

**EXPLORING UNDERUTILISATION OF LOCAL CRIMINAL RECORD CENTRE FOR
FINGERPRINTS INVESTIGATION IN SECUNDA**

By

COLLEN TAMBANI

Submitted in accordance with the requirements

For the degree

MAGISTER TECHNOLOGIAE

In the subject

CRIMINAL JUSTICE

At the UNIVERSITY OF SOUTH AFRICA

SUPERVISOR: DR. DQ MABUNDA

DECLARATION

I am hereby declaring that EXPLORING UNDERUTILISATION OF LOCAL CRIMINAL RECORD CENTRE FOR FINGERPRINTS INVESTIGATION IN SECUNDA is the work I have don by myself and the sources that I have been using or cited I have indicated them as well as acknowledged them in a way of complete references.



COLLEN TAMBANI

2021-10-14

ACKNOWLEDGEMENT

Firstly, allow me to appreciate the Lord for the grace, for his guidance as well as the strength he has given me while busy with my studies.

- I also would like to show my deepest expression to the only supervisor, Dr D.Q. Mabunda with his professional leadership skills and his willingness to assist me with my studies.
- Special thanks to my mother ELISA MAMUNANA, my children, my brothers and sisters for their endless support and encouragement through many challenges that I encountered in the journey of my life and my studies. If it was not for my mother, I would not have finished at all.
- To my participants, thank you for your willingness to help me in the interviews and for sharing your knowledge.
- Lastly, to the SAPS management as well as the institution, by granting me the permission to conduct the research has not gone unnoticed.

May the heavenly Lord abundantly bless you further.

DEDICATION

Dear Mama

I am dedicating this dissertation to you. You raised me as a single mother together with my siblings. Not forgetting you dear friends and family.

To all my colleagues in the CR and CSM as well as men and woman in the blue uniform, I dedicate the dissertation to you.

This mini dissertation is as well dedicated to all the South Africans at large as well as those who want to follow the Forensic career path.

LIST OF FIGURES

Figure 2.7.1: Plain and Tented arch	Page 37
Figure 2.7.2: Whorl pattern	Page 38
Figure 2.7.3: Radial and Ulnar loop	Page 38
Figure 3.3: AFIS components	Page 38

CERTIFICATE BY EDITOR

22 March 2022

Email: vic@humboldt.ac.uk

Cell: 004996319

Declaration of professional edit

This letter serves to confirm that

Exploring Underutilisation of LCRC for Fingerprints Investigation in Secunda

A study by
Collen Tambani

was submitted for editing.

I declare that I have edited and proofread this document. The process involved line or copy editing and structural editing.

The project was professionally edited with the use of track changes and suggestions in the document. The author's intents were not altered during editing. It is the student's responsibility to submit the edited version of the work. The author has the prerogative to accept, reject or change amendments made by the editor before submission.



Humbulani Victoria Tshiguxho

vic@humboldt.ac.uk

vic@humboldt.ac.uk

vic@humboldt.ac.uk

vic@humboldt.ac.uk

vic@humboldt.ac.uk

Professional Editors' Guild- T581001 (Associate Professional Editor)

LIST OF ABBREVIATIONS AND ACRONYMS

AFIS	:	Automated Fingerprint Identification System
CAS	:	Case Administration System
CCCF	:	Crime Combat Committee Forum
CSC	:	Community Service Centre
CRC	:	Criminal Record Centre
CR & CSM	:	Criminal Record and Crime Scene Management
CRIM	:	Criminal Record Information Management
CSI	:	Crime Scene Investigator
DNA	:	Deoxyribonucleic acid
FIPS	:	Fingerprint Identification Profiling System
FSL	:	Forensic Science Laboratory
HANIS	:	Home Affairs National Identification System
HRD	:	Human Resources Development
IAFIS	:	Integrated Automated Fingerprint Identification system
LCRC	:	Local Criminal Record Centre
PFMA	:	Public Finance Management Act
SAPS	:	South African Police Service
UNISA	:	University of South Africa

ABSTRACT

The responsibility of the Local Criminal Record Centre (LCRC) in the South African Police Service (SAPS) is to provide evidence in court by means of fingerprints obtained from the crime scene. When the LCRC is not utilised accordingly, justice is compromised, and criminals run free in the streets. The LCRC is not fully performing its responsibility as per its mandate due to unforeseen hindrances that come into play during the reporting of a crime. Research is necessary to uncover such hindrances.

The main reason in this research was to explore the underutilisation of the LCRC for fingerprint investigation in Secunda. The focus was on exposing the setbacks or causal factors of the underutilisation of the LCRC in order to address them for the improvement of the utilisation of the LCRC at crime scenes. The research sought to highlight importance of LCRC in the crime investigation. It is as well to emphasise the need for SAPS to activate the LCRC where fingerprint collection is required at the crime scene.

The motivation of this study is that the LCRC, Client Service Centre (CSC), Crime Prevention, the Department of Justice and the community at large might not be aware of all the hindrances of the LCRC in performing its duty. This follows the fact that during the Crime Combat Committee Forum (CCCCF), the commander of the LCRC is also expected to address the problem of the underutilisation of the unit to the station commanders. The station commanders should therefore address the issue with the shift commanders in order to alert the members about the importance of fingerprints in the crime scene investigation. They should consider fingerprint department each time when fingerprints are needed.

This study used qualitative research approach in interviews which were used as a method to data collection. The sample was composed of 40 participants sampled from the three sub-branches of the SAPS which are CSC, Crime Prevention, and LCRC (forensic experts).

This study explored the underutilisation of the LCRC at crime scenes. The study was able to pinpoint setbacks and also came up with suggestions on how the utilisation of the LCRC for fingerprints investigation can be improved. Through the themes that

emerged during data analysis, this study found out that there is little knowledge and a pressing need for awareness that should focus on the meaning, importance and necessity of fingerprints during the investigation of crime.

The study realised that justice is a constitutional right for all. If the LCRC could be fully utilised as per the recommendations of this study, then the successful prosecution and justice could be obtained for all.

KEY WORDS: Crime scene; Physical evidence; Identification; Fingerprints; Individualisation.

TABLE OF CONTENTS

DECLARATION.....	i
ACKNOWLEDGEMENT	ii
DEDICATION	iii
LIST OF FIGURES	iv
CERTIFICATE BY EDITOR.....	v
LIST OF ABBREVIATIONS AND ACRONYMS.....	vi
ABSTRACT	vii
CHAPTER 1: GENERAL ORIENTATION.....	1
1.1 INTRODUCTION	1
1.2 PROBLEM STATEMENT	1
1.3 AIM OF THE RESEARCH	2
1.4 PURPOSE OF THE RESEARCH.....	3
1.5 RESEARCH QUESTION	4
1.6 KEY THOERITICAL CONCEPT.....	4
1.6.1 Crime scene.....	5
1.6.2 Physical evidence	5
1.6.3 Identification.....	5
1.6.4 Fingerprint	5
1.6.5 Individualisation	5
1.7 VALUE OF THE RESEARCH.....	5
1.7.1 Value to the first participants.....	6
1.7.2 Value to the academic community	6
1.8 PRELIMINARY LITERATURE REVIEW.....	7
1.8.1 Physical evidence	7
1.8.2 Crime scene.....	8
1.8.3 Fingerprint	9
1.8.4 Identification.....	9
1.8.5 Individualization	9
1.9 RESEARCH DESIGN AND APPROACH	10
1.9.1 Research design.....	10
1.10 TARGET POPULATION.....	12
1.11 SAMPLING	13
1.12 DATA COLLECTION	14

1.12.1 Literature review	15
1.12.2 Interviews.....	16
1.13 DATA ANALYSIS	18
1.14 METHODS USED TO ENSURE VALIDITY	20
1.14.1 Credibility.....	20
1.14.2 Transferability.....	21
1.14.3 Dependability	21
1.14.4 Conformability	21
1.15 METHODS USED TO ENSURE RELIABILITY	21
1.16 ETHICAL CONSIDERATION.....	22
1.16.1 Protection from harm.....	23
1.16.2 Informed consent.....	23
1.16.3 Right to privacy	24
1.16.4 Approval to conduct research.....	24
1.17 SUMMARY.....	24
CHAPTER 2: FINGERPRINT IDENTIFICATION	25
2.1 INTRODUCTION.....	25
2.2 FINGERPRINT	26
2.2.1 Fingerprint Identification.....	27
2.3 THE ROLE OF THE CRIMINAL RECORD CENTRE (CRC).....	28
2.3.1 Criminal Investigation.....	29
2.3.2 Objective of criminal investigation.....	30
2.3.3 Identification.....	31
2.3.4 Individualization	32
2.4 THE SIGNIFICANCE OF FINGERPRINT EVIDENCE IN THE HOUSEBREAKING INVESTIGATION	33
2.5 TECHNIQUES USED TO LOCATE FINGERPRINT	34
2.5.1 The powdering techniques.....	34
2.6 WHAT DOES FINGERPRINT IDENTIFICATION ENTAIL?	35
2.6.1 How can fingerprints be identified?	36
2.7 FINGERPRINT PATTERNS.....	37
2.7.1 Arches.....	37
2.7.2 Whorls	37
2.7.3 Loops.....	38
2.8 SUMMARY.....	38

CHAPTER 3: THE IMPORTANCE OF AUTOMATED FINGERPRINT INVESTIGATION SYSTEM IN IDENTIFYING THE SUSPECT	40
3.1 INTRODUCTION.....	40
3.2 AUTOMATED FINGERPRINT IDENTIFICATION SYSTEM (AFIS).....	40
3.2.1 Identification practices prior to AFIS.....	42
3.2.2 The purpose of using AFIS.....	43
3.2.3 Why fingerprint-based check is important (Validation).....	43
3.3 AUTOMATED FINGERPRINT IDENTIFICATION COMPONENTS	43
3.4 AFIS CHALLENGES IN THE SOUTH AFRICAN POLICE SERVICE	44
3.5 THE IMPORTANCE OF AFIS IN THE SOUTH AFRICAN POLICE SERVICE	45
3.5.1 The strength of AFIS	46
3.5.2 The weakness of AFIS	46
3.5.3 The tracing and counting of ridges in making AFIS identification	47
3.5.4 The significance of CRIM (Criminal Record Identification Management) System in AFIS	47
3.5.5 The importance of AFIS training within the Criminal Justice System	48
3.5.6 Missed identification AFIS.....	48
3.5.7 Best practices to improve identification in AFIS.....	49
3.6 SUMMARY.....	50
CHAPTER 4: PRESENTATION AND INTERPRETATION OF RESEARCH FINDINGS.....	51
4.1 INTRODUCTION.....	51
4.2 EMERGING THEMES	51
4.2.1 Theme 1: Investigative procedures and processes.....	51
4.2.2 Theme 2: Criminal investigation	52
4.2.3 Theme 3: Giving fingerprint evidence in court.....	52
4.2.4 Theme 4: Fingerprint identification	53
4.2.5 Theme 5: Investigating house breaking cases.....	54
4.2.6 Theme 6: Significance of fingerprint evidence	54
4.2.7 Theme 7: Understanding the term “Individualization”.....	55
4.2.8 Theme 8: Physical evidence.....	56
4.2.9 Theme 9: Types of fingerprints	57
4.2.10 Theme 10: Techniques used to locate fingerprints	57
4.2.11 Theme 11: Automated Fingerprint Identification System (AFIS)	58
4.2.12 Theme 12: Significance of AFIS to link suspects.....	59
4.3 SUMMARY.....	59
CHAPTER 5: SUMMARY, RECOMMENDATIONS AND CONCLUSION.....	61

5.1	INTRODUCTION	61
5.2	SUMMARY OF THE CHAPTERS	61
5.2.1	Summary of Chapter 1	61
5.2.2	Summary of Chapter 2	62
5.2.3	Summary of Chapter 3	62
5.2.4	Summary of Chapter 4	62
5.3	FINDINGS	62
5.4	PRIMARY FINDINGS	62
5.4.1	Research question 1: How can utilisation of fingerprints investigation be improved in a crime scene?	62
5.5	SECONDARY FINDINGS	63
5.5.1	Fingerprint	63
5.5.2	Fingerprint identification	64
5.5.3	Latent print	64
5.5.4	The role of the Criminal Record Centre	64
5.6	CRIMINAL INVESTIGATION	65
5.6.1	Objectives of Criminal investigation	65
5.6.2	Identification	65
5.6.3	Individualisation	66
5.6.4	The significance of fingerprint evidence in the housebreaking investigation	66
5.6.5	Techniques used to locate fingerprint	66
5.6.6	The powdering techniques	66
5.6.7	What does fingerprint identification entail?	67
5.6.8	How can fingerprints be identified?	67
5.6.9	Fingerprint patterns	67
5.7	RECOMMENDATIONS	67
5.8	CONCLUSION	68
	LIST OF REFERENCES	70
	ANNEXURE A: INTERVIEW SCHEDULE FOR SAMPLE A, B AND SAMPLE C	79
	ANNEXURE B: APPROVAL TO CONDUCT RESEARCH	87
	ANNEXURE C: UNISA ETHICAL CLEARANCE	88
	ANNEXURE D: TURN-IT-IN REPORT	90
	ANNEXURE E: UNISA COVID-19 POSITION STATEMENT ON RESEARCH ETHICS	91

CHAPTER 1: GENERAL ORIENTATION

1.1 INTRODUCTION

The researcher intended to conduct a study about the underutilisation of Local Criminal Record Centre (LCRC) for fingerprints investigations in Secunda. Some scenes of crime get contaminated before the arrival of the fingerprint expert. The primary responsibilities of LCRC fieldworkers on crime scenes are to search, locate, locate, collect, and safe keep physical evidence for analysis and possible presentation of such evidence during a subsequent trial Maneli (2018:1). The first responder on the crime scene which can lead to linking the suspect to the scene of a crime. Most police officers who responded to crime scenes, e.g., housebreaking and theft, failed to inform the complainants that LCRC will visit the crime scene with the purpose of collecting evidence such as fingerprints.

Upon arrival of the fingerprint expert at the scene of crime, they find such place is already cleaned, and the complainant was not informed. At some point the LCRC is not even summoned at all to the crime scene. The first responders in these cases are the Community Service Centre (CSC) patrol police members. The researcher had asked at least 40 members to participate in the study, (client service centre members, LCRC members and crime prevention members). These participants were interviewed by the researcher telephonically. Covid-19 restrictions made it impossible for face-to-face interviews. The researcher is an experienced fingerprint expert working in the LCRC. The main focus in this study was therefore on exploring the significance of fingerprint in the crime investigation.

1.2 PROBLEM STATEMENT

Welman, Kruger and Mitchell (2005:14) explained that a problem statement is a complication experienced by the researcher in either a situation of practical as well as theoretical in a manner that he or she would want to solve such difficulty. Leedy and Ormrod (2010:44) added that the initial requirement of the process of the research was to make sure the problem with unwavering lucidity and to indicate it in exact it in exact and mistakable terms.

According to Case Management System, cases registered the Secunda cluster, out of the 5000 (five thousand) cases (housebreaking and theft) reported at the police during the period of 1 January 2018 until 1 April 2018, only 3500 (three thousand five

hundred) cases had possible physical evidence collected by LCRC fieldworkers from the crime scene. Out of 5000 (five thousand) cases reported, LCRC fieldworkers were only activated on 3600 (three thousand six hundred) cases according to the LCRC case register. The LCRC was measured on a hundred percent utilisation in attending to cases. Based on the number of cases reported and cases attended by the LCRC, it was clear that the stations were not reporting cases to the LCRC, for example housebreaking and theft cases.

LCRC fieldworkers are primarily responsible for recording the crime scene, search, and collect possible physical evidence. Ideally, the LCRC should be activated immediately to cases that require the attention of the LCRC once the case is reported to the police. LCRC fieldworkers should respond immediately on receiving the case according to South African Police Service (2003).

Station commanders meet every Wednesday to discuss scene statistics and any other problems that arise with regard to crime and attending crime scenes, but it does not seem like the station commanders are addressing issues that are discussed during the commanders' meeting at the station level. The researcher wanted to find out why LCRC is underutilised for fingerprints investigation.

It was important to conduct the research to encourage, enforce and ensure that the first responders to crime scenes make the complainant aware of the use of LCRC fieldworkers in processing crime scenes for physical evidence such as fingerprint in order to individualise a suspect. The researcher had focused on how LCRC fingerprint expert investigation could be improved to assist in searching and locating fingerprints that they may have found at the scene of a crime as evidence and used to individualise a suspect.

1.3 AIM OF THE RESEARCH

According to Oliver (2013:102), the aims of the research are one of the most important attributes of research. Oliver also stated that aims of the research essentially an expression of what you will want to achieve from the research you have conducted.

De Vos, Strydom, Fouché and Delport (2011:94) explained the 'objective', 'purpose', 'goal' and 'aim' as those are always used by researcher correspondent as meaning for one another. Both authors continued and explained that the goal, purpose or aim

are viewed as the results desired for something that one has plans to do or achieve, while on the other side some objectives are refers to the researcher's steps that he or she has to take, by beginning at the basic level, as well as within specific time frame, so that the desired results can be reached or achieved as planned by the researcher. In this research, the researcher referred to the aim of the research result desired and wished to accomplish. The aim of this study is to explore the underutilisation of LCRC for fingerprints investigations in Secunda cluster.

1.4 PURPOSE OF THE RESEARCH

According to the Concise Oxford Dictionary (2007:948), the 'purpose' was defined as "something that exists or soothing that is done". Creswell (2014:123) refers to Locke, Spirduso and Silverman (2013) by stating that the purpose of the statement indicates the reason you want to conduct the study and what you wished to achieve.

The reason behind research was the willingness to solve problem in a practical manner or to better the procedure. Welman, Kruger and Mitchell (2012:23) explained that to conduct researcher and put it into theory as well as other problems of the research, is to define, consequently explain and predict even to modify or control the human behaviour, events and its product. Babbie and Benaquisto (2010:92) stated the most important three purpose of the research as explanation, description and exploration that should be separately examined due to them being implicated differently for other aspects of the research design. According to Henning, Van Rensburg and Smit (2011:1), research purpose had an influence for certain methods used for data analysis and data collection. Based on the above indicated definition, the purpose of this study are as follows:

- To evaluate the underutilisation of LCRC for fingerprints in the investigation of crime.
- The development of best practice, stated by Denscombe (2002:27), by addressing and make recommendations to a problem that are practical by making use of fingerprint as evidence in the court of law.
- To reach to the recommendations to have better practice on the significance of fingerprint in the investigation of crime that can enhance the performance of members of the SAPS in certain crime scene.

- To develop the awareness in the importance of the fingerprint as well as to help the investigators with well-informed ideal required skills in the use of fingerprint in the investigation of crime.

1.5 RESEARCH QUESTION

Bless, Higson-Smith and Sithole (2015:71) said that the beginning of the research question is the determination of the type of research in the entire study, the research design, the manner in which the sample is created, the manner in which the data is collected and analysed, and finally the manner in which the results are reported. According to Denscombe (2002:31), research questions identify clearly what is to be investigated; they are investigated by the research directly; and are noticed, even and cross-examined in order to shed light on the wide topic. Jansen (2014:3) certify that research questions state what fascinate the researcher and focus on what the researcher intends to study.

A quality research question directs the researcher to appropriate literature resources and provides the researcher with the focus for data collection. Hammond and Wellington (2013:127) are of the opinion that a research question summarises what the researcher is trying to find and give direction and structure for the research, the research question gives the direction in the beginning of research methodology. Gorard (2013:36) cautions the significance that the researcher should begin with research question that is drafted orderly because only then can the suitable design be created, or else the research will not be research, but just a gathering of data.

The questions leading to the design gives the data gathering a necessary structure, they help the researcher on what kind of data to collect, when, where and how it should be analysed. The researcher has drawn up the following research question to label the research problem:

- How can the underutilisation of fingerprint investigations be improved in a crime scene?

1.6 KEY THOERITICAL CONCEPT

The reason for describing the key concepts is to avert any misinterpretation according to Leedy and Ormrod (2010:1149). Leedy and Ormrod (2010:58) further stated that in describing a term, the researcher constructs the meaning of the term in a way he or

she desires it to mean inside the factors of the issue and its sub-issues. The following key concepts are defined so that the reader of this document understands the specific concepts discussed.

1.6.1 Crime scene

The crime scene may be described as the location that may be associated with a crime that is committed, the instant location nearby the scene, including entrances and exits to and from the scene and anywhere evidence of the scene of crime can be found (Dempsey, 2003:47).

1.6.2 Physical evidence

Physical evidence can be described as something that has been left, removed, used or contaminated throughout mission of the crime by the suspect or the victim (Hawthorne, 1999:3).

1.6.3 Identification

Is originated on the concept that every person in the world is unique, in other words there is only one of his/her kind (TUT study guide, 2002:78).

1.6.4 Fingerprint

A fingerprint is made of the imprint of the ridge features of the rubbing skin, and it also include the end joint of the finger (Siegel, 2011:52).

1.6.5 Individualisation

Girard (2011:15) states that individualisation is best explained as a process that proves that a questioned sample and a known sample share a common and unique origin.

1.7 VALUE OF THE RESEARCH

Creswell (2014:119) submitted that writers many times involve a particular piece outlining the importance of the study for preferable audiences as a means to deliver the importance of the issue for unique groups that may gain from reading. In other words, the writer sought to convince the reader by means of well thought out arguments that the study was significant and had assisted those who had attended to the crime scene, as well as the investigating officer who had been investigating the case by advising them and the complainants about the importance of LCRC in the investigation of crime. Creswell (2014:119) further stated that in this section the writer

might include what the study builds to the academic research and literature in the area, how to give assistance in order to better practice and why it would improve policy or decision-making. Most importantly, Sarantakos (2013:12) pointed out that research produce knowledge, and knowledge is power. This view was indeed a point of departure, without knowledge, we might not be able to define a problem that needs investigation and what causes that problem.

According to McNiff and Whitehead (2011:164), doing research involves finding out and to understand why and what is transpiring in the social situation, and how to confront normative behaviour and contribute to improving the social order. A police investigation is a science of legally gathering information which can be presented as evidence during the court proceeding or any legal proceedings to prove or disapprove certain allegations. It requires one to keep up to date with the new methods of gathering evidence. The main objective of keeping up with the new methods is to present credible evidence in court which would result in convictions.

Gray (2014:45) stated that researchers should consider whether their research projects will add value in terms of personal career development. This study is relevant for personal career development for all individuals whose area of specialisation is within the police service, which include the first responders to the reported crime, detectives, fingerprint experts and station commanders.

1.7.1 Value to the first participants

According to Denscombe (2010:26), research answers to the action that need change in connection to things such as organisational rules, police agendas and work practices. McNiff and Whitehead (2011:94) claimed that the research can be important in that it informs new practices and new policies. On successful completion, this would be made accessible in the CSC and South African Police Service (SAPS) in order assist all organisations to refine their investigation mechanisms and benchmark them against the best international practices in order to be utilised by LCRC (fingerprint experts) in the investigation of crime scenes.

1.7.2 Value to the academic community

Denscombe (2010:13) submits that good research is whose topic and direction are a direct consequence of working at the cutting edge of knowledge, driven by theoretical issues and practical problems that the community of scholars identifies as necessary

for the further advancement of the discipline. McNiff and Whitehead (2011:166) agree with these sentiments and state that the researcher's contribution is to share their knowledge so that others can learn from it and develop it. It is envisaged that the research findings will be published in an accredited scientific professional organ in which the new knowledge and information derived from this study would be shared with other scholars (Denscombe, 2012:50).

1.8 PRELIMINARY LITERATURE REVIEW

Fouche and Delpont (2005:123) express that literature review is sought at contributing towards a clear interpretation of the essence and understanding of the identified problem. Bless, Higson-Smith and Kagee (2006:24), are of the view that literature review is to read anything that has been published and it relevantly appears to the research topic. Kaniki (2014:19-20) states that the literature review places the research into factors by indicating how it can be placed together into the particular field. In addition, Kaniki (2014:19-22) states that literature review is orchestrated with the motive of linking understanding gaps; developing problem research; single out matters and variables linked to the research topic; determining conceptual and working definitions; identifying methodologies; clarifying key concepts and developing and accomplish a literature search strategy.

Thomas (2013:58) mentions that literature is reviewed to discover what other people have found in researching the topic. Hammond and Wellington (2013:99) agree with Thomas (2013:58) and state that literature review gives an overview of what has been written about a particular topic and it covers what has been said, who has said it and sets out prevailing methodologies and theories. The researcher has visited the library in order to search for literature that is related to the study as well as checked if there is any literature that is the similar to the topic of this study. For the purpose of obtaining the relevant literature information, the concept of the research topic was divided in the following manner: physical evidence, fingerprint, crime scene, individualisation and identification.

1.8.1 Physical evidence

Physical evidence forms part of any kind of all objects that can establish that there was a crime committed or give a link between crime and suspect, but it should be an item that is physical, such evidence should not only be touchable, but it can also be a

print that is left at the crime scene (Gilbert, 2004:59). Rondinelli (2013a:26) also agree with Gilbert (2004:59) as he said “physical evidence may be something visible that is linked to scene of a crime.

Such evidence also involves objects that link a suspect with a scene of a crime. In this research, physical evidence which the researcher focused on involves fingerprints that are found on any crime scene. Lyle (2012:22) and Gilbert (2004:105) stipulate that evidence at the crime scene provides various purpose in the investigation of crime and such purpose are as follows:

- Identification of suspect.
- Show the modus operandi by suspect.
- Revelation of exact type of crime.
- Connect the suspect to the crime scene.
- Providing leads to investigation.
- Reconstruction of crime scene.
- Evidence verification can give proof or disprove suspect or statements of witness.

When evidence is found at the crime scene, the investigation officer must have accounting responsibility from when it was identified until it reaches the courtroom. Evidence plays an important role in criminal case investigations and as such needs to be properly packaged to avoid contamination so that it can be admissible in a court of law.

1.8.2 Crime scene

Crime scene is the place where majority of the evidence that is connected to a scene of crime is collected, and it gives the investigators the beginning of enquiry to identify who the suspect is and combined what occurred during the crime Fisher (2004:149). Watkins (2013:114) concur and stipulate that scene of crime can be anywhere the crime has been committed and a place where the evidence relating to a crime has been collected. The researcher concurs with Fisher (2004:149) and Watkins (2013:114), when they say crime scene is the place where investigation begin and that the scene of crime should be taken care of in order to protect evidence from being contaminated. The crime scene processing is one of the most important phases of investigation. The crime scene investigator focuses on the search for physical

evidence that might be left at the crime scene. Crime scene frequently provide the key to the solution of a case and therefore careful observation of the crime scene is essential (Houck & Siegel, 2010:32).

1.8.3 Fingerprint

Nath (2010:10) describes fingerprint as a process of ridge features of the first nail joint of the finger and it encompass the remaining the joint of the finger. When one considers the meaning of fingerprint, one may discover that it is actually the correct meaning. Therefore, the researcher agrees with (Nath, 2010:10). An example of such instance would be when the fingerprint expert attending the crime scene for fingerprint investigation. This is where they retrieve fingerprint by applying powders, after where visible latent/physical fingerprints eventually emerge or become visible. Such developed fingerprints are then taken to the office for comparison with those in the files. This argument is supported by Karen (2010:135), who actually highlighted the similarities in the meaning of fingerprint.

1.8.4 Identification

Girard (2015:40) indicated that the motive of analyzing physical evidence is for comparison and identification. Van Rooyen (2012:20-21) states that identification is based on the reality that everything in the world is different, and it has particular characteristics. Moreover, Van Rooyen (2012:20) indicate that identification is used to spot an object as that belong to specific classification of objects. Such classification is the process where the objects of the same characteristics are placed in one class. Fisher and Fisher (2012:5); Girard (2015:40) and Saferstein (2011:61) also share the same point of view by saying that the identification is the method of ascertaining a substance's chemical or physical identity as much as possible. Fisher and Fisher (2012:5) moreover stipulate that identification examples are drug analysis and residue analysis.

1.8.5 Individualization

Individualization can be defined as the process where there is a conclusive match on either side of fingerprint or that of a specific person (Technikon S.A, (2001:4). According to Investigation of Crime II (2002: 80), individualization can be defined as a process where samples (e.g. fingerprints) found at a scene of crime is compared with the existing samples (comparison standards). From the aforementioned, it is clear that

both sources agree on all the elements of the definition of individualization. Both sources state that during individualization there is a match between two samples. This can be a fingerprint found at a scene of crime by a fingerprint expert and compared with the one taken from the offender arrested.

The researcher supports the viewpoints raised by both sources that individualization comes after identification. An example of this is when fingerprints lifted from the scene then taken to AFIS for comparison with those on the system. This argument is supported by Chauhan (2011:131), who actually highlights the similarity in the individualization.

1.9 RESEARCH DESIGN AND APPROACH

1.9.1 Research design

The research design, according to Fink (2010:63), refers to the method that is used to organize and measure research subjects or participants such as students, patients or customers. Babbie and Mouton (2004:197), further proposed that research designs are a structure or plan that describes how a researcher intends to conduct the research process as a way to solve the research problem. David and Sutton (2011:204) state that, the research design is intended to provide a framework for collecting and analyzing data. Moreover, it provides the framework on which the research is conducted, enabling the researcher to assemble evidence to answer the research question.

Boeijie (2010:19) further added that a research design includes the research questions, research objectives, an ethical statement, an outline of the overall research strategy, as well as specifics about the techniques and instruments to be utilized during the research process.

In this dissertation, the research design addressed a key question, that is, what type of study was conducted, in an effort to provide satisfactory answers to the research questions. Here, the researcher describes the type of research design that was used in the study, the rationale for choosing the design, and the possible difficulties or limitations in the design that need to be addressed (Mouton, 2006:49). An empirical design was used by the researcher. An empirical study collects primary data through surveys, experiments, case studies, program evaluation and ethnography, according to Mouton (2006:57). By conducting telephonic interviews with investigators and

members of crime prevention, the researcher was able to obtain factual information about the situation and that is the logic behind using the design. In the opinion of Grix (2004:165), observations, experimentation and experiences constitute empirical studies.

Since the initial investigation uncovered limited amounts of information about the research topic, the researcher believed an empirical design was the most appropriate approach for the study. Getting out of your chair, going out of the office, and seeking information intentionally is an important part of empirical research, as Denscombe (2002) noted. Through interviews, the empirical study helped answer the research question by gaining a better understanding of the problem. In this case, Mouton (2006:49.57) and Grix (2004:165) described the design as the most suitable because it incorporated primary data collection utilizing interviews and program evaluations.

The research approach consists of the steps from broad assumptions to detailed methods for collecting, analyzing, and interpreting data (Creswell, 2014:3). An inquiry that is qualitative is called a naturalistic inquiry, since the research is conducted in a real-world setting, without attempting to manipulate the environment (Roberts, 2004:11). Mouton (2001:161-162) asserted that qualitative evaluation approaches use predominantly qualitative methods for the description and evaluation of programs in their natural environments, focusing on process rather than an outcome. A qualitative approach was considered because the researcher had gone into the field, collected data, observed, conducted in-depth interviews and looked at documents (Roberts, 2004:11). To be clear, the researcher examined something's essential nature, not the quantity.

Through a comprehensive literature review and semi-structured individual interviews, the researcher preferred a qualitative approach to collecting data. Hart (2005:182) maintains that qualitative research relies on participant and nonparticipant observations, unstructured interviews, and non-statistical data sources for analysis. It was the best approach since it was possible to compare qualitative studies on the same topic and draw out similarities and differences based on the approaches and concepts used by the studies (Hart, 2005:182). According to Marshall and Rossman (2011:3), qualitative research has the following features:

- occurring in the real world

- utilizing a variety of methods that are interactive and humanistic
- emphasizing context
- emerging as opposed to being tightly prefigured
- being fundamentally interpretive

Additionally, this researcher applied a qualitative approach in support of the empirical design, since it was vital to hear the ideas of participants and gain a deeper understanding of their experiences. The focus of qualitative research is on phenomena that occur in the real world and involves studying those phenomena in all their intricacies, according to Leedy and Ormrod (2005:133). The researcher interviewed the investigators and members of crime prevention who dealt with cases that specifically require LCRC, such as burglaries and thefts in order to meet these requirements.

1.10 TARGET POPULATION

A population is defined by Bless, Higson-Smith and Sithole (2015:162) as the whole set of objects or individuals the researchers are studying and about which some characteristics are to be determined. The definition of the population by Babbie and Mouton (2012:173) is the theoretically prescribed aggregation of the elements of the study. Due to time and cost constraints, Maree and Pietersen (2014:172) indicated that it is usually unfeasible to study the entire population.

For this research, the target population was ideally supposed to be Client Service Centre members, members of crime prevention and LCRC members within the SAPS; however, it was not possible to study the wide population due to the time and expenses involved; therefore, the researcher used the target population as a sample. In the study, Babbie (2010:199) characterized the study population as the assemblage of elements from which the sample is drawn. According to Du Plooy (2013:109) and Welman, Kruger and Mitchell (2012:126), the target population is the actual population to which the researcher ideally would like to make inferences based on the information contained in a sample. The target population is defined by Du Plooy (2013:109) and Welman, Kruger and Mitchell (2012:126) as the actual population about which the researcher would like to draw conclusions using information from the sample. Mpumalanga Province (Secunda cluster) was chosen for this study as it was cost-

effective and the Secunda area was where the problem was identified. There are 13 police stations under the Secunda cluster. The researcher selected stations based on the 2018/2019 crime statistics.

To select the stations, the researcher used a simple random sampling method. The researchers wrote the names of the selected stations on pieces of paper and put them in boxes. Then they closed their eyes and drew a station. Among the participants in this study were CSC, detectives, and crime prevention officers from selected Police Stations.

Detailed explanations of these three samples follow.

1.11 SAMPLING

Sampling is the process that involves choosing which people, settings, events, behaviours and/or social processes to observe out of a whole population (Durrheim, 2014:49). A sample is a collection of elements drawn from the population for the purpose of achieving some insight into the population as a whole (Bless, Higson-Smith & Sithole, 2015:394).

According to Babbie (2010:191-200) and Strydom (2005:198-200), there are two categories of sampling: probability and non-probability. In probability sampling, people or sample units are randomly selected from the population. There are several types of probability sampling, including simple random sampling, stratified random sampling, proportional stratified sampling, cluster sampling, and systematic sampling. Among the non-probability sampling techniques are purposive sampling, quota sampling, and convenience sampling, (Leedy & Ormrod, 2015:179-183).

Each member of the sampling frame has a fair chance of being chosen as a study participant in a random sample (Vanderstoep & Johnston, 2009:27). In both samples A and B, simple random sampling was used for participant selection. In simple random sampling, a certain number of participants are chosen from a pool of all possible participants in a sampling frame. A fixed percentage of the sample frame was selected for participation in simple random sampling (Vanderstoep & Johnston, 2009:29). Due to the fact that systematic random sampling affords equal chances for each individual in the population, the researcher chose this approach (Du Plooy, 2013:110). The following information was gathered during the interviews in which sample A (LCRC

members), involve 13 participants: five participants had been investigating officers with a working period of 1 to 5 years, five participants had been investigating officers with a working period of 5 to 10 years and three participants were investigating officers who worked for a period of 10 to 20 years.

Sample B's (client service members) participants had the following backgrounds: five participants were client service members with working periods of one to five years, five participants were client service centre members with working periods of five to 10 years and three participants were client service centre members with working periods of 10 to 20 years.

The background of sample C's (Crime prevention) 13 participants was as follows: five participants were Crime Prevention members with working periods of one to five years, five participants were crime prevention members with a working period of five to 10 years and three participants were crime prevention members with a working period of 10 to 20 years. The sample for this study consisted of 40 participants. The participants were the LCRC members, CSC members and Crime Prevention members in the Secunda cluster. The 40 participants were divided into three. Three samples were used in the study, namely, samples A, B, and C, respectively.

- Sample A: Secunda LCRC has a total of 20 members. The researcher conducted research on selected LCRC members. The list of the LCRC members was compiled, and every third name was selected as part of the study after counting the names from the first.
- Sample B: Embalenhle police station consists of 67 crime prevention members. The researcher interviewed 13.3% of the members for this study. Among the names on the list, every second name was chosen for inclusion in the study.
- Sample C: Secunda CSC were also targeted, as they are responsible for taking the statement. There are 83 members, of which 13.3% were studied by the researcher. Every fourth name on the drawn CSC list was selected.

1.12 DATA COLLECTION

Data collection refers to the methods of gathering information. Creswell (2014:189) described the steps for collecting data as establishing study boundaries, obtaining information through unstructured or semi-structured observations and interviews, documents, and visual materials, as well as establishing a protocol for identifying data.

To ensure the reliability of the result, the researcher collected data through interviews and literature. Data collection methods used in this study include the following:

1.12.1 Literature review

A literature review serves the purpose of finding out what has been done in the study area (Mouton, 2014:119). The purpose of a literature review is for the researcher to identify and familiarize himself/herself with existing research in the field, according to Blessed et al., (2015:49) and Mouton (2014:119-120). In addition to providing useful guidelines on the design of one's project, reviewing previous studies provides useful definitions of key concepts.

Bless *et al.*, (2015:49-50) believed that a literature review is also conducted to identify gaps in knowledge as well as weakness in previous studies, to identify variables that must be considered in research as well as those that might be irrelevant, and to study the advantages and disadvantages of the research methods used by others to adopt or improve on them in one's research. Fouché and Schurink (2017:302) indicated that a literature review provides the current state of knowledge regarding the research problem and assists the researcher to learn how others have delineated similar problems.

Among the types of literature searches listed by Welman and Kruger (2001:33) are prior research, journal articles, current literature, tracing and noting relevant literature. Library collections are no longer the sole source of information, according to Welman, Kruger, and Mitchell (2012:39). Studies have shown people can obtain information from journals, newspapers, government publications, conference presentations, and online databases (Leedy and Ormrod, 2014:52). In addition, the researcher accessed literature related to this study on the internet. Internet, according to Fouche and Delport (2005:128), is a reliable information service that is accessible 24/7, as well as a time-saving tool. Similarly, Kumar (2011:37) affirmed that the Internet has become an essential tool for locating published material. Fouche and Delport (2017b:140) stated that a wide variety of sources of information can be consulted as part of a comprehensive literature review. Any source related to the research topic or question can provide the researcher with useful information.

To gather literature relevant to the topic of the study, the researcher visited the library. To find literature on the topic, the research topic was divided into the following

concepts: fingerprints, forensic science, crime scene investigation, criminal investigation, and the role of forensic science in solving crimes.

1.12.2 Interviews

Hammond and Wellington (2013:91) define interviews as conversations between the researcher and participants. Interviews involve making clear the terms of the conversation, such as what is being discussed, how long and what role each party is expected to play. Researchers can explore issues in detail using qualitative interviews, and participants have greater control over how the conversation will proceed (Babbie & Benaquisto, 2010:342). An objective of qualitative interviews is to gain an understanding of the world through the perspective of the participants, as stated by Nieuwenhuis (2014:87). Qualitative interviews further provide rich descriptions that enable the researcher to understand participants' conceptions of knowledge and reality through their construction of knowledge. Using interviews as a method of data collection was another useful technique since it is a commonly used way of obtaining information from people (Kumar, 2011:109).

Using semi-structured interviews, the researcher gained insight into participants' views, perceptions, and accounts on a particular topic. In semi-structured interviews, questions are predefined by the researcher and answered by participants according to predetermined questions, and participants are allowed to clarify their answers (Nieuwenhuis, 2014:87). Participants and the researcher were able to be more flexible with semi-structured interviews because the researcher was able to explore interesting avenues that came up during the interview and participants could give a more complete picture. The researcher used different schedules for various samples, and copies of each schedule were attached, as follows: Annexures A, B, and C for samples A, B, and C respectively.

Interview questions were generated based on the research aim and research questions. To evaluate measurement instruments, analysis methods, and procedures, Leedy and Ormrod (2015:128) recommend performing a pilot study. During the piloting of the interview schedule, the wording of the questions was revised, assessed and checked for whether the questions asked were appropriate; this also allowed to ensure that the right questions were asked to the correct people. Whenever a new instrument is developed, Welman, Kruger, and Mitchell (2005:148) suggest testing it out before

implementing it. The Pilot study aimed to identify possible flaws in measurement procedure as well as clarify ambiguously formulated items. Following the identification of deficiencies, the draft interview schedule was sent to the supervisor for review and approval. Several interview schedules were tested with three different types of samples (detectives, crime-prevention members and CSC members) for the conducted study.

In this study, the people to be tested were identified by no particular method, but by their availability and willingness to participate. People who were not part of the research participated in the pilot study. In accordance with Leedy and Ormrod's (2015:282-285) guidelines, the researcher conducted interviews. Following these guidelines, the following steps were taken:

- Preparing in advance by identifying general interview questions.

An interview schedule was developed based on the research questions and objectives. Open-ended questions comprised the interview schedule.

- Considering the impact of participants' cultural backgrounds on their responses.

In conducting the interview, the researcher was sensitive to the verity that culture may have an influence on how participants interpret and respond to the questions.

Including people whose information you are seeking in your sample.

During the research process, several participant groups were interviewed to obtain various perspectives and perceptions about the subject being studied. In addition to interviewing the investigating officers, the members of the CSC and the Crime Prevention Unit were also interviewed.

Obtaining the necessary permissions.

Telephone interviews were conducted with participants, and they were at ease in their own spaces.

- Requesting permission in writing.

The researchers sought consent to conduct research from the SAPS and Unisa and were granted (See Annexures B and C). The researcher explained the

study's nature and how it would be used to the participants during the interview process. Participants gave written consent, affirming that they were participating in the research of their own free will and they were free to withdraw from the interview at any time.

- Building and maintaining rapport.

At all times, the researcher was courteous and respectful of the participants and showed genuine interest in their opinions.

- Putting no words in other people's mouths.

Participants were permitted to express themselves as they saw fit. Listening to the participants and allowing them to speak their minds was an integral part of the researcher's methods.

- Ensuring that responses were recorded verbatim.

In addition to recording the participants' responses, the researcher also wrote down the responses. Everything that was said in the interviews was captured.

- Keeping reactions to yourself is the best policy.

There was no reaction from the researcher to the responses of the participants, nor any indication of surprise, agreement, or disapproval of their responses.

- Keeping in mind that you are not necessarily getting facts.

Rather than treating the responses as facts, the researcher considered them as perceptions and opinions.

1.13 DATA ANALYSIS

As defined by Hammond and Wellington (2013:9), analysis entails dissecting a topic or object into its constituent parts and understanding how the parts relate to one another. An analysis of data seeks to make sense of text and images by segmenting, breaking down, and reassembling information (Creswell, 2014:195). Durrheim (2014:52) stated and affirmed that data analysis is the process of transforming raw data into an answer to the original research question. As part of the data analysis, the researcher captured all the raw information collected and read the data in detail before

categorizing it. In order to gain a deeper understanding, themes were identified (Leedy & Ormrod, 2014:143-144).

Data analysis involves extracting meaning from textual and visual data, suggests Creswell (2009:183). In this process, the data is prepared for analysis, different analyses are conducted, a deeper and deeper understanding is gained, representations and interpretations of the data are made. In qualitative data analysis, Leedy and Ormrod (2015:309) noted that data is closely analysed to discover its meanings. In addition, Leedy and Ormrod (2015:315) indicated that Creswell's (2013) spiral of data analysis best explains and illustrates how qualitative data analysis can be organized.

Leedy and Ormrod (2015:315) explain Creswell's data analysis spiral as used in this study. As discussed below, the phases of the data analysis spiral were as follows:

- As part of the data preparation, the researcher typed up field notes and transcribed interview recordings for analysis. Preparing field notes and transcripts entails converting the notes into written accounts that can be read, edited, commented on and analysed as outlined by Welman, Kruger and Mitchell (2012:211).
- To gain a general sense of the information, and to understand the general ideas the participants shared, the researcher read and re-read the data several times. As described by Bless, Higson-Smith, and Sithole (2015:342), a fundamental step in qualitative data analysis is immersion in data, in which the researcher reads and re-reads the collected data so as to develop a mental picture of the entire dataset. Additionally, the researcher learned how to categorize data.
- Several common characteristics were found in the data fragments or categories. Bless *et al.* (2015:342) and Creswell (2009:186) called this process coding, defining it as the process of separating the collected data into segments and then putting each segment into various categories before it is given meaning. Bless *et al.*, (2015:342) suggested that themes and patterns in data are often used to create codes.
- The researcher identified categories and themes, then integrated and analysed the data. Analysing results were conveyed through narrative passages (Creswell, 2009:189; Leedy & Ormrod, 2015:315).

1.14 METHODS USED TO ENSURE VALIDITY

A valid empirical measure is one that reflects a concept's true meaning, as defined by Babbie (2010:153). Validity refers not only to the accuracy and precision of the data but also to their suitability to the research problem (Denscombe, 2011:298). The study information was gathered through literature and interviews. Furthermore, the researcher conducted pilot interviews in order to enhance validity, to identify obvious and possible flaws in the interview schedule as the instrument was used for assembling data during interviews (Leedy & Ormrod, 2014:94).

In order to ensure that accurate and reliable information was gathered, specific books and journals in the relevant subject area were consulted for more information. According to Mouton (2014:110-111), all interpretations, analyses, and conclusions were drawn from literature and interviews.

1.14.1 Credibility

Researchers conduct quantitative studies to examine people's experiences, perceptions, feelings and beliefs. A survey was administered to participants to determine whether the results accurately reflected their opinions and feelings. Validity is synonymous with credibility in quantitative research and is evaluated by the degree of participant agreement. For approval, congruency, validation and confirmation, the researcher took the findings to those who participated in the study. The validity of the study increased with higher outcomes (Kumar, 2011:185). Denscombe (2011:299) argues that credibility is dependent on a qualitative researcher's ability to demonstrate that their data is relevant and accurate. Creswell (2014:200) lays out the following validation strategies to ensure the credibility of this study:

- **Triangulation** involves a process whereby multiple approaches are used in investigating the research question. Through an examination of evidence from different sources, the researcher was able to develop a justification for themes that emerged. The study's credibility was enhanced by the convergence of multiple sources and perspectives of participants.
- **Member checking** refers to the researcher testing the accuracy of the findings by providing the participants with an opportunity to comment on the preliminary findings and themes that emerged before following up with them to find out whether they felt they were accurate.

□ **Prolonged time in the field** involves the researchers spending more time on-site to gain an in-depth understanding of the phenomenon being studied, which helps them convey details about the participants in narrative form.

1.14.2 Transferability

If the results can be applied to other similar situations, then they are transferable (Bless, Higson-Smith & Sithole, 2013:237). Hammond and Wellington (2013:80) and Kelly (2014:381) referred to transferability as generalizability, indicating that this means that an interpretation or a consequence of one action may be transferred to other contexts which are not the one being studied. Verbatim quotations allowed the researcher to convey the results of the research by detailing in-depth the participants' responses to the interview questions. The complete details provided a foundation for connecting the details, giving the discussion a sense of sharing experiences. Readers could make decisions about the transferability of the findings based on such detailed descriptions.

1.14.3 Dependability

For dependability to work, the researcher must follow a clearly defined research strategy and indicate that each step was fully completed (Bless, Higson-Smith & Sithole, 2013:237). To ensure reliability, the researcher documented all research procedures so that others could follow the same ones. While recordings and written notes were made of participants' responses, the researcher checked transcripts to ensure participants' responses were accurately reflected.

1.14.4 Conformability

Bless, Higson-Smith and Sithole (2013:237) assert that conformability means that a researcher should be able to come up with similar results if the same research is conducted in the same context and under the same conditions. As part of the conformity process, a detailed record of the research process was kept so that the interpretation of the results, recommendations and conclusions can be traced back to the sources.

1.15 METHODS USED TO ENSURE RELIABILITY

Denscombe (2011: 298) defines reliability as the same research instrument producing the same results on successive occasions and everything becomes equal. It refers to how neutral an instrument is and whether it is consistent in its use across many

applications. In relation to reliability, one must ensure the methods used to collect data are consistent and do not distort the results; thus, one must examine the methods and the techniques used to collect data (Denscombe, 2002:100). Babbie (2010:150) and Durrheim and Painter (2014:152) suggest that reliability refers to the repeatability or consistency of a measurement instrument; for example, how well the instrument behaves after repeated use. The researchers explained how the data would be collected, analysed, and sampled.

In accordance with Henning, Van Rensburg and Smit (2011:33-34), to accurately report the results of the study, the researcher has to possess a comprehensive understanding of the methods and methodologies, be acquainted with the recent literature, and be familiar with the empirical field and the location of the study. Participants who conduct criminal investigations at Secunda Police Station, client service centre members from Embalenhle Police Station, and LCRC members from Secunda Police Station were interviewed.

Interview data provides an opportunity for the researcher to hear what individuals believe, perceive, do, and have to say, allowing them to articulate their subjective realities in a formatted discussion that was guided and formatted by the interviewer and later incorporated into a report by Henning *et al.*, (2011:52). For a proper analysis of the interviews, they were recorded and transcribed. They were structured so that similar types of information were requested regarding each participant to ensure consistency, and that the same questions were asked of all the participants. In addition to ensuring anonymity and confidentiality, the researcher conducted the interviews in private, which allowed participants to freely express themselves. There was no use of leading questions or manipulation of the answers of the participants on the part of the researcher. This report acknowledges every piece of literature used. Literature review and semi-structured interviews ensure that the data is rich.

1.16 ETHICAL CONSIDERATION

Participants in the research project adopted and followed well-accepted conventions and expectations based on mutual trust, acceptance, cooperation, and commitment. As explained by Bless *et al.*, (2013:28-29) research ethics provides considerations as to whether an individual's behaviour is congruent with the code or standards. Optimising the safety of research participants was the purpose of research ethics.

Humane and sensitive treatment of participants is essential. Researchers are entitled to conduct their research but should not do so at the expense of the participant's rights.

Therefore, ethics is a set of moral principles that are suggested and subsequently widely accepted by individuals or groups, offering rules and expectations about the most responsible behaviour towards experimental subjects, participants, employers, sponsors, assistants, and students. Leedy and Ormrod (2014:106) warned that researchers who are conducting studies that involve human subjects are responsible for considering ethical implications.

Strydom (2015:113) states that all parties involved in a research project should be able to trust, accept, cooperate, honour and adhere to well-defined conventions and expectations throughout the research process. In conducting this research, the researcher studied, familiarized and adhered to the University of South Africa's (UNISA's) policy on research ethics. UNISA's policy on research ethics guided the researcher (University of South Africa, 2007:7). The researcher also adhered to SAPS code of ethics in conducting research in the SAPS as per national Instruction 1/2006; permission to conduct research in the SAPS. This study adhered to Leedy and Ormrod's (2014:106-111) ethical guidelines:

1.16.1 Protection from harm

It was ensured that no physical or psychological harm was inflicted on the participants. Participants' identities were kept anonymous, and they were treated with dignity and respect by the researcher. Interviews took place in a comfortable and safe setting where participants could be themselves.

1.16.2 Informed consent

Participants were told about the research's type, purpose, and characteristics. Participation in the study was voluntary, and participants were notified that there was no reward or incentive to expect. Study participants signed consent forms indicating that they were not compelled to participate. An annexure of the agreement, which is a blank copy of the agreement, was attached by the researcher. Informed participants understood that they were free to withdraw from this study at any time and that no they were not forced to explain as to why they wished to do so.

1.16.3 Right to privacy

By ensuring that responses were kept confidential, participants' rights to privacy were respected at all times. Only the researcher knew how each participant interacted or responded during interviews. No one other than the researcher had access to the participants' responses, and the data that was collected from them was kept secure at all times. Numbers were used to identifying the participants rather than names. Every effort was made to respect and maintain participants' privacy.

1.16.4 Approval to conduct research

Prior to the research being conducted, the researcher applied for approval from the SAPS research committee. Also taken into account was SAPS National Instruction 1/2006, and the latest one during the writing of this dissertation was (National Instruction 4/2022) which governs SAPS research. At the end of the research, an official letter of approval is attached.

1.17 SUMMARY

The following were presented in this chapter: problem statement; research purpose; questions addressed; concept definitions; the design and approach of the research; experimental procedure; research design and approach; target population; sampling methods; data collection; data analysis; and methods for ensuring validity and reliability. The next chapter is on fingerprint identification.

CHAPTER 2: FINGERPRINT IDENTIFICATION

2.1 INTRODUCTION

The chapter focused on determining the level of participants' awareness and understanding of the meaning, the necessity, and the importance of fingerprint identification. Participants provided answers to questions that were asked about fingerprint investigation, and they also expounded on their understanding of fingerprints. The answers of the participants were compared with the reviewed literature.

Evidence gathered at the crime scene is the most significance type of evidence. Chance fingerprints are commonly called latent prints, they are found on weapons or other items at the scene of crime (Nath, 2010:38), as a results, fingerprint offer an infallible method individual identification (Gilbert, 2010:454; Nath, 2010:1; Saferstein, 2011:534). Three thousand years ago, the Chinese used fingerprints to sign documents (Fisher, Tilstone & Woytowicz, 2009:50; Gilbert, 2010:454).

Juan Vucetich, an Argentine chief police officer, created the first method of recording the fingerprints of individuals on file, associating these fingerprints to the anthropometrics system of Alphonse Bertillon who had created system of identification in 1879. The system measured part of the body and described their appearance and shape, among other attributes. In the incident, a man named Will West was convicted and sentenced to United State of America (USA). He denied the charge despite that the fact that his measurements were identical to those already taken from the prisoner called William West (Fisher, Tilstone & Woytowicz, 2009:50; Gilbert).

In the 20th century, fingerprint experts used Bertillon measurement system to identify criminals, but were unsuccessful in identifying the identical twin brothers (Gilbert, 2010:20; Saferstein, 2013:134-135).

The researcher focused this chapter on fingerprints as evidence. After learning that the fingerprint study is part of the SAPS' investigative function, the study explored fingerprints means of identification, as well as the fingerprint pattern as evidence. Such patterns are cores, deltas and the seven- point criteria that is used in South Africa.

2.2 FINGERPRINT

Fingerprint is an impression left by the friction ridge skin at the tips of fingers (Fisher, 2009:54). Nath (2010:1), notes that the skin covering the interior surface of the human hand and the planter (sole) of the human foot differ from the skin covering the rest of the human body because the human foot has friction ridges. Pepper (2010:81) describes two kinds of prints that may be left on surface if the interior of the hand is touched: visible and latent invisible prints (see also Gilbert, 2010:456). A fingerprint is formed by separating the friction ridge skin from the cuticle to the cuticle of each finger (Siegel, 2011:52).

In the world of the forensic science, fingerprints represent one of the oldest and most important categories of evidence. James and Nordby (2009:355) argued that while fingerprint individuality is a matter of faith among the public, it is almost universally accepted among scientists and forensic scientists (see also Zeffertt & Paizes, 2010:333-334).

Participants responded to a question “what is fingerprint?” as follows:

- It is an impression left by the friction ridge skin at the tips of fingers (10 participants)
- An impression or mark made on a surface by a person’s fingertip (3 participants).
- It is the reproduction of the ridge first joint of the finger but excluding the palm (13 participants)
- It is an impression left by the friction ridges of a human finger (13 participants)

The response from the participants shows that they understand the meaning of fingerprint.

Fingerprints can be “developed” in several ways. The most common method is to set the print with a high-contrast powder, depending on the background, and then either photograph it or physically lift it off the surface with a syphon (Evans, 2009:24). According to Bertino and Bertino (2010:138), fingerprints can be made visible by dusting them with powder or by making them more visible through a chemical reaction.

2.2.1 Fingerprint Identification

Fingerprint identification is a process of comparing prints (found at a scene of crime or on an object and taken from a suspect) until at least seven identical dots are found that are similar in all respects (in ratio, direction, position, size and with no unexplained differences) (Siegel, 2011:56; du Preez, 1996a:25).

Identification is the study of the chemical and physical properties of an object and using them to categorise the object and the use of these properties to categories the object as a member of a group, according to Houck and Siegel (2010:57). Fingerprints are also important in making identification of human remains more especially where the methods of post-mortem identification cannot be used (James & Norby, 2009:355-6). The Criminal Law (Forensic Procedures) Amendment Act 6 of 2010, section 36B allows the officer to take fingerprints of any arrested or suspected person who is suspected of committing a crime to be taken (South Africa Police Service, 2010).

A trained fingerprint investigator cannot give evidence on identification of fingerprint but can give evidence on collection of fingerprints. The court is not usually qualified to form its own opinion on identification evidence (Zeffertt & Paizes, 2010:23):

- Zeffertt and Paizes (2010:194), the court decided on the circumstantial identification by a fingerprint will, for instance, the court tend to believe on the identification of fingerprint than the witness who saw the accused person.
- In court of law, they stressed that the fingerprint expert should enlarge (court chart) the fingerprint found at the crime scene together with that obtained from the accused (Zeffertt & Paizes, 2010:194).

Nath (2010:11) suggested that fingerprint identification must also be used in the following areas:

- As security features to help avoid problem of forgery documents (see also James & Nordby, 2009:356).
- In government departments to gain access.

Participants were asked the following: What is fingerprint identification?" they answered as follows:

- Fingerprint identification is when you compare two fingerprints and you find them to be the same (5 participants);

- Fingerprint identification should be the same in terms of shape, relation and the pattern (3 participants);
- By comparing the suspect's fingerprint with those on the database (5 participants);
- Comparing two fingerprints without unexplainable different. (10 participants);
- Counting and tracing of ridge characteristics of the prints (3 participants) and
- When the suspect's fingerprint is linked matches (13 participants).

2.3 THE ROLE OF THE CRIMINAL RECORD CENTRE (CRC)

According to the SAPS strategic plan (SAPS, 2010:16), the CRC role is to make sure that all the people that are arrested, their fingerprint are stored in the database (Terry, 2011; see also South Africa, 2010). The CRC role also includes the profiling of offender/suspect of their previous convictions. The Criminal Law (Forensic Procedures) Amendment Act 6 of 2010, section 2 and 3 authorise the CRC to be in charge of the national data fingerprint database as well making sure that fingerprint of the suspect that are convicted are in the database in AFIS (South Africa Police Service, 2010).

Criminal Procedure Act 51 of 1977 (South Africa, 1977b) stipulates that the other role of the CRC is to expunge records. The records of the criminals/offenders are expunged from the system after specified time has elapsed by the law. The copy of the certificate of expungement must be attached to the communication by the head of South African Police Service Criminal Record Centre (SAPSCRC).

Response to question: "What are the duties of the CRC?" the participants responded as follows:

- To collect fingerprint from the crime scene (10 participants);
- To keep criminal records (8 participants);
- To identify criminals/suspects from the database (12 participants) and
- To manage the fingerprints database and profiling of the offenders (10 participants).

The researcher discovered that the responses from the participants indicated that they understood the legislation and SAPS strategic plan and they supported each other. The answers are aligned with literature reviewed and were correct.

2.3.1 Criminal Investigation

Criminal investigation is an organised, reasoning, systematic, thinking, examination analysis process that is designed to seek for the truth, during the inquiry and analysis that manage all types of unlawful acts (Zinn & Dintwe, 2015:19). According to Pepper (2005:93), criminal investigation is an official effort to uncover crime. Once the crime has been reported to the authorities, officials normally have two primary concerns, (1) who committed the crime? (2) What was the motive? The motive of the officials is to catch the criminal. Houck and Siegel (2010:581) explained that the criminal investigation process involves the discovering of who committed the crime or if there is a suspect arrested for the crime, searching for evidence that could assist in the conviction or exonerating that suspect. According to Osterburg and Ward (2010:5), investigation of crime encompasses “the collection of information and evidence for identifying, apprehending and convicting suspected offender”. The primary role of the criminal investigator in processing the scene is the collection, identification and reporting of evidence found at the crime scene, says Birzer and Roberson (2012:25).

In response to the question: what do you understand on the concept “criminal investigation?” the responses by the participants were as follows:

- Criminal investigation is when an investigator trying to discover the information for the occurred crime in order to arrest the culprit involve (7 participants);
- Criminal investigation is when the police are investigating the crime (8 participants);
- Is when the investigation officer asking witness information about the crime (13 participants);
- Involves searching for what happened during the crime (12 participants).

The researcher discovered that the participants shared the same sentiments of the concept of criminal investigation. Generally, the question was answered accordingly. The participants’ responses are supported by Houck and Siegel (2010:581), where it is explained that the criminal investigation is a process that involves the discovering of who committed the offence or, if there is a suspect arrested for the crime, searching for evidence that could assist in the conviction or exonerating that suspect.

2.3.2 Objective of criminal investigation

According to Benson, Jones and Horne (2015:10), the objectives of the criminal investigation are as follows:

- To find out if there was crime committed;
- To find leads;
- To ensure that the suspect is behind bars;
- To find the property that has been stolen;
- To ensure enough evidence that link the responsible person;
- and assist the state in prosecuting.

Stelfox (2009:2) expressed the thought that bringing the suspect to justice, identification of suspect and gathering of evidence that will support the prosecution as the only motive of criminal investigation. Furthermore, Stelfox (2009:2) believes that taking care of victims, disruption of criminal of activities network, reassurance and community and crime risks wide range management are objectives of criminal investigation. The criminal investigation objectives to find out who committed a crime may seems simple, but the reality is that, is not easy. The criminal investigation has several roles that are important in order to hold the offenders into account. The most important goal is to discover that the crime has been committed, obtain information legally as well as evidence in order to identify the responsible offender, arresting of suspect, recovery of property that has been stolen and the presentation of evidence in the court of law (Hess & Hess, 2010:8).

Crowder (2010:336) indicated that evidence gathering and related information to the crime that has been committed, locating and facilitating the arrest of the suspects, stolen property recovery, and evidence presentation preparation to the court of law. Lynman, (2011:15) outlined the objectives of criminal investigations as follows: to locate, detect and identification of suspect at the scene of crime, to document, locate and protect evidence in crimes, arresting of suspect, stolen property recovery, and evidence presentation in court. Similarly, Benson, Jones and Horne (2015:13) also believes that the criminal investigation objectives are to detect the crime, systematic and organise search for the truth; identification of suspect and locating; gathering objective and subjective evidence about an alleged offence; to discover the facts in

order to prove the conviction of suspect by presenting evidence in the court of law. In response of the participants to the question 'what are the objectives of criminal investigation? Participants had this to say:

- To find the truth of what had happened (5 participants).
- To get the criminal who committed the crime (5 participants).
- To arrest criminal and take them for prosecution (7 participants).
- To get the suspect who committed the crime (6 participants).
- To search for what was stolen and arrest the suspect (3 participants).
- To detect crime (13 participants).

The research discovered that the participants' responses are in agreement with the objectives of criminal investigation as outlined by the literature, regardless that the participants didn't strictly mention all the criminal objectives as per literature, and the participants understood the objectives of criminal investigation.

Benson, Jones and Horne (2015:20) agree with Dempsey (2003:29-30), Hess and Hess (2010:8) that objectives of criminal investigation are to detect locate and identify suspect in crimes.

2.3.3 Identification

Identification is the process of categorizing an object according to its chemical and physical properties, according to Houck and Siegel (2010:57). Gilbert (2007:104) stated that identification refers to the process of determining a substance's physical or chemical identity with the greatest level of certainty possible using analytical techniques. Girard (2011:38) agreed with Gilbert (2007:19) and made an example about the white powder that is found at the crime scene, that a technician might conduct chemical tests to identify it as an illicit drug, such as heroin or residue from bomb-making. An example is of a laboratory technician who uses presumptive test kit to proof the human blood. Saferstein (2011:86) said the identification purpose is to determine the chemical or physical identity of a substance with certainty. An example of this would be when the forensic experts collect the primer residue and send/forward to ballistic unit where they will request if the sent item is the gun powder. Fisher, Tilstone and Woytowicz (2009:12) stated that the identification evidence is adequate close and different to give enough evidence of identity. In response to the question, participants were asked identification term, and their responses was as follows:

- Is to identify the exact culprit who committed the crime (10 participants).
- Is to collect evidence and find out who the suspect is (3 participants).
- When someone pointed out as the person who committed an offence (9 participants).
- When someone has been identified by DNA or fingerprint (4 participants).
- When two prints are compared (7 participants).
- When the suspect is linked to a crime (3 participants).
- When suspect was identified through fingerprint (3 participants).

Based on their responses of the participants, it is clear that they have an idea of what identification means. Houck and Siegel (2010:57) described the meaning of identification as the study of chemical and physical properties of an object and the analysis of the properties to determine the object's membership in a particular group.

2.3.4 Individualization

Identifying similarities in individual characteristics requires finding evidence that has a very high probability of pointing to a common source. Example of this will two fingerprints that are associated in terms of ridge characteristics (Saferstein, 2011:88). According to Ogle (2012:9), the individuality of a specific object, based on the individual characteristics and object class, when different to only one member of a class, gives the identification of the individual source of the evidence item, this process is called "individualisation". The questioned item is an independent piece of data that compares a specific set of characteristics from the known sample to those in the known sample or it's exemplary, says Ogle (2012:9). The researcher realised that all the authors agreed that individualisation involves the proving of a known sample and that of unknown sample share a unique common origin, however, Girard (2011:15) and Ogle (2012:9) referred to the unknown sample' class, that the unknown sample should be individualised including the members of its class. Houck and Siegel (2010:59) described individualisation as the concept of two assumptions which are:

- All things are different in time and space.
- The properties by which a thing is analysed are continuously over time.

According to Gardner (2012:30), biological substance can exist in the form of other bodily fluids such as semen vaginal, blood or any other DNA source. Bertino and Bertino (2012:23) explained that there is usually such a unique combination of

characteristics that individual evidence tends to narrow the identity to a single individual or thing. Saferstein (2011:87) and Gilbert (2007:104) argued that a comparison analysis subjects a suspect specimen and a standard specimen to the same tests and examination in order to determine whether they have a common origin. An example refers to a forensic scientist that may place a suspect at a certain location by noting the similarities of a hair found at a crime scene to hairs that has been removed from the head of the suspect. The concept of individualisation was asked to participants, and they responded as follows:

- 4 participants said to separate two things from each other.
- 10 participants said they don't know.
- 4 participants said it means one thing.
- 9 participants said they don't know.
- 13 participants said they don't know.

The researcher noted that the participants did not know what individualisation is.

2.4 THE SIGNIFICANCE OF FINGERPRINT EVIDENCE IN THE HOUSEBREAKING INVESTIGATION

According to Nath (2010:11), personal identification through fingerprints has long been recognised and is regarded as the best contribution to law enforcement. The author stated further that through the fingerprint characteristics, the science of fingerprints provides unique service in the administration of justice and also in other areas where positive identification is highly important. Fingerprints are friction skin of the ridges that are found on the palm surface, and sole of feet Fish, Miller and Braswell (2011:86). According to Dutelle (2011:173), the whole point of recognising and collecting fingerprints is to identify them in order to find suspect or identify a person. Fish *et al.* (2011:93) agree with Dutelle (2011:173) when they say that fingerprints are an infallible means to establishing identity.

According to Gardner (2012: 28), fingerprints are the most common forms of evidence sought at the scene of crime. Nath (2010:1) agreed with Gardner (2012:28) and stated that among the most important clues at the scene of a crime are palm prints and fingerprints. Gardner (2012:28) stated further that the use fingerprints is a means of identification. Saferstein (2011:534) disagreed with the author by stating that the Chinese used fingerprints to sign documents.

2.5 TECHNIQUES USED TO LOCATE FINGERPRINT

The fingerprint experts search for latent prints in a systematic and intelligent manner and develop techniques to trace fingerprint at a crime scene, according to Dutelle (2011:173). Ogle (2012:131) agrees with the author and states that the physical and chemical methods for latent detection: (a) a thorough visual search using enough lighting for the presence of patent impressions and (b) a search with the poly light or any light source or a long-wave ultraviolet light.

Fisher, Tilstone and Woytowicz (2009:62) stated that the processing of crime scene or evidence items for fingerprints starts with a search for visible prints, then search for latent prints using powders or chemicals. The authors further advised that the examiner should select an appropriate method based on properties of the surface being examined, such as porous or nonporous. James and Nordby (2009:365) agreed by stating that most methods for the development of latent prints are developed based on the knowledge of the latent print and the object the print is on. Girard (2011:141) supported the views made by Fisher, Tilstone and Woytowicz (2009:62) and James and Nordby (2009:365) by stating various methods for enhancing a latent print. It is also dependant on the surface that is to be examined.

2.5.1 The powdering techniques

In order to collect latent prints, there are good techniques such as aluminium magnetic powder and super glue fuming (Hamilton in Van der Westhuizen, 1996:277). According to James and Nordby (2009:365), due to lack of materials, these methods were used but not practical. Latent fingerprint collection from the document as one pack requires great care. Using chemicals is the most and best secure techniques than developing latent fingerprints by means of powder. Some of the investigator's preferences is to immediately search for fingerprints at the crime scene, as it is advantageous before it is exposed to damage. Fingerprint can be easily destroyed during transportation; it is important to collect them at the scene of crime. Although there is an advantage to collect the fingerprints at the crime scene, it has its own challenges. Some fingerprints can be better to photographs or make use of chemicals than collecting those using powders. According to James and Nordby (2009:365), forensic expert collectors make use of various powders based on the colour of the surface during the collection of fingerprints. They use powders based on the colour of the materials. In some equipment, some powders work well but difficult to work on

other equipment. This prove that all powders are important to make prints visible but cannot be magnifier in all latent fingerprints.

Professional used some other powders at the crime scene as well as at the laboratory. However, the magnetic powder is the most important powder to use on the documents.

2.6 WHAT DOES FINGERPRINT IDENTIFICATION ENTAIL?

Evans (2009:18) share the knowledge that even the twins don't share the same fingerprints. There are two most important reason which fingerprints are used for personal identification means which are:

- Every human being has different fingerprints. Nath (2010:13) wrote that there are different ridges features to an individual:
- "No two fingers have been discovered as the same".

Fingerprint does not change during a human's lifetime, except when dermis layer skin is damaged (James & Nordby, 2009:356).

According to Nath (2010:15), fingerprints can be classified systematically because of the ridge patterns.

The participants responded to a question: "what does identification of fingerprint entails?" and the answer was as follow:

- Same ridge features on the print with that of the other print (13 participants).
- It establishes the fingerprint that has been collected from the scene of crime with those on the database (5 participants).
- It entails the matching of two fingerprint to identify an individual (13 participants).
- It determines the fingerprint of the suspect by matching two fingerprints (5 participants).
- It entails characteristics of ridges and should be the same with those of the other print (3 participants).

The responses from participants are quite similar and slightly agree with the literature that has been consulted.

2.6.1 How can fingerprints be identified?

Karen (2010:140) specified that once print has been scanned, the process of comparison follows to check for specific different features in order to identify suspect. The fingerprint patterns are called arches, loops and whorls. Osterburg and Ward (2010:54) specified that ridges features are important in terms of classification as well as individualisation. Identification works in terms of type line, characteristics of ridges features, and line pattern of fingerprint. Osterburg and Ward (2010:54) emphasised that the rule of system classification, is by making use of ridge features in groups which are whorls, loops and arches. The moment the fingerprint is made visible by powder and lifted by means of a tape lifter and have reasonable number of ridges for comparison, it is then scanned and compared with those known prints (James & Nordby, 2009:72). Regardless the ridge characteristics give the print its individual character (Saferstein, 2011:544).

According to Osterburg and Ward (2014:51-52), to identify a latent fingerprint simply means to minimising it for any detectable class characteristics that are not of the same pattern type; then you individualise them by means of ridge characteristics and put them together. The grouping of pattern is chosen as an indicator to be searched with the known print; if the grouping doesn't match, then the print that is known is eliminated. If a match is found, then the following move is to compare the latent print to identify the one which is closest with the prints group; then the print is collated to see if the ridge characteristics are present by means of ridge counting. When all points of identification in each are being put in place as the same type such as (Lake, trifurcation, crossover etc.) in the same location and no unexplainable differences are found, a decision that both prints are of the same person should be justified (Osterburg & Ward, 2014:52).

Participants responded to the question "How can a fingerprint be identified?" as follows:

- Through following the techniques of comparing such as counting ridges (2 participants);
- By comparing a known print to unknown print (3 participants);
- By checking the patterns (4 participants);

- By searching fingerprints on Automated Fingerprint Identification System (AFIS) (3 participants);
- By establishing the correspondence in terms of relation, size, place and position without any unexplainable differences (2 participants).

According to the responses, the participants have knowledge, however some mentioned AFIS without mentioning how it is used. The responses of the participants support those that were mentioned in the literature.

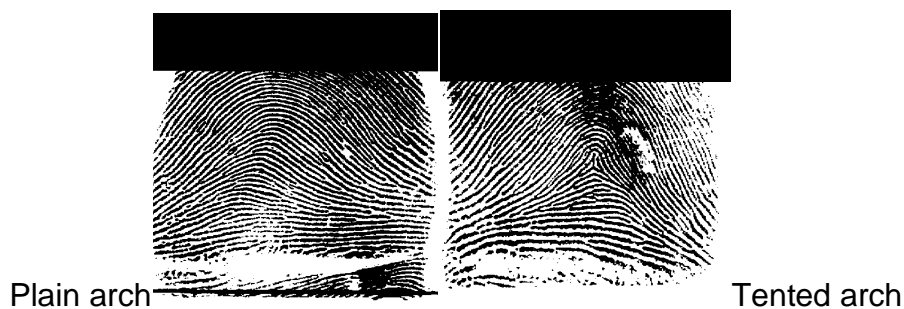
2.7 FINGERPRINT PATTERNS

The purpose of fingerprint identification is based on the use of ridge outlines that found on the bulbs on the inside of the end joints of the fingers and thumbs. It is possible to classify fingerprints into three general patterns: the arch, the loop, and the whorl (Lynman, 2011:108).

2.7.1 Arches

An arch pattern is made up of parallel ridges running from one side of the finger to the other without making any backwards turns. This type of arch pattern may take the form of plain or tented arches (Nath, 2010:26-27). There is no core or delta in the arch pattern (see example below).

Figure 2.7.1: Plain and Tented arch

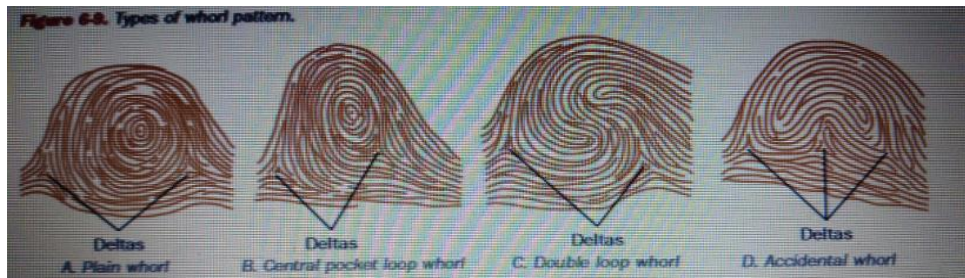


(Nath, 2010:26-27)

2.7.2 Whorls

This pattern looks like bull's-eye, with at least two deltas. Whorl pattern has either one or more deltas or one or more core (James & Nordby, 2009:356; Saferstein, 2011:240-241).

Figure 2.7.2: Whorl pattern



(James & Nordby, 2009:356; Saferstein, 2011:240-241)

2.7.3 Loops

The ridges in this pattern should make an independent backward turn; there should be one delta and one core and there should be at least a count between the core and the delta. There is ulnar and radial in the loops (Nath, 2010:28-29; Pepper, 2010:945). The ridges in the ulnar pattern flow in the direction of the ulnar bone from the right hand to the little finger. If it is the left, the ridges flow to the direction of the left little finger (Nath, 2010:29). See example below.

Figure 2.7.3: Radial and Ulnar loop



Radial loop

ulnar loop

(Nath, 2010:29)

2.8 SUMMARY

Fingerprint plays the most important role in the investigation of crime. It primarily locates, identify, and eliminate suspects in criminal cases. According to literature, no two people have identical fingerprints, and every person's fingerprints are unique. During the identification of fingerprints. There are ways to follow in order to get the two fingerprints of the same person to be an identity. Fingerprints consist of ridge characteristics and is also called a minutia. Ridge characteristics in fingerprint

terminology are as follows: Bifurcation, Trifurcation, Lake, Island and Crossover. Fingerprint also consist of patterns that also assist in terms of classification. The fingerprint patterns are called: Arches, Loops and Whorls. During the comparison of fingerprint in order to identify a suspect, this is the main procedure to follow. In terms of the South African law, there is seven-point criteria that has been approved to a minimum of seven ridge characteristic to consider an identification of suspect a hit.

CHAPTER 3: THE IMPORTANCE OF AUTOMATED FINGERPRINT INVESTIGATION SYSTEM IN IDENTIFYING THE SUSPECT

3.1 INTRODUCTION

Fingerprint is one of the best and most reliable type of physical evidence that link a criminal with a scene of crime (Hess & Wroblewski, 2006:321). Collection of fingerprints in the investigation of crime is a norm by fingerprint expert and it has greatly improved and supported by computer search such as AFIS and is a method computerised for searching fingerprint (Gilbert, 2010:463).

Identification cannot be done by any fingerprint investigator, a fingerprint investigator should be well experienced in the field (James & Norby, 2009:37). According to Osterburg and Ward (2010:59), various types of training are required for an expert to be called an AFIS expert who compare fingerprint qualifying to be hits; they also have to undergo courses such as fingerprint comparison, an AFIS course (Joubert, 2010:283-4).

There is a process within the LCRC that must be followed after the fingerprint is collected from the crime scene. After collection of the fingerprints, the expert has to firstly do the elimination to proof that the fingerprints collected are not of the complainant. The collected fingerprints are handed over to the inspecting officer for checking and correctness. Subsequently, the fingerprints are forwarded to the AFIS expert for scanning. If there is a hit, the fingerprint will then be verified and validated to confirm that the correct person is identified.

In this chapter the researcher discussed the importance of AFIS as well as how techniques are used in the identification of suspects. The topic addressed the following in the chapter: the process of print to identification; the purpose of verification and validation, identification practice prior to AFIS system. The researcher also discussed the importance of the use of AFIS as a database in South Africa.

3.2 AUTOMATED FINGERPRINT IDENTIFICATION SYSTEM (AFIS)

According to the researcher, AFIS is established to minimise the frustration and time consumption during the comparison of various fingerprints. Fingerprint are collected by fingerprint expert and taken to AFIS for scanning. Fingerprint expert should be a qualified person who has gone through AFIS training to understand the techniques to identify a single print out of many that are in the database. According to Mokwele

(2016:5), "AFIS" is a software used to encrypt fingerprint when they are scanned into it. AFIS refers to the computerised system for matching fingerprint specimens (Treverton, Wollman, Wilke & Lai, 2011:134).

AFIS is the system that is designed to identify the patterns, but it is the duty of the AFIS expert to establish the pattern during the scanning. During the searching, the system determines the pattern. The AFIS expert have to determine the correct fingerprint out of certain amount that the system established to be the same pattern.

Fingerprint is the feature pattern in the finger. It is imprint formed by the friction skin and the thumb. Fingerprint is used as immutability and individuality to identification. "Individuality" refers to the uniqueness of ridge features on each finger whereas "immutability" refers to the unchanged and permanent feature of each finger. The ridge features are the uniqueness on the fingerprint that is able to differentiate the pattern ridges in fingerprints that are able to individualise minutiae. Fingerprints are distinguished by the minutiae points not by the ridges (Tukur, 2015:1).

According to Gardner (2012:256), identification of fingerprint involves the known prints comparison (recorded prints) together with those that are not known prints found at the scene of crime for the identification purpose. Van Graan and Budhram (2015:47) further defines the term "identification" as a classification system when the objects with similar characteristics are classified into one group.

Nath (2010:115) refers to "AFIS" as fingerprints database taken and stored. Not all AFIS systems are the same. Some areas that are larger have their AFIS system that stand alone that may directly or indirectly connected to the state identification bureau. Treverton, Wollman, Wilke and Lai (2011:134) refers to "AFIS" that is a software computer program used to encode individual fingerprints. The digital world has moved the old search system dismally in a way that the new members coming into world of forensic do not know what "classification" mean. Regardless that manual search exists as backup, the new generation will not pick up with the manual search since they are not taught how it works due to advances in technological system currently in place.

Petcovich (2011:13) accord the view of Komarinski (2005:4) and Gardner (2012:256) and gives a brief explanation of the four components of the name "AFIS", (A) "Automated replaced searching fingerprint comparison card, (F) Fingerprint evolves a

rolled individual fingerprint scanner or cards, (I) Identification is a process of acquiring fingerprint images from the comparison fingerprint database, and (S) the technology system that has been used to connect the software with other identification system”.

3.2.1 Identification practices prior to AFIS

The automated process has simplified the process of classification from locating fingerprint cards from a file and compares two fingerprints physical cards. This system is a searchable database and is composed of fingerprint images that has been collected from individuals; in most cases, fingerprints are collected when individual is seeking for work or when the person is arrested. The fingerprint card is scanned through the system and remain in the database. The identification aspect occurs when the person is fingerprinted, and the resulting images are searched against the database of fingerprint images on a local, state, or national database (Komarinski, 2005:4). Similarly, Barnes (2004:6) posits that almost all the criminal files of individuals contained rolled fingerprint per card for a total of 150 million single fingerprints. Records were manually classified and searched against this file using classification; this simply means that the fingerprint expert will manually compare fingerprints per pattern with those of similar until they found identification. The time and human resources to accomplish this daily workload continued to grow. As the size of the criminal file and the daily workload increase, the time consumed in searching increased.

According to Taylor (2015:54), fingerprints were stored in an alphanumeric order in terms of classification and are place in the cabinet search room. Then when the suspect is arrested, the fingerprint is taken in a form of a card and filed in the filing cabinet search according to classification label. During the classification of fingerprint identification, the pattern such as transverse curve, oblique loop, almond whorl, and spiral whorl were used as classifications in order to identify the suspect (Barnes, 2004:5).

The researcher identified that there was a lot of time consumed during the comparison of large number of fingerprints during classification as compared to today's practice where computer system is used. The introduction of “AFIS” came to the rescue and prevents time consumption during comparison.

3.2.2 The purpose of using AFIS

The purpose of using AFIS system is to fast track and accurately identify fingerprint. The system helps to identify many suspects as fast as possible (Saferstein, 2011:545). As compared to manual comparison, AFIS increases the match accuracy (Dutelle, 2011:181). AFIS system is quicker and compares significantly more latent prints in the database (Gilbert, 2010:464). Comparing fingerprints manually can take longer. Komarinski (2005:16) support the view and state that computer search millions of records in seconds. If the images match an existing record, the record is updated.

3.2.3 Why fingerprint-based check is important (Validation)

According to the researcher, it is important to perform a fingerprint base check to avoid identifying a wrong suspect or candidate in AFIS. Normally there are two AFIS experts who check the identification in order to confirm the identification. According to Soanes and Stevenson (2009:197), it is important to check in order to prove and confirm the truth or validity of AFIS identification.

The purpose of validation-based check is to confirm identification. In other words, validation is performed when the hit has been made in AFIS. After the hit by an expert, another expert will have to confirm or validate the identification. No expert can validate his or her own identification. That process is to avoid a misidentification that creates a long process to remove the person who has been wrongly identified from the system.

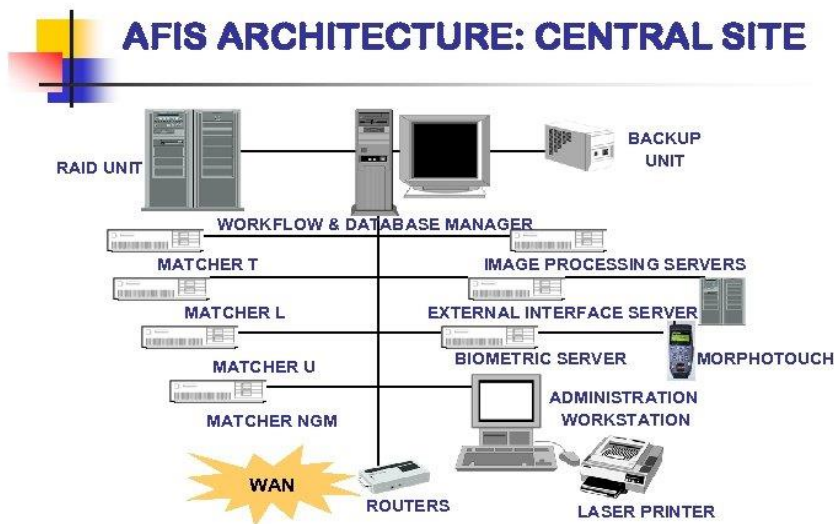
The opinion of another expert is used to confirm the validity of fingerprint identification made by the other expert (Morris, 2007:153). According to Morris (2007:152), misidentifications are still made regardless of the validation made by another expert. Most of the misidentifications are not recorded to avoid being departmentally charged. The best expert depends on the experience (Morris, 2007:152).

3.3 AUTOMATED FINGERPRINT IDENTIFICATION COMPONENTS

The main goal of identification process makes sure that suspects are identified as soon as possible with the given resources. This process is quantity driven, with the need to respond to a request with a complete criminal history or rap sheet within a limited time period. The system compares minutiae, the AFIS expert compare the one-on-one finger images on the AFIS screen (Komarinski, 2005:89). There are various components that enable the digitised fingerprint identification process in AFIS. The most important common components of the AFIS are network equipment, system

administrator workstation, matching block, server cluster and data archiving module, control and query workstation, the identification workstation and workflow station (Bio-Metrica 2011: n.p.). In the forensic division under the SAPS, the connected system is connected nationally from Criminal Record Centre Component to the Provincial as well as the Local Criminal Record Centre Nationwide (Du Toit 2007: n.p.). However, the researcher realised that most offices with AFIS installed are those which are regarded as huge offices. Due to AFIS being expensive, the other offices have to travel to other offices to perform the scanning of latent in AFIS.

Figure 3.3: AFIS components



Source: CRC Presentation (2012: n.p.)

This technology is the most reliable database across the globe. According to Bio-Metrica (2011: n.p.), the features provide a highly reliable speed and operate effectively. AFIS has a built-in back up mode to ensure that fingerprint evidential data are always secured.

3.4 AFIS CHALLENGES IN THE SOUTH AFRICAN POLICE SERVICE

According to the researcher, there are various challenges within the South African Police Service that are related to the system itself and to the socio-cultural context within the police service. System related issue is the bidding of the system in terms of the Public Finance Management Act (PFMA). According to the PFMA regulation 1 of

1999, in terms of procurement and binding tenders, there should be three quotations and the government should opt for the cheapest bidder. However, when it comes to AFIS in the SAPS, there is only one bidder and no other AFIS operation company in the country. Should there be a financial disagreement between the SAPS and the current company (Merthamorpho) that is providing SAPS with the service, AFIS will not function and there will be no identification.

In terms of the socio-cultural context within the police service, there are demoralising law enforcement practices, this includes the use of technology in a manner that does not consider the diversity of the South African culture and societal characteristics. The utilisation of the technology depends on the internal management environment within the police service. According to Sinclair and Matlala (2011:47), police agencies rely on technologies in order to help them drive the developments. The police must understand challenges that are linked to the use of a technology in order to achieve the desired aim of the use of that particular technology. While some organisations could not operate without technology, key features in any organisation rely on the organisation's people, structure, politics, culture and operational procedures. Some of the challenges that are related to the use of AFIS by the SAPS are as follow:

- **Power failure:** during load shedding, it is quite evident that there will not be identification made. No suspect will be arrested.
- **Shortage of AFIS experts:** the LCRC has limited AFIS experts, most of the experts are old and almost at retirement age. Due to the demand of identification, there is less in-service training.
- **Shortage of SAPS 218 forms:** during the arrest of suspect, the investigator doesn't take the palm print of suspect, which leaves the number of palms in the database not identified.
- **SAPS 76 forms:** AFIS rely on SAPS 76 (Criminal form) which is used when the suspect is arrested. If the form cannot be scanned in AFIS, it will be difficult to identify a suspect. The database consists of the fingerprints collected from the crime scene and those from SAPS 76 to create a match.

3.5 THE IMPORTANCE OF AFIS IN THE SOUTH AFRICAN POLICE SERVICE

In 2002, AFIS was implemented within the CRC of the SAPS in Pretoria (Terry, 2011). It was thereafter installed in the provinces. Not every LCRC within the provinces had

AFIS because it is costly. AFIS was installed in large office per the structure of the Division Forensic Service. Medium offices had to travel to the large office in order to scan fingerprint for identification purpose. Secunda LCRC used to travel to Ermelo LCRC to scan latent fingerprints whereas Kwamhlanga LCRC had to travel to Witbank LCRC. AFIS was then implemented in Secunda in 2012 and it was also implemented in Kwamhlanga in November 2014 which minimised travelling.

3.5.1 The strength of AFIS

AFIS has become a widely accepted method for identifying persons in a one to-many search. In both forensic and civil applicants, AFIS system offer great chance to identify a suspect as quick as possible, and in many cases that are in the database (Komarinski, 2005:121). Depending on the number of fingers stored in the database, the chances of identification can exceed to 99.97%. That means that three people in 10.000 are not identified, but 9.997 of the 10.000 are. That number can be increased with the following situations:

- The type of finger.
- Searching a lot of fingers.
- More records of the same person on the database.
- More accurate matching algorithms.
- More accurate coding algorithms.
- Finger with better ridges on the database
- Better image comparison.

The latest generation of AFIS matchers and codes will be more accurate and better in the future (Komarinski, 2005:122)

3.5.2 The weakness of AFIS

According to the researcher, AFIS rely on the collection of fingerprints taken from the arrested person. If there are no arrested persons, the database will not have fingerprint to search in order to identify a suspect. AFIS in the SAPS is not linked with Home Affairs Department, which make it difficult to link a suspect on a database. AFIS is not completely interoperable. They do not function with ease as compared to automated teller machines that can connect to any virtually financial institution and debit or credit account (Komarinski, 2005:123). The database of millions of AFIS records available in one state is not immediately available in another state for searching. While the path

does not exist, through IAFIS (Integrated Automated Fingerprint Identification System), it does not connect every existing AFIS database. As has been discussed, a search for a local criminal application (e.g. for an arrest) may return as a “no hit”. Not every arrest may give “hit” results since AFIS rely only on fingerprint taken from an arrested person or a jobseeker whose fingerprints were scanned on AFIS.

According to Daluz (2015:96), the match will only be done with those known fingerprints searched in AFIS. This is supported by Komarinski (2005:123), who said, not every arrest has a “hit”, and only those fingerprints of an arrested person that were already scanned on AFIS may give “hit” results.

3.5.3 The tracing and counting of ridges in making AFIS identification

It is the responsibility of the AFIS technician to make final decision when comparing fingerprint in AFIS. AFIS is a tool that makes life easier to the AFIS technician by giving possible fingerprints that are similar to those in searches. It is the responsibility of the AFIS technician to compare fingerprints through ridge counting and tracing in order to determine the match (Osterburg & Ward 2010:57). The possibility that prints can be matched without making use of one or both ridge tracing and counting techniques is not there. This view is supported by study guide (SAPS, 2010:105), which says, in order to make identification, you must make use of ridge tracing and counting, shape relation and ridge characteristics. The identification can be made by making use of ridge counting and tracing as well as ridge characteristics.

3.5.4 The significance of CRIM (Criminal Record Identification Management) System in AFIS

AFIS cannot make identification without the contribution of CRIM section within LCRC. CRIM is responsible for registration of SAPS 76 on CRIM to enable a search on AFIS to provide criminal record report for sentencing purpose at Local Criminal Record Centre South African Police Service (2016:5).

After capturing of the SAPS 76 form on CRIM system, the form should be taken to AFIS for scanning. During the scanning of SAPS 76 form, AFIS operator will do quality control. SAPS 76 form is the form that is used only when a suspect is charged. The form is used in the South African Police Service for criminal record purpose. The information remains in the database. When searching for identification purpose, AFIS operator picks the specific fingerprint if the person has the previous convictions. The

fingerprint that has been identified indicate the fingerprint number. Through the fingerprint number that has been identified, the CRIM system assists in terms of identifying the suspect who matches information and the address of the suspect by printing the profile. The AFIS expert is expected to open the identification docket and inform the detective officer. During the process of SAPS 76 in AFIS, the CRIM personnel should perform the quality control, TP (Ten Print) verification and validation to unsolved latent cases. The actions enable the AFIS expert to identify the suspect South African Police Service (2016:6).

3.5.5 The importance of AFIS training within the Criminal Justice System

According to the researcher, there is a necessity to train the prosecutors or to inform them of the importance of AFIS during the court proceedings. This is because most cases were withdrawn in court due to lack of knowledge on how AFIS works. During the “justice meeting” where the elements of crime and the issues of court proceeding are discussed; it is important to address the importance of fingerprint as evidence. Sennewald and Tsukanyama (2006:146) mention that the investigators in the private sector are very knowledgeable about the science and mechanics of fingerprints. Justice official should have knowledge on the process of identification in AFIS during the giving of evidence. This involves the AFIS expert’s statement with regard to crime investigation up to identification of suspect from AFIS. This information will give better understanding and reduce the number of cases that has been withdrawn in court due to lack of knowledge. It will also minimise unnecessary attending of court by AFIS expert who are required to give evidence.

Nath (2010: ii) expects majority of people to read the book on fingerprint identification. He writes:

“The knowledge in this book would be of enormous significance to practicing lawyers, researchers, post-graduate students if forensic science, civil servant, police officials and the ones fascinated to be acquainted with fingerprint science, who wishes to acquire knowledge on the use of fingerprints for personal identification”.

3.5.6 Missed identification AFIS

According to Mokwele (2016:73), missed identification occurs when AFIS expert either identified both fingerprint which doesn’t match or when both fingerprints are identical or match, but the AFIS expert established them as “no hit”. That is called a missed

identification due to the fact that the AFIS expert failed to apply their knowledge as an AFIS expert. SAPS policy letter numbered 7/2003, when AFIS expert made a missed identification, the disciplinary steps shall follow against the member. Milne (2013:104), mentions that misidentification occurs mostly in the poor quality of the crime scene print. An AFIS expert is expected to have no misidentification because they can face a disciplinary action. As (Milne, 2013:105) specified, misidentification is caused by the poor quality of a crime scene print.

3.5.7 Best practices to improve identification in AFIS

According to Pepper (2010:102), best practices are as follow:

- The fingerprint collected from crime scene should be scanned in AFIS as soon as possible. This will give a better chance to arrest the suspect in time.
- The complainant should be made aware of the importance of fingerprints by the investigator when visiting the crime scene so that they don't clean the crime scene. According to Pepper (2010:93), fingerprint should be obtained properly, that will give a better chance of identification during comparison.
- According to Saferstein (2011:547), AFIS should be linked with IAFIS as well as HANIS (Home Affairs National Identification System) in order to link the suspect easily.
- If HANIS and AFIS can be linked, it will give an opportunity to identify the suspects immediately (Saferstein, 2011:544).
- Morpho touch should be implemented because you can easily move with it anywhere. That can be used to scan individuals (Pepper. 2010:102).

The best practice in AFIS *Afrika Tshipembe*, the LCRC should implement rotation of AFIS experts. AFIS experts should be working during the day and night in a rotation basis in order to effect as much identification as possible. The system during the night flow faster than during the day due to the fact that most experts are not using it during the night. After the attending the crime scene, the fingerprint investigator will immediately hand in the fingerprints to the AFIS expert to scan. That will provide an opportunity for fast identification of suspects. During the CCCF (Crime Combating Committee Forum) meetings, the LCRC commander should make an awareness to the station commanders to conscientize investigators that when they visit the crime

scene, they should make the complainant aware of the importance of fingerprints and also ensure that the complainant does not contaminate the crime scene.

3.6 SUMMARY

The chapter presented the significance of Automated Fingerprints Investigation System (AFIS) in identifying suspects. The researcher also explored AFIS components as well as the administrative section (CRIM) which is tasked in verifying information, such as SAPS76 forms which eventually links suspects to crime scenes. Lastly, best practices as well as flaws in the system were identified in order to enhance the capabilities of the system going forward.

CHAPTER 4: PRESENTATION AND INTERPRETATION OF RESEARCH FINDINGS

4.1 INTRODUCTION

The researcher collected and analysed data during interviews. These data were arranged in terms of themes which assisted in clarifying certain issues which the researcher sought to explore. Due to the quality of certain responses, the arrangement and selection of themes were based on the importance of responses. For this reason, themes are presented in the section below.

4.2 EMERGING THEMES

In this section, themes which came as a result of data analysis are presented. In order to retain originality of responses, some responses were made verbatim (reflecting exact words by participants).

4.2.1 Theme 1: Investigative procedures and processes

When asked about their understanding of investigative procedures and processes, participants responded as follows:

“Investigative procedures and processes means:”

- *“Gathering of evidence”.*
- *“To analyse information”.*
- *“To form reasonable ground to believe”.*
- *“To Arrest and charge the suspect”.*

The researcher agrees with the participants (40) as this explanation is in line with Dempsey (2003:29-30) who described the investigative procedures and processes as follows: to establish what happened at the crime scene, to locate the leads, to arrest the suspects, to locate and recover what has been stolen, to assist the court. On the contrary, Stelfox (2009:2) argues that investigative procedures and processes are not only to bring the suspect to prosecution. Furthermore, Stelfox (2009:2) believes intelligence gathering are also the fundamental of investigative processes and procedures. This means that when investigators are at the crime scene, they should also consider the processes and procedures when collecting evidence for court so that the process can be admissible. The researcher agrees with the author that, when

collecting the evidence that will link the suspect, they should also consider the procedures to avoid the case being thrown out of court.

4.2.2 Theme 2: Criminal investigation

When asked about their understanding of Criminal investigation, participants responded as follows:

“Criminal Investigation mean investigation of crime that has been committed by the suspect. By analysing and searching for the truth during the investigation”.

The researcher agrees with participants (40), as this explanation is in line with Zinn and Dintwe (2015:19) who described Criminal Investigation as a systematic, thinking reasoning, analysis and organising the process designed to search for the truth, during which all crime acts are thoroughly analysed. Similarly, Pepper (2005:93) also said that criminal investigation is an effort to uncover the crime. The minute the crime has been reported to the authorities, the question will be, who committed the crime? Houck and Siegel (2010:581) explained criminal investigation as the process that involves the discovering of who committed the crime and searching for the suspect who committed the crime through evidence that could assist in conviction of suspect. The investigator’s role is to process the crime scene for collection, identification, and reporting of evidence found at the crime scene, Birzer and Roberson (2012:25). This means that investigators must always come up with new methods of investigating crime scenes for fingerprints as criminals always try their best to conceal their criminal activities or modus operandi.

4.2.3 Theme 3: Giving fingerprint evidence in court

When asked about their understanding of giving fingerprint evidence in court, participants responded as follows:

- *“Giving fingerprint evidence in court is the process of the fingerprint investigator presenting what he found from the crime scene as evidence”.*
- *“Is the testimony by the investigator of what had occurred from the crime scene”.*
- *“Refers to the testimony and the knowledge of facts presented to the court of law by the investigator”;*
- *“Is either admissible or in admissible base on the facts given to court”.*

The researcher agrees with the participants (14), as this explanation is in line with Zeffertt and Paizes (2009:237) who said giving of evidence should be admissible and must be relevant. Schwikkard and Van der Merwe (2009:20) support the Zeffertt and Paizes (2009:237) by saying for the evidence to be admissible, it must be relevant. Schwikkard and Van der Merwe (2009:20) further stated that there is no degree of admissibility, it is either the evidence is admissible or inadmissible. The evidence may carry more or less weight in terms of the particular case circumstances.

For example: fingerprints collected from the crime scene – fingerprint examiner should detail all the information on where the fingerprints were found at the crime scene to avoid confusion at a later stage. There should not be unexplainable differences with what transpired from the crime scene. Lyle (2008:18) cautioned that the testimony should be measured and honest to avoid uncertainty. The expert should make sure that they detailed all the information from the crime scene so that the defence might not undermine their credibility.

4.2.4 Theme 4: Fingerprint identification

When asked about their understanding of Fingerprint Identification, participants responded as follows:

- *“Fingerprint identification is when you compare two fingerprints, and you find them to be the same”. (5 participants).*
- *“Fingerprint identification should be the same in terms of shape, relation and the patterns (3 participants)”.*
- *“By comparing the suspect’s fingerprint with those on the database (8 participants)”.*
- *“By comparing two fingerprints without unexplainable different (10 participants)”.*
- *“Counting and tracing of ridge characteristics of the prints (13 participants)”.*

The participants had an idea and understood the question of fingerprint identification. The researcher agrees with all participants, as their explanation is in line with Siegel (2011:56) who described fingerprint identification as the process where prints are compared and found the same in terms of relation, size, position, and direction without unexplainable differences. In the same vein, Houck and Siegel (2010:57), argued that fingerprint identification is the examination of physical objects and using them to

categorise an object as a member of the group. The researcher supports both the viewpoint of the authors because at his working environment, fingerprint is identified when two fingerprints are being compared and found to be the same without any unexplainable difference to qualify as a hit. For example: when the fingerprint is collected from the crime scene, the fingerprint expert should either compare the fingerprint manually if there is a suspect. This process will be followed in the following manner, the investigating officer will take the fingerprints of the suspect on the 192 form and bring it to the fingerprint expert to compare. If there is no suspect, the fingerprint investigator will scan the fingerprint and compare the fingerprint with those on the database until there is a correspondence of the two prints.

4.2.5 Theme 5: Investigating house breaking cases

When asked about their understanding of investigative house breaking cases, participants responded as follows:

- *“Investigative house breaking cases is done for the purpose of collecting evidence such as fingerprint or DNA in order to link the suspect”.*
- *“To determine the purpose of evidence to identify the responsible person”.*

The researcher agrees with participants as this explanation is in line with Dutelle (2011:173) who explained the purpose of the investigation of house breaking cases as the point of recognising and collecting fingerprints to identify the suspect. On the contrary, Saferstein (2011:534) argued that fingerprints in Chinese are used to sign documents. Gardner (2012:28) disagreed with Saferstein (2011:534) and stated that the investigation of house breaking cases is to collect fingerprints as a means to identify the suspect. Nath (2010:1) agreed with (Dutelle 2011:173; Gardner 2012:28) that fingerprint in the investigation of house breaking cases are collected in order to identify the suspect. The researcher agrees with Dutelle (2011:173) and Gardner (2012:28). This means that when the fingerprint experts are at the crime scene, they should consider fingerprints as one of the crucial pieces of evidence at the crime scene. They should not consider other evidence to be unimportant.

4.2.6 Theme 6: Significance of fingerprint evidence

When asked about their understanding of significance of fingerprint evidence, participants responded as follows:

“Significance of fingerprint evidence helps to identify a suspect who committed a crime because no one has identical fingerprint”.

The researcher agrees with the participants as this explanation is in line with Dutelle (2011:173) who mentioned that fingerprints are collected to identify them in order to find the suspect or identify a person. On the contrary, Saferstein (2011:534) argued that fingerprints are used to sign documents in China. According to Gardner (2012:28), fingerprints are the most common forms of evidence sought at the crime scene. Nath (2010:1), agreed with Gardner (2012:28) and stated that amongst valuable clues found at the scene of crime are palm prints and fingerprints. Gardner (2012:28) stated further that fingerprints are used as a means of identification. This means that, when investigators are visiting the crime scene, they should consider fingerprints as one of the most valuable pieces of evidence to bring clues at the crime scene. They should achieve this by ensuring that fingerprint expert visit the crime scene each time.

4.2.7 Theme 7: Understanding the term “Individualization”

When asked about their understanding of individualisation, participants responded as follows:

“Individualisation is when you are separating two things from each other”.

The researcher disagrees with the participant, as this explanation is not in line with Ogle (2012:9) who described individualisation as specific object, based on the objects class and individual characteristics, to a unique class of one member and also allow identification of the individual source of the evidence item, such process is called “individualisation”. The item is individual characteristics found in the known sample characteristics or exemplary Ogle (2012:9). The researcher noticed that the authors agreed that individualisation is a way to prove the known sample with those of the unknown sample that it shares a unique common origin. Girard (2011:15) and Ogle (2012:9) argued that individualisation refers to the unknown sample class that the unknown should be individualised with the members of its class. Houck and Siegel (2010:59) described individualisation assumption of two concepts:

- Everything is unique in time and space.
- By which all things are constantly classified over time.

Other participants also mentioned that they don’t know the concept “individualisation”:

- 10 participants said they don't know.
- 4 participants said it means "one thing".
- 9 participants said they don't know.
- 14 participants said they don't know as well.

The researcher noted that the participants did not know the concept "individualisation". The researcher argues that, when some participants had a different perspective about the concept, while others did not know the concept completely, investigative principles must be so clear that investigators should be able to achieve the same results regardless of where the crime was committed. This can only happen when these investigators received the same kind of training.

4.2.8 Theme 8: Physical evidence

When asked about their understanding of physical evidence, participants responded as follows:

"Physical evidence refers to any object that has been recovered from the crime scene and be used to link a suspect. Example, fingerprint or firearm cartridge". (14 participants)

"Physical evidence refers to tangible item". (13 participants)

"Physical evidence refers to any object found at the crime scene which may results to identification of suspect". (13 participants)

The researcher agrees with all participants (40 participants) as this is in line with Gilbert (2004:59) who described physical evidence as any kind of objects that is associated with identification which might be a thing that is perceptible by touch, unlike any evidence that may results to inferences. Similarly, Rondinelli (2013a:26), described "physical evidence" as actual objects related to the crime. Lyle (2012:22), further stated that crime scene evidence plays several role and purpose in the criminal investigation such as suspect identification, linkage of suspect to the victim and providing investigative leads. This means that investigators at the crime scene must always consider physical evidence that can link a suspect with the crime scene. This is because criminals always try their best to conceal their criminal activities or modus operandi. For example, a cell phone box found at the crime scene and alleged to be

touched by the suspect. The investigator should collect the box to the fingerprint laboratory to be investigated for fingerprint purpose.

4.2.9 Theme 9: Types of fingerprints

When asked about their understanding of types of fingerprints, participants responded as follows:

“Types of fingerprints consists of Whorls, Loops and Arches”.

The researcher agrees with the participants (13) as this explanation is in line with Lynman (2011:108) who described types of fingerprints as Whorls, Loop and Arches. Nath (2010:26-27), also added that types of fingerprints consist of Whorl, Loops and Arches. Similarly, Osterburg and Ward (2010:54), described types of fingerprints as Whorls, Loops and Arches. Nath 2010:26-27) further described each pattern in the following manner. He described arch as a pattern that consist of parallel flow of ridges without making any backwards turn. He further described the arch patterns as plain and tented arch and that there is no core or the delta. Whorl pattern has one or more deltas as well as one or more cores. He explained that the loop pattern should have a count between the core and the delta to be classified as loop. James and Nordby (2009:356) agreed with Saferstein (2011:240-241) and stated that the whorl pattern consist of parallel flow of ridges without making backward turn. This means that the fingerprint experts should consider the types of fingerprints when comparing the fingerprint for identification purpose. Other participants (26) indicated that they did not know the types of fingerprints.

4.2.10 Theme 10: Techniques used to locate fingerprints

When asked about their understanding of techniques used to locate fingerprints, participants responded as follows:

“Techniques used to locate fingerprints refers to equipment that are used to make fingerprints visible from crime scene such as powders”.

The researcher agrees with participant as this explanation is in line with Dutelle (2011:173) who describes the techniques as the systematic and intelligent manner and develop techniques to trace fingerprint at a crime scene. Ogle (2012:131) agrees with Dutelle (2011:173) and provided the physical and chemical methods for latent detection: (a) a thorough visual search such as using lighting source for the presence

of latent impressions and (b) a search for fingerprints at the crime scene by making use of light source such as poliflare or ultraviolet light. Fisher, Tilstone and Woytowicz (2009:62), stated that processing of crime scene or evidence items for fingerprints starts with a search for visible prints, search for latent prints using powder or chemicals. The author further states that the fingerprint examiner should apply an appropriate method based on the surface like porous or nonporous. James and Nordby (2009:365) agreed by stating that most of the methods of development are based on the experience of the examiner during the development of fingerprints at the crime scene. This means that when the examiner is examining the surfaces at the crime scene, they should apply their mind and experience as to which methods to use and on what surface in order to avoid the distortion of fingerprint during the search. The researcher supports the statements made by authors and he agrees that during the search of fingerprints, the examiner should determine which methods he/she is going to apply based on the surface.

4.2.11 Theme 11: Automated Fingerprint Identification System (AFIS)

When asked about their understanding of Automated Fingerprint Identification System, participants responded as follows:

“Automated Fingerprint Identification System refers to computerised system that is designed to compare fingerprint to identify the suspect”. (14 participants)

Participants (26) showed no clue of the function of AFIS.

The researcher agrees with the participants (14), as this explanation is in line with Mokwele (2016:5) who said “AFIS” is a software used to encrypt fingerprint when these are scanned into it. Treverton, Wollman, Wilke and Lai, (2011:134), also stated that “AFIS” refers to the computerised system for matching fingerprints. On the contrary, Gardner (2012:256) argues that fingerprint identification involves the comparison of known prints with those that are not known prints found at the crime scene for the purpose of identification. This means that, during the comparison of fingerprint in AFIS, examiners should pay attention because the machine doesn’t automatically give a match however it gives a possible fingerprints match in terms of patterns. The examiner behind the matching should establish the identification based on the experience.

4.2.12 Theme 12: Significance of AFIS to link suspects

When asked about their understanding of significance of AFIS to link suspect, participants responded as follows:

- *“The significance of AFIS help to link the suspect quicker”.*
- *“It assists the AFIS expert to compare fingerprints without any delay”.*
- *“It increases the accuracy than manual comparison”.*
- *“Is faster as compared to manual comparison”.*

The researcher agrees with the participants (14) as this explanation is in line with Saferstein (2011:545) who described the significance of AFIS to link suspect as the system that helps to identify many suspects as fast as possible. Similarly, Dutelle (2011:181) described AFIS as the system that increase match accuracy as compared to manual comparison. Gilbert (2010:464), supported the view made by both authors when he stated that AFIS is the system that is quicker and compares significantly more latent prints in the database. Komarinski (2005:16), also supported the view and stated that computer search millions of records in seconds if the images exist in the database. This means that, the fingerprint examiner should scan the fingerprints as soon as possible in AFIS in order to link the suspect to prevent the suspect from committing other crime. Other participants could not give the importance of AFIS since they had no clue of its function.

4.3 SUMMARY

According to Wright (2007:70) who referred to Dr Edmond Locard’s description on how evidence link the criminal:

“Whatever the criminal touches anything, he or she leaves the trace at the crime scene. Such trace can be fingerprint, footprint or hairs”. This directly links the suspect with the crime scene. It is important that when the investigators are at the crime scene, they always consider that there is a trace which remain at the crime scene. During the investigation of crime, it is significant to consider that the only proof that will link the suspect with crime in the court of law is evidence that is admissible. Fingerprint plays the most critical role at the crime scene. The suspect can be identified through fingerprint by making use of AFIS comparing or manual. The role of AFIS during investigation of crime has a huge impact in identification of suspect. The system is able to identify the suspect quicker that the manual search which also help in

preventing the criminal from committing other crime in the process Komarinski (2005:121). In terms of locating the fingerprint, the fingerprint investigator should understand the techniques on how and what surface should the powder be applied. Fisher *et al.*, (2009:62) states that the processing of crime scene for fingerprint start with the search for visible fingerprint using powder or chemical. The author further advised that when the examiner is searching for prints, they should select the method based on the examination of surface. It is the responsibility of the examiner to ensure that all the processes in terms of crime scene investigation are followed in order to bring criminals to justice. The researcher noticed that training is very important based on the responses he received from the participants. The participants are knowledgeable and understand what is expected from them.

CHAPTER 5: SUMMARY, RECOMMENDATIONS AND CONCLUSION

5.1 INTRODUCTION

Fingerprint plays a huge role in the crime scene and is the most reliable evidence to connect the suspect with the crime scene. It is the quickest evidence to bring the solution to determine who committed the crime as compared to other evidence collected from the crime scene, such as DNA and firearm cartridges. When fingerprints are collected from the crime scene, they are then compared with those existing fingerprints that are on the database. The comparison is either conducted manually or systematically in order to identify the suspect.

The researcher decided to conduct this research in order to enhance the knowledge on exploring the underutilisation of LCRC for fingerprints investigation. The aim of this research was to find out why fingerprints are underutilised in the investigation of crime.

To achieve the aim of the research, one research question was asked, and the question was:

- How can utilisation of fingerprints investigation be improved in a crime scene.

This chapter mainly focused on what was discovered during the research. The findings related to the problem of the research, the research question, and the research aim. Recommendations will emanate from these findings. Below is the findings and the recommendations that are all based on the information that has been obtained during the interviews with the LCRC analysts, CSC and Crime Prevention personnel from Secunda SAPS, merged with literature study on the topic.

5.2 SUMMARY OF THE CHAPTERS

This section summarises chapters one to four, after which the interpretations derived from Chapter 4 were presented and from where conclusions were drawn, and recommendations made. The propositions made are grounded on the main outcomes from the identified themes and sub-themes that emerged from Chapter 4.

5.2.1 Summary of Chapter 1

Chapter 1 presented an overview, definition of terms, problem statement, aim, purpose, research questions, and the value of this inquiry.

5.2.2 Summary of Chapter 2

Chapter 2 presented fingerprint identification, the role of Criminal Record Centre (CRC), the role of Local Criminal Record Centre (LCRC), crime scene management, the significance of fingerprint evidence in the house breaking investigation, technologies used to locate fingerprints at crime scenes, and lastly, types/patterns of fingerprints.

5.2.3 Summary of Chapter 3

Chapter 3 presented the significance of Automated Fingerprint Investigation System (AFIS) in identifying suspects, AFIS architecture, AFIS challenges and opportunities, missed identifications and implications.

5.2.4 Summary of Chapter 4

In chapter four, themes were identified, interpreted and supported with participants responses, including verbatim responses in order to avoid distortion of facts. Participant views which were obtained during interviews were analysed in order to understand perceptions regarding the phenomenon being studied. Similar trends and patterns regarding conversations were grouped together in themes and sub-themes. Participant's responses were significant in terms of addressing the research objective of this study.

5.3 FINDINGS

The findings emanated from the information that has been obtained from the interviews that has been conducted from the consulted literature and chosen samples.

5.4 PRIMARY FINDINGS

The primary findings answered the research questions of this study. These findings basically responded to all questions that were asked.

5.4.1 Research question 1: How can utilisation of fingerprints investigation be improved in a crime scene?

During the reporting of a crime that requires the attention of the LCRC, there are mainly two sections within the SAPS that must consider fingerprints as the most important evidence at the crime scene: CSC and Crime Prevention. Reporting of the crime scene come in two ways: either by the complainant who will go directly to the police station CSC to report a crime, or telephonically. When the complainant goes directly to the

CSC to report a crime, it is the responsibility of the CSC personnel to advise the complainant not to contaminate the crime scene. This research found out that in most cases, complainants were not made aware of the LCRC and its functions. As a result, when the LCRC forensic analysts arrive at the crime scene, they found that the crime scene was already contaminated.

The researcher found out that when the crime was reported telephonically, it was attended by the Crime Prevention personnel who would obtain the statement of what transpired at the scene of crime. After obtaining the statement, it is expected of the Crime Prevention personnel to inform the LCRC and the complainant about the LCRC duties, and this was not done accordingly.

This study found out that there were cases in which both CSC and Crime prevention personnel did not report the crime to the LCRC which led to crime scene not being attended to. In this instance, perpetrators walk free without any arrest from the crime they committed. Such conduct leaves the community with no trust on the police. the worse part of it is that it gives the perpetrator an opportunity to commit crime countless times.

In addition, this research realised that there are cases that resulted to 'no investigation' or 'negative results' due to the fact that the crime scenes had been fixed. Example of fixed crime scene is when the complainant replaced the window or the door through which the suspect gained the entrance into the building. Such action limited a lot of crime scene investigations that could have connected the suspect with the crime scene and put such suspect behind bars. The research also discovered that most crimes were reported late to LCRC. This limited the opportunities of collecting sufficient and reasonable fingerprints from the crime scene that could have possibly given a better chance to identify the suspect.

5.5 SECONDARY FINDINGS

The secondary findings emanated from the aspects that aroused from the discussion of every chapter. These findings are outlined below.

5.5.1 Fingerprint

Finding 1

The responses from participants showed that they understood the meaning of fingerprint.

Finding 2

Fingerprint is an impression left by the friction ridge skin at the tips of fingers (Fisher, 2009:54). According to Nath (2010:1), the skin covering the interior surface of the human hand.

5.5.2 Fingerprint identification

Finding 1

The responses from participants indicated that they understood the meaning of fingerprint identification and the researcher was convinced by their responses.

5.5.3 Latent print

Finding 1

The participant's responses showed that they understood the meaning of the latent print, however 5 participants indicated that they were not sure of the answer when they said it is when a person touches something, and sweat is left at the crime scene.

Finding 2

Karen (2010:135) gave the definition of a latent print, both primary and secondary as impressions transferred to a surface, by sweat on the ridges of the finger. Lynman (2011:106), stated that latent prints are impression produced by the ridged skin on human fingers.

5.5.4 The role of the Criminal Record Centre

Finding 1

The criminal Law (Forensic Procedures) Amendment Act 6 of 2010, section 2 and 3 permit the CRC to manage the national fingerprint database, also to ensure convicted suspect's fingerprint to be stored on AFIS database (South Africa Police Service, 2010).

Finding 2

The participants managed to describe the role of the CRC by stipulating that it is to manage the fingerprints database and profiling of the offenders. However other participants spoke about the collection and keeping of the records which is still the role of the CRC, and they were not wrong.

5.6 CRIMINAL INVESTIGATION

Finding 1

Participants generally said it is when the investigator is trying to discover the information for the crime which occurred in order to arrest the culprit involved. Other participants further responded by saying it is when the police are investigating the crime. The researcher found that the participants had an idea of what criminal investigation entails.

5.6.1 Objectives of Criminal investigation

Finding 1

According to Dempsey (2003:29-30; Hess & Hess 2013:11) the objectives is to establish if the crime was committed, locate leads, and to arrest the suspects.

Finding 2

The researcher discovered that the participant's responses were correct on the objectives of criminal investigation as outlined by literature regardless that they did not strictly stipulate the objectives as per literature. The participants understood the objectives.

5.6.2 Identification

Finding 1

The responses from the participants were mixed and indicated that they did not know the meaning of identification exactly.

Finding 2

According to Houck and Siegel (2010:57), identification is the examination of the chemical and physical properties of an object and using them to categorise the object as a member of a group.

5.6.3 Individualisation

Finding1

The participants' responses were clear that they did not understand the meaning of identification and were not in agreement with regard to the concept. Three participants said it is to separate two things from each other. Ten participants said they did not know. Four participants said it meant one thing. Nine participants said they did not know. Thirteen participants also didn't know the concept. The researcher noticed that there was no idea on what individualisation is.

5.6.4 The significance of fingerprint evidence in the housebreaking investigation

Finding 1

For Nath (2010:11) fingerprints provide unique service in the administration of justice and also in other areas where positive identification is highly important. Dutelle (2011:173), stated that the whole point of recognising and collecting fingerprints is to identify them in order to find suspect or identify a person.

5.6.5 Techniques used to locate fingerprint

Finding 1

The fingerprint expert search for latent prints in a systematically and intelligent manner and develop techniques to trace fingerprint at a crime scene Dutelle (2011:173).

Finding 2

Fisher, Tilstone and Woytowicz (2009:62) state that the processing of crime scene or evidence items for fingerprints starts with a search for visible prints, then search for latent prints using powders or chemicals.

5.6.6 The powdering techniques

Finding 1

According to Fisher, Tilstone and Woytowicz (2009:62), the forensic evidence collectors use different powders to magnify and collect fingerprints from materials depending on the colour of the material. The powder they use are opposite in colour to the materials. Some powders may work well with some equipment, but they may

not be important for others. This shows that all powders are useful to magnify latent prints, but no single powder can be magnifier for every latent fingerprint.

5.6.7 What does fingerprint identification entail?

Finding 1

The responses from the participants indicated that they had an idea of what fingerprint identification entails. They said it entails the ridge features on the print and others said it entails the fingerprint matching of two fingerprint to identify an individual.

Finding 2

Nath (2010:15) gave explanation that fingerprints have ridge patterns that allow them to be systematically identified.

5.6.8 How can fingerprints be identified?

Finding 1

Participants had a knowledge of how the fingerprint can be identified. Ten participants said by following the techniques of comparing such as counting. Three participants said by comparing the unknown print to unknown print. Thirteen participants said by establishing the correspondence in terms of relation, size place and position without unexplainable difference.

5.6.9 Fingerprint patterns

Finding 1

The fingerprint pattern is based on distinctive ridge outlines that appear on the bulbs on the inside of the end joints of the finger and thumbs. Fingerprint pattern may be resolved into three large general group of patterns: the arch, whorl and loo (Lynman, 2011:108).

5.7 RECOMMENDATIONS

The following recommendations are made based on the findings of the study: during the Crime Combat Committee Forum (CCCF), the station commanders should sensitise the members about crime scenes that require the attention of the LCRC. The shift commanders should have parade before they resume with their duties. These parades could provide perfect environment and opportunities to sensitise the members

about the importance of fingerprints in the investigation of crime. The Crime Prevention plays a huge role when taking statement at the crime scene. They should inform the complainant about the importance of fingerprints and educate the complainant on how to prevent contamination of the crime scene.

The study recommends that Crime Prevention personnel receive refresher courses on how to protect the crime scene, not only from contamination by the complainant, also from contamination by the by-standers and people who seek to offer help to the complainant.

This research also recommends that there should be the forensic awareness conducted in terms of fingerprint crime investigation to the members and the community as well. The intention to conduct forensic awareness was to make sure that the community also play a role in fighting crime by preventing contamination of the crime scene after the crime has been committed.

When the LCRC commander meets with the station commanders during CCCF meetings, they should focus much on providing solutions to promote the utilisation of the LCRC at crime scenes. They should set disciplinary measures for those members who did not utilise the service of the LCRC intentionally, i.e. after awareness.

Future research should focus on conducting this research on a large scale, e.g. at a provincial level. The research should also use different methods of collecting data, such as following up on cases that are already closed to get an understanding of all the processes that were followed in involving the LCRC.

Future research should also aim at designing projects for community and SAPS awareness on how to utilise the already available service of the LCRC.

5.8 CONCLUSION

To improve the utilisation of the LCRC at fingerprint investigation scenes, the Crime Prevention within the SAPS should be made aware of the responsibility of the LCRC as they are considered to be the first people to arrive at the crime scene. Most community members prefer to go to the police station to report the crime. Once the docket has been opened, they go back home and fix their property. This happens because community members are not informed about the importance of the fingerprints that can lead to the arrest of suspects who committed the crime. Such

occurred due to the fact that the CSC personnel who took the statement did not inform the complainant about the responsibility of the LCRC as well as the importance of taking the fingerprints.

Fingerprints play an important role in the investigation of crime by locating, identifying and eliminating suspects. They should be prioritised considered at all times in order to promote justice for all, which is a constitutional right. Matters of justice for all affect both the complainant and the suspect. This is because underutilisation of the LCRC mostly leads to wrongful arrests. During the parade, the shift commander should address this matter with the members who are reporting on duty. This will minimise the contamination of the crime scene and bring more arrest of the perpetrators.

LIST OF REFERENCES

- Barnes, J.G 2004. *The fingerprint*. Office of Justice Programs: Washington, DC.
- Babbie, E. & Mouton, J. 2004. *The practice of social research*. Cape Town: Oxford University Press.
- Babbie, E. 2010. *The Practice of Social Research*. 12th edition. Wadsworth: Cengage Learning.
- Babbie, E. & Benaquisto, L. 2010. *Fundamentals of Social Research*. 2nd edition. Toronto: Nelson Education.
- Babbie, E. 2011. *Introduction to Social Research*. 5th edition. Wadsworth: Cengage Learning.
- Babbie, E. & Mouton, J. 2012. *The Practice of Social Research*. Cape Town: Oxford University Press.
- Benson, B.C., Jones, G. & Horne, J.S. 2015. *Forensic investigation of crime, irregularities and transgressions*. In Zinn, R.J. & Dintwe, S. 2015. *Forensic Investigation: Legislative Principles and Investigative Practices*. Cape Town: Juta.
- Bertino, A.J. & Bertino, P.N. 2012. *Forensic Science: Fundamentals and Investigations*. USA: South-Western, Cengage Learning.
- Bio-Metrica. 2011. *AFIS Automated Fingerprint Identification System*. From:
<http://www.bio-metrica.com/SYS B CRIMINAL AFIS.php>
- Birzer, M.L. & Roberson, C.2012. *Introduction to Criminal Investigation*. USA: CRC Press.
- Bless, C., Higson-Smith, G. & Kagee, A. 2006. *Fundamentals of Social Research Methods: An African Perspective*. 4th edition. Claremont: Juta.
- Bless, C., Higson-Smith, G. & Sithole, S.L. 2013. *Fundamentals of Social Research Methods: An African Perspective*. 5th edition. Claremont: Juta.

- Chauhan, Y.K. 2011. *Dictionary of Forensic Science*. New Delhi: Cyber Tech Publications.
- Concise Oxford Dictionary. 5th edition. 2007. s.v. "purpose". Oxford: Clarendon Press.
- Creswell, J.W. 2009. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. London: Sage.
- Creswell, J.W. 2013. *Qualitative inquiry & research design: Choosing among five approaches*. 3rd ed. Los Angeles, CA: Sage.
- Creswell, J.W. 2014. *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*. 4th edition. Thousand Oaks: Sage.
- Crowder, S. 2010. *Law enforcement investigations: Essential considerations*. In Petherick, W.A., Turvey, B.E. & Ferguson, C.E. 2010. *Forensic Criminology*. USA: Elsevier Academic Press.
- Daluz, H.M. 2015. *Fundamental of Fingerprint Analysis*. Boca Raton, London New York: CRC Press.
- De Vos, A.S., Strydom, H., Fouché, C.B. & Delpont, C.S.L. 2011. *Research at grass roots: For the social sciences and human service professions*. Pretoria: Van Schaik.
- Dempsey, J.S. 2003. *Introduction to Investigations*. 2nd edition. Wadsworth: Thomson.
- Denscombe, M. 2002. *Ground Rules for Good Research: A Ten Point Guide for Social Research*. Philadelphia, USA: Open University Press.
- Denscombe, M. 2010. *Ground rules for social research: Guidelines for good practice*. New York: Open University Press.
- Denscombe, M. 2011. *The Good Research Guide: For small– Scale Social Research Projects*. 4th edition. England: McGraw Hill, Open University Press.
- Denscombe, M. 2012. *Research Proposal: A Practical Guide*. England: McGraw Hill: Open University Press.

- Du Plooy, G.M. 2013. *Communication Research: Techniques, Methods and Applications*. 2nd edition. Cape Town: Juta.
- Durrheim, K. 2014. *Research Design*. In Terre Blanche, M., Durrheim, K. & Painter, D. 2014. *Research in Practice: Applied Methods for the Social Sciences*. 2nd edition. Cape Town: UCT Press.
- Dutelle, A.W. 2011. *An Introduction to Crime Scene Investigation*. USA: Jones and Bartlett Publishers.
- Du Toit, P.J.L 2007. *Automated Fingerprint Identification System (AFIS)*. Pretoria: Commissioners of the South African Police Service.
- Evans, C. 2009. *Criminal investigation: Crime scene investigation*. Chelsea: Infobase Publishing.
- Fish, J.T., Miller, L.S., Braswell, M.C. 2011. *Crime Scene Investigation: Second edition*. USA: Anderson Publishing.
- Fisher, B.A. & Fisher, D.R. 2012. *Techniques of Crime Scene Investigation*. 8th edition. USA: CRC Press.
- Fisher, B.A.J. 2004. *Techniques of Crime Scene Investigation*. 7th edition. London: CRC Press.
- Fisher, B.A.J., Tilstone, W.J. & Woytowicz, C. 2009. *Introduction to Criminalistics: The Foundation of Forensic Science*. USA: Academic Press.
- Fouché, C.B. & Delpont, C.S.L. 2005. *In-depth review of literature*. In De Vos, A.S., Strydom, H. Fouché, C.B. & Delpont, C.S.L. 2005. *Research at Grass Roots: For the Social Sciences and Human Service Professions*. 3rd edition. Pretoria: Van Schaik.
- Fouché, C.B. & Schurink, W. 2017. *Theory and literature*. In De Vos, A.S., Strydom, H. Fouché, C.B. & Delpont, C.S.L. 2005. *Research at Grass Roots: For the Social Sciences and Human Service Professions*. 3rd edition. Pretoria: Van Schaik.

- Gardner, R.M. 2012. *Practical Crime Scene Processing and Investigation*: Second edition. Florida: CRC Press.
- Gilbert, J.N. 2004. *Criminal Investigation*. 6th edition. New Jersey: Pearson.
- Gilbert, J.N. 2007. *Criminal Investigation*: Seventh edition. USA: Pearson Education.
- Gilbert, N.J. 2010. *Criminal investigation*. 8th ed. Upper Saddle River, NJ: Pearson Education.
- Girard, J.E. 2011. *Criminalistics: Forensic Science, Crime and Terrorism*: Second edition. USA: Jones & Bartlett Learning.
- Girard, J.E. 2015. *Criminalistics: Forensic Science, Crime and Terrorism*. 3rd edition. Washington, DC: Jones & Bartlett Learning.
- Gorard, S. 2013. *Research Design: Creating Robust Approaches for the Social Sciences*. London: Sage.
- Gray, D.E. 2014. *Doing research in the real world*. 3rd Edition. Los Angeles, CA: Sage.
- Hammond, M. & Wellington, J. 2013. *Research Methods: The Key Concepts*. USA: Routledge.
- Hawthorne, M.R. 1999. *First Unit Responder: A Guide to Physical Evidence Collection for Patrol Officers*. USA: CRC Press.
- Henning, E., Van Rensburg, W. & Smit, B. 2011. *Finding your way in Qualitative Research*. Pretoria: Van Schaik.
- Hess, K.M. & Wroblewski, H.M. 2006. *Police operations: Theory and practice*. 4th ed. Belmont: Thompson Wardsworth.
- Hess, C.O. & Hess, K.M. 2010. *Criminal investigation*. 9th edition. Delmar: Cengage Learning.
- Hess, C.O. & Hess, K.M. 2013. *Criminal investigation*. 10th edition. Delmar: Cengage Learning.
- Houck, M.M. & Siegel, J.A. 2010. *Fundamentals of forensic science*. 2nd edition. Oxford: Academic Press.

- James, S.H. & Nordby, J.J. 2009. *Forensic science: An introduction to scientific and investigative techniques*. 3rd ed. Boca Raton, FL: Taylor & Francis.
- Jansen, J.D. 2014. *The research*. In Maree, K., Creswell, J.W., Ebersohn, L., Eloff, I., Ferreira, R., Ivankova, N.V., Jansen, J.D., Nieuwenhuis, J., Pietersen, J., Plano Clark, V.L. & Van der Westhuizen, C. 2014. *First Steps in Research*. Pretoria: Van Schaik.
- Joubert. C. 2010. *Applied law for police officials*. 3rd ed. Cape Town: CTP Printers.
- Kaniki, A. 2014. *Doing information search*. In Terre Blanche, M., Durrheim, K. & Painter, D. 2014. *Research in Practice: Applied Methods for the Social Sciences*. 2nd edition. Cape Town: UCT Press.
- Komarinski. P. 2005. *Automated Fingerprint Identification System*. Amsterdam: Elsevier.
- Kumar, R. 2011. *Research Methodology: A Step-by-Step Guide for Beginners*. 3rd edition. Thousand Oaks, London: Sage.
- Leedy, P. D. & Ormrod, J.E. 2010. *Practical research: Planning and design*: 9th edition. Upper Saddle River, NJ: Merrill Prentice Hall.
- Leedy, P.D. & Ormrod, J.E. 2014. *Practical Research: Planning and Design*. 10th edition. USA: Pearson.
- Leedy, P.D. & Ormrod, J.E. 2015. *Practical Research: Planning and Design*. 11th edition. England: Pearson Prentice Hall.
- Lockey, L.F., Spirduso, W.A. & Silverman, S.J. 2000. *Proposals that work: A guide for planning dissertations and grant proposals*. 4th ed. London: Sage.
- Lyle, D.P.M.D 2008. *Forensics: A Guide for Writers*. USA: Writers Digest.
- Lyle, D.P.M.D. 2012. *Forensic Science*. USA: Bar Association.
- Lynman, M.D. 2011. *Criminal investigation. The art and the Science*, 6th edition. Prentice Hall: Pearson Education.

- Maneli, L. 2018. *Assessing the utilisation of Local Criminal Record Centre in rape crime scenes*. Master of technology dissertation, University of South Africa, Pretoria, South Africa.
- Maree, K. & Pietersen, J. 2014. Sampling. In Maree, K., Creswell, J.W., Ebersohn, L., Eloff, I., Ferreira, R., Ivankova, N.V., Jansen, J.D., Nieuwenhuis, J., Pietersen, J., Plano Clark, V.L. & Van der Westhuizen, C. 2014. *First Steps in Research*. Pretoria: Van Schaik.
- Maxfield, M.G. & Babbie, E. 1995. *Research Methods for Criminal Justice and Criminology*. Belmont: Wadsworth.
- McNiff, J. & Whitehead, J. 2011. *Doing and writing action research*. London: Sage.
- Milne, R. 2013. *Forensic intelligence*. Boca Rotan, FL: CRC Press.
- Mokwele, M.E. 2016. *The value of the automated fingerprint identification system as a technique in the identification of suspect*. Master of technology dissertation, University of South Africa, Pretoria, South Africa.
- Morris, W. 2007. *Articles and research: expert error: the mind trap*. Fingerprint World, June, 33(128), Warwickshire CV31 1QD: The Fingerprint Society.
- Mouton, J. 2014. *Understanding Social Research*. Pretoria: Van Schaik.
- Nath, S. 2010. *Fingerprint identification*. New Delhi: Sliv Shakti Book Traders.
- Nieuwenhuis, J. 2014. *Qualitative research designs and data gathering techniques*.
- Ogle, R.R. 2012. *Crime Scene Investigation and Reconstruction: Third edition*. New Jersey: Prentice Hall.
- Oliver, P. 2013. *Writing your Thesis*. London: Sage.
- Osterburg, J.W. & Ward, R.H. 2010. *Criminal Investigation: A Method for Reconstructing the Past: Sixth edition*. New Providence: LexisNexis Group.
- Osterburg, J.W & Ward, R.H. 2014. *Criminal investigation: A reconstructing the past*. 7th ed. New York: LexisNexis Group.
- Pepper, I.K. 2005. *Crime Scene Investigation*. London: Open University Press.

- Pepper, I.K. 2010. *Crime scene investigation methods and procedure*. 2nd ed. London: McGraw-Hill Company.
- Petkovich, J.C.2011. *A fingerprint identification system*. Master of Computer science Dissertation, Carlton University, Ottawa, Ontario.
- Rondinelli, V. 2013a. *Evidence in courtroom*. In Watkins, K., Anderson, G. & Rondinelli, V. 2013. *Evidence and Investigation: From the Crime Scene to the Courtroom*. Canada: Emond Montgomery.
- Saferstein, R. 2011. *Criminalistics: An Introduction to Forensic Science*. 10th edition. USA: Pearson, Prentice Hall.
- Saferstein, R. 2013. *Forensic science: From crime scene to the crime lab*. 2nd ed. New York: Pearson.
- Sarantakos, S. 2013. *Social research*. 4th edition. Hampshire: Palgrave Macmillan.
- Schwikkard, P.J. & Van Der Merwe, S.E. 2009. *Principles of Evidence*. 3rd edition. Cape Town: Juta.
- Sennewald, C.A & Tsukanyana, J.K. 2006. *The Process of investigation: Concepts and strategies for investigators in the private sector*.3rd. New York: Elsevier Butterworth Heinemann.
- Siegel, J.2011. *Forensic science at work: Contemporary issues*. New York: Rosen Publishing.
- Sinclair, I & Matlala, M. 2011. The Use of Technology and Leadership in Enhancing Strategic Cooperative Policing Within the SADC Region. *International Journal of African Renaissance Studies: Multi-, Inter-and Trans- disciplinary*, Vol. 6, No. 1, June.
- Soanes, C. & Stevenson, A. 2009. *Concise Oxford English dictionary*. 11th ed. New York: Oxford University Press.
- South Africa. 2010. *Criminal Law (Forensic Procedures) Amendment Act, Act 6 of 2010*. Pretoria: Government Printers.

- South African Police Service. 2003. *National Instruction 5/2003: Documents on the business of the LCRC*. Pretoria: Criminal Records Centre.
- South African Police Service. 2016. *Quality Management: Criminalistics Bureau*. Pretoria: CRC.
- Stelfox, P. 2009. *Criminal investigation: An Introduction to Principles and Practice*. USA: Willian Publishing.
- Strydom, H. 2015. *Ethical aspects of research in the social sciences and human service professions*. In De Vos, A.S., Strydom, H., Fouché, C.B. & Delport, C.S.L. 2015. *Research at Grass Roots for the Social Sciences and Human Service Professions*. 4th edition. Pretoria: Van Schaik.'
- Swanson, C.R. 1996. *Criminal Investigation*. New York: McGraw Hill.
- Thomas, G. 2013. *How to do your Research Project: A Guide for Students in Education and Applied Social Sciences*. 2nd edition. London: Sage.
- Treverton, G.F., Wollman, M., Wilke, E. & Lai, D. 2011. *Moving toward the future of policing: Verifying and processing*. Arlington: Rand Corporation.
- Tshwane University of Technology. 2002. *Investigation of crime II: Study guide for ICR20AA*.
- Tukur, A. 2015. *Fingerprint recognition and matching using Matlab*. *The international Journal of Engineering and Objectives*. E-Learning Research methods.
- University of South Africa. 2007. *Policy on Research Ethics*. Florida: UNISA.
- Vanderstoep, S.W. & Johnston, D.D. 2009. *Research Methods for Everyday Life: Blending Qualitative and Quantitative Approaches*. San Francisco: Jossey Bass.
- Van der Westhuizen, J. 1996. *Forensic criminalistics*. 2nd ed. Johannesburg, South Africa: Heinemann Higher and Further Education.
- Van Graan, J.& Budhram, T. 2015. *Principles of investigation*. In Zinn, R & Dintwe, S. (eds). 2015. *Forensic investigation: Legislative principles and investigative practice*. Cape Town, South Africa: Juta.

- Van Rooyen, H.J.N. 2012. *The Practitioner's Guide to Forensic Investigation in South Africa*. Pretoria: Henmar.
- Watkins, K. 2013. *Crime scene investigation and management*. In Watkins, K., Anderson, G. & Rondinelli, V. 2013. *Evidence and Investigation: From the Crime Scene to the Courtroom*. Canada: Edmond Montgomery.
- Welman, J.C. & Kruger, S.J. 2001. *Research Methodology for Business and Administrative Science*. Cape Town: Oxford University Press.
- Welman, J.C., Kruger, S.J. & Mitchell, B. 2005. *Research Methodology*. Cape Town: Oxford University Press.
- Welman, J.C., Kruger, S.J. & Mitchell, B. 2012. *Research Methodology*. 3rd edition. Cape Town: Oxford University Press.
- Wright, J.D. 2007. *Crime Investigation*. UK: Parragon Books Ltd.
- Zeffertt, D.T., Paizes, A.P. & Skeem 2003. *The South African law of evidence*. Durban: LexisNexis.
- Zeffertt, D.T., Paizes, A.P. 2009. *The South African Law of Evidence*. 2nd edition. Durban: LexisNexis.
- Zeffertt, D.T. & Paizes, A.P. 2010. *Essential evidence*. Durban: LexisNexis.
- Zinn, R. & Dintwe, S. 2015. *Forensic Investigation: Legislative Principles and Investigative Practice*. Cape Town, SA: Juta and Co.

ANNEXURE A: INTERVIEW SCHEDULE FOR SAMPLE A, B AND SAMPLE C

TOPIC:

EXPLORING UNDERUTILISATION OF LOCAL CRIMINAL RECORD CENTRE FOR FINGERPRINTS INVESTIGATION IN SECUNDA MPUMALANGA, SOUTH AFRICA

RESEARCH AIM

The aim of this research is to explore underutilisation of Local Criminal Record Centre for fingerprints investigation in Secunda Mpumalanga, South Africa

RESEARCH QUESTION

➤ How can utilisation of fingerprints investigation be improved in a crime scene?
My name is Collen Tambani, a Captain in the South African Police Service attached to Secunda Local Criminal Record Centre as Forensic analyst and CSI section commander. I am a student at the University of South Africa (UNISA) and I am currently conducting research in exploring the underutilisation of LCRC for fingerprints investigation.

You are kindly requested to answer the following questions in this interview schedule in order to determine the importance of fingerprints in the crime scene investigation.

Written authorisation to conduct the study among members of the South African Police Service (SAPS) was granted in 2021 as per the attached letter of approval from the SAPS.

I am bound to ethics and code for the research of the University of South Africa. The information that you are going to provide will be used in the research project for a Master of Technology in Forensic Investigation Degree registered programme: Police Practice at the University of South Africa.

I will note your answers on the paper and you are more than welcome to ask question for clarification if there is any.

Do you give permission to be interviewed as well as for your information to be supplied to me to be used in this research?

YES/NO

PART "A"

Question 1: Age

Age		Age	
20-24 years		26-29	
30-34		35-39	
40-44		45-49	
50-55		55-59	
60+			

Question 2: Highest educational qualification

Highest educational qualification	
Standard 8/Grade 10	
Standard 9/Grade 11	
Standard 10/Grade 12	
Certificate Level NQF 3-4	
Certificate Level NQF 5	
1-year Diploma	
BA degree	

BTech	
Masters	

Question 3

What is your position within Local Criminal Record Centre (LCRC)?

Question 4

What courses did you attend to improve your skills in your field/occupation?

crime scene reconstruction	
Automated Fingerprint Identification System	
Evidence collection and processing	
Advance Crime scene	

Question 5

How long does the course take?

Question 6

Did you attend to basic police course?

Question 7

How many years have you been working as a field worker/crime scene investigator?

Years of work experience in crime scene investigation	
Less than 1 year	

1 year	
2 years	
3 years	
4 years	
5 years	
6-9 years	
10 years	
11-15 years	
More than 15 years	

Question 8

What is your current work position (within the domain of crime scene investigation)?

Rank structure	
Colonel	
Lt colonel	
Captain	
Warrant officer	
Sergeant	
Constable	

Question 9

What investigative procedures and processes do you follow during an investigation?

.....
.....

Question 10

How many years of experience do you have in criminal investigation?

Question 11

Are you a Criminalistics expert?

Question 12

What process does one has to follow to become a Criminalistics expert?

Question 13

Have you been to court for giving of evidence in terms of fingerprint?

Question 14

What process do you follow during the fingerprint investigation to the identification of fingerprint?

PART “B”

1. Based on your experience, what do you understand about the term “criminal investigation?
2. According to your understanding, what are the objectives of criminal investigation?
3. What is the meaning of the term “evidence?
4. What is the meaning of crime scene?

5. What is housebreaking?

6. What are the legal elements of housebreaking?

7. What is the significance of fingerprint evidence housebreaking investigations?

8. Base on your experience, have you ever witnessed the collection of fingerprint at the crime scene?

9. What is the purpose of fingerprint collection from the crime scene?

PART "C"

1. What is fingerprint?
.....
.....
.....

2. What does fingerprint identification entail?
.....
.....
.....

3. What do you understand by the term "identification"?
.....
.....
.....

4. What do you understand by the term "individualisation"?

.....
.....
.....

5. What is physical evidence?

.....
.....
.....

6. Name the different types of fingerprints?

.....
.....
.....

7. What are the techniques used to locate fingerprint?

.....
.....
.....

8. What is the significance of fingerprint evidence in housebreaking investigations?

.....
.....
.....
.....
.....

9. What is Automated Fingerprint Identification System (AFIS)?

.....
.....
.....

10. What is the purpose for AFIS?

.....
.....
.....

11. What is the reason for AFIS?

.....
.....
.....

12. What is the process to be followed when making identification in AFIS?

.....
.....
.....
.....
.....

13. What is the significance of AFIS to identify and link suspects to a housebreaking crime scene?

.....
.....
.....
.....
.....

14. What is the purpose of validation in AFIS?

.....
.....
.....
.....

Thank you for your participation

Closing remarks: is there something that you think I miss out that I can add?

Thank you.

ANNEXURE B: APPROVAL TO CONDUCT RESEARCH

South African Police Service



Suid-Afrikaanse Polisie

Privatebak:
Private Bag 394

Pretoria
0021

Faks No.
Fax No.

(012) 363 2128

Your reference/U verwysing:

My referensie/My verwysing: **3342**

THE HEAD: RESEARCH
SOUTH AFRICAN POLICE SERVICE
PRETORIA
0021

Enquiries/Navroes:

Lt Col Joubert

AC Thanga

Tel:

(012) 363 3118

Email:

JoubertG@saps.gov.za

APPROVED

Mr C Tambani
UNIVERSITY OF SOUTH AFRICA

RE: PERMISSION TO CONDUCT RESEARCH IN SAPS: EXPLORING UNDERUTILISATION OF FINGERPRINTS INVESTIGATION IN SECUNDA: UNIVERSITY OF SOUTH AFRICA: MASTERS DEGREE: RESEARCHER: C TAMBANI

The above subject matter refers.

You are hereby granted approval for your research study on the above mentioned topic in terms of National Instruction 1 of 2006.

Further arrangements regarding the research study may be made with the following offices:

The Provincial Commissioner: Mpumalanga:

- Contact Person: Col Moodley
- Contact Details: (013) 762 4673/060 992 2042
- Email Address: MoodleyPV@saps.gov.za

The Divisional Commissioner: Forensic Services:

- Contact Person: Col NM Rababalela
- Contact Details: (012) 421 0413
- Email Address : RababalelaM@saps.gov.za/

Kindly adhere to paragraph 6 of our attached letter signed on the 2021-03-24 with the same above reference number.

MAJOR GENERAL

THE HEAD: RESEARCH
DR PR VUMA

DATE: 2021-07-21

ANNEXURE C: UNISA ETHICAL CLEARANCE



UNISA 2022 ETHICS REVIEW COMMITTEE

Date: 2022:01:06

ERC Reference No.: ST81
Name: C Tambani

Dear Mr Collen Tambani

**Decision: Ethics Approval from
2022:01:06 to 2025:01:06**

Researcher: Mr Collen Tambani

Supervisor: Dr DQ Mabunda

Exploring underutilisation of Local Criminal Record Centre for fingerprints investigation in Secunda Mpumalanga, South Africa

Qualification: Magister Technologiae: Forensic Investigations

Thank you for the application for research ethics clearance by the Unisa 2022 Ethics Review Committee for the above mentioned research. Ethics approval is granted for 3 years.

The low risk application was reviewed by the CLAW Ethics Review Committee on 6 January 2022 in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.

The proposed research may now commence with the provisions that:

- 1. The researcher will ensure that the research project adheres to the relevant guidelines set out in the Unisa Covid-19 position statement on research ethics attached.**
- 2. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.**



University of South Africa
Pretter Street, Auckland Park, City of Johannesburg
PO Box 992 UNISA, 0009 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

3. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the CLAW Committee.
4. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
5. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
6. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable:

Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.

7. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
8. No field work activities may continue after the expiry date **2025:01:06**. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number ST81-2021 should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.

Yours sincerely,

Prof R Cassim

Chair of CLAW ERC

E-mail: cassir@unisa.ac.za

Tel: (012) 429-6780

Prof OJ Kole

Acting Executive Dean: CLAW

E-mail: koleoj@unisa.ac.za

Tel: (012) 429-8305

URERC 16.04.29 - Decision template (V2) – Approve



ANNEXURE E: UNISA COVID-19 POSITION STATEMENT ON RESEARCH ETHICS



Prof T Meyiwa
P. O. Box 392, UNISA, 0003
TELE: +27 (0) 12 429 2851
EMAIL: meyiwt@unisa.ac.za

TO: ALL RESEACHERS

DATE: 09 April 2020

SUBJECT: UNIVERSITY OF SOUTH AFRICA COVID-19 POSITION STATEMENT ON RESEARCH ETHICS

Dear Colleagues

On 15 March 2020 President Cyril Ramaphosa addressed the nation to declare a state of national disaster, following an increase in confirmed cases of COVID-19. The evolving COVID-19 pandemic requires that research is adapted on an ongoing basis to the dynamic situation.

A responsible approach to human participant, community engaged, animal, environmental, molecular and cell research is required in the context of COVID-19. Unisa supports the continuation of research activities, where possible, guided by the following principles and activities supported by the Policy on Research Ethics:

Protection of the participant, the community, and the researcher(s) and research support staff from any risks of harm while conducting research through the implementation of clear pragmatic risk mitigation measures.

Researchers must assess the risk - benefit ratio of a research study, particularly research that requires face-to-face contact, and the collection of data in public spaces or in locations where social distancing cannot be practiced.

The respect for the participant's rights for self-determination should always be carefully considered, for example the right to decline participation or to withdraw or collectively exploring alternative ways of participation.

In the interest of participants and researchers, the consensus is that new face-to-face or studies with an inherent risk to participants and/or researchers should not be embarked upon for the duration of the lockdown period.

Although this sounds like a blanket statement, registered Unisa Health Research Ethics Review Committees would be willing to consider well-motivated applications as exceptions only. The researcher needs to provide an accompanying letter with a detailed rationale for why this research study needs to be enacted during this time.

Unisa Ethics Review Committees (ERCs) will continue to accept and review research ethics applications but will clearly indicate where the ERC does NOT wish this study to commence with immediate effect in accordance with the lockdown regulations.

No research involving face-to-face contact or research studies involving settings where it is difficult to institute social distancing or practice protective measures may continue without formal notification and approval by the ERC that granted the approval in consultation with one of Unisa's registered Health ERCs/RECs.

Where or when it is unavoidable to reduce, suspend or postpone research activities, the onus is on the principal researcher to notify the ERC that approved the research study and to provide a rationale why the research needs to continue.

The ERC must inform the Unisa Research Ethics Review Committee (URERC) of all ongoing studies that may pose a risk of harm relating to the Covid-19 pandemic. National instituted protective measures such as hand hygiene, cough etiquette, and social distancing should be implemented, and monitored at sites where these studies will continue.

Research for degree purposes: The College of Graduate Studies and the Heads: Graduate Studies and Research will negotiate processes to mitigate the possible negative fallout to student progress (both new research and research that is in progress). The COVID-19 outbreak and its ramifications are difficult to measure or predict, but the suggested time frame for this position statement to be enacted is not less than the lockdown period.

Staff, researchers and supervisors are requested to carefully monitor any further internal communications for directives and guidance on this matter. Researchers who are dependent on internal, and more so external, sources of funding and sponsorship should consider the potential risks that COVID-19 and social distancing strategies will have on project milestones and audit reporting deadlines. Where possible, researchers should engage with the funder/sponsor regarding these timeframes.