mindmuzik – Electronic Assessment System

Mindmuzik Media Electronic Assessment System (EAS) originated from a private psychology practice after the need for career products and affordable customised products was identified. The Mindmuzik EAS offers assessment of aptitude, personality, values, interests and Mathematical proficiency. The system is designed for learners between Grade 7 – 12.

Through the Mindmuzik EAS, the organization says the computer assisted testing system aims to assist teachers in:

- administering educational and psychological tests on computer
- eliminating human error by scoring tests electronically
- accessing results and reports immediately
- printing and exporting reports of raw scores and standard scores
- printing and exporting of graphs
- constructing individualised aptitude batteries
- keeping records of clients
- setting time limits

The tests that are included in the system are:

- Jung Personality Questionnaire
- 19 Field Interest Inventory

- South African Vocational Interest Inventory
- Career Development Questionnaire
- Values Scale and
- Mathematical Proficiency Test (MPT 11)

In this research, Mindmuzik EAS was evaluated by G High School and F High School learners. Psychology practitioners from E High School, G High School and F High School also gave an account on how the system is used at their respective schools. The data analysis and discussion section (Chapter 5, page 49) discusses the results in detail.

3.4.3 The Online Career Guide

The Online Career Guide tool is a CACGS that is developed by The Education Agency (TEA). According to the organization, "The Online Career Guide provides comprehensive, individual meaningful career guidance based on a learner's interests, skills and personality characteristics, to ensure a career path best suited to them", (Online Career Guidance, 2014).

The Online Career Guide consists of a self-rated interest, skill and personality questionnaire. The questionnaire was developed by clinical psychologist, Dr. Lee Conway and is based on Holland's Theory. The system provides a guide to grade 9's on their most suitable subject choice for grade 10 and a career guidance report that points grade 11's and 12's in which qualification and career choices are best suited to them. The system also provides ongoing support resources for learners to make informed decisions at every stage of their development and career journey (Online Career Guidance, 2014).

The self-rated Interest, Skill and Personality Questionnaire as contained in the Online Career Guide can assist teenagers and young adults to refine and focus their career search, by aligning the result to a specific career orientation classification. The tool is not registered as a psychometric test, nor is it designed to be prescriptive or prevent the possibility of research into other career choices, which have not been identified based on the results. As Holland's theory is so easily understood, it is also possible to search the career orientation categories that a person believes to be the best description of themselves. However, this can often be very difficult for the teenager and young adult who are still in the process of self-discovery (Online Career Guidance, 2014).

The Education Agency developed the Skills, Interest and Personality Questionnaire to serve as a starting point to assist with career guidance and provide comprehensive information relevant to the learner or student at their specific stage of development. At the end of the

questionnaire, a report is produced with recommended individual career direction, school subject selection, tertiary qualification and institutions, as well as full details on the ideal career options (Online Career Guidance, 2014).

In this research, the Online Career Guide was evaluated by learners at D High School. Additionally, the school's Life Orientation teacher gave an account of how the systems is used at D High School. The data analysis and findings section (Chapter 5, page 49) discusses the results in detail.

3.4.4 JVR Strong Interest Inventory

JVR Psychometrics provides a combination of assessments to assist psychometrists and psychologists in high schools. JVR still largely uses traditional paper based assessments, however they have recently introduced an online offering for high schools. The key online assessment provided by JVR is the Strong Interest Inventory (Strong) assessment based on Holland's personality theory. According to the JVR website, the Strong assessment is highly reliable and can be used to determine learner's interests, preferences and personal styles. The Strong questionnaire primarily compares the learner's likes and dislikes with those of people who are already succeeding in a various occupation. The assessment determines the learner's work interests with the aim of showing the types of jobs the learner might be comfortable with (Psychometrics, 2015).

In this research, JVR Strong Interest Inventory was evaluated by A High School learners. Additionally, the school psychologists revealed how the system is used at the school in Chapter 5 (Data analysis and discussion, page 49).

3.5 Chapter summary

This chapter looked at personality as defined by Phares (1991), asserting that it is the pattern of personal characteristics that differentiates between individuals over situations and time. The chapter also looked at underlying personality theories that are used in the development of CACGS. Holland's theory, Jung personality theory and Meyers-Briggs personality theory were all discussed in detail as the CACGS underlying theories. The selected CACGS for this research were highlighted with their objectives and the underlying theories. In total, four CACGS (JVR Strong, Online Career Guide, Mindmuzik-EAS and PACE Career Center) were discussed together with the schools that evaluated them.

4. Methodology

This chapter provides an overview of the methodology that was used to measure and analyse various CACGS selected for this study. The measuring instruments are discussed, followed by the data analysis procedure, the sample, data collection procedure and how the data was analysed.

This research followed a mixed methods approach, investigating CACGS through qualitative and quantitative methods. According to Petersen (1987) et al., the goal of Computer Assisted Career Guidance Systems should be helping learners in developing career decision making skills. This can be accomplished by helping individuals to:

a. Develop their career decision-making skills
b. Clarify their values, interest, and abilities
c. Identify potentially satisfying occupations congruent with their values, interest, and abilities
d. Acquire an understanding of the world of work
e. Integrate their understanding of self, the world of work, and the needs of significant others so as to make an optimal occupational choice and; to
f. Formulate a systematic plan of action to implement their occupational choice

(Peterson, Ryan-Jones, Sampson, Reardon, & Shahnasarian, 1987)

4.1 Quantitative method

4.1.1 Measuring Instrument

The criteria above, as stated in Petersen (1987) et al., is at the core of CACGS development. In order to measure the effectiveness of CACGS based on this criterion, this section details how the adopted quantitative instrument was used.

This study adopted the original instrument that was developed by the Center for the Study of Technology in Counseling and Career Development as presented in their Technical Report number 6 published in 1987. The rationale behind the use of this instrument was that it has been tried, tested and enhanced over the years in various studies conducted by the Department under the Florida State University. The instrument has also been reviewed by subject matter experts in Career Guidance including developers of the well-known CACGS such as SIGI, DISCOVERY an SIGI-Plus.

The questionnaire that was used in the current study was a survey comprised of 24 questions (see Appendix A). The factors that were evaluated are listed below and in Appendix A in descending order of Eigen values:

a. Attractiveness of CACG systems
b. Needs for occupational knowledge
c. Credibility of alternatives
d. Knowledge of occupational rewards and demands
e. Satisfaction of alternatives and
f. Clarifying self-knowledge

The form used a six-point Likert type rate scale to measure each question, where 1 = strongly agree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree, and 6 = does not apply. The twenty-four questions were then combined through Factor analysis, categorizing the questions to form the three higher order composite scales, Analysis, Synthesis and Computer Effect. The Analysis scale consisted of ten questions comprising factors b, d and f (Needs for occupational knowledge, Knowledge of occupational rewards and demands, and Clarifying self-knowledge) and it was used to measure how well the CACG system has helped learners to acquire self-knowledge and occupational knowledge. These constructs are important in formulating plausible career choices. The Synthesis scale comprises of nine questions that fall under factor c and e (Credibility of alternatives and Satisfaction of alternatives) as listed above. This scale measures the degree to which a CACG system helped users to identify potential career alternatives. The last scale, Computer effect, only has one factor, a (Attractiveness of CACGS), consisting of five questions which measure the degree to which learners found interacting with the system rewarding.

The learners' results were captured and consolidated on a Microsoft Excel spreadsheet then computed on a statistics software (R), through the (R) studio IDE. The results were used to examine the correlations between the three composite scales and determine the statistically significant variables. The composite scales were; becoming familiar with oneself and the world of work (Analysis), developing and evaluating career options (Synthesis) and believing that one is being helped (Computer effect) (Peterson et al., 1987).

The learners' characteristics that may bear on the impact of CACGS were measured by the Occupational Alternatives Questions (OAQ). As illustrated in Appendix A, OAQ consists of two questions: a. List all occupations you are considering right now and b. Which occupation is your first choice? The results of these questions have previously demonstrated that the OAQ has concurrent validity with other measures of career decision when responses are scored as follows: 1 = a first choice is listed without any alternatives, 2 = a first choice is listed along with alternatives, 3 = nor first choice is listed, just

alternatives, and 4 =neither first choice nor alternative are listed. This format of scoring system was used in this study.

4.1.2 Data analysis procedures

4.1.2.1 Factor analysis

Yong and Pearce (2013) state that factor analysis operates on the notion that measurable and observable variables can be reduced to fewer latent variables that share a common variance and are unobservable, which is known as reducing dimensionality (Yong & Sean, 2013).

The learners were asked 24 questions which have been reduced from 64 in the original research using a factor technique. Building from section 4.1.1 (Measuring instrument), this section discusses in detail how the factor analysis process was used to extract the three main variables (Analysis, Synthesis, Computer effect) from the survey questions.

The questions were responded to on a scale of -2 = strongly disagree to 2 = strongly agree with 0 = neutral. Once the data was coded, factor analysis was the next step, reducing the dimensionality of data by applying linear algebra.

How was this done exactly? Firstly, the data has its means removed from each observation such that the mean is zero. In this case, the average of each question was subtracted from each response. Secondly, the data is formed into a covariance matrix. For example, the covariance of two data sets j and k is the average of the product of the deviations from their means represented as follows:

$$COV(X_j, X_k) = \frac{\Sigma_{i=1}^{n}(x_{ij} - \hat{x}_j)(x_{ik} - \hat{x}_k)}{n - 1}$$

This becomes a square matrix when applied to every pair of questions including questions that are the same. This square matrix can then be decomposed into a matrix and vector pair. The eigen value vector and eigen vector matrix. The eigen values describe the relative amount of variation explained by a particular eigen vector. The eigen vectors describe the structure of the data up to multiplicity. In other words, the matrices X and Y = 2X will have the same eigen vector matrices but the eigen values of Y will simply be double the size of those of X (Johnson & Wichern, 2007).

Given eigen value and vector pairs, one can choose the eigen vectors that describe the greatest amount of variation in the data and discard the rest. In other words, the underlying structure of the questions could be captured by a handful of eigen vectors formed by decomposing the covariance matrix of the data. This would make for easier modelling. In this case, following from the Peterson et. al. (1987)

method, the rest of the six factors were extracted and varimax rotated. The varimax rotation technique is useful for transforming the loading or eigen vector values such that they are large for a few dimensions and zero for the remainder (Johnson & Wichern, 2007). In this way, the interpretation of the eigen vectors is more straight forward as there are fewer relationships to interpret. Figure 2 demonstrates these relationships

Varimax rotated questionnaire factor plot

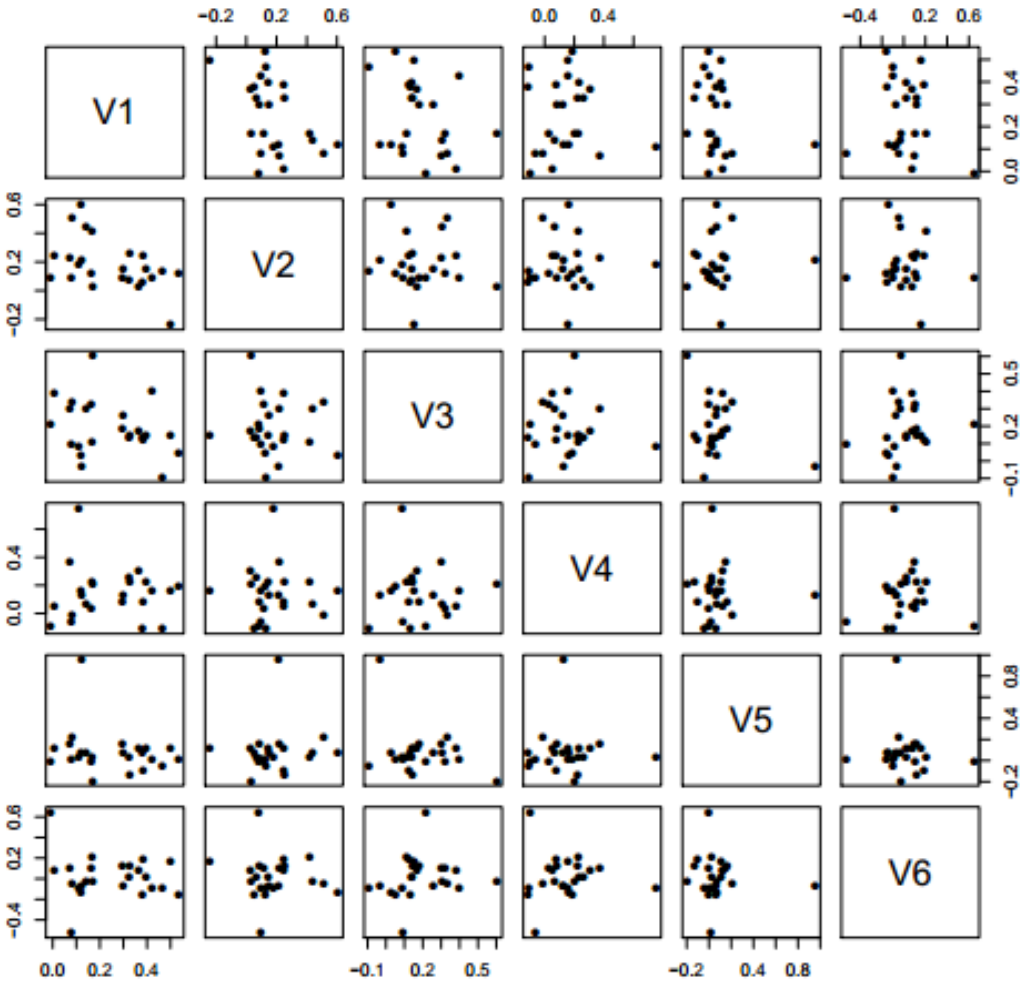

Figure 2: Illustration of the Varimax rotated questionnaire factor plot

Once the factors were extracted, the loadings were made orthogonal such that the inner product of the factors produced a diagonal matrix (Figure 2). In particular, the maximum loading for each variable was retained such that each variable only loaded on a single factor. Thereafter, the variables were combined into new factors in accordance with Peterson et. al. (1987). The exact formation of the factors is listed below. The factors were similarly named as Analysis, Synthesis and Computer effect, where the numbers represent the question numbers asked to learners in the survey.

- **Analysis = 1, 2, 5, 10, 11, 16, 17, 18, 20, 21**
- **Synthesis = 3, 6, 7, 12, 14, 19, 22, 23, 24**
- **Computer Effect = 4, 8, 9, 13, 15**

Figure 3 below demonstrates the Analysis, Synthesis and Computer effects data loadings

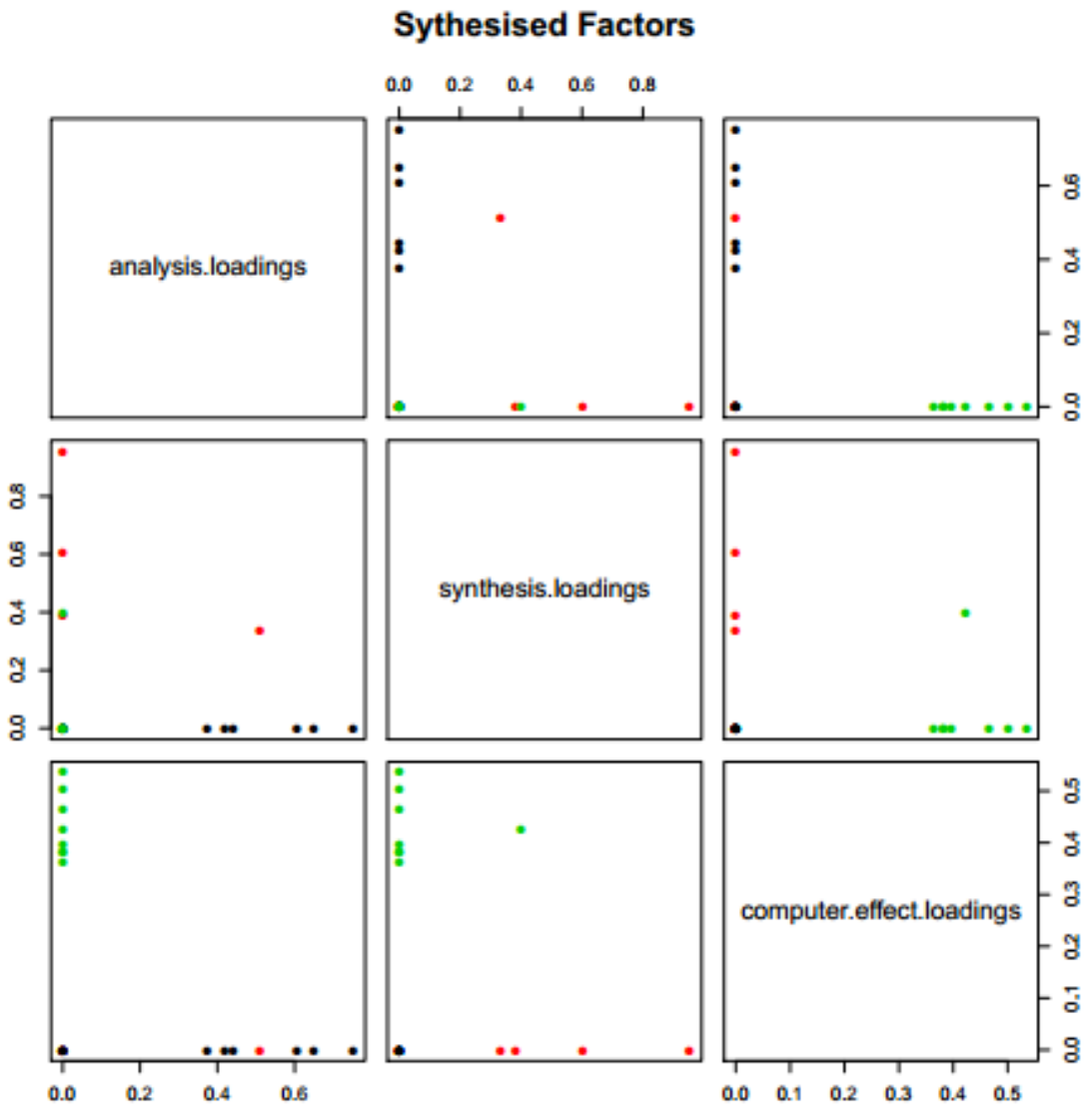

Figure 3: Synthesized factors

The factors which are vectors that combine the original data with some weighting scheme were then applied to the data to produce 3 new variables (Figure 3), Analysis, Synthesis and Computer Effect. Post the combination, the Analysis scale consisted of 10 items that measure how well the CACGS helped the learners to acquire self-knowledge and occupational knowledge. Such constructs are important in the learners' ability to formulate plausible career alternatives (Analysis). The Synthesis scale, composed of 9 items that measured the degree to which a CACG system helped the learners to identify potential career alternatives. The third scale, Computer Effect, which consisted of 5 items, measured the degree to which learners found interacting with the computer to their liking.

This new scale comprising of synthetic variables can be assessed for reliability and validity in numerous ways. The first way that was chosen for the current study was correlation. Correlations provide a measure of similarity in a data series. High correlations indicate that the data typically moves at the same time whereas low correlations means they typically move at different times. In this way, a correlation can indicate whether data are related. In this study, the correlation between the three scales ranged from 0.505 to 1, while the respective Cronbach's alpha reliabilities were Analysis, 0.67; Synthesis, 0.67; and Computer effect 0.76. This then means the scales were considered as independent and reliable measures.

Cronbach's alpha was used as an estimate of the scale reliability. Reynaldo and Santos (1999) assert that reliability comes to the forefront when variables are developed from a summarized scale, especially when the computed outcome results are used for the purposes of predicating components in a data set. These scales were then used to compare the degree to which evaluated CACGS perform three important functions in the learner's career decision making. These include, becoming familiar with self, understanding personal values, and knowing about occupations that might be satisfying based on personal values (Analysis). Additionally, learning about educational programs that will lead to satisfying careers (Synthesis) and believing that one is getting help from the CACGS (Computer effect).

Table 1: Table illustrating the correlations between analysis, synthesis and computer effect

	Analysis	Synthesis	Computer effect	Means	SD	Alpha
Analysis (10 items)	1	0	0	1.33194	4,517082	0.67
Synthesis (9 items)	0.616858	1	0	0.96388	3,38208	0.67
Computer effect (5 items)	0.504586	0.501153	1	0.31472	3,196818	0.76

4.1.2.2 Analysis of variance: ANOVA

According to Keller and Warrack (2003), the analysis of variance is a statistical technique used to determine the differences between means in different populations. The technique is used to decompose the variance between populations and with the help of the total variance to determine if population means differ as expressed:

$$H_0: \mu_{OAQ} = \mu_{Grade} = \mu_{OAQ\times Grade}$$

The Sum of Squares for Treatments $SST = \Sigma_{j=1}^{k} n_j \left(\bar{x}_j - \bar{x}\right)^2$ is zero when the differences between population means is zero. This is compared to the Sum of Squares for Error $SSE = \Sigma_{j=1}^{k} \Sigma_{i=1}^{n_j} \left(x_{ij} - \bar{x_j}\right)^2$ which grows with the sample size and decreases when the population values are close to the population mean. In other words, the Sum of Squares for Error are similar to the variance. To standardise the values, the Mean Square for Treatments $MST = \frac{SST}{k-1}$ and Mean Square for Error $MST = \frac{SSE}{n-k}$ are introduced. Together these values are used to compute the F-statistic $F = \frac{MST}{MSE}$.

The F-statistic is used to compute the probability $P\left(F_{critical} \geq F_{alpha,k-1,n-k}\right)$ of observing an F-statistic or critical value given the degrees of freedom $(k-1, n-k)$. The higher the F-statistic, the lower the p-value, and the lower the p-value the more likely it is that the null hypothesis should be rejected. The null hypothesis in this case is that the population means are the same. There are n observations and k population above (Keller & Warrack, 2003).

Another way to see that this conclusion follows is to look at the numerator of the F-statistic. The MST is a scaled version of the SST which becomes bigger as the difference between population or treatment means and the grand mean becomes bigger. If these differences are large, it is reasonable to expect a difference in the population means (Johnson & Wichern, 2007).

4.1.2.3 Multiple analysis of variance: MANOVA

Manova is a multivariate extension of Anova. Whereas Anova test for differences in the means of different groups, Manova tests for differences between groups across responses. A one-way Multivariate analysis of variance (MANOVA) with all evaluated CACGS was used to determine whether there is a multivariate effect among the respective CACGS. Multivariate analysis allowed for an examination of more than one independent variable. “Multivariate analysis is a method of

analyzing the simultaneous relationships amongst several variables. It may also be used to understand the relationship between two variables more fully" (Babbie, 2007, p. 247).

The null hypothesis looks similar but it should be noted that the means in the expression below are vectors corresponding to each group for each response. The groups are Occupational Alternatives Questions (OAQ) and Grade, while the responses are the 3 the synthetic variables, Analysis, Synthesis and Computer Effect.

$$H_0: \boldsymbol{\mu}_{analysis} = \boldsymbol{\mu}_{synthesis} = \boldsymbol{\mu}_{computer\ effect}$$

Like the Anova, the variance is decomposed and compared to determine if there are statistical differences between the groups. In this case there is a matrix for sum of square errors E and sum of square treatments G and total sum of squares $T = E + G$. There are four different statistics used to compute the p-value for the Manova test and they are discussed below.

The first one is the Wilks method. Wilks is the most common measure. It compares the determinants of the sum of squares matrix to the total sum of squares matrix. If the sum of square error is small relative to the sum of squares for treatments, then the differences inside the groups are large but between the groups they are small. As such, if Wilks Lambda is small the null hypothesis is likely to be rejected (Johnson & Wichern, 2007).

$$\lambda = \frac{\det(E)}{\det(T)}$$

The second measure is the Hoteling-Lawley Trace method. Hotelling-Lawley Trace takes the trace of the matrix that results when the ratio of the sum of squares for treatment are taken. The trace in this case is the sum of the diagonal entries. This matrix can be thought of as dividing the treatment sum of square with the error sum of squares. If the difference between groups are larger than the difference within groups, then G will be larger than E and Hotelling-Lawley's Trace will be large. As such the null hypothesis is rejected when this statistic is large (Johnson & Wichern, 2007).

$$T = trace(GE^{-1})$$

The third one is the Pillais Trace method. Pillais Trace evaluates a ratio similar to Hotelling-Lawley, but it adds sum of square for treatments to the denominator. Therefore, the interpretation is similar to Hotelling-Lawley. When the statistic is large then the null hypothesis is likely to be rejected.

$$P = trace(GT^{-1})$$

The fourth method is the Roy's maximum root. Roy's maximum root evaluates the same matrix as Hotelling-Lawley and decomposes the resulting matrix into 2 parts. One that captures the structure of the matrix and another that captures the size. These are referred to as eigen value and eigen vector pairs. There is an eigen value for each row and an eigen vector for each row of the matrix. Once decomposed the largest eigen value becomes the statistic. In this case as in the previous two the larger eigenvalue is associated with rejecting the null hypothesis (Johnson & Wichern, 2007)

$$Largest\ Eigen\ Value\ of\ GE^{-1}$$

In this case, the computation of MANOVA was used to measure one of the characteristics that that is considered to bear on the impact of CACGS.

The learner character characteristics that may bear on the impact of CACGS were measured by learner Grade and the Occupational Alternative question (OAQ). The OAQ consists of two parts: (a) "list all the occupations you are considering right now" and (b) "which occupation is your first choice?' (if undecided, write undecided). The test-retest reliability of a questionnaire that included this question was .93 (Redmond, 1973).

To be more specific, MANOVA was used to determine if there was a multivariate effect among the evaluated CACGS. Where the dependent variables Analysis, Synthesis, and Computer Effect were used, while Grade and OAQ scores were used as covariates. Studies have demonstrated that the OAQ has considerable concurrent validity with other measures of career indecision when the responses are scored as follows: 1 = a first choice is listed without any alternatives; 2 = a first choice is listed along with alternatives; 3 = no first choice is listed, just alternatives; and 4 = neither first choice nor alternatives are listed. Participants were assigned to two levels in this study, those with a first choice (1 or 2) and those who did not have one (3 or 4).

The OAQ score values were re-coded (2) low and (1) high career decidedness based on the median split of the scores of the learners. High career decidedness included those individuals who indicated either a first choice only or a first choice plus alternatives. Low career decidedness included those learners who listed alternatives but no first choice as well as those who had neither a first choice nor alternatives.

Data analysis and discussion (Chapter 5, page 49) demonstrates the results and analysis of the MANOVA computed for measuring career decidedness through the OAQ.

4.2 Qualitative method

The research also used a qualitative method to understand how the CACGS are used in the seven selected schools. This method was used to further understand what parents expect after learners have completed career assessments and how schools measure the impact of CACGS. The research adopted and amended interview questions from the paper "Current status and future potential for evaluating the design and use of computer based information delivery systems in the United States: Technical report 17". The paper looks at various methods that have been used in CAGCS evaluation and suggests interview questions that can be used in the evaluation (Sampson, 1993).

The questions that were selected for this research (See Appendix B) assisted in answering some of questions posed in the Research questions section (Chapter 1.4, page 10) from a teacher's perspective. Seven teachers from the schools listed in Table 1 participated in the interviews process. For the purposes of this current research, the interviewees were given pseudonyms Teacher A – Teacher G, with abbreviations (TA) to (TG). All interviews with participating teachers were arranged in advance to suit the teacher's academic schedule.

Furthermore, prior the interview, a letter with the study details was sent to the schools for approval by the principal and in some cases by the school's governing body as well. Interviews were conducted at the teacher's school for convenience purposes. All participating teachers were informed about the purpose the study once again before the interview started and they were made aware that the interview was recorded. Each interview lasted between 45 – 60 minutes. The interview comprised of open ended questions with follow up questions where it was deemed appropriate.

According to Maxwell (2008) in Bickman and Rog (2008), in studies that can assist in improving practices, it is valuable to understand how things happen in a situation than merely measuring outcomes to compare with other situations. The research also lists the advantages of telling the story like it is rather than a presentation of numbers to back up recommendations.

The qualitative component of this study sought to understand more about the process that is followed by teachers or school psychologists in using CACGS in Career Guidance or Life Orientation and furthermore understand the impact of the process on learners together with the perceived usefulness by both teachers and learners. Table 1 shows the schools from which the interviews were conducted with the role of the individual responsible for career guidance at the school and the system that the school uses. For the purposes of this thesis, four key interviews were selected for analysis according to each CACGS used in selected schools.

Table 2: Table showing the CACGS used in each participating school

School	Interviewee pseudonym	School role	CACGS Used
A High School	Teacher A (TA)	School Psychologist	JVR Strong Interest Inventory
B High School	Teacher B (TB)	School Psychologist	PACE Career Centre
C High School	Teacher C (TC)	School Psychologist/Teacher	Online Career Guide
D High School	Teacher D (TD)	School Psychologist	Mindmuzik EAS
E High School	Teacher E (TE)	School Psychologist	Mindmuzik EAS
F High School	Teacher F (TF)	School Psychometrists	Mindmuzik EAS
G High School	Teacher G (TG)	School Psychologist	Mindmuzik EAS

During the interviews with the school teachers and counsellors, five key themes emerged from the data. These were;

a. Grade introduction and the aim of CACGS
b. The CACGS as a complementary tool
c. CACGS formal evaluation
d. The perception by parents and learners against expectations and
e. The ease of CACGS use

These themes emerged through reading the data from the interviews as categorized by the response from the interview questions. Using a deductive approach, the interview responses were recorded and grouped using a word editor, where similarities and differences in data were identified to form discussion points for all five themes identified.

4.3 Data Collection

Primary data were used for this research. The survey for the learners comprised of 24 questions. Electronic surveys were made available via Survey Monkey, Google forms and through physical printed forms. The learners' surveys were completed anonymously. Learners were given specific links related to their school to complete the survey. Additionally, learners were also given hard copies to evaluate their specific CACGS during Life Orientation period at school

One on one interview sessions with participating teachers were conducted at the selected schools using voice recording tools Evernote, Supernote and a cell phone recorder. The recordings were thereafter transcribed from voice to text using Transcribe player.

4.4 Sampling and participants

The study focused on seven private schools which were given pseudonyms; A High School, B High School, C High School, D High School, E High School, F High School and G High School. Two out of the seven schools were co-ed schools, three were all boys schools and two were all girls high school. The selected schools were all located in different regions of the Gauteng Province. The rationale behind selecting private schools was that these schools were well resourced and over the years have invested in different forms of CACGS. The annual school fees in the selected schools ranged from R39 950 to R 114 200 further highlighting the ability to afford learning resources, especially educational technologies. All the schools A – G High school have their own adopted CACGS and for the purposes of this research, learners in these schools evaluated their own school's CACGS.

In the selected schools, seven interviews with a duration of between 45 – 60 minutes, were conducted with either the school's psychologist, teacher or psychometrist. Six out of the seven teachers/psychometrists were females and one psychometrists from the all-boys high school was male. Learners who participated in the CACGS evaluation excluded learners from E High School and F High School, however the school psychologists of the respective schools were interviewed. The research had 177 participants completing the surveys from Grades 9, 10, 11 and 12. The learner participation in the study was voluntary and the distribution across grades in each school was as follows:

Table 3: Table illustrating the evaluation participants in each school, according to Grade

School	Grade 9	Grade 10	Grade 11	Grade 12	Total
C High School	44	1			**45**
B High School	18				**18**
D High School	40		29		**69**
G High School	24				**24**
A High School	1		9	11	**21**
Total	**127**	**1**	**38**	**11**	**177**

The learner's ages were as follows, 14 year olds (10), 15 year olds (94), 16 year olds (19), 17 year olds (36) and 18 year olds (18). The majority being grade 9 learners at the age of 15 years followed by 17 year olds in Grade 11. The large number of Grade 9 learners (127) is attributed to most schools starting to use CAGCS during the subject selection phase. As stated by Fretwell and Watts (2004), the grade 9 phase signifies the end of junior secondary schooling and learners needing to make critical subject selection decisions, hence the focus on that Grade.

4.5 Research ethics

Permission to use the raw data of this survey for the purpose of this study was obtained from the school, teachers, and parents and the individual learners. A formal letter of introduction and purpose of research was sent to each participating school, together with forms of consent (Appendix C). During the interview phase, further information about the research was given and it was mentioned that the interview is recorded for the purposes of transcribing. Alias names were given for the participating schools throughout this thesis for protecting the identity of the schools.

5 Data analysis and discussion

The purpose of this study was to examine the usefulness of CACGS in selected Gauteng private schools from a learner perspective. Furthermore, the project aimed at understanding how teachers use CACGS in schools, the parent's expectations and how schools evaluate the CACGS against set school objectives. This chapter provides both a high level and an in-depth analysis of results based on the surveys completed by learners and the interview responses by teachers or school psychologists.

5.1 Descriptive analysis

A scatter plot of the School, System used, Age of learners, Number of Occupations selected and learner Satisfaction level is presented in figure 4 below. This scatter plot allows for a view of selected key variables in a single plot and extract relationships where they might arise. In this case, as illustrated by figure 4, the dots have been coloured according to learner satisfaction. The green colour highlighting the highest level of satisfaction, blue the second highest, orange the second lowest and red the lowest level of satisfaction.

Scatter plot of the school, system, age, number of occupation and satisfaction level

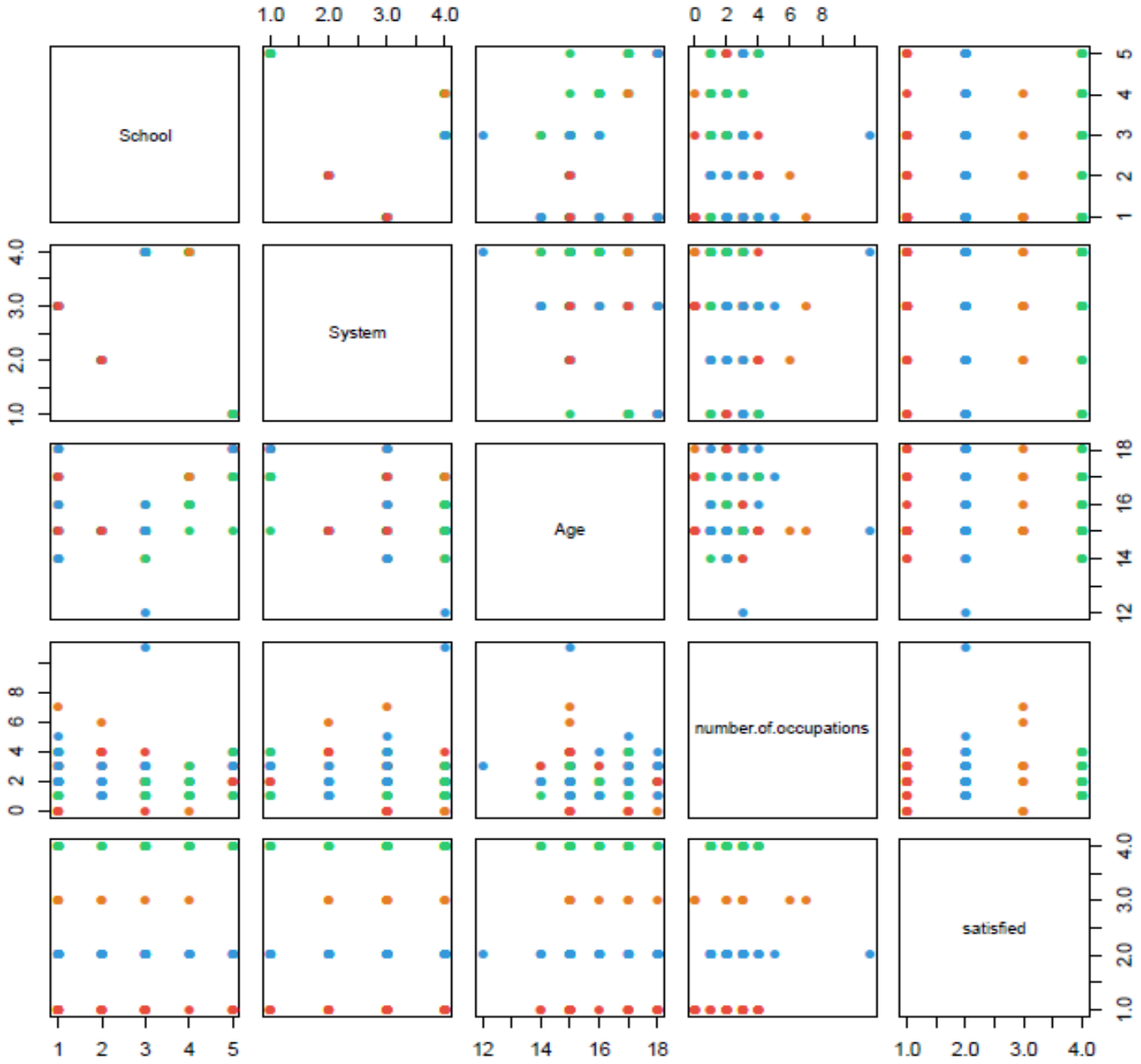

Figure 4: Scatter plot of the school, system, age, number of occupation and satisfaction level

From figure 4 above, ideally a pattern should arise in the colouring scheme which will indicate a relationship between satisfaction on one of the other variables. At a glance, it seems like the schools have uniform levels of satisfaction and the system also plays no role in the level of satisfaction a learner might feel. This seems highly unlikely and could be a result of the weakness of the representation of the diagram. The scatter plot does not show the incidence of events that are the same.

As a result of the limitations of the scatter plot with respect to categorical data, only general relationships can be drawn. From the results above, it seems like there is a relationship between age and occupation. This is explored in detail when discussing the relationship between the Age and OAQ (Occupational Alternative

Question) in section and 5.3. While the high levels of satisfaction seem to oscillate peaking at age 16, there does seem to be an ongoing drop to 18 years of age. This is the case while the number of undecided learners seem to steadily rise. It can be argued that this result might be contrary to conventional wisdom as it would have expected that towards the end of the high school life cycle, learners would be more certain about their desired career paths. There are numerous reasons why this could be the case. One of the reasons could be, the older the learners get, the more exposure they get on the variety of careers that are in the market, i.e. the more they do research, their more information they come across that is new to them, thus the increasing level of indecisiveness. Whereas at the ages 17 and below, there might be no pressure to make a career decision as university applications and career decisions are still an afterthought. Additionally, for first time CACGS users, the system might be introducing the learners to concepts that they were not aware of when making career decisions, e.g. a consideration of values when selecting a career. This conclusion is drawn from the perception that only abilities or interests should be considered when selecting a career. The numerous variables that are introduced by the assessments in CACGS do pose a potential for some level of undecidedness.

While the descriptive analysis is good at demonstrating a high level overview of the research results, it is important that a more detailed approach, with specific questions mining, is adopted to look at the primary data in order to determine whether learners found the systems useful. In answering the specific questions on the effectiveness of CACGS, a further analysis of the results was done to illustrate learner's thoughts on how each CACGS contributed towards their career decision-making skills. This was followed by statistical analysis in order to determine the statistically significant elements of the learners' feedback. This further analysis of results directly answers questions posed in Chapter 1.3.

a. Has the CACGS clarified learner's values, interest, and abilities?

This section gives an analysis of results based on the learner's ratings on the system's ability to clarify their values, interests and abilities.

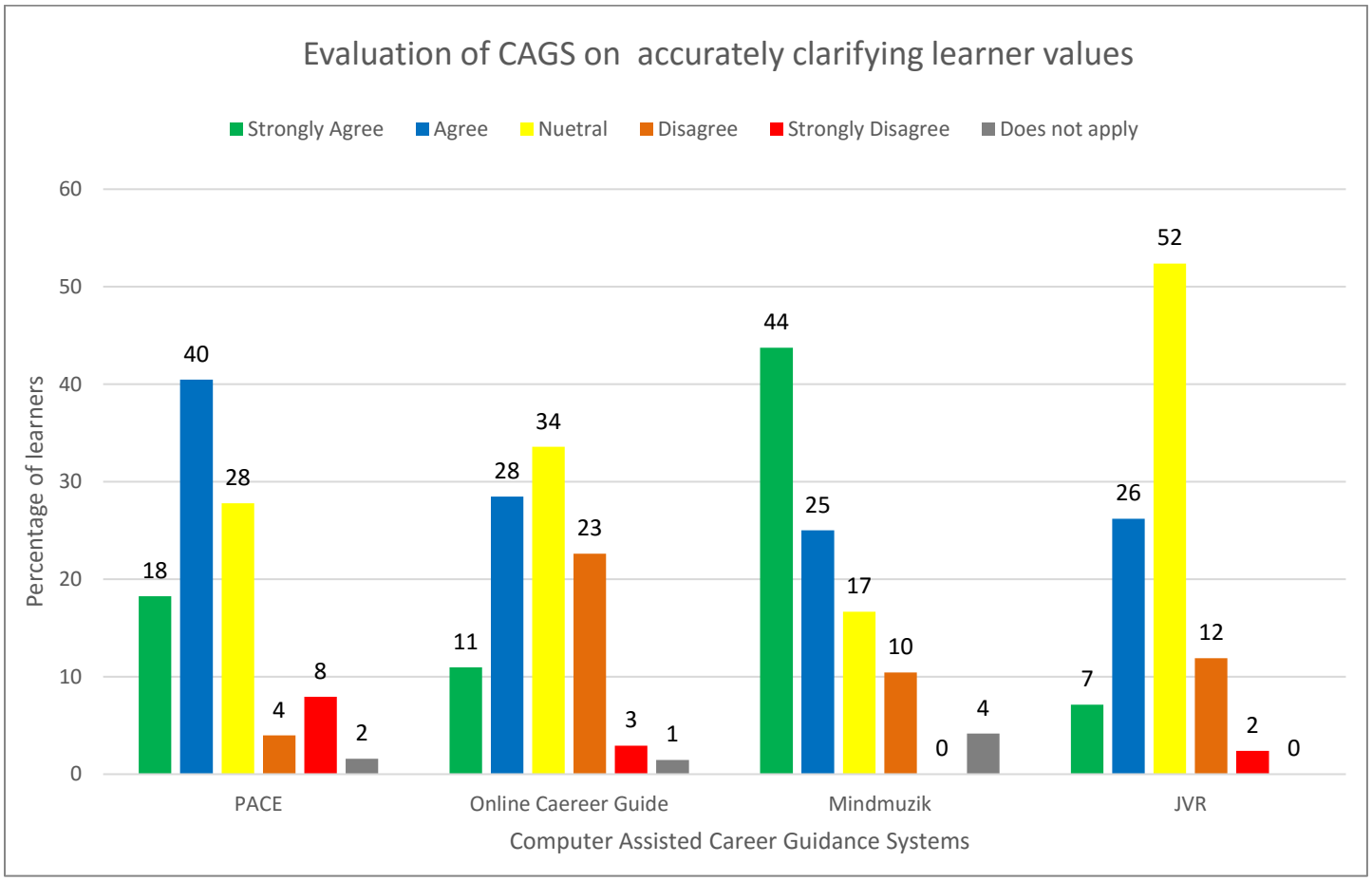

Figure 5: Bar chart showing an evaluation of CAGCS based on accurately clarifying learner values

Figure 5 shows the results of an evaluation of PACE, Online Career Guide, Mindmuzik EAS, and JVR Strong Interest Inventory by learners, specifically on the CACGS ability to accurately clarify learners' values. The results illustrated in this bar chart are based on the following statement: The system was helpful in accurately clarifying my values. This question sought to understand whether or not the learners thought the system was helpful in clarifying their personal values**.**

The results, as illustrated by the bar charts, suggest that learners perceived Mindmuzik as a systems that is able to accurately clarify their values. This is based on the fact that 44% of learners strongly agreed that the system clarified their values, while no learner strongly disagreed with the statement. This is by far the stronger indication of Mindmuzik EAS as a system with an ability to clarify learner values. Following Mindmuzik EAS high rating evaluation is PACE with a combined 58% (18% strongly agreed and 40 % agreed) of learners who have evaluated the system positively with only 10% of learners rating the system negatively.

The results also show that the Online Career Guide is positively evaluated by learners, however 23% of the learners disagree that the Online Career Guide clarified their values. This discrepancy between learners who agree and disagree should be further investigated as it is almost equal quantitatively. One of the reasons for this could be that learners who disagreed in the evaluation did not fully understand their values after using Online Career Guide or possibly they do not know exactly what their values are yet. The same can be said about the 34% of learners who remained neutral, this could be based on not fully understanding one's values as these results include Grade 9 learners, or not being sure that the system produced results aligned to personal values.

It is also clear from the bar charts that JVR Strong Interest Inventory evaluators were the most neutral learners in the study. Once again, it can be argued that the 52% of learners that remained neutral might be caused by the lack of understanding of what values are or the system's inability to accurately determine learner values based on the information given to the system about the learner.

In conclusion, all the CACGS evaluated seemed to have largely clarified the learner's values. However, further investigation of the Online Career Guide system should be done to determine the underlying reason behind the disparities in learners who found the system useful and the learners who did not, specifically on the ability to accurately determine learner values.

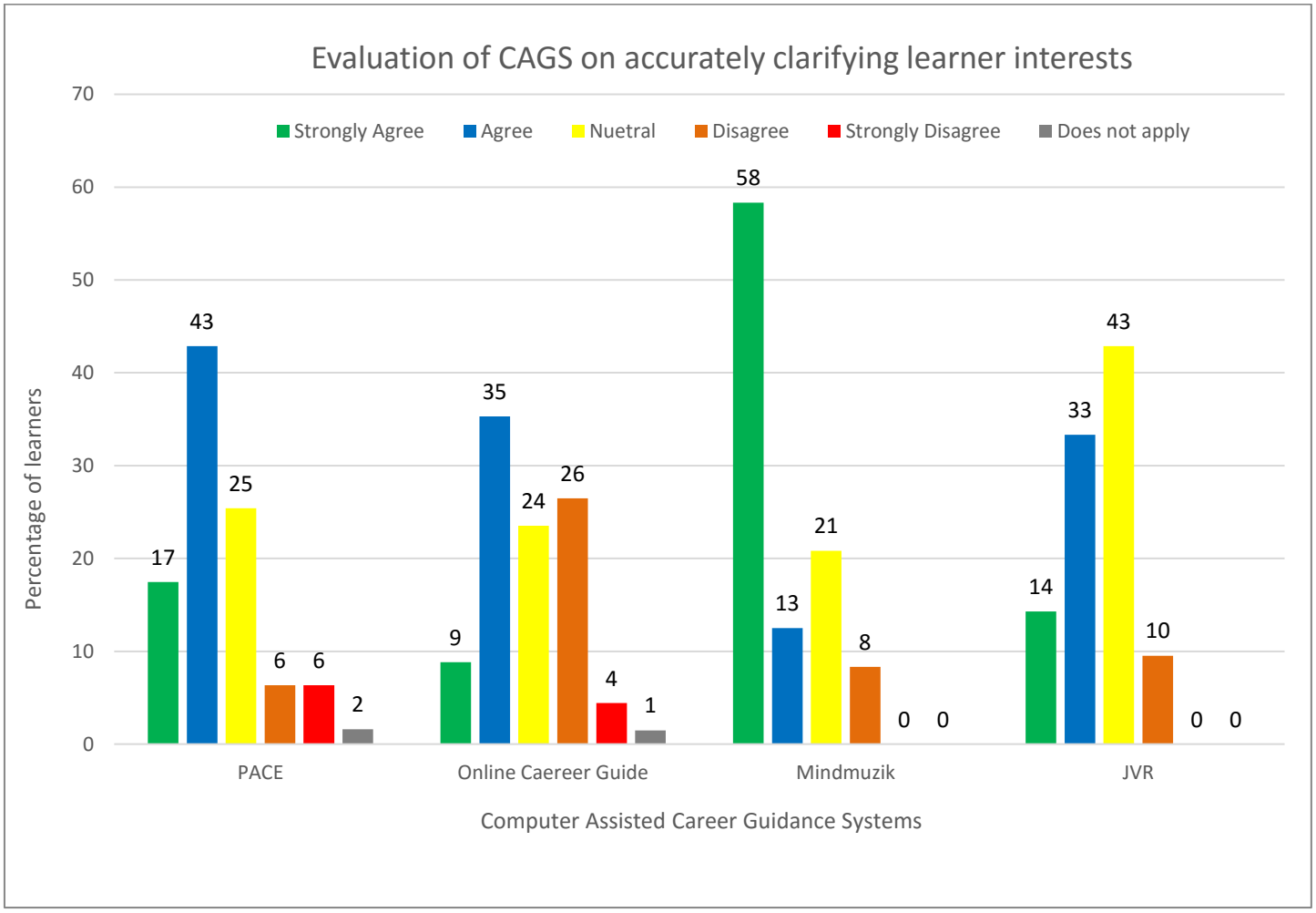

Figure 6: Bar chart showing an evaluation of CAGCS based on accurately clarifying learner interests

Figure 6 demonstrates the results of an evaluation of all CACGS in the study by learners, on the CACGS ability to accurately clarify learners' interests. The results illustrated in this bar chart are based on the following statement: The system was helpful in accurately clarifying my interests. This question sought to understand whether or not the learners thought the system was helpful in clarifying their personal interests**.**

The results, as shown by the bar charts demonstrate, once again, that the learners who evaluated Mindmuzik perceived the it as a CACGS that is able to accurately clarify their interests. This was concluded based on the fact that 58% of learners strongly agreed that the system had clarified their values and 13% also agreed that this was the case, while no learner strongly disagreed with the statement. This is another strong indicator of Mindmuzik EAS system as a comprehensive system with an ability to clarify learner values. Following Mindmuzik EAS strong approval rating is PACE with a combined 60% of learners who have evaluated the system positively (strongly agreed and agreed) with only 12% of learners rating the system negatively (strongly disagree and disagree).

The results also show that the Online Career Guide was positively evaluated by learners, although 26% of the learners disagreed that the Online Career Guide clarified their values. Similar to the previous question on values, this discrepancy between learners who agree and disagree should be further investigated as it represents a strong difference of opinions on evaluating this system on its ability to clarify interests. One of the reasons for this could be that learners who disagreed in the evaluation did not fully understand what their interests are after using Online Career Guide, or possibly do not yet know their exact primary interests and the system didn't help in clarifying these either. The same can be argued about the 21% of learners who remained neutral, this could be based on not fully understanding one's interests as these results include Grade 9 learners or not being sure that the system produced results aligned to personal interests.

It is also clear from the bar charts that once more, JVR Strong Interest Inventory evaluators were the most neutral learners in the study. Again, it can be argued that the 43% of learners that remained neutral might be caused by the lack of understanding of what interests are or the system's inability to accurately determine learners interest based on the information supplied to the system by learners.

In conclusion, all the CACGS evaluated seemed to have largely clarified the learner's interests. However, further investigation of the Online Career Guide system should be done to determine the underlying reason behind the disparities in learners who find the system useful and the learners who do not.

b. Has the CACGS helped the learner to identify satisfying occupations congruent with their values, interest, and abilities of the leaner?

This sections gives an analysis of results based on the learners' feedback on the CACGS ability to identify occupations that are congruent with the learners' values, interests and abilities of the learners.

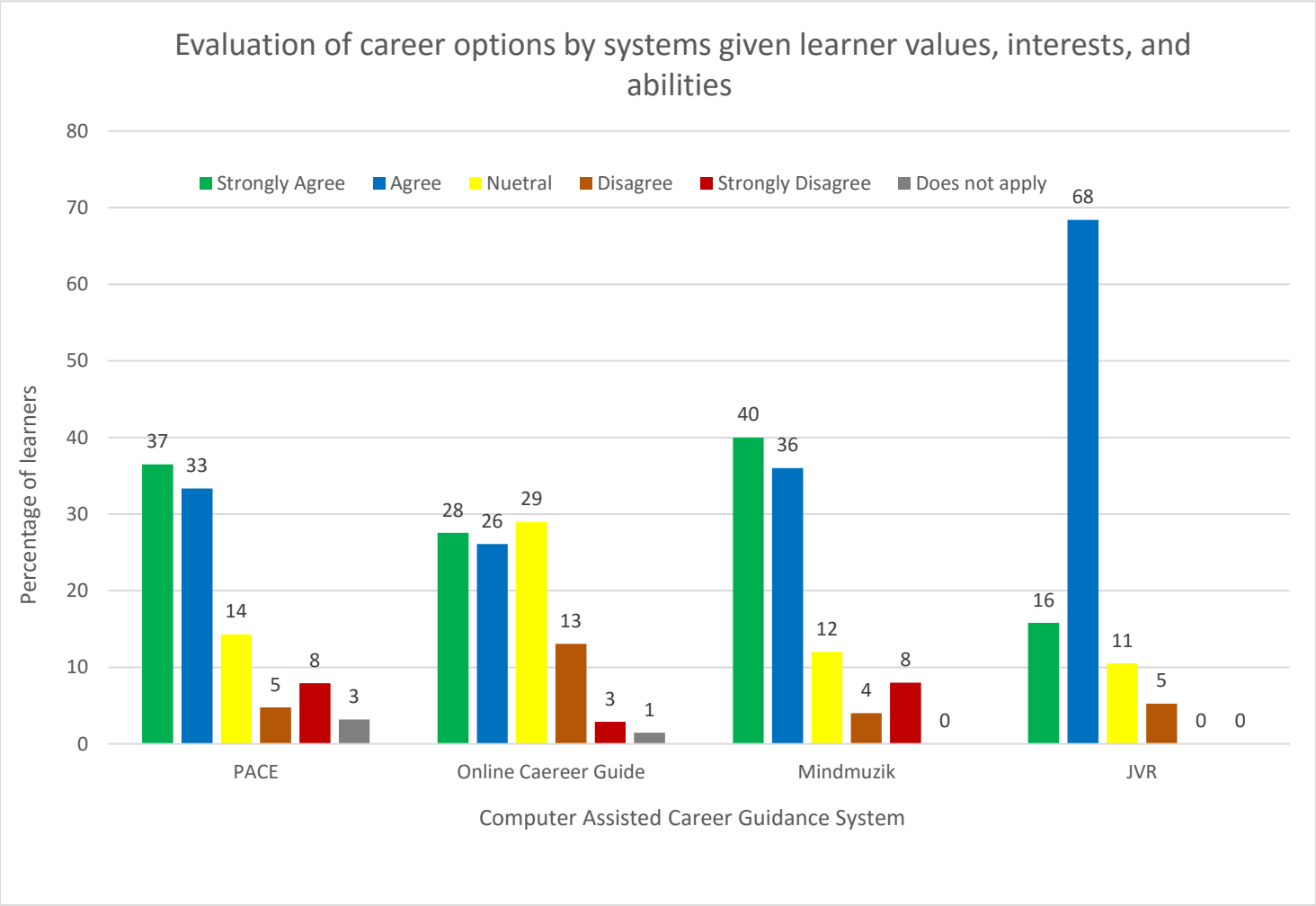

Figure 7: Bar chart showing an evaluation of CACGS given learner values, interests, and abilities

The bar chart above (figure 7) illustrates the results of an evaluation of each system by learners, specifically on the CACGS ability to give career recommendations based on learner's personal values, interests and abilities. This analysis is based on the survey question: The system presented logical career options given my values, interests, and abilities.

Figure 7 suggests that the CACGS that were used and evaluated by all schools largely helped the learners in identifying occupations that are aligned to their personal values, interests and abilities. According to the bar chat, 37% of learners strongly agreed that PACE helped in identifying careers that are aligned to their values, interests and abilities. While 33% of learners also agreed that PACE assisted in identifying careers that are aligned to their values and interests. The graph illustrates that JVR (84%), followed by Mindmuzik EAS (76%) are the systems which were highly rated by learners in terms of their ability to assist learners in their career search that is congruent to personal values, interests and abilities. Less than 15% of learners across each system concluded that the CACGS did not assist in recommending careers that are aligned to values, interests and abilities. This means, based on this evidence, learners strongly believed that evaluated CACGS, JVR Strong Interest Inventory, Mindmuzik, Online Career Guide, and PACE played a key role in determining careers aligned to values, ability and interests.

Another way that can be used to investigate the ability of CACGS to give satisfying occupations is to evaluate how learners scored in the Occupational Alternative Questions (OAQ). The OAQ is considered as one of the learner characteristics that may bear on the impact of CACGS. As discussed in section 4.1.2, the OAQ consists of two parts: (a) “list all the occupations you are considering right now” and (b) “which occupation is your first choice?’ (if undecided, write undecided). Studies have demonstrated that the OAQ has considerable concurrent validity with other measures of career indecision when the responses are scored as follows: 1 = a first-choice career is listed without any alternatives; 2 = a first-choice career is listed along with alternatives; 3 = no first choice is listed, just alternatives; and 4 = neither first choice nor alternatives are listed. Participants were assigned to two levels in this study, those with a first choice (1 or 2) and those who did not have one (3 or 4) (Peterson, Ryan-Jones, Sampson, Reardon, & Shahnasarian, 1987).

Graphically, figure 8 represents the bar chart that confirms the results in figure 7. Learners that evaluated JVR were all certain about their first choice career, while only 25% of learners who evaluated Mindmuzik EAS and PACE were uncertain about their first choice career. The OAQ results also showed that at the end of the evaluation, 84% of learners who evaluated PACE had certainty about their first choice career option. Once again, from this metric, it can be concluded that the CACGS were positively evaluated by the learners, thus few learners had uncertainly

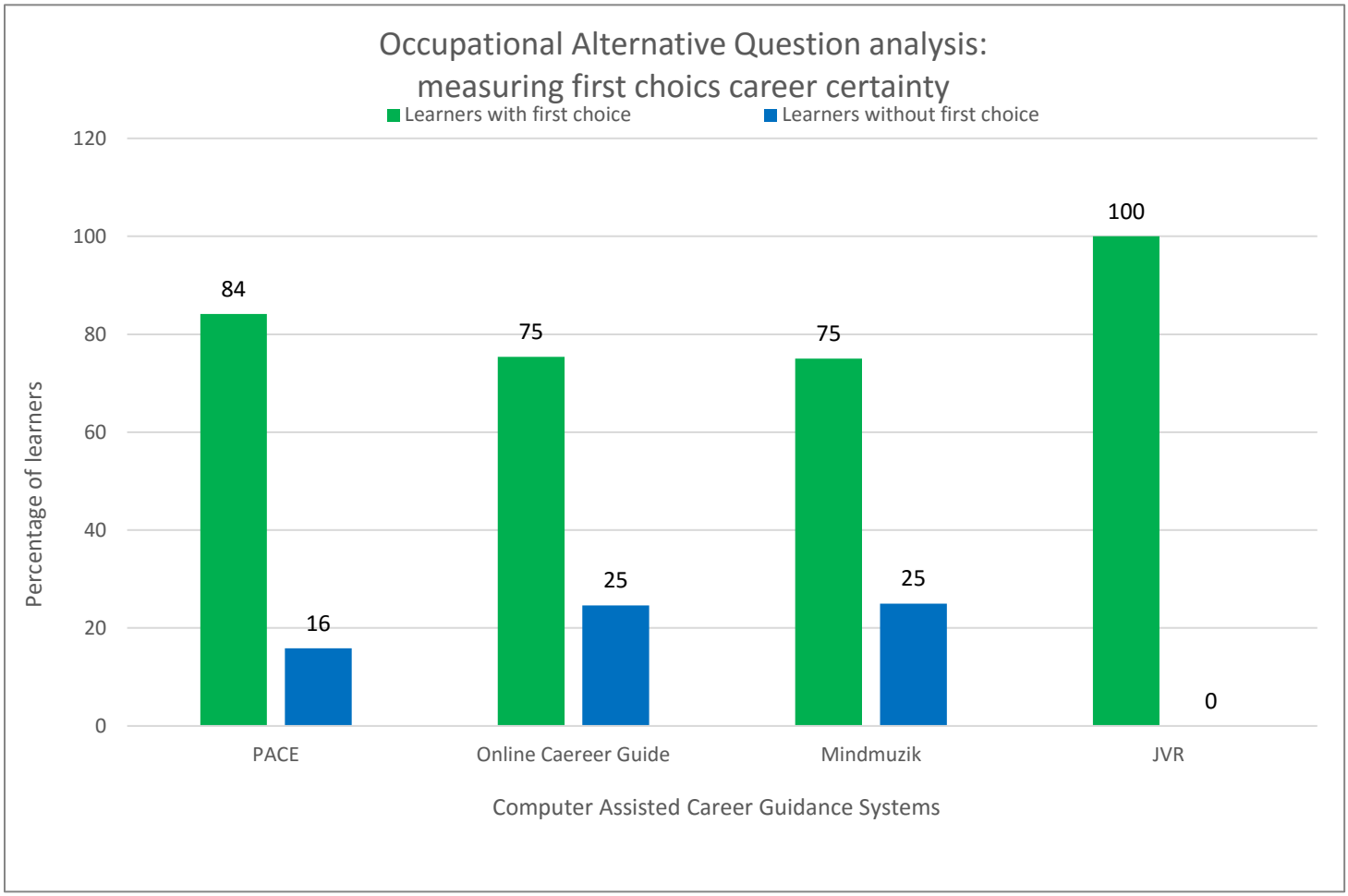

Figure 8: Bar chart showing an evaluation of CACGS based on the learner OAQ

c. Has the CACGS helped the learner to acquire an understanding of the world of work?

This section gives an analysis of results based on the learners' perception of how well the system helped in understanding the world of work.

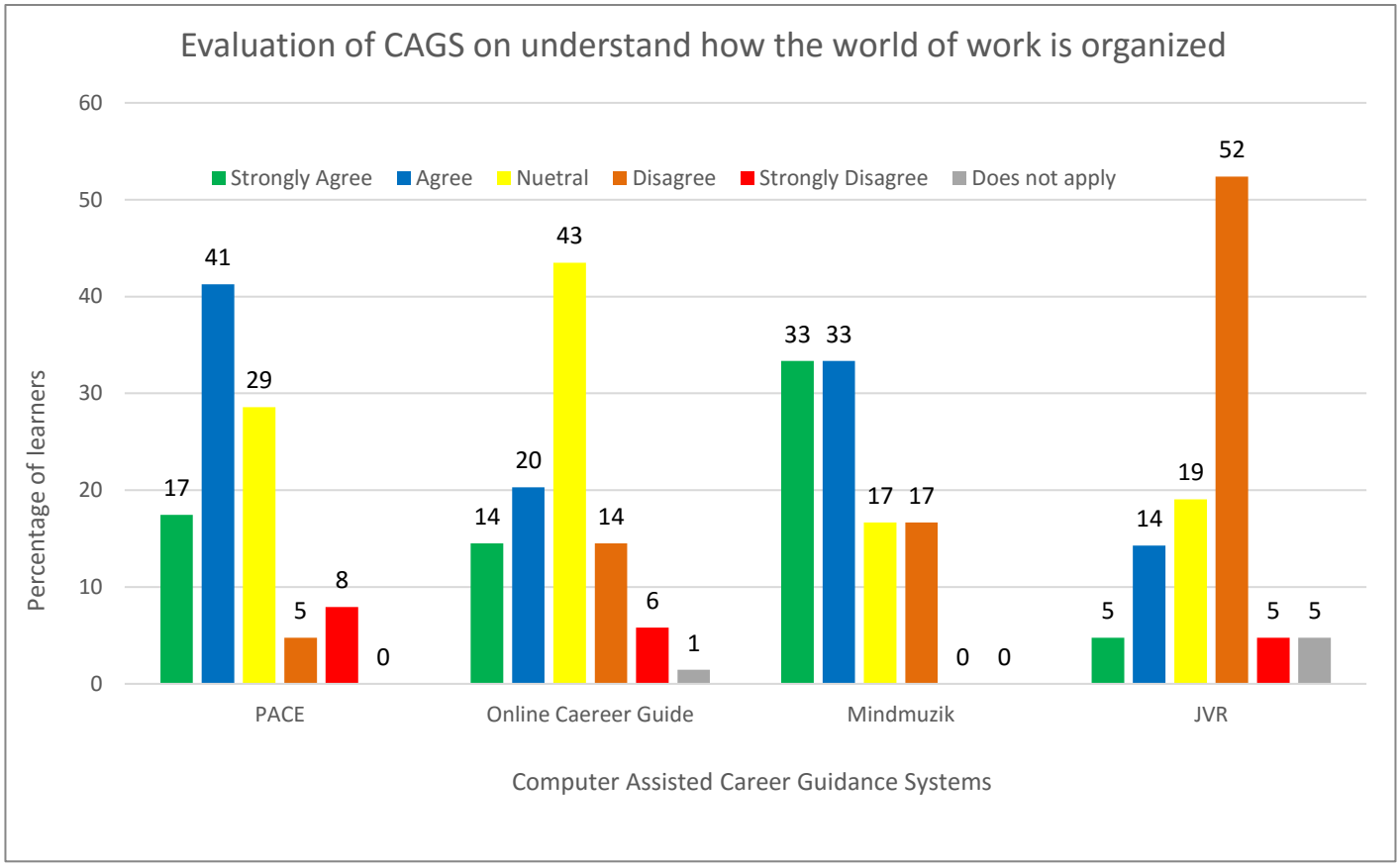

Figure 9: Bar chart showing an evaluation of CACGS on understanding the world of work

Figure 9 highlights the results of the evaluation of each system by learners, specifically on the CACGS ability to make learners better understand how the world of work is organized. These results illustrated in this bar chart are based on the question: The system helped me better understand how the world of work is organized.

The bar charts suggest that PACE and Mindmuzik systems were perceived as useful systems in enabling learners to understand more about the world of work. On the evaluation of PACE, 58% of learners who evaluated this CACGS agreed and strongly agreed that PACE gave them an edge in terms of better understanding the world of work, while 66% of learners who evaluated Mindmuzik also shared the same sentiment. It is clear from the bar charts that JVR Strong Interest Inventory and the Online Career Guide where considered as the least helpful systems, by the learners who evaluated these CACGS independently, when it comes to understanding how the world of work works in the learner's desired career paths. In the case of the Online Career Guide, this is contrary

to what the company prides its self for, making earners understand how the working world works in relation to each career.

When evaluating the Online Career Guide, 43% of learners remained neutral when it came to rating the system's ability to give information pertaining to the world of work. This could either mean the learners were not fully confident that the system gave them enough information on the world of work, or the system was not that clear in highlighting what the world of work entails, thus the neutral rating. On the other hand, it can also be argued that the system has insufficient information about the world of work for some specific careers only. This was based on the fact that 14% of the learners that evaluated the Online Career Guide strongly agreed that the Online Career Guide did have information and it helped in understanding the world of work better. Further investigation of the Online Career Guide system should be done to determine the underlying reason behind the disparities in learners who find the system useful and the learners who do not.

d. Has the CACGS assisted the learner to understand the personal demands of the world of work and the needs of significant others so as to make an optimal occupational choice

This section analyses the results on the learner's perception of how well the system helped in understanding the demands of the world of work including the amount of free time and education demands in the occupation.

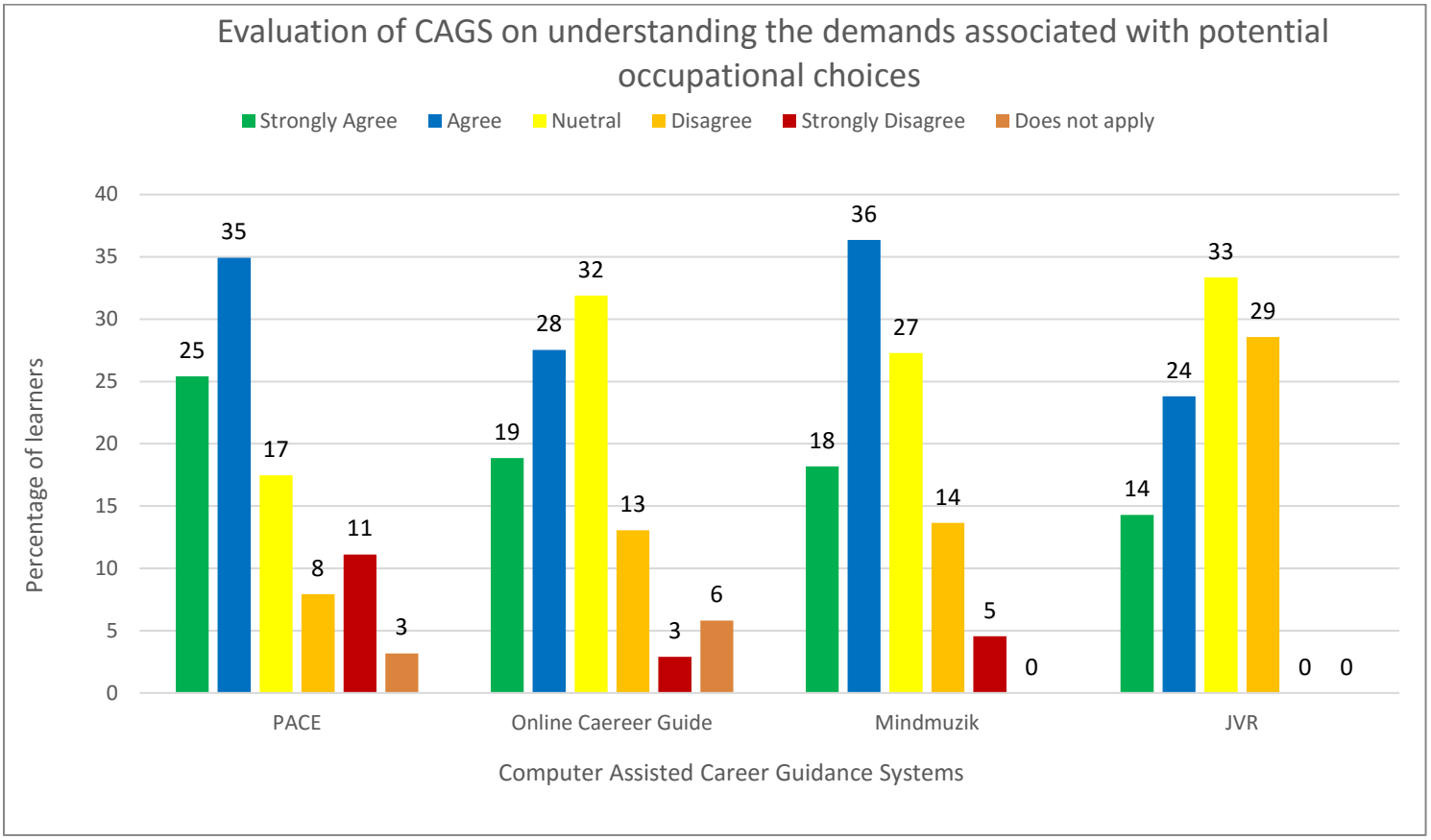

Figure 10: Bar chart showing an evaluation of CACGS on understanding on understanding the demands associated with potential occupational choices

Figure 10 shows the results of an evaluation of each CACGS by learners, specifically on the CACGS ability to make learners better understand the demands associated with their potential occupational choices. The results illustrated in this bar chart are based on the question: The system helped me better understand the demands associated with potential occupational choices, such as amount of free time, vacations, and continuing education. This question is partially related to the previous question, the system helped me better understand how the world of work is organized and it helps in answering the question on making optimal career decision based on considering the needs of significant others**.**

Similarly, to the results on the question of understanding how the world of work is organized, the bar charts suggest that PACE and Mindmuzik systems were perceived as useful systems that enable learners to have a better understanding of the demands associated with their desired occupational choice. The results show that PACE had 60% of learners who agreed and strongly agreed that the system gave them an edge in terms of understanding occupational demands, while 54% of learners who evaluated Mindmuzik also shared the same perspective. From these results, together with the previous question on how the world of work is organized, we can conclude that both Mindmuzik and PACE have a better occupational database, where the learners can get more information not only about careers aligned to interests and abilities but also a better understanding of what happens in these careers in terms of career demand, amount of free time and even further education

requirements and demands. These are critical questions that must be clarified to learners as they might have an impact on decision making when the learners reach the end of their high school cycle.

It is also clear from the bar chats that JVR Strong Inventory and the Online Career Guide where the least helpful systems to the learners when it comes to understanding the demands of the potential occupation choices. However, it must be noted that the Online Career Guide fared much better in this aspect compared to the results in the previous questions. More than 45% of the learners agreed and strongly agreed that the Online Career Guide assisted in understanding the demands associated with their potential occupations, while 32% of learners remained neutral in this question. Once again, it can be argued that the 32% of respondents that remained neutral might be as a result of the unavailability of related careers for these individuals. Additionally, this could also mean that the learners were not fully confident that the system gave them enough information on the world of work, or the system was not that clear in highlighting what the world of work entails and demands, thus the neutral rating.

Further investigation of the Online Career Guide system should be done to determine the underlying reason behind the disparities in learners who find the system useful and the learners who do not.

e. Has the CACGS helped in formulating a systematic plan of action to implement leaner's occupational choice?

This section gives an analysis of results based on the learner's perception of how well the system helped them to systematically plan further steps towards achieving their occupation choice.

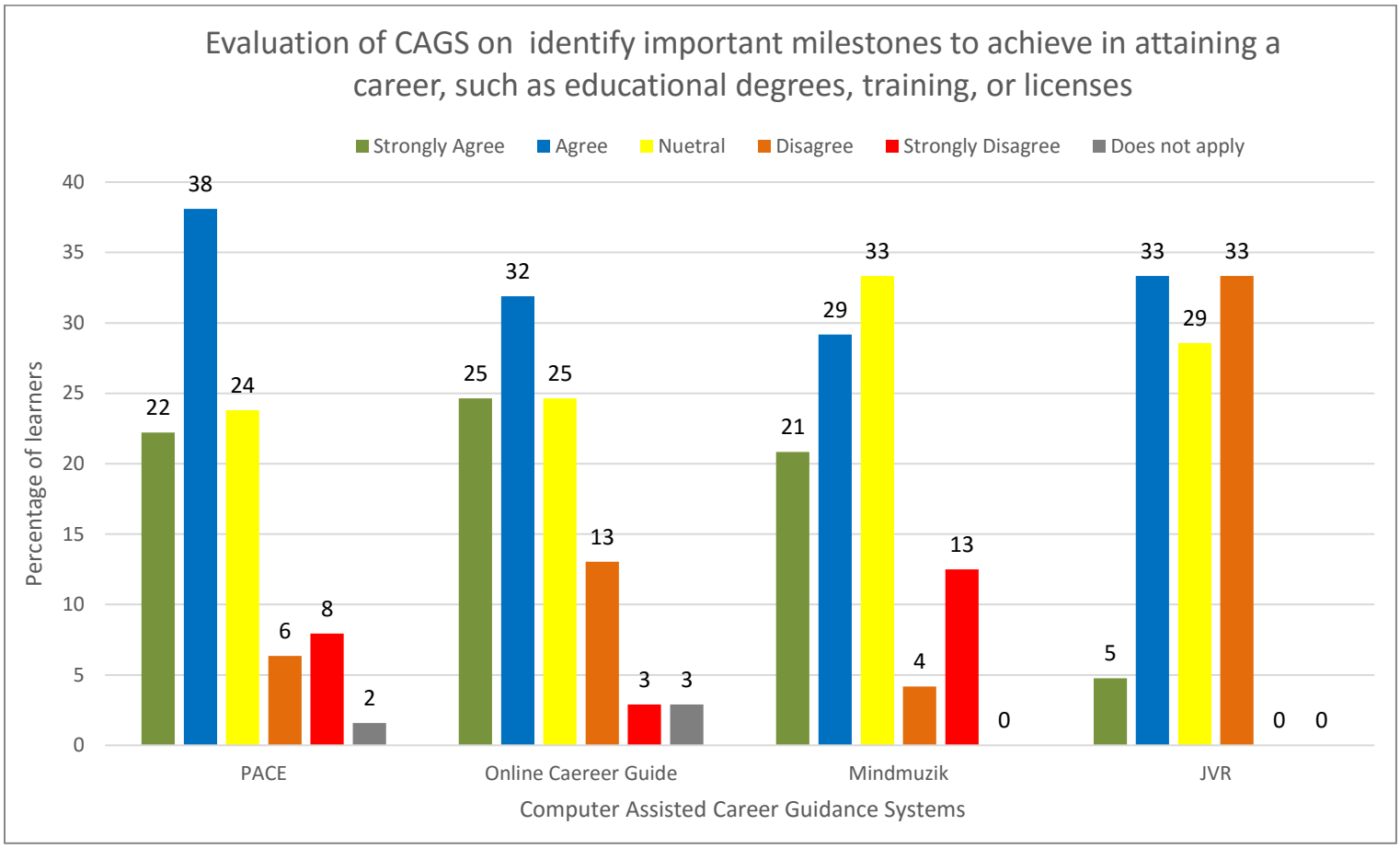

Figure 11: Bar chart showing an evaluation of CACGS on the ability to identify important milestones to achieve in attaining a career

Figure 11 demonstrates the results of an evaluation of PACE, Online Career Guide, Mindmuzik EAS and JVR by learners, specifically on the CACGS capability of setting milestones or plan of action to implement in order to attain recommended or desired career choice. The results illustrated in this bar chart (figure 11) are based on the evaluated statement: The system helped me to identify important milestones to achieve in attaining a career, such as educational degrees, training, or licenses. This question helps in answering the research question on the capability of the system to formulate a systematic plan of action to implement the learner's occupational choice.

Overall, based on the graph results, it can be concluded that the evaluated CAGS do have the capability of identifying important milestones that a learner must achieve to pursue their desired or recommended career path. This statement is based on the fact that 38% and 22% of learners agreed and strongly agreed respectively

that PACE was able to identify important milestones to achieve in attaining a career e.g. educational degrees, training, or licenses. On the same questions, 57% of Online Career Guide users, 40% of Mindmuzik EAS and 38% of learners using JVR believed that these systems were clear and able to show the ability to see and set milestones related to prospective career paths. It can also be concluded that this is true for the CACGS that have the information on degrees or training required for the career suggested or desired.

The results showed that there was a high percentage of learners who remained neutral across all systems, with PACE (24%), Online Career Guide (25%), Mindmuzik EAS (33%) and JVR (29%) evaluators remaining neutral. Once again, the assumption in this case is that these learners perceived the CACGS not to have satisfying information on how and what to prepare for their prospective careers, moreover the systems might not be able to formulate the systematic plan with limited information, thus the neutral response.

The bar chart (figure 11) also illustrates that once again that there was a high percentage of learners who were not satisfied with JVR results. This trend can also be traced back to the preceding two questions that are directly related to the world of work and its demands. In this case, figure 11 shows that 33% of learners disagreed that JVR assisted them in identifying important milestones to achieve in attaining their prospective careers. This dissatisfaction trend could either demonstrate a limited career database information in general from JVR or that the system has insufficient information specifically on the world of work. This assumption can be justified by the fact that JVR is largely comprised of battery of tests or assessments more than occupational information. In Chapter 3.4.4 (page 35)**,** where the paper covers JVR Strong Interest Inventory, there is a confirmation that the Strong Interests Inventory is the primary offering from JVR, where career information is secondary.

In contrast to the above findings, it seemes that learners considered PACE as a system that is able to deliver desired results, continuing from previous questions ratings on the world of work. In this instance, it can also be argued that PACE might have the best occupational database, where the learners can get more information about careers aligned to interests and abilities, understanding what happens in these careers in terms of career demand, and most important offer learners an ability to systematically plan for these prospective careers.

In conclusion, a further investigation of the JVR Strong Inventory system should be done to determine the underlying reason behind the disparities in learners who agreed that the system helped them to systematically plan for their careers (38%) and those learners who disagreed (33%). With these questions answered directly, it is important to take into consideration the rest of the survey results as a holistic snap shot of how learners perceive their schools' CACGS. As discussed in Chapter 4, factor analysis allows for the combination of these survey questions and the next section will further elaborate on that.

5.2 Factor Analysis

In Chapter 4.1.2 (page 38) Data analysis a) Factor analysis describes how the questionnaire was reduced from 24 to 3 categories Analysis, Synthesis and Computer effect through factor analysis. Through this method, the results yielded the following conclusion regarding the three factors:

- Analysis = 1, 2, 5, 10, 11, 16, 17, 18, 20, 21
- Synthesis = 3, 6, 7, 12, 14, 19, 22, 23, 24
- Computer Effect = 4, 8, 9, 13, 15

Where each number represents the question that was asked to each learner participant.

Table 4 below illustrates correlation co-efficient results when all questions have been categorized. Correlation as a statistical measure indicates the extent to which variables fluctuate together. High correlations mean data typically moves at the same time whereas low correlations mean they typically move at different times. The stronger the positive correlation, the closer the value of the correlation coefficient will be to +1. In contrast, the stronger the negative correlation, the closer the correlation coefficient will be to –1.

In this particular case, a correlation calculation indicates whether or not data is related. The statistical results as shown in table 1 below indicate that the correlations between the three variables is rather high, with a range of 0.505 to 1, while the respective alpha reliabilities were Analysis, 0.67; Synthesis, 0.67; and Computer effect 0.76. Therefore, the scales were considered as independent and reliable.

Table 4: Table illustrating the correlations between analysis, synthesis and computer effect

	Analysis	Synthesis	Computer effect	Means	SD	Alpha
Analysis (10 items)	1	0	0	1.33194	4,517082	0.67
Synthesis (9 items)	0.616858	1	0	0.96388	3,38208	0.67
Computer effect (5 items)	0.504586	0.501153	1	0.31472	3,196818	0.76

In Chapter 4.1.2, this paper defined the analysis of variance as a statistical technique that is used to determine the differences between means in different populations. Looking at the overall combined statistics for the evaluation of different CACGS, Tables 4 illustrates the analysis of variances according to the three scales, Analysis, Synthesis and Computer effect. Where the OAQ (Occupational Alternative Question) and the learner Grades represents the impact of learner character characteristics that may bear on the impact of CACGS.

Table 5: Table illustrating the analysis of variance according to Analysis, Synthesis and Computer effect

Analysis

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
OAQ	1	3.50	3.53	0.176	0.676
Grade	1	26.30	26.26	1.307	0.255
OAQ: Grade	1	85.30	85.35	4.248	0.041
Residuals	173	3,476.00	20.09		

Synthesis

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
OAQ	1	0.05	0.05	0.004	0.950
Grade	1	35.38	35.38	3.100	0.080
OAQ: Grade	1	3.21	3.21	0.281	0.597
Residuals	173	1,974.54	11.41		

Computer Effect

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
OAQ	1	7.38	7.38	0.736	0.392
Grade	1	52.54	52.54	5.235	0.023
OAQ: Grade	1	2.57	2.57	0.256	0.614
Residuals	173	1,736.17	10.04		

The above analysis (Table 5) of variance for Synthesis and Computer Effect has p-values of 8% and 2.3% for the Grade variable. Typically, a p-value lower than 5% is considered significant. As such it seems likely that there is a statistical difference on the impact that the Grade has on Synthesis and Computer effect whereas it is unlikely that OAQ has any effect on any of the synthetic variables (this has been

partly proven by figure 9, section 5.1). Considering the definition on Synthesis (developing and evaluating career options), and Computer effect (believing that one is being helped) in this thesis, this statistical difference could mean that the Grade at which the learner is currently has a lot to do with how learners consider CACGS having an impact on developing their career options and believing that they are being helped. Considering that the majority of the participants in this study were in the 9th Grade, this is highly likely as learners are going through a major schooling transition between secondary school and high school.

It is worth noting that for Synthesis, the interaction between OAQ and Grade was significant at the 5% level. This suggests that the combination of these factors was important in explaining Synthesis (developing and evaluating career options).

5.3 Multiple analysis of variance: Manova according to systems

In Chapter 4.1.2 (page 42) Manova is described as a multivariate extension of Anova. Whereas Anova test for differences in the means of different groups, Manova tests for differences between groups across responses. A one way MANOVA with four levels of CACGS (PACE, Mindmuzik, Online Career Guide, PACE) was used to further determine if there was a multivariate effect among the respective CACGS. The dependent variables included Analysis, Synthesis, and Computer effect, while the Grade and OAQ scores were used as covariates to partial out variance attributed to learner entry characteristics. A series of post-hoc 2 X 3 ANOVA's (two levels of client characteristics (Grade and OAQ) X Three levels of computer) were conducted to determine whether high or low grade, OAQ, or Grade were related to perceptions of CACGS effectiveness amongst the four systems.

None of the p-values were significant at the 5% level and 2 were significant at the 10% level. Grade for Online Career Guide was the closest to significance along with OAQ for PACE. This result can be interpreted as; learners who evaluated PACE had a better crystalized vocational identity than learners who used Mindmuzik or the Online Career Guide. The systems statistics that had inconclusive results for OAQ or Grade were not included in this table (table 6).

Table 6: Table illustrating the MANOVA analysis of Synthesis, Analysis and Computer effect

		Pillai	Wilks	Hotelling-Lawley	Roy	approx F	num DF	den DF	Pr(>F)
JVR	**Grade**	0.1972	0.8028	0.2457	0.2457	1.39	3.00	17.00	0.2793
Mind muzic	**OAQ**	0.0789	0.9211	0.0857	0.0857	0.57	3.00	20.00	0.6403
Online Career Guide	**OAQ**	0.0560	0.9440	0.0593	0.0593	1.27	3.00	64.00	0.2938
	Grade	0.1121	0.8879	0.1262	0.1262	2.69	3.00	64.00	0.0535
PACE	**OAQ**	0.1069	0.8931	0.1196	0.1196	2.31	3.00	58.00	0.0854
	Grade	0.0575	0.9425	0.0610	0.0610	1.18	3.00	58.00	5.3257

5.5 Qualitative analysis

In this study, interviews were conducted with seven high school teachers, councillors, psychometrists and school psychologists to understand how they use CACGS in their respective schools and their perspectives on the usefulness of the various systems. From the combined interview questions and answers, 5 major themes emerged from the data. These were;

a. Grade introduction and the aim of CACGS

b. The CACGS as a complementary tool

c. CACGS formal evaluation

d. The perception by parents and learners against expectations and

e. The ease of CACGS use

To make the study more meaningful, the data are presented as a combined narrative story for the selected interviewees.The key interviews for this section were selected based on the system that the school is using. In the analysis, the themes have the following meaning:

- **Grade introduction and aim of CACGS -** the grade at which the high school learners are introduced to CACGS for the first time in high school. This highlighted when learners first encountered CACGS and how well they responded to the assessments. This theme also highlights the school specific objectives in using CACGS for the Career Guidance module. This measure helped in understanding whether or not the school's objectives were met by the CACGS, thus evaluating the system's usefulness at the schooling level.

- **The CACGS as a complementary tool –** the CACGS as a tool that is used in conjunction with other career related assessment tools. This theme highlighted a cross cutting phenomena in all schools, where the primary CACGS selected was either used in conjunction with other systems or as a complementary tool to face to face interventions. In the interview questions, there were no specific questions that asked about the use of multiple systems or complementary services in addition to adopted CACGS, however a trend emerged when most respondents highlighted that the use of CACGS alone was not sufficient to complete the Career Guidance programme at school.

- **CACGS school formal evaluation –** the school's results on the usefulness of the selected CACGS, based on the initial aim or purpose. This theme illustrated how schools evaluated their systems formally, whether there were measures in place.

- **Assessment parent's expectations and feedback –** the expectations from the parents after the learner has gone through the career assessment programme and most importantly their feedback or reaction post results as presented in the reports. This measure helped with understanding whether or not parents deemed the CACGS intervention useful. This theme also covered parent's expectations in general, beyond the CACGS assessment outcome.

- **Ease of use CACGS use -** the degree to which the users found interacting with the CACGS to their liking.

Below are the interviews from the selected schools, where the letter "US" highlights the questions asked by the interviewer (Unathi September – the researcher) and the abbreviations "TA" – "TG", indicates the answer given by the interviewee as defined in table 1 in the research methodology .

5.5.1 JVR Strong Inventory

A High School

A High School, an all-girls school, considered as the school with one of the best Counselling and Psychology support programmes in South Africa invested in JVR Strong Interest Inventory as their computer based CACGS. The following were the responses from the school psychologists who is responsible for career guidance at the school, as per the selected themes:

- **Grade introduction and aim of CACGS**

  US: What are the specific aims of the CACGS and each component for the target age group/grade?

  TA: *"The aim is not to be too prescriptive, so not to say you are suited for this a particular degree from a specific university. It's a bigger picture process where our learners are able to get insights to structure information about themselves so that as they are faced with different careers choices and study options, they are able to make those decisions themselves because they understand themselves so well. We start them in Grade 10 and 11"*

  Based on this response, the focus area for Teacher A in A High school in using JVR Strong Interest Inventory was on learner's self-awareness. Where the school is primarily aiming to help the learners acquire self-knowledge to make careers decisions in future. This response was in line with Peterson et al. (1987) Analysis view of CACGS where the focus is on the CACGS ability to help learners acquire self-knowledge.

- **The CACGS as a complementary tool**

  Referring to JVR Strong Interest Inventory as a complementary tool, Teacher A had the following to share:

  "In order to make sure that our programme is comprehensive and that we're not making recommendations based on one individual item or category, we need to make sure that we cover everything. In career choices we look at strengths, abilities and interests. Each assessment looks at these factors separately. We need to make sure that we combine all of these factors before making recommendations. So our NBTI assessment looks at the personality and personality preferences, whether the learners are introverted or extroverted, do they think picture? Do they like detailed? Would they be more suited in an environment where there's a lot of feelings, empathy, or compassion? Or are they objective decision makers based on facts etc. The next one[assessment] *that we use is the Strong Interests inventory, and that looks specifically at the interests. So generally, a lot of assessment use Hollands theory, where work categories are broken down into six categories and we check if they're more artistic, or investigative etc. and we use that to complement the personality* [test]*. The last one is the careers value scale, and that looks at their* [learners] *work values. Is it about helping people? Is it about being creative, is financial reward important to them etc., so what is their underlying core values in the work place?"*

  In the literature review, it was argued that the best approach to career guidance interventions includes "a combination of written exercises, individualized interpretation and feedback, information on the world of work, modeling, and attention to building support" (Fowkes & McWhirter, 2007, p. 390). This is evident from this statement from A High school psychologist. The combination of the three systems in this school validates the fact about multiple tools for a holistic career guidance programme. The combination of the NBTI, JVR Strong Interest Inventory and Career Choices in this school gives learners a more comprehensive report that forms part of their Career Guidance programme.

- **CACGS school formal evaluation**

  US: Does the school evaluate the effects of guidance programming?

  TA: *"We don't have a formal evaluation for our systems, we probably should look into a way to evaluate. One of the things I do is just feedback sessions that's qualitative, so me just saying, does this help you. But that's a good point, we should look at introducing that formal evaluation. I'm constantly looking at what's out there and what is available, what's up to date and what's been researched. I think the problem in South Africa is that a lot of our assessments are made or published in America, they are not always relevant for our context. If there are South African products that are suitable, we would love to use those. We have in the past swooped the JVR Strong Inventory system with the Online Career Guide which is the South African product, but I wasn't totally satisfied because I felt like there's not enough research that's been done there. A lot of careers that were recommended, I didn't see where it came from. I'm a bit weary of that, I do think it has some value but I prefer the* [JVR] *Strong Interest Inventory assessment because they have a lot of research on it."*

  The school does not have a formal evaluation for their selected CACGS. This means, despite the set objectives by the school, there is no clear way to determine whether the CACGS outcomes meet the set objectives and aims. It is interesting however, that the school psychologist mentioned that in most cases the systems that they use was still based on American context rather than local context. This interview also highlighted that the school has in the past attempted to use a local product, the Online Career Guide (which is also used by D High school), however this CACGS was not satisfactory according to her informal evaluation. This statement also highlights one of the challenges explored in the research *Issues in adapting a computer-assisted career guidance system for use in another country* when using a foreign CACGS**.** While most schools use American based CACGS, it must be noted that research has demonstrated that there are differences in how countries grade aspects such as personal values, interests' fields, special skills, education levels and avoidance factors (Lokan & Fleming, 2003).

  While there is no formal evaluation at A High school, based on the experimentation in changing system, it is clear that the school is always critical about the services they provide to the learners.

- **The perception by parents and learners against expectations**

  US: What are the expectation from the parents after learners have done the assessment?

  TA: *"It's different from parents to parents, you get different responses. For some of them, they just want to know what must my child study* [based on the CACGS outcomes]*. And for some, they're more open to this* [programme] *providing valuable information about my child, about who they are as a person, what they enjoy that will help them for future decision making. Parents want to know because of the nature of our lives at the moment. They just want to know what's next and help me to make this decision for my child. At times, there's a disconnect between what parents expect* [and the report outcomes]*, because parents are coming from a different generation, where you study something and loyal to a company and follow a specific path that you stay in the field, whereas things are changing with technology and many creative fields coming up"*

  The response on the parents' expectations revealed diverse expectations, where one group of parents held a narrow view on what career their children should pursue after receiving the CACGS report, whilst the other group is more open to the self-knowledge approach as a primary objective. The interviewee attributes some of the different expectations to the generational gap and the difference in viewing the career journey.

- **Ease of CACGS use**

  US: What are your perceptions of accessibility and ease of use of the system?

  TA: *"I find it very easy to use, our services provider JVR is very good with their online systems, and making it easy to use. It's really not a problem, it would be nice to get a single report with all of the reports though. As far as the girls doing their assessments, it's quite straight forward and it doesn't take too long."*

  The response to the question on the ease of use confirmed that, like the other systems, JVR Strong Interest Inventory was an easy system to use.

5.5.2 PACE

B High School

B High School, considered as one of the best private boy's high schools in Gauteng, uses PACE as their school's computer based CACGS. The following were the responses from the school's head of Life Orientation (Teacher B), responsible for career guidance at the school, as per the selected themes:

- **Grade introduction and aim of CACGS**

US: What are the specific aims of the CACGS and each component for the target age group/grade?

TB*: "How we approach the whole career thing, we start in Grade 9 and we spend a lot of time doing subject choices, and when we do subject choices, we don't only look for what you need to get into the course, but what career it directly impacts on. In Grade 9, they don't only think about subjects, but further. In grade 9, term 2 is dedicated to career selections and development"*

In line with Fretwell and Watts (2004) assertion of learners making initial career decisions at the end of their ninth grade, B High school introduces learners to PACE in Grade 9 with the aim of guiding learners to select appropriate subjects that are aligned to future careers of interest. In this school, the entire second term of the year (out of three terms) in Life Orientation is dedicated to this task, illustrating its importance to the school.

- **The CACGS as a complementary tool**

On the topic of CACGS as a complementary tool, the interviewee had this to say:

TB: *"..and I have found that they understand more if they get out and do it practically than using a programme that I find quite structured. I like the idea that they can go job shadowing 5 or 6 different careers."*

One of the insights drawn from this school was that the PACE system was just a part of an extensive Career Guidance programme, it was not a system that the school heavily relies on for assessments and career information. Learners, as early as the 9th Grade, are introduced to job shadowing to understand practically what a particular career entails. In the interview, the school head of Life Orientation also mentioned that during the first term of school, in March specifically, the school organises a Careers Day with higher learning institutions and professionals involved in order to give a broader perspective of various careers. This proves Fowkes and McWhirter (2007) argument on Career Guidance as a combination of written exercises, individualized interpretation and practical understanding of the world of world of work.

- **CACGS school formal evaluation**

US: Does the school evaluate the effects of guidance programming?

TB: *"No, because we don't use it as a base tool, but it's there for support."*

The point highlighted by Teacher B once again demonstrates that PACE at the school is not a primary source for Career Guidance. Technology is used a complementary tool in the broader Career Guidance Programme. This was given as a reason for the lack of the system evaluation.

- **The perception by parents and learners against expectations**

US: What are the expectation from parents after the learners have done the assessment?

TB: *"Huge expectations, especially in this private school. The expectation is that money equals results. We have small classes, max 18, min 4. In our school, parents want engineering, mathematics and accounting, sometime kids can't necessary do those."*

The feedback from the LO head was not specific to the system as it became clearer that PACE was a secondary tool in the school's Career Guidance programme. However, what was clear and a cross cutting theme in all seven schools in this study was that some parents have high expectations when it comes to career selection by learners, and unfortunately at times the expectations are not aligned with the learner's capabilities nor interests.

- **Ease of CACGS use**

US: What are your perceptions of accessibility and ease of use of the system?

TB**:** *"Yes, it's easy to use. I mean the kids can manage pretty well. They find it ok, no one has ever raved about it, it's just ok."*

The system seems to be easy to use for the learners. The inference that can be made from the last sentence however, is that of an average rating by the users.

5.5.3 Online Career Guide

C High School

C High School, one of two co-ed schools in this study invested in the Online Career Guide as their computer based CACGS. The following were the responses from the school's head of Life Orientation (Teacher C), responsible for career guidance at the school, as per the selected themes:

- **Grade introduction and aim of CACGS**

  US: What are the specific aims of the CACGS and each component for the target age group/grade?

  TC: *"We prefer to use the Online Career Guide in Grade 9 and 11. In 9 because of subject selection for Grade 10 and Grade 11 because of university preparation. What we tend to see with our little ones, they tend to not take it seriously, whereas Grade 11s love this programme, with so many careers that they didn't know even existed, so an age plays a very important role*"

  Similar with other schools, the learners at C High school were introduced to the school's selected CACGS (Online Career Guide) in Grade 9. It also appears that after Grade 9, the learners once again interact formally with the CACGS in Grade 11 when they are further exploring careers that they may not have been exposed to. From the response above it can be concluded that the main aim of the CACGS in Grade 9 was to ensure that learners were well prepared for subject selection period in the transition between Grade 9 and 11. Moreover, for Grade 11 the aim is to ensure that learners are exposed to careers that are aligned to their interest.

- **The CACGS as a complementary tool**

  There was no clear indication from the interview that the school may be using other systems in collaboration with the Online Career Guide. However, the school's Life Orientation head in the informal introduction highlighted that the Online Career Guide is used during the Career Guidance module of the course in Grade 11 where learners are also expected to do careers research assignments from other sources as well. The Online Career Guide was the only system that was formally discussed in this study.

- **CACGS school formal evaluation**

US: Does the school evaluate the effects of guidance programming

TC: *"We have no formal evaluation, I would often login, and check what is new, what has changed. Example, the law degree now has changed, it's amazing how they keep the information up to date, you could clearly see that its kept up to date. We expect our learners as well to be kept up to date as this is their research point for their Life Orientation assessments in terms of career guidance.*

US: Would you consider changing the system?

TC: *"For me personally, as the HOD of LO, I'm open for change, I'm open for change, next year I will re-evaluate, I'm open for change. Every year we revise, if we find something better we will change, if its better"*

Once again, a constant theme across all schools in this study is the lack of a formal evaluation for the CACGS. Similar to other schools, the evaluation of the Online Career Guide was done informally by an internal school staff member, where there was no comparison between what the school seeks to achieve and the presented outcomes by the CACGS. However, it must be noted that when further probed about the possibility of changing the system, the Teacher C conceded that from an individual perspective, she is open to look at other systems. One of the key points that can be taken away from this answer is that it seems like the school's decision making regarding adopted CACGS lies with the Head of Life Orientation. Clearly, there is no formal evaluation strategy set in place for acquisition and evaluation of CACGS for the school.

- **The perception by parents and learners against expectations**

US: What are the expectation from parents after learners have done the assessment?

TC: *"The problem with some of the parents is that, they want to force learners to certain career paths. So, what this programme brings are dynamics like, your child doesn't like to be in an office environment, your child likes to be out there with people not with computer**.** Often parents came back and say, this was an eye opener, my son tells me he doesn't want to be a doctor and I didn't listen, but from personality wise, he is not interested in this. Sometimes parents say this is nonsense and they require a full in-depth assessment with an external psychologist. For us this is just a less expensive exercise to get a feeling of what your child would like to do."*

The experiences narrated by Teacher C on the parents' expectations highlighted that the system's report has an impact on how the parent perceives their child's future. The report may give outcomes that are contrary to what the parent expected, thus providing an opportunity for the child to pursue a career that is aligned more to his or her interests. The response also indicated that parents may not have full confidence on the systems' results based on their expectations, hence a third party alternative testing for some parents.

- **Ease of CACGS use**

  US: What are your perceptions of accessibility and ease of use of the system?

  TC: *"This programme is very easy to use, for both me and the learners."*

  On measuring the computer effect as per the definition in this study (the degree to which learners found interacting with the system rewarding) from the response it seems like the users were very satisfied by the Online Career Guide from this perspective.

5.5.4 Mindmuzik EAS

G High School

G High School, one of two co-ed schools in this study, invested in the Mindmuzik EAS as their computer based CACGS. The following were the responses from the school's psychologist, responsible for career guidance at the school, as per the identified themes:

- **Grade introduction and aim of CACGS**

US: What are the specific aims of the CACGS and each component for the target age group/grade?

TG: *"Firstly we start with the Grade 9s because they have to make subject choice for Grade 10. That is where it is very important, that is the first time where we would test them. Sometimes they also do it in primary school in Grade 7 when going to grade 8, but in high school we always do it in Grade 9, because now they have to make subject choices. In terms of what careers they want to follow. So that will be for to test for example* [should the learner take] *Maths or Maths Lit and Science or are they going to need Science or Drama, or any type of subjects they want to choose. So that is very important in Grade 9. Then, once again grade 11. We also test the learners or asses the learners because they have to make their choices in terms of their career, because next year the beginning of the year they have to apply to universities. Those are the grades we mostly work with."*

Similar to other schools in this study, the learners are introduced to Mindmuzik EAS in Grade 9 at G High school. Different from other schools though, there is an indication that the learners in this school might have encountered some form of career assessment in primary school through Mindmuzik EAS. The learners are also then exposed formally to the system in Grade 11 when selecting careers. Furthermore, Teacher G said this about the aims:

TG: *"The Grade 9 assessment specifically wants to provide the learners with the best possible subject that suits them. Grade 9 is focusing on subjects, and that will also help them regarding careers but it is not set in stone because the learners are still very young. They are still going to change. They often get to change choices, you can't tell a Grade 9 that you'll be an excellence doctor because the child can still change and later they might want to be something else, so Grade 9 is subject* [choice selection]. *In Grade 11, that's where we really focus on career guidance, what am I going to study, what type of career would suit me? Sometimes if they are struggling with the subjects, we would look at the stronger points."*

From the response above, it is clear that the school's aim in Grade 9 is to ensure that after completing their assessments, Grade 9 learners are able to select appropriate subjects for the senior phase of high school. It is interesting that it was highlighted that although these learners might have specific career interests at an early age, these are likely to change over time. The interview also highlights that the emphasis in Grade 11 is on self-knowledge and the selection of suitable career. In this interview, Teacher G also indicated that the report Mindmuzik-EAS generates does not only high light one career, but a range of careers that the learner should consider based on interests and competencies.

- **The CACGS as a complementary tool**

In all schools that were investigated in this study that have adopted Mindmuzik EAS, none of them seemed to have an alternative technology system to complement Mindmuzik EAS comprehensive tool.

- **CACGS school formal evaluation**

US: Does the school evaluate the effects of guidance programming?

TG: *"No, but from the feedback I get from the parents, it shows positive feedback. Indirectly assessed through seeing the learners who were recommended to careers that where in the report are currently pursuing those. It's not just a mechanical thing, as a psychologist you have to interpret, I put in a lot of effort in my assessments. I put effort and that's why if there are any concerns, they can come and*

talk to me. I want to ensure that my child chooses the best subject and the best career. It can be a human error if I don't do my work properly, because if I don't interpret it correctly it will cost the child, but I really put in effort to make sure this is the best possible option that I can recommend to them."

The school does not have a formal assessment method for Mindmuzik, however it relies on the psychologist's observation of learners' final career choice and the feedback from the parents. Again, in this case, it is difficult to see how the school measures the overall system outcomes against the set overall aims of Mindmuzik.

From the learners' perspective, a similar approach is taken when it comes to the evaluation of CACGS.

TG: *"…..learners will talk to me about the system, and say where they confused about the report here and there. This is the first time the kids come into contact with information like this, so my role is to clarify. But we don't formally assess the system."*

- **The perception by parents and learners against expectations**

US: What are the expectation from parents after the learners have done the assessment?
TG: *"Parents have specific needs, I will assess the learners and afterwards we'll meet parents and discuss results about concerns for example a learner taking Physical Sciences. Example: last parent was advised to take Mathematics and not Maths Lit*[eracy]*, but the mother said the child must take Maths Lit*[eracy]*, but I said no, based on the results, the learner is capable. Some parents believe that kids should take Mathematics, if they fail then they can move to Maths Literacy. In Grade 9, the focus is the subjects. In grade 11 parents want to know about careers more than subjects"*

In this instance, it seems like the parents' expectations on face value are similar to those of the schools, that in Grade 9, learners must be able to select subjects and in Grade 11 careers. As indicated by the school's psychologist the system report generated by Mindmuzik bring debating points where parents will have opposing views to those of the system assessments.

- **Ease of use CACGS use**

US: What are your perceptions of accessibility and ease of use of the system?

TG**:** *"This programme is very easy to use, for both me and the learners."*

On measuring the computer effect as per the definition in this study (the degree to which learners found interacting with the system rewarding) from the response it seems like the users are very satisfied by the Online Career Guide from this perspective.

- **Ease of use CACGS use**

US: What are your perceptions of accessibility and ease of use of the system?

TG**:** *"It's great, I also think the kids enjoy it more when they're doing it on tablets and PCs."*

On measuring the computer effect as per the definition in this study (the degree to which learners found interacting with the system rewarding) from the response, it seems like the users are very satisfied by the Online Career Guide. It should also be noted that the interviewee used the adjective *"enjoy"* when describing the feeling of the learners on the interaction with the computer or tablet instead of completing the assessments traditionally on paper.

5.6 Chapter summary

This chapter looked at the study results, both from a qualitative and quantitative perspective. The chapter started with a high level descriptive analysis, breaking down the data into four key comparative categories, satisfaction by schools, system, occupation and age. Results illustrated that learners from all schools positively rated their school's systems.

The data were also broken down according the study key questions, directly answering the impact of CACGS on learners' values, interests, abilities to an in-depth analysis of CAGCS ability to formulate a plan of action for pursuing desired careers. Factor analysis then followed, categorizing the survey questions according to Analysis, Synthesis, and Computer Effect, where results showed that it was likely that there is a statistical difference on the impact that the Grade has on Synthesis and Computer effect whereas it was unlikely that OAQ has any effect on any of the synthetic variables. In this chapter, a qualitative analysis of the interviews was also completed, getting insights on how different CACGS are implemented at school by teachers/school psychologists, the expectations of parents and how different schools examine the impact of adopted CACGS against the set aims.

6 Conclusion and recommendations

6.1 Conclusion

The study results provided additional support in literature that CACGS have a positive influence on learners during the period of choosing careers. In this case specifically, Mindmuzik EAS, JVR, Online Career Guide, and PACE have been proven to have a perceived positive impact on career decision making, particularly in the South African context. This was based on the positive evaluation by learners and the interview feedback from teachers and school psychologists.

Results of this study indicated that it is likely that there is a statistical difference on the impact that the learner Grade has on developing and evaluating career options and believing that one is being helped by a CACGS. This means that the Grade at which the learner is currently, has a lot to do with how the learner considers CACGS as having an impact on developing their career options and believing that they are being helped. Considering that the majority of the participants in this study were in the 9th Grade, this is highly likely as learners are going through a major schooling transition between secondary school and high school.

The following questions presented in Chapter 1 provide a detailed conclusion for this study.

a) Has the CACGS improved learner's career decision-making skills?

Results indicated that the use of Mindmuzik had a significant, positive impact on identifying and clarifying learners' values and interests, where no learners strongly objected nor disputed the system's ability to clarify these learner aspects. Although overall all CACGS were positively rated, it was worth noting that the JVR Strong Inventory system left most learners unsure about whether their values and interests were clarified or not.

b) Has the CACGS clarified learner's values, interest, and abilities?

Results also revealed that learners strongly believed that evaluated CACGS, JVR Strong Interest Inventory, Mindmuzik, Online Career Guide, and PACE played a key role in determining careers aligned to values, ability and interests. Where, Mindmuzik EAS and PACE were the systems with high ratings. This was also confirmed by looking at the Occupational Alternative Questions results that revealed that 84% of learners who evaluated PACE and 75% of learners who evaluated Mindmuzik EAS had certainty about their first-choice career options

c) Has the CACGS helped the learner to acquire an understanding of the world of work?

Similarly, in answering this question, results suggested that PACE and Mindmuzik systems were considered as systems that enable learners to understand more about the world of work. While JVR Strong Interest Inventory

and the Online Career Guide were considered as weak systems by the learners when it comes to enabling them to understand how the world of work operates in the learner's desired career paths. The study concluded that this might be as a result of Mindmuzik and PACE having better occupational databases, where the learners can get more information not only about careers aligned to interests and abilities but also a better understanding of what happens in these careers in terms of career demand, amount of free time and even further education requirements and demands.

d) Has the CACGS assisted the learner to understand the personal demands of the world of work and the needs of significant others so as to make an optimal occupational choice?

While the systems were largely positively rated, learners who evaluated PACE and Mindmuzik systems highly rated these systems in their ability to shed a better understanding about the demands associated with the potential occupational choice.

e) Has the CACGS helped in formulating a systematic plan of action to implement the learner's occupational choice?

Overall, it can be concluded that the evaluated CAGS do have the capability of identifying important milestones that a learner must achieve to pursue their desired or recommended career path. Learners strongly suggested that PACE and Mindmuzik were able to identify important milestones to achieve in attaining a desired career e.g. educational degrees, training, or licenses.

On the use and implementation of CACGS, the study also found five key themes based on all interviews that were carried with teachers and school psychologists.

a. Grade introduction and aim of CACGS

Results indicated that the majority of schools start to introduce learners to CACGS in the 9th Grade. While there are varying reasons for the introduction of CACGS in the 9th Grade, primarily all schools are preparing their learners for the secondary phase of high school, hence the emphasis on the examination self-awareness and understanding of one's capabilities at this stage. These evaluations are largely aimed at ensuring that learners select the correct subjects that are aligned to their career interests and capabilities.

b. The CACGS as a complementary tool

As Fowkes and McWhirter (2007) argued that a comprehensive Career Guidance program is a combination of written exercises, individualized interpretation and feedback, information on the world of work,

modeling, and attention to building support, this study found that schools are not using CACGS in isolation. Where the CACGS has no comprehensive battery of tests, schools opt for multiple sources for Career development to ensure that learners are given a well-rounded opinion about their capabilities and desired career paths. Schools that used Mindmuzik had the least diverse programs in terms of tools that are used for Grade 9 in Life Orientation. This is based on Mindmuzik EAS comprehensive battery of tests that examines learner interests, personality types and up to subject capabilities.

c. CACGS formal evaluation

The results in this study revealed that not a single school has a formal CACGS evaluation method. All schools either rely on the teacher's subjective evaluation or no formal evaluation of the system is done at all.

d. The perception by parents and learners against expectations

Research results revealed that there are high expectations by parents on which careers paths their children should follow. However, the results produced by CACGS can be contrary to what parents expect and desire for their children. Parents take different measures after reports are generated and presented to them, other groups opt for external third party opinions while other parents come to a realisation of their children's capabilities versus the parent's desired careers.

e. The ease of CACGS use

All schools' interviews showed that the adopted CACGS by schools are intuitive and easy to use by both teachers and learners. Furthermore, where required, the CACGS providers have stand by support to assist the teachers.

6.2 Recommendations

There are numerous studies on the evaluation of CACGS, specifically on European and American developed CACGS that are used in the university context. Studies based on the evaluation, implementation and use of CACGS in the South African context were found to be non-existent, even more so in the high school context. This study adds to the understanding of the use of CACGS in South African high schools. Discussions in the current thesis have raised further questions for example, about some CACGS ability to determine accurately learner values or interests, and CACGS ability to systematically plan for their careers. Several of these questions should be considered as topics for future research. Research topics, addressed in the form of questions are listed below.

1. How can schools evaluate the impact of CACGS in relation to the set school's CACGS aims?

2. What influence does socio-economic background and gender have on the perceptions of learners on CACGS?

3. Does the mode in which a CACGS is used (e.g. as a complementary tool or on its own) have an impact on the perception of CACGS as a useful tool in Career Guidance?

4. Do learners follow the recommendations of careers that are given by CACGS in high school at university students?

This study set out to examine how learners perceived Computer Assisted Career Guidance Systems in seven high schools that are based in Gauteng, South Africa. The research was also concerned with how schools implement these Computer Assisted Career Guidance Systems. Similar to the reviewed literature, the findings showed a general acceptance and satisfaction of CACGS by learners, where the learners' Grade has an impact on their perceptions of CAGCS. Where CACGS are used with either another system or in collaboration with other initiatives that seeks to create career awareness in Career Guidance. The study also revealed that schools do not have a formal CACGS evaluation method. All schools either rely on the teacher's subjective evaluation or no formal evaluation of the system is done at all. The thesis results also revealed that there are high expectations from parents on which careers paths their children should follow. However, the results produced by the CACGS can be contrary to what parents expect and their children's career desires.

7 Bibliography

August, J. (2011, April 25). *Character Personality type*. Retrieved May 20, 2015, from Comicvine: http://www.comicvine.com/profile/the_psyentist/blog/what-is-your-characters-personality-type/68258/

Babbie, E. (2007). *The practice of social research* (Vol. 11th Edition). Belmont: Thomson Wadsworth.

Barrick, M., Parks, L., & Mount, M. (2005). Self monitoring as a moderator of the relationships between personality traits and perfomance. *Personnel Psychology, 58*, 745-767.

Careers, P. (2016, January 6). *Home*. Retrieved from PACE Career Centre: http://www.pacecareers.com/index.html

Collins, A., & Halverson, R. (2009). *Rethinking Education in the age of technology.* New York: Teachers College Press.

Collins, A., & Halverson, R. (2010). The second educational revolution: rethinking education in the age of technology. *Journal of Computer Assisted Learning, 26*(1), 18-27.

Crossland, L. (2006). *The development and evaluation of a career guidance centre for historically disadvantaged learners in Zululand, South Africa.* KwaZulu Natal: Univarsity of Zululand.

Crossland, L., & Ebersohn, E. (2003). Career counselling in disadvantaged schools in the 21 st century. *University of Zululand Joumal of Psychology,*(19), 36-49.

De Klerk, F. W. (2012, October 17). *Unequal-societies-world*. Retrieved May 7, 2015, from Global Education Magazine: http://www.globaleducationmagazine.com/south-africa-unequal-societies-world/

Discover. (2015, January 1). *Education*. Retrieved May 12, 2015, from Act website: http://www.act.org/discover/

Fiske, E., & Ladd, H. (2003). *Balancing Public and Private Resources for Basic Education: School Fees in Post-Apartheid South Africa.* Durham: Terry Sanford Institute.

Fowkes, K., & McWhirter, E. (2007). Evaluation of Computer-Assisted Career Guidance in Middle and Secondary Education Settings: Status, Obstacles, and Suggestions. *Journal of Career Assessment, 15*(3), 338-400.

Fretwell, D., & Watts, A. (2004). *Public Policies For Career Developmwne.* World Bank.

Gati, I. (1994). Computer Assisted Career Councelling: Dilemas, Problemsand Possibilities. *Journal of Counseling & Development, 73*, 51- 56.

Guidance, O. C. (2014). *About us*. Retrieved from Online Career Guidance: http://www.onlinecareerguidance.co.za/AboutUs.aspx

Harris-Bowlsbey, J. (2013). Computer Assisted Career Guidance Systems: A part of NCDA history. *The Career Development Quarterly, 61*(1), 181-185.

Harris-Bowlsbey, J. (2013). Computer Assisted CareerGuidance Systems: A partof NCDA History. *Career Development Quarterly, 61*(2).

Itamar Gati, N. S. (2001). Should I use a computer-assisted career guidance system? It depends on where your career decision making difficulty lie. *British Journal of Guidance & Counselling, 29*(3), 301-320.

Jacobs, A. (2011). Jacobs, ALife Orientation as experienced by learners: aqualitative study in NorthWest Province. *South African Journal of Education, 31*(1), 212-223.

Johnson, R., & Wichern, D. (2007). *Applied Multivariate Statistics Analysis.* New Jersey: Printice-Hall.

Kay, L., & Fretwell, D. (2003). *Public Policies and Career Development: a Framework for the Design of Career Information, Guidance and Counselling Services in Developing Countries: Country Report on South Africa.* Washington DC: World Bank.

Keller, G., & Warrack. (2003). *Statistics for Management and Economics.* Cincinnati: South Western College Publisher.

Kristyn, M., & Fowkes, M. (2007). Evaluation of Computer-Assisted Career Guidance in Middle and Secondary Education Settings: Status, Obstacles and Suggestions. *Journal of Career Assesment, 15*(3), 388-400.

Lentz, J., Reardon, R., & Sampson, J. (1991). *Holland's Theory and Effective Use of Computer-Assisted Career Guidance Systems: Technical Report 12.* The Florida State University, Department of Human Services and Studies. Florida: Center for the Study of Technology in Counseling.

Lokan, J., & Fleming, M. (2003). Issues in adapting a computer-assisted career guidance system for use in another country. *Language Testing, 20*(2), 167-177.

Maduakolam, I. (2000). Career Development Theories and Their Implications for High School Career Guidance and Counceling. *The High School Journal, 83*(2), 28-40.

Maxwel, J. (2008). Designing a qualitative study. In L. Bickman, & D. Rog, *The Sage handbook of applied social research methods* (pp. 214 - 252). London: Sage.

Morehouse, R., Farley, F., & Youngquist, J. (1990). Type T Personality and the Jungian classification system. *Journal of personality assessment, 54*(1), 231-235.

Mount, M., Barrick, M., Scullen, S., & Rounds, J. (2005). Higher order dimensions of the big five personality traits and the big six vocational interest types. *Personal Psychology, 58*, 447-478.

Muroyama, H. (2002). *Development of a Computer-Assisted Career Guidance System.* The Japan Institute for Labour Policy and Training.

Osborn, D., & Baggerly, J. (2004). School Counselor's Perceptions of CareerCounseling and Career Testing: Preferences, Priorities, and Predictors. *Journal of Career Development, 31*(1), 45-59.

Peterson, G., Ryan-Jones, R., Sampson, J., Reardon, R., & Shahnasarian, M. (1987). *A comparison of the Effectiveness of Three Computer-Assisted Career Guidance Systems on College Student's CareerDecision Making Pocesses: Technical Report No. 6.* The Florida State University, Department of Human Services and Studies. Florida: Center for the Study of Technology in Counceling and Career Development.

Phares, E. (1991). *Introduction to personality.* (3. edition, Ed.) Harper Collins Publishers.

Psychometrics, J. (2015, November 16). *Assessments*. Retrieved from jvrpsychometrics: https://www.jvrpsychometrics.co.za/

Reynaldo, J., & Santos, A. (1999). Cronbach's Alpha: A Tool for Assessing the Reliability of Scales. *The Journal of Extension, 37*(2).

Roberts, B., Kuncel, N., Shiner, R., Caspi, A., & Goldberg, L. (2007). The power of personality: The comparative Validity of Personality Traits, Socioeconomic Status, and Cognitive Ability for Predicting Important Life Outcomes. *Perspectives on psychological science, 2*(4), 313-345.

Sampson, J. (1993). *Current status and future potential for evaluating the design and use of Computer Based Career Information Delivery Systems in the United States: Technical Report Number 17.* Center for the Study of Technology in Counseling and Career Development. Florida: Florida State University.

Seeger, B. (1988). *The effect of using a computer assisted career guidance system on career development attitudes, knowledge, and behaviors in students.* Iowa State University.

Stead, G., & Watson, M. (1999). *Career psychology in the South African context.* Pretoria: J.L. van Schaik.

Taber, B., & Darrell, L. (1999). *A comprehensive Review of Research Evaluating the Effectiveness of Discovery in Promoting Career Development.* ACT.

The Myers & Briggs Foundation. (2016). *MBTI Basics*. Retrieved from Myers Briggs: http://www.myersbriggs.org

The South African Qualification Authority. (2012). *An Environmental Scan of Career Advice Services in South Africa* . Waterkloof: The South African Qualifications Authority.

Titus, S. (2011). *The relationship between self-selected personality characteristics and preferences for job features, organisational features and career goals.* Cape Town: University of Cape Town.

Valprint. (2015, April 20). *Sigi3*. Retrieved May 13, 2015, from Valprint Website: http://www.valparint.com/

Van Deventer, K. (2008). Perception of Life Orientation teachers regarding the implementation of the learning area in Grade 8 and 9: A survey in selected Western Cape Schools. *South African Journal for Research in Sport, Physical Education and Recreation, 30*(2), 131-146.

Watts, A., & Kidd, J. (1991). PROSPECT (HE): An evaluation of user responses. *British Journal of Guidance & Counselling, 19*(1), 66.

Yong, A. G., & Sean, P. (2013). A Beginners Guide to Factor Analysis: Focusing on Exploratory Factor Analysis. *Tutorials in Quantitative Methods for Psychology, 9*(2), 79-94.

8 Appendices

a. Computer Assisted Career Guidance Learner Evaluation Form

Date: _____

Grade: _____

Age: _____

1. System evaluated: _____
2. List all occupations you are considering right now: _____
3. Which occupation is your first choice? (If undecided, write undecided) _____
4. How well satisfied are you with your first choice? [circle option]
   a. Well satisfied with choice
   b. Satisfied, but have a few doubts
   c. Not sure
   d. Dissatisfied and intend to change
   e. Undecided about my future career

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Does Not Apply
	Question	**1**	**2**	**3**	**4**	**5**	**6**
1	The system helped me to learn much more about several occupations						
2	The system was helpful in showing me whether I needed more information about occupations before making career decisions						
3	Using the system was like was like talking to a career councilor						
4	The system presented logical career options given my values, interests, and abilities						
5	The system helped me to understand the rewards potential occupations offer, such as salary, interesting work, prestige, variety, and challenge						
6	I felt the system understood my career problems						
7	I have learnt about some new educational programs as a result of using the system						
8	The system helped me feel confident that I would find most of occupations satisfying						

9	The system satisfied me with the variety of career options it gave me to consider						
10	The system helped me to become more familiar with the educational requirements of potential occupational choices						
11	The system was helpful in accurately clarifying my values						
12	The system helped me to feel more hopeful of finding a satisfying occupation						
13	I can seriously consider most of the occupations the system suggested						
14	My family or friends would like would like the outcomes suggested by the system						
15	The system satisfied me with the number of career options it gave me to consider						
16	The system was helpful in accurately clarifying my interests						
17	The system was helpful in showing me whether I need more information about myself before making career decisions						
18	The system helped me understand the demands associated with potential occupational choices, such as amount of free time, vacations, and continuing education						
19	The system answered most of my career questions to my satisfaction						
20	The system helped me to identify important milestones to achieve in attaining a career, such as educational degrees, training, or licenses						
21	The system helped me better understand how the world of work is organized						
22	I understand myself better now						
23	I felt better about my career after I used the system						

24	The systems helped me become more confident of being able to choose a satisfying occupation						

b. Computer Assisted Career Guidance evaluation questions for teacher

Date: _____

School: _____

Role at the school: _____

System evaluated: _____

Underpinning theory of the school's system: _____

1. Tell me a bit about your role at the school
2. What are the specific aims of the CACGS and each component for the target age group/grade?
3. What is the recommended dosage per component?
4. How should learners be different after using the system?
5. How is the system utilized at the school?
6. In your experience, has the use of CACGS improved leaner's career decision-making skills?
7. Does the CACG help in formulating a systematic plan of action to implement leaner's occupational choice?
8. What are the Career Guidance personnel/teacher's perceptions of accessibility ease of use, and effects of the system?
9. What are the learner's perceptions of the effects of the system? If possible according to their personality types.
10. What goals or benchmarks is the school trying to achieve with its career guidance program and with the CACGS?
11. What are the Career Guidance parent's perceptions of effects of the system?
12. What do parents expect their children to gain from the school's Career Guidance curriculum?
13. How do those goals fit together with the goals of the CACGS?
14. What curricular and technological supports are in place for system usage?
15. Does the school evaluate the effects of guidance programming?

c. Ethics consent form for learners

Project Title: Evaluation and comparison of South African private schools use of Computer Assisted Career Guidance Systems: Analysis, Synthesis and Computer effect

Researcher: Unathi September

I volunteer to participate in a research project conducted by **Unathi September** from the University of Cape Town. I understand that this research project is designed to study Computer Assisted Career Guidance Systems in South African schools.

As a learner at (**institution name**)

_____, I understand that I am being invited to take part in a survey and. I understand that in agreeing to participate:

- My participation is voluntary. I understand that I will not be paid for my participation.
- The survey will take approximately 20 minutes to complete.
- I understand that the researcher will not identify me by name in any reports using the information obtained from the survey. My confidentiality as a participant will remain secure. Subsequent uses of data will be subject to standard data use policies which protect anonymity of individuals and institutions.
- If I choose to be interviewed, I have the right to view and comment on the transcribed interview data before the findings are analysed.
- I have read and understood the participant information sheet provided to me. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study.
- I have been given a copy of this consent form.

I hereby agree / disagree (check the applicable option) to participate in the survey for this study.