

**THE VALUE OF THE AUTOMATED FINGERPRINT IDENTIFICATION SYSTEM
AS A TECHNIQUE
IN THE IDENTIFICATION OF SUSPECTS**

by

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DECLARATION

I, Madimetja Edward Mokwele, student number 30795451 declare that “The value of the Automated Fingerprint Identification System as a technique in the identification of suspects” is my own work and that all the sources that I have used have been indicated and acknowledged by means of complete references.

A rectangular box containing a handwritten signature in black ink. The signature is stylized and appears to be the name 'Madimetja Edward Mokwele'.

MADIMETJA EDWARD MOKWELE

28/09/2015

ABSTRACT

This research is concerned with the value of the Automated Fingerprint Identification System (AFIS) as a technique in the identification of suspects. A problem was identified in the withdrawal of cases where suspects had been identified by means of fingerprints. The study attempted to determine the value of AFIS in the identification of suspects, to find new knowledge that could improve the situation and suggest ways to apply this knowledge to enhance the performance of AFIS experts, criminal investigators and the prosecution in a court of law. The study adopted a multi-method approach to data collection, with the researcher using a literature review, docket analysis and interviews with AFIS experts from Limpopo Province as his sources of data.

The results of the study showed that AFIS is a valuable system for the identification of fingerprints in that it is fast and accurate but that in South Africa AFIS experts encounter a number of challenges with the system. The main challenges identified were the potential for the system to be attacked by computer hackers; the slowness of creating an SAPS 69 record, particularly when dealing with prints of poor quality; which leads to cases being closed where AFIS experts' evidence is not tested/accepted; and the fact that in South Africa AFIS is not applied across government departments, which would allow a more comprehensive database.

On the basis of these findings, the study recommends that steps be taken to improve the quality of prints taken at crime scenes, that attention be paid to speeding up the process of dealing with the relevant SAPS 69 records, that investigators and prosecutors be informed about the AFIS process and that the AFIS database be extended to include the fingerprints of all South Africans and immigrants to the country. Lastly, the study suggests that the databases of government departments such as Home Affairs, Public Works Roads & Transport and Safety Security & Liaison (Traffics) be combined to form one national database.

DEDICATION

I dedicate this paper to my lovely family and friends.

I also dedicate this paper to all of the many brothers and sisters in the Forensic Science Division to all detectives and to all in blue SAPS uniforms.

This mini-dissertation is dedicated to every South African who is interested in the study of Fingerprints as a science. Remember there is light at the end of the tunnel.

“Modimo o phala baloi”

MADIMETJA EDWARD MOKWELE

28/09/2015

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I thank God that I am alive and have been given the opportunity to contribute to a solution to one of the many challenges we face.

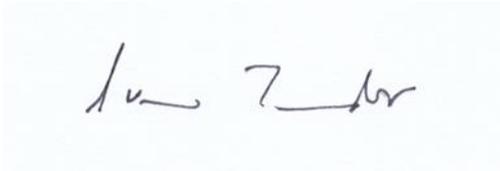
I also wish to express my gratitude to the following people for their contribution to this mini-dissertation on fingerprint science:

- My supervisors, Dr. Juanida Horne and Dr N.J.C. Olivier, for their support and unwavering confidence in me. Their experience and knowledge and their insight into the topic have made it possible for me to complete this research
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MADIMETJA EDWARD MOKWELE

CERTIFICATE BY EDITOR

I, Susan van Tonder, MA Linguistics, ID 6009160072083, hereby declare that I have edited the master's thesis "The value of the Automated Fingerprint Identification System as a technique in the identification of suspects" by Madimetja Edward Mokwele.

A handwritten signature in black ink on a light blue background. The signature appears to be 'Susan van Tonder' written in a cursive style.

Susan van Tonder

11 September 2015

ABBREVIATIONS AND ACRONYMS

ACE-V	Analyse, Compare, Evaluate and Verify
AFIS	Automated Fingerprint Identification System
CAPT.	Captain
COL.	Colonel
CONST.	Constable
CRC	Criminal Record Centre
CR & CSM	Criminal Record and Crime Scene Management
CRIM	Criminal Record System
CSI	Crime Scene Investigator
DLS	Digital Lift Scanner
DNA	Deoxyribonucleic Acid
FBI	Federal Bureau of Investigation
FIPS	Fingerprint Identification Profile System
FS	Forensic Services
HANIS	Home Affairs National Identification System
IAFIS	Integrated Automated Fingerprint Identification System
IAI	International Association of Identification
IO	Investigating Officer
LCRC	Local Criminal Record Centre
LIEUT	Lieutenant
NFA	National Fingerprint Agencies
PP	Public Prosecutor
SA	South Africa
SAPS	South African Police Service
SAPSCRC	South African Police Service Criminal Record Centre
SGT	Sergeant
SOP	Standard Operational Procedure
UK	United Kingdom
USA	United States of America

TABLE OF CONTENTS

DECLARATION	ii
ABSTRACT	iii
DEDICATION	iv
ACKNOWLEDGEMENTS	v
CERTIFICATE BY EDITOR	vi
ABBREVIATIONS AND ACRONYMS	vii
List of Tables	viii
List of Figures	xi
CHAPTER 1.GENERAL ORIENTATION	1
1.1 INTRODUCTION	1
1.2 PROBLEM STATEMENT	1
1.3 AIM OF THE RESEARCH	3
1.4 PURPOSES OF THE RESEARCH.....	3
1.5 RESEARCH QUESTIONS	4
1.6 DEFINITIONS OF KEY CONCEPTS	4
1.7 RESEARCH DESIGN AND APPROACH	6
1.7.1 <i>Research design</i>	6
1.7.2 <i>Research approach</i>	7
1.8 TARGET POPULATION	7
1.9 SAMPLING	8
1.10 DATA COLLECTION	10
1.10.1 <i>Interviews</i>	10
1.10.2 <i>Literature study</i>	12
1.10.3 <i>Documentation</i>	13
1.10.4 <i>Personal experience</i>	14
1.11 DATA ANALYSIS	15
1.11.1 <i>Background information on the participants</i>	15
1.12 METHODS USED TO ENSURE VALIDITY	16
1.13 METHODS USED TO ENSURE RELIABILITY	19
1.14 ETHICAL ISSUES IN RESEARCH	21
1.15 RESEARCH STRUCTURE (CHAPTERS & LAYOUT).....	22

CHAPTER 2

FINGERPRINT IDENTIFICATION	24
2.1 INTRODUCTION	24
2.2 THE FUNCTIONS OF THE SOUTH AFRICAN POLICE SERVICE	25
2.3 THE ROLE OF THE CRIMINAL RECORD CENTRE (CRC)	25
2.4 FUNCTIONS OF THE CRIMINAL RECORD CENTRE	26
2.5 MEANING OF “INVESTIGATION”	27
2.6 OBJECTIVES OF INVESTIGATION	28
2.7 DEFINITION OF “FINGERPRINT”	28
2.8 FINGERPRINT IDENTIFICATION	30
2.9 WHAT DOES FINGERPRINT IDENTIFICATION ENTAIL?	31
2.10 HOW CAN FINGERPRINTS BE IDENTIFIED?	32
2.11 RIDGE CHARACTERISTICS IN FINGERPRINTS	34
2.12 MINUTIAE	36
2.13 DELTA AND CORES	37
2.14 LATENT PRINTS	39
2.15 RIDGE TRACING	40
2.15.1 <i>The procedure applied to ridge tracing</i>	41
2.16 PATTERN AREA	41
2.17 RIDGE COUNTING	42
2.17.1 <i>Procedure for ridge counting</i>	42
2.18 DIFFERENCES BETWEEN RIDGE TRACING AND RIDGE COUNTING	43
2.19 BASIC FINGERPRINT PATTERNS	44
2.19.1 <i>Arches</i>	44
2.19.2 <i>Loops</i>	45
2.19.3 <i>Whorls</i>	46
2.20 THE SEVEN-POINT IDENTIFICATION CRITERIA	46
2.21 IDENTIFICATION	49
2.21.1 <i>Categories of identification</i>	51
2.22 INDIVIDUALISATION	51
2.23 DIFFERENCES BETWEEN “IDENTIFICATION” AND “INDIVIDUALISATION”	52
2.24 SUMMARY	54

CHAPTER 3. THE VALUE OF THE AUTOMATED FINGERPRINT IDENTIFICATION SYSTEM..... 55

3.1 INTRODUCTION..... 55

3.2 AUTOMATED FINGERPRINT IDENTIFICATION SYSTEM (AFIS) 56

3.3 THE PURPOSE OF AFIS 57

3.4 THE IMPLEMENTATION OF AFIS IN SOUTH AFRICA 58

3.5 REASONS FOR IMPLEMENTING AFIS IN SOUTH AFRICA 59

3.6 THE PURPOSE OF AFIS IDENTIFICATION..... 60

3.7 THE PROCESS FOLLOWED WHEN MAKING AN IDENTIFICATION ON AFIS 61

3.8 THE PURPOSE OF AFIS VALIDATION..... 62

3.9 RIDGE TRACING AND RIDGE COUNTING WHEN MAKING AFIS IDENTIFICATION..... 64

3.10 VERIFICATION OF AFIS IDENTIFICATIONS..... 65

3.11 MANUAL FINGERPRINT IDENTIFICATION PROCESS..... 67

3.12 DIFFERENCES BETWEEN AFIS AND MANUAL FINGERPRINT IDENTIFICATIONS..... 70

3.13 MISSED IDENTIFICATION 73

3.14 AFIS's INCREASING INSTRUMENTALITY IN LINKING SUSPECTS TO CRIMES..... 73

3.15 PRACTICES TO IMPROVE AFIS IN THE IDENTIFICATION OF SUSPECTS 76

3.16 SUGGESTIONS FOR IMPROVING TRAINING OF AFIS EXPERTS..... 77

3.17 IMPORTANCE OF TRAINING INVESTIGATORS AND PROSECUTORS ON AFIS 78

3.18 CRIMINAL LAW (FORENSIC PROCEDURES) AMENDMENT ACT, 2010 AND THE CRIMINAL PROCEDURE ACT OF 1977 80

3.19 THE VALUE OF AFIS AS A TECHNIQUE IN THE IDENTIFICATION OF SUSPECTS 81

3.20 SUMMARY 85

CHAPTER 4.

RESEARCH FINDINGS AND RECOMMENDATIONS 87

4.1 INTRODUCTION..... 87

4.2	FINDINGS	87
4.2.1	<i>Primary findings</i>	87
4.2.2	<i>Secondary findings: Research question 1</i>	88
4.2.3	<i>Secondary findings: Research question 2</i>	90
4.3	RECOMMENDATIONS	91
4.4	CONCLUSION.....	92
	LIST OF REFERENCES.....	93
	DECIDED CASES.....	98
	ANNEXURE A: INTERVIEW SCHEDULE	99
	ANNEXURE B: APPROVAL TO CONDUCT RESEARCH	104

List of Tables

Table 1.01:	Interviews with participants.....	16
Table 2.01:	Differences between ridge tracing and ridge counting.....	43
Table 2.02:	Differences between “identification” and “individualisation”	53
Table 3.01:	Differences between manual fingerprint identification and AFIS	72

List of Figures

Figure 2.01:	Different ridge characteristics.....	35
Figure 2.02:	Loop and whorl patterns with delta and core indicated	38
Figure 2.03:	Loop patterns with core and delta indicated	39
Figure 2.04:	Arches	45
Figure 2.05:	Loops	45
Figure 2.06:	Whorls.....	46

CHAPTER 1

GENERAL ORIENTATION

1.1 INTRODUCTION

According to Lyman (2013:57), identifying suspects through fingerprinting has proven to be one of the most effective methods of apprehending people who might otherwise go undetected and continue their criminal activities. When a crime is committed, fingerprint experts develop latent prints at the crime scene. These crime scene prints are called “unknown prints”. In South Africa, the unknown prints are scanned into a fingerprint identification system known as the Automated Fingerprint Identification System (AFIS), which AFIS experts can use to compare all the prints scanned. The known and unknown prints appear on the screen, enlarged to double the size of the normal images or even more (all points are more visible this way). The unknown prints are compared with known prints by tracing and/or counting the prominent points or ridges of the fingerprints from one ridge point to another, until seven consecutive/similar points are found on both prints (known and unknown). After a fingerprint identification has been made in this way, it must be validated or confirmed by another fingerprint expert.

1.2 PROBLEM STATEMENT

The primary task of criminal investigation is to identify the suspects involved in the crime being investigated (Gilbert, 2010:455). Many cases reported to investigating officers involve unknown suspects, where the suspects’ actions are known but personal identification has not been made (Gilbert, 2010:455).

Fingerprint identification can provide a useful source of evidence regarding the identity of suspects. However, the researcher found two problems regarding fingerprint identification in Tzaneen in the Limpopo Province of South Africa. From the researcher’s experience, in most investigations the investigating officer focuses on the evidence of the eye witnesses only, without paying attention to other significant sources of evidence, such as fingerprints and deoxyribonucleic acid (DNA) because of a lack of knowledge that fingerprints and DNA can be used as evidence.

The AFIS method is a reliable way of identifying fingerprints as it is accurate and can be used to compare known and unknown fingerprints. The AFIS is:

“a computer software program used to encode individual fingerprints when the fingerprint is scanned into AFIS; the assigned characteristics are plotted on an x-y axis. A map is created containing the location and direction of all the characteristics of the fingerprints” (Mitanoya Training College, 2008:18).

The system works in this way: the known prints, i.e. a suspect's prints, are obtained on the South African Police Service (SAPS) forms, e.g. SAPS 76, which is used to take only fingerprints of suspects and SAPS 192 is used to take both finger and palm prints of suspects. The linked prints are then scanned into the system by AFIS experts or operators.

The system was first implemented in the SAPS in 2002 and is used by the SAPS Criminal Record and Crime Scene Management (CR & CSM) and the Local Criminal Record centres (LCRCs). However, for the system to produce accurate results, the system needs to be used optimally, with high quality prints entered into the system.

The second problem that compelled the researcher to conduct this research is that where fingerprints are taken from the scenes of crime investigated, the fingerprint investigators do not lift valuable prints; i.e. visible prints. Most of the prints lifted from crime scenes cannot be scanned into AFIS. This might be influenced by various factors such as age of prints, prints made in or with dust or techniques and reagents used to develop latent prints. In addition, fingerprint investigators do not take fingerprint eliminations of the complainants, employees or witnesses immediately after investigations, which means that the fingerprints taken at the scene of crime cannot be compared to known prints.

A lack of usable fingerprint evidence may mean that suspects are never identified and that cases are closed or withdrawn by the prosecutor. The researcher chose 40 finalised AFIS dockets as target population. The dockets analysed were chosen according to whether they contained fingerprint identification statements. In most cases it was found that scene prints were not properly visible for a match or that complainants and witnesses' prints were lifted at the crime scenes without taking their

fingerprints for elimination and, as such, cases were often withdrawn where fingerprint identification was faulty.

Because of the lack of knowledge among judicial officers and investigating officers, and the need for quality prints to be taken, the researcher intended to use this study to empower himself and others with the latest information on AFIS as a valuable tool in suspect identification.

1.3 AIM OF THE RESEARCH

There must be an aim in research in order to establish facts, gather new data and determine whether interesting patterns exist in the data (Mouton, 1996:103). The aim of this research is to evaluate the significance of AFIS as a technique in the identification of suspects in criminal cases being investigated in Limpopo Province, South Africa.

1.4 PURPOSES OF THE RESEARCH

According to Denscombe (2002:25), there must be a reason for doing research or else there would be no point in spending time, money and effort undertaking the investigation. The purposes of this research are to:

- Establish how fingerprint experts use AFIS as a technique in the identification of suspects, with the intention of weighing up the strengths and weaknesses of the system and considering how the use of AFIS can be improved;
- Explore both domestic and international literature with the intention of finding new information on the topic;
- Develop good practice, as mentioned by Denscombe (2002:27), by making recommendations that address practical problems such as using fingerprint evidence in court;
- Empower both the researcher and fingerprint experts with new knowledge of the value of AFIS as a technique in the identification of suspects. The researcher intends to make available the final report as reading material so that interested people can read its findings for themselves.

1.5 RESEARCH QUESTIONS

Research questions, according to Denscombe (2002:31), refer to “things that are directly investigated by the researcher, i.e. specific things that are to be observed, measured and interrogated in order to shed light on the broader topic”. The research questions should be “general enough to permit exploration but focused enough to delimit the study” (Marshall & Rossmann, 1999:38-39).

How a researcher eventually conducts a research study depends largely on the research questions he or she develops (Berg, 2009:37). According to Creswell (2014:20), research questions may address a description of the themes that emerge from studying the research topic; research questions may also be based on a body of existing literature. These questions become working guidelines rather than proven truth (Thomas, in Creswell, 2014:140).

The following are the research questions for this research:

1.5.1 What does fingerprint identification entail?

1.5.2 What is the value of the Automated Fingerprint Identification System in the identification of suspects?

1.6 DEFINITIONS OF KEY CONCEPTS

Leedy and Ormrod (2005:56) point out that “each term must be defined operationally; meaning that definitions of key concepts must interpret the term as it is used in relation to the researcher’s project.” The researcher’s definitions of key terms need to be clear and specific and relevant to the problem and topic of the research. Mouton (1996:67) argues that the term “key concept” refers to “the words or concepts in the problem statement and relating the problem to a broader conceptual framework or context”. A term may require a definition to help the reader to understand the research problem and questions or hypothesis in the study (Creswell, 2014:44).

Since the definition section in a dissertation provides an opportunity for the researcher to be specific about the terms used in the study, the researcher is expected to use the

language available in the research literature and commonly used by the research community (Creswell, 2014:44; see also Babbie, 2013:176).

The terms defined below are considered key to the research:

1.6.1 Crime, according to Snyman (2002:6), is “the unlawful, blameworthy conduct punishable by the state” (see also Burchell & Milton, 2005:1).

1.6.2 Fingerprint is defined as “the reproduction of the ridge area of the first, or nail joint of the finger in any manner whatever and it also includes the ridge area of the remaining joint of the finger” (van Schalkwyk, 1996:246; Nath, 2010:10).

1.6.3 Forensic investigation is the “collection of facts that may serve as evidence before a court of law where the accused person can be associated with the commission of a crime” (Gardner, 2005:2).

1.6.4 “Latent print”, according to Graham (1993:6), refers to “the invisible prints found at or near the scene of crime” (see also Shaler, 2012:594).

1.6.5 Ridge characteristics, according to van Schalkwyk (1996:247), are “the details of ridge structure, information and elements which differentiate one finger/palm print from another and which impact individually on each fingerprint. They consist of the beginning or ending, fork or bifurcations, island, short ridge, lake, spur, crossover, overlapping etc.” (see also Osterburg & Ward, 2014:52).

1.6.6 AFIS is a “computer software program used to encode individual fingerprints when the fingerprint is scanned into AFIS; the assigned characteristics are plotted on an x-y axis. A map is created containing the location and direction of all the characteristics of the fingerprint” (Mitanoya Training College, 2008:18).

1.6.7 An AFIS expert is regarded as a fingerprint expert who is trained and knowledgeable in the operation of AFIS, including the scanning, comparison and identification of fingerprints (Soanes & Stevenson, 2009:501).

1.6.8 An operator is regarded as any person who operates equipment or a machine, including AFIS, but who is not an expert (Soanes & Stevenson, 2009:1002).

1.6.9 An expert is “any person whose competency can be established by educational degrees, attendance and participation in specialised training courses, membership of professional organisations, the number and substance of professional publications and, most importantly, the number of years of occupational experience” (Birzer & Roberson, 2012:101).

1.6.10 The term “independent expert”, according to Soanes and Stevenson (2009:501 & 723), refers to any person who is very knowledgeable about or skilful in a particular area of study and who does not depend on another person for their livelihood or is capable of acting or thinking for themselves on a specific topic.

1.6.11 Hacking is an intensive task that requires a high level of technical expertise and is only used on systems that are likely to have personal data for multiple people, such as schools, banks, hospitals and corporate databases. Hacking involves trying to compromise a system’s security in order to gain unauthorized access to it (Easttom & Taylor, 2011:11).

1.6.12 The term “criminalistics expert”, according to Soanes and Stevenson (2009:501 & 557), refers to any person who is very knowledgeable about or skillful in the application of scientific methods and techniques to the investigation of crime.

1.7 RESEARCH DESIGN AND APPROACH

1.7.1 Research design

A design is defined as a “plan or blueprint of how you intend conducting the research” (Mouton, 2001:55). According to Lockey, Spirduso and Silverman (2000:117), a design “is used only in designating an inquiry based on the data of experience, things that the investigator saw or heard that can then be employed as the warrant for a claim”. The researcher used the empirical design because of the scarcity of research studies on the topic of this study. The empirical design focuses particularly on the field of study and on the personal experience of the participants in the research (Mouton,

2001:149) and is used in studies where not much has been written on the study topic and the researcher is obliged to produce his own data through, for example, conducting interviews with experts. The outcome of the empirical design is the production of knowledge based on experience or observation (Maxfield & Babbie, 1995:4). It also entails the use of a combination of several methods of data collection, such as a review of available literature and interviews with participants. The researcher considers the empirical design as the best design for this research because it focuses on the experience and knowledge of participants (Maxfield & Babbie, 1995:4). The researcher utilised AFIS experts as his sample and held face-to-face interviews with them. Owing to their experience and knowledge in the field, these experts added value to the study.

1.7.2 Research approach

The qualitative research approach is a systematic strategy for answering questions about people in a particular social context (Lockey et al., 2000:98). The researcher used the qualitative approach because, as stated by Leedy and Ormrod (2005:94), it “is typically used to answer questions about the complex nature of phenomena, often with the purpose of describing and understanding the phenomena from the participants’ points of views”. The researcher applied the qualitative approach to this study in that he had face-to-face contact with the participants of the study and he obtained practical answers to the research problem. In the qualitative approach, “procedures are not strictly analysed while the space is more likely to be undefined” (the space cannot be limited) (Mouton & Marais, 1996:155-156).

The researcher also considered the qualitative approach to be appropriate because verbal data was collected through neutral interaction with people in an everyday situation. The reliable identification of suspect’s needs to be explored to improve the performance of detectives and increase conviction rates in court.

1.8 TARGET POPULATION

According to Roscoe, as quoted by Mouton (2001:134), a population is “a collection of objects, events or individuals having some common characteristics that the researcher is interested in studying”. Welman and Kruger (2001:46) claim that a population is “the

study object which may consist of individuals, groups, organizations, human products and events or the conditions to which individuals are exposed". Leedy and Ormrod (2005:205) contend that a population is "generally a homogeneous group of individual units".

The ideal population for this study is all AFIS experts over South Africa in the SAPS but constraints related to distance, finance, time and the large number of participants to cover meant that it was necessary for the researcher to focus on a target population.

A target population or study population consists of all elements from which the sample is actually selected (Maxfield & Babbie, 1995:186). The target population is the population to which the researcher would like to generalise his or her results (Welman, Kruger & Mitchell, 2005:126).

The researcher used AFIS experts from Limpopo Province as his target population because Limpopo is the province where the problem was identified. This population was also closer to his reach; selecting experts from other provinces would have involved greater travelling cost. The researcher focused particularly on Limpopo Province because this is where he worked and this made it economically viable for him to conduct the research in this province.

1.9 SAMPLING

Sampling refers to "the process of selecting things or objects when it is impossible to have knowledge of a larger collection of these objects" (Mouton, 1996:132). The researcher limited his sample to 34 AFIS experts from the 67 experts in the province. The researcher decided to choose half of the 67 experts as the study sample. A sample is a small portion of the whole population that could be studied (Denscombe, 1998:11). The ideal sample for the current study is one that provides a perfect representation of the population, with all the relevant features of the population included in the sample in the same proportion. The researcher considered the sample to be representative because the sample had the exact properties in the exact same proportions as the population from which it (the sample) was drawn in smaller numbers (Welman et al., 2005:55). According to Leedy and Ormrod (2001:211), probability

sampling allows the researcher to specify in advance the segment of the population that will be represented. As the researcher used a probability sampling method for selecting the sample, the sample could be considered to be representative of the general population of AFIS experts in the province.

The sampling technique applied in the study was probability sampling. The 67 experts were stationed at the following LCRC offices: Giyani (2), Makhado (5), Groblersdal (3), Modimolle (5), Mokopane (3), Musina (2), Lebowakgomo (2), Lephalale (3), Phalaborwa (2), Polokwane (17), Thabazimbi (3), Thohoyandou (12), and Tzaneen (8). This range of offices serves the population of Limpopo Province.

Simple random sample, according to Welman and Kruger (2001:53), “involves that each member of the population has the same chance of being included in the sample and each sample of a particular size has the same probability of being chosen/selected”. This technique was used so that each of the 67 AFIS experts was given a chance of being selected. The researcher did not look at the ranks, gender or years of service of the AFIS experts. The researcher made a list of names in alphabetic order then numbered the names on the list from “1” to “67”. Then he wrote each number on a piece of paper and put the paper in a non-transparent pot like a lotto draw. The draw was made where the numbers were taken out one by one until 34 participants had been drawn. The 34 names drawn from the container then formed the sample that was used.

The results of the study can be generalized to all AFIS experts in Limpopo Province since the sample group of 34 was representative of the target population and its selection was impartial. The researcher has generalized the research and its results (see Flick, 2009:253). Although 34 participants were selected, six AFIS experts withdrew when the interview process started as a result of work pressure/load and the interviews were conducted with 28 participants. According to Huysamen (1993:183), a sample of 25 participants is considered sufficient in conducting qualitative research.

1.10 DATA COLLECTION

The data-collection techniques that were used in the study are qualitative techniques. The study made use of several sources for data collection, which included notes from observations and documents, as well as interview transcripts (Robson, 2000:118). The researcher collected primary data as the most valid, the most illuminating and the most truth-manifesting data (Leedy & Ormrod, 2001:95). Primary data results from direct contact between the researcher and the sources of data, and is generated by the application of particular methods by the researcher (Blaickie, 2003:18).

The researcher used a multi-method approach (Denscombe, 2002:134; see also Welman et al., 2005:194). As a search method reveals different aspects of empirical reality, multiple methods must be employed. As such, the researcher used interviews, a literature study, a review of documentation, case docket analysis and personal experience as data-collection methods in this research. The use of several different research methods to test the same finding is called triangulation (Babbie, 2013:117; see also Berg, 2009:5). Creswell (2014:201) recommends the use of multiple methods, and stresses that these should enhance the researcher's ability to assess the accuracy of findings and convince readers of their accuracy.

1.10.1 Interviews

According to Leedy and Ormrod (2005:146), interviews can "yield a great deal of useful information by asking questions related to facts, peoples' belief, feelings, motives, etc." Welman and Kruger (2001:158) are of the opinion that the interviewer should visit the participants at their homes or their workplaces or should conduct the interviews at public places. Interviews can take different forms, such as the structured, semi-structured or unstructured interview. The questions for interviews are determined by the research questions and the aims of the research. The semi-structured interview is a type of interview in which some of the questions are specified (Walizer & Wienir, 1978:269). Robson (2000:90) emphasises that a semi-structured interview is "one where the interviewer has worked out in advance the main areas he wishes to cover, but is free to vary the exact working of questions as well as their ordering".

A semi-structured interview is applicable “when the topic is of a very sensitive nature and an interview guide is used” (Welman & Kruger, 2001:161). This technique is relevant to this study because interviews were conducted by an experienced AFIS expert who had drawn up an interview schedule in advance. The researcher also considered the semi-structured interview technique appropriate to this study because, where the participants appeared to be confused or upset about the questions, the technique enabled the interviewer to ask another question to clarify a previous question (see Welman & Kruger, 2001:161). All participants were asked the same questions, which included questions about AFIS terminology (see interview schedule attached as Annexure A).

An interview was conducted with each participant individually and separately. The questions for the interviews came from the research aim, research questions and also from the researcher’s knowledge about the historical background of the participants. According to Welman and Kruger (2001:165), when formulating questions, the researcher should take the literacy level of the participants into consideration. The researcher formulated questions using terms and concepts that were familiar to AFIS experts. The questions were brief and focused on the topic of the research (in line with advice by Welman & Kruger, 2001:167).

The interviews were not recorded on a voice recorder, which meant that the words of the participants were recorded on the interview schedules by writing (see Welman & Kruger, 2001:189). The researcher conducted a pilot study and on the basis of this study adapted the interview schedule. A pilot study is designed and used to try out a particular instrument, carefully scrutinizing it for obvious or possible weakness, and modifying it in minor or major ways (Leedy & Ormrod, 2013:92). Furthermore, although it may take some time initially, a pilot study may ultimately save the researcher time by letting the researcher know – after only a small investment of time on their part – which approaches will or will not be effective in helping solve the overall research problem (Leedy & Ormrod, 2013:112). The researcher interviewed four fingerprint experts from Mpumalanga Province and North West Province during the Forensic & Criminal Record & Crime Scene Management conference held in Pretoria on 27 to 30 September 2013 to test the understand ability of the questions. The comments of the pilot study interviewees were not incorporated into the final research, in line with

guidance provided by (Creswell, 2014:161). Instead, the researcher interviewed the four fingerprint experts to test whether the questions on the interview schedule were relevant and would be understood by the participants. The four experts did not make any negative comments or suggestions regarding the questions; as such, no changes were made to the interview schedule.

The researcher applied the following guidelines from Leedy and Ormrod (2005:147) for ensuring a productive interview:

- Make sure your interviewees are representative of the group: The researcher used the simple random sampling method to select the sample; this meant that the interviewees were representative of the population.
- Find a suitable location: The researcher visited the participants and interviews were conducted in offices behind locked doors. This prevented possible interruptions and distractions and the locations were quiet and peaceful.
- Take a few minutes to establish rapport: The researcher began each interview by building rapport through asking the interviewees about their families, discussing gardening, sport or other activities. The researcher was courteous and respectful during the interviews.
- Focus on the actual rather than on the abstract or hypothetical: The researcher asked questions about AFIS identifications, about the ridge characteristics of fingerprints, and about policies such as SAPS policy no. 5/2003 and SAPS policy no. 7/2007. This focuses on the actual activities of the participants because all participants were trained on fingerprint identifications and the operation of AFIS.
- Remember that you are not necessarily getting the facts: The researcher was aware that the interviewees would not reveal factual information only.

1.10.2 Literature study

A literature review is a step-by-step process that involves the identification of published and unpublished work from secondary data sources on the topic of interest, the evaluation of this work in relation to the problem, and the documentation of this work (Sekaran & Bougie, 2009:38). Relevant literature, such as international and national books were obtained from UNISA Polokwane and Mokopane community libraries, and

SAPS journal articles, SAPS/CR and CSM manuals, newspaper articles and printouts of articles obtained on the internet, was studied during the research. The information selected from the literature concerned suspect identification through AFIS. The information obtained from each of the sources consulted was integrated and compared and correlated with each other to find relevant information about the topic. The researcher was guided by the techniques, procedures and methods described in the SAPS manuals and applied during the operation of the system (AFIS) as far as suspect identification is concerned.

The researcher did not find literature on exactly the same topic as covered in this study. To find literature related to this topic, the researcher identified the following variables in the topic:

- Automated Fingerprint Identification System;
- Identification of suspects; and
- Fingerprints.

The researcher integrated the primary data collected from the participants with the data obtained from the literature study and the case docket analysis to find correlating information on the topic. The literature sources consulted are acknowledged in the list of references.

1.10.3 Documentation

The researcher analysed documents on AFIS for data about how AFIS is used to identify fingerprints. Documents refer “to standardized artifacts, in so far as they typically occur in particular formats: as notes, case reports, contracts, death certificates, remarks, diaries, statistics, annual reports, certificates, judgments, letters, experts opinion” (Flick, 2009:124). Documents on AFIS, such as circulars and policy letters, are available to a limited circle of recipients (among them police officials), who are authorised to access them. The researcher requested permission to access and use the documents from the Provincial Head: Criminal Record (CR) and Crime Scene Management (CSM). The request was made in written form and clearly stated the purpose of accessing the documents, in line with guidance provided by Flick (2009:124). Once permission to access the documents was obtained and the

documents were received by the researcher, they were safe guarded, as suggested by Robson (2000:100).

The following were the questions the researcher sought answers to from the documentation:

- What is AFIS?
- What does fingerprint identification entail?
- What does Standard Operational Procedure (SOP) or the Criminal Record Centre (CRC) policy letter state about AFIS?
- How can a missed AFIS identification be detected, according to instructions on the operation of AFIS?
- What do the instructions from the CRC circulars say about how AFIS operates/functions?

1.10.4 Personal experience

The researcher has been the commander of the AFIS office at Tzaneen for the past three years and has 17 years' experience as a fingerprint expert and seven years as an AFIS expert. As such, the researcher skills and experience assisted in conducting interviews and in the analysis of data during and after the use of AFIS in suspect identification. The researcher used experience as an AFIS expert of scanning and validating data on AFIS on a weekly basis.

The researcher was appointed to head an adjudication panel for fingerprint experts in Limpopo Province from April to August 2012, where candidates were interviewed and assessed on their knowledge of fingerprint activities. Throughout the data-collection process of the current study, the researcher suspended any preconceived notions based on personal experience and/or rank that might have unduly influenced what the researcher "heard" participants saying (see also Leedy & Ormrod, 2013:146). During interviews, the researcher focused on listening, with the participants doing most of the talking (see also Leedy & Ormrod, 2013:146).

1.11 DATA ANALYSIS

After collecting all the data, the researcher used the following steps recommended by Creswell (cited in Leedy & Ormrod, 2005:150-151) during the data analysis. This method is known as the data analysis spiral:

- Organisation of details about the case: Here the researcher arranged facts in chronological order to ensure relevancy.
- Categorisation of data: The researcher broke down the data into meaningful units/groups for analysis purposes.
- Interpretation of single instances: Literature, documents and other data were examined for relevancy to the topic/theme.
- Identification of patterns: The researcher examined carefully the underlying themes and other patterns that described the topic being investigated more accurately than a single piece of information could reveal.
- Synthesis and generalisation: Here the researcher combined all separated data to formulate the overall picture/portrait of the study and at this stage drew valid conclusions.

This method allowed the researcher to analyse data even during the collection phase of the study. It also allowed data analysis in all data-collection methods; e.g. interviews, literature studies and the document study (Robson, 2000:81). The researcher conducted an analysis of the data during and immediately after he had collected it. The findings of the docket analysis and literature were discussed with co-workers to clear up any misunderstanding and irrelevant data was eliminated.

1.11.1 Background information on the participants

As mentioned earlier, the researcher conducted interviews with AFIS experts from Limpopo Province. The participants had more than three years of experience as experts and most of them had giving evidence in court in fingerprint identifications. Participants had completed fingerprint courses and were considered to be criminalistics experts. Participants had attended police basic training courses.

Table1.01: Interviews with participants

QUESTION	ANSWERS
Are you a fingerprint expert?	All participants answered “Yes.”
How long have you been a fingerprint expert?	<ul style="list-style-type: none"> • Above 10 years (15 participants); • 10 years & less (7 participants); and • Less than 5 years (6 participants).
Did you undergo a fingerprint course?	Yes (28 participants)
How long does it take to complete a fingerprint course?	Twelve months (28 participants)
Which of these courses did you undergo?	<ul style="list-style-type: none"> • Advanced crime scene course (15 participants); • Scene proficiency courses (9 participants); and • Introduction course for members of South African Criminal Bureau (SACB) (4 participants).
Are you a criminalistics expert?	Yes (28 participants)
What qualifications or training do you need to become a criminalistics expert?	<ul style="list-style-type: none"> • Advanced crime scene course; • F.orensic courses; and • Video course (28 participants).
Did you receive training in the Automated Fingerprint Identification System?	Yes (28 participants)
How long was the course you attended?	Two weeks (28 participants)
Are you an AFIS expert?	Yes (28 participants)
How long have you been an AFIS expert?	<ul style="list-style-type: none"> • Less than five years (4 participants); • Less than 10 years (9 participants); and • More than 10 years (15 participants).
Did you undergo basic police training?	Yes (28 participants)
Did you give evidence concerning a fingerprint case recently?	<ul style="list-style-type: none"> • Yes (25 participants); and • No (3 participants).
How many AFIS experts are there at your office?	<ul style="list-style-type: none"> • Two AFIS experts (3 participants); • Three AFIS experts (4 participants); • Five AFIS experts (3 participants); • Eight AFIS experts (6 participants); • Twelve AFIS experts (5 participants); and • Seventeen AFIS experts (7 participants).

1.12 METHODS USED TO ENSURE VALIDITY

Denscombe (2002:100) points out that validity “concerns the accuracy of the questions asked, the data collected and the explanation offered, generally it relates to the data and the analysis in the research”. In this research, the researcher applied multiple sources of data, which included literature, interviews, docket study and documents

(Mouton, 2001:100). Literature was gathered from relevant published books, SAPS journals and articles.

The researcher asked questions that were relevant to the research topic and working title. The questions were based on the AFIS and manual fingerprint identification method. The researcher compiled an interview schedule. The questions on the interview schedule were aimed at addressing the topic, the aim of the study and the research questions. The questions were designed to find the accuracy of the research being investigated. As such, the interview schedule was new and contained questions that had not been asked by previous researchers, in line with Denscombe's (2002:101) specifications. The interview schedule was forwarded to the researcher's academic supervisor, as a research expert, for checking of its validity, following Denscombe (2002:102). The researcher collected data from different angles, which gave similar findings on the topic (following Denscombe, 2002:104; Mouton, 1996:156).

Lastly, the interviews were conducted with well-informed and experienced AFIS experts in the province (see Denscombe, 2002:105). To ensure validity (Leedy & Ormrod, 2005:92), the researcher used criterion validity to test whether the results of the interviews and docket study correlated with the literature study. "Criterion validity" refers to the degree to which a diagnostic and selection measurement or test correctly predicts the relevant criterion (Welman & Kruger, 2001:137). The researcher ensured that the methods used in the collection of data were consistent with each other, accurate and honest. The questions asked during the interviews were valid because the researcher used an interview schedule, which ensured that all participants were asked the same questions during the interviews. The researcher applied criterion validity in determining the validity of the data-collection techniques used. The different sets of data collected were found to correlate with each other (see Leedy & Ormrod, 2005:92). All interpretations, analysis and conclusions were made on the basis of the data gathered from the literature, interviews and docket studies, as explained by Mouton (2001:110).

The researcher applied the following strategies, which are frequently used in qualitative studies, to ensure validity (Creswell, 2014:201-202):

- Triangulation: The researcher used multiple and different sources, methods, participants, literature and the researcher's personal experience to provide corroborating evidence. When qualitative researchers locate evidence to document a code or theme in different sources of data, they triangulate information and provide validity to their findings (Creswell, 2013:251).
- Peer review or debriefing: Peer review provides an external check of the research process, in the same way as the language editor and academic supervisor check for correctness and reliability of the text and content of the dissertation. The researcher ensured that the research was regularly reviewed for correctness and validity by the researcher's academic supervisors.
- Clarifying researcher bias: Clarifying potential researcher bias from the outset of the study is important so that the reader understands the researcher's position and any biased assumptions that may have an impact on the results of the study (Creswell, 2013:251). The researcher presents past experiences that may shape the researcher's interpretation of the study in Section 1.10.5. As mentioned in the same section, the researcher made an effort to ensure that experience and rank did not influence the participants' willingness to participate in the study freely. The researcher informed the participants that the researcher was conducting the interviews as a private person. The researcher requested participants to participate freely and voluntarily in the study without undue influence. Throughout the data collection process, the researcher suspended any preconceived notions (rank) or personal experiences that may unduly influenced what the researcher "hears" the participants saying. Although the researcher is experienced in the researched topic, the researcher had to suspend rank; knowledge and experience in order to gain an understanding of the research topic from other experienced AFIS experts (Leedy & Ormrod, 2013:146).
- Member checking: The researcher used the member-checking technique in which the researcher asked for participants' views of the credibility of the findings and interpretations. The member-checking technique is considered by Lincoln and Guba (1985) in Creswell (2013:252), to be "the most critical technique for establishing credibility". Member checking is conducted in most qualitative studies and involves taking data, analyses, interpretations and

conclusions back to the participants so that they can judge the accuracy and credibility of the study (Creswell, 2013:252). The researcher involved four participants and they all agreed that the outcome of the study is valid. Member checking was conducted with four participants and these participants did not give additional information about the research. Thus, the outcome of the member checking by the participants was that the research is valid.

1.13 METHODS USED TO ENSURE RELIABILITY

Reliability, according to Herbert (1990:51), refers to “the stability, dependability of the test/methods you are using, in other words their precision or accuracy”. This definition is confirmed by the definition provided by Grinnell (1998:120), who mentions three methods of measuring reliability as: thoughts, feelings and behaviour. To ensure that the research was reliable, the researcher applied multi-method data collection, such as thoughts and behaviour. These methods included conducting interviews and reviewing current and relevant literature. The multi-methods employed in data collection assisted in comparing words/answers with similar meanings. They also helped in finding correlations among the interviews, literature, documentation and experience used in the research (see also Denscombe, 2002:134). The research design also helped to ensure reliability in the study. This multi-method approach is known as triangulation (Denscombe, 2002:134).

The researcher used the following techniques to ensure reliability:

- Eliminating drift in definitions: The researcher ensured that he prevented or avoided misunderstanding in the general meaning of codes during the process of coding. He accomplished this by constantly comparing data with the codes and by writing memos about the codes and their definitions (see Creswell, 2014:203).
- Cross-checking codes: The researcher used the cross-checking method by comparing several of these procedures as evidence that had consistent results in this research (Creswell, 2014:203).

Creswell (2014:203) recommends that several procedures be included in a study and that single researchers find another person who can cross-check their codes for what

is called inter-coder agreement (cross-checking). The researcher cross-checked the codes that emerged from the data to ensure that the methods applied during the collection of information were consistent and reliable.

The interviews were conducted face to face and assisted the researcher to observe each participant's body reactions and non-verbal language. Bailey (1987:72; see also Herbert, 1990:42) states that there must be consistency in data-collection procedures; if this happens the same results will be achieved. For the research to be reliable, the questions in the interview schedule must not be repeated; if they are repeated the participants will have negative impressions of the research. For the research to be reliable, data collection with the use of multi-methods must be similar and must correlate across methods. Moreover, questions in the interview schedule must be clear and not misleading or confusing. Similar answers to the same questions should be given by most of the participants. That is, all participants must give the same or similar answers to the researcher. The participants must be asked similar questions to determine words or sentences that are frequently used.

In this study, the study of literature, case docket analysis and semi-structured interviews ensured a particular richness and consistency of data. This was because the participants had received the same training courses in AFIS and therefore could be expected to have the same expert understanding of how the system worked, its value to the solving of cases, and the problems AFIS experts encountered with the system.

To achieve reliability, the researcher ensured that all the participants were asked the same questions, which also meant that the interviews produced similar results. Data collection was carried out by the researcher himself. He used the data-collection methods consistently in accordance with the qualitative approach. The data-collection techniques were valid because the methods were used and applied in a consistent manner, in that the researcher arranged the facts according to the time at which they happened, e.g. earlier facts first and later facts after the first facts. To ensure that the techniques used to analyse data were valid, the researcher combined and generalised all data collected and formulated an overall picture of the study. This also ensured relevancy to the themes identified in the research (Leedy & Ormrod, 2005:92).

1.14 ETHICAL ISSUES IN RESEARCH

Leedy and Ormrod (2005:107) refer to the ethical principles related to what one is proposing to do or achieve in a research study as being:

- Protection from harm – The researcher ensured that participants were not singled out to be interviewed and that they would be protected against any potential harm that might derive from the research findings in the future (Walizer & Wienir, 1978:153-4).
- Informed consent – This is about the right of participants to determine for themselves whether or not they want to be part of a research project (Ruane, 2005:19). The researcher fully informed the participants about their right to withdraw their consent to participate in a letter, which they signed, which outlined the option to withdraw and stated the purpose of the research project (Ruane, 2005:19; see also Denscombe, 2002:145). The study was strictly voluntary without promises or undue influence (Leedy & Ormrod, 2005:108; see also Miles & Huberman, 1994:291). The researcher compiled a consent form and this was signed by all the participants and indicated their consent, in line with Robson's (2000:29) recommendations.
- Right of privacy – The participants were guaranteed that their right to privacy would be adhered to. The researcher did not reveal their names and, instead, the interviewees were recorded as "Participant 1", "Participant 2" etc. to hide their identities (see also Robson, 2000:33; Ruane, 2005:22-3).
- Honesty with professional colleagues – The researcher achieved this by acknowledging all the sources he consulted. Publications consulted are recorded in the list of references at the end of the research report.
- Get written permission: The researcher applied for and received permission from the SAPS to conduct the research (see permission letter attached as Annexure B). The researcher also obtained written permission in advance from the Limpopo Police Provincial Commissioner to interview all the participants and consent forms were forwarded to the participants and signed by them. All participants agreed to be interviewed and gave their consent for the interview to be recorded on the interview schedule. The written consent forms have not been attached to the dissertation for confidentiality reasons (Leedy & Ormrod, 2005:147).

- Don't put words in people's mouths: During the interviews the researcher did not give suggestions or try to change the manner in which the questions were answered. The actual words said by the participants were not recorded on a voice recorder but only recorded by the researcher on the interview schedules for each participant in the researcher's hand writing (Leedy & Ormrod, 2005:147).
- Keep your reactions to yourself: The researcher ensured that he listened attentively and did not show any expression of surprise or approval during the interviews (Leedy & Ormrod, 2005:147).
- Confidentiality: The researcher ensured that the identity of each of the interviewees was kept confidential by using the term "participant" in the dissertation rather than stating their names (Leedy & Ormrod, 2005:147).

1.15 RESEARCH STRUCTURE (CHAPTERS AND LAYOUT)

To gather data, the researcher made use of different techniques: extensive literature research guided by the research questions and the aim of the research; a review of relevant documents, such as circulars, policies, standing orders and documentation that was not available to the public; docket analysis; and semi-structured interviews. In writing up the dissertation, the researcher decided to make use of an integrated approach, where data from literature, documents and the interviews was integrated to get a better understanding of the phenomenon and the problems that investigators experience. An integrated approach, from the viewpoint of the researcher, has the potential also to contribute to a better understanding among those involved in the investigation and prosecution of crime.

The dissertation is divided into the following chapters:

Chapter 1: General Orientation

The chapter discusses the problem statement; aim of the research; purpose of the research; research questions; definition of concepts; research design and approach; target population; sampling; data-collection methods; data analysis; methods to ensure validity and reliability; and ethical issues.

Chapter 2: Fingerprint Identification

In this chapter the researcher presents his research on the different types of identification and the concept “individualising”. The chapter further discusses the distinction between identification and individualisation. The researcher also presents the types of fingerprint patterns and criteria used globally for fingerprint identifications.

Chapter 3: The Value of the Automated Fingerprint Identification System in the Identification of Suspects

In this chapter the researcher discusses the differences between manual and AFIS identification, the importance of AFIS in South Africa, and the disadvantages of manual identifications.

Chapter 4: Findings and Recommendations

In this chapter, the researcher summarises the findings of the research and makes recommendations for practitioners.

CHAPTER 2

FINGERPRINT IDENTIFICATION

2.1 INTRODUCTION

The most important evidence found at a crime scene is a chance fingerprint. Chance fingerprints are latent prints left at the crime scene, on a weapon or on other objects at the location of crime (Nath, 2010:38), because fingerprints offer an infallible means of personal identification (Gilbert, 2010:454; Nath, 2010:1; Saferstein, 2011:534). The Chinese used fingerprints to sign documents as far back as three thousand years ago (Fisher, Tilstone & Woytowicz, 2009:50; Gilbert, 2010:454).

The first personal identification methodology was developed by a French police expert, Alphonse Bertillon, in 1883 and was known as anthropometry. The system measured body parts, described the appearance and shape of the body, and described visible marks that appeared on the body such as scars, warts or tattoos. However, an incident arose in which a man called Will West was convicted and sentenced to a United States of America (USA) prison. He denied the charge despite the fact that his measurements were identical to those already taken from a prisoner called William West.

After the unsuccessful identification of the West identical twin brothers by the Bertillon measurement system, fingerprints were used in the early 20th century by fingerprint experts as their primary method of identifying criminals (Gilbert, 2010:20; Saferstein, 2013:134-135).

In this chapter, the researcher focuses on fingerprints as evidence. After locating the study of fingerprints within the investigative function of the SAPS, the chapter explores the concept of fingerprints as a means of identification, and includes fingerprint patterns, deltas, cores and the seven-point criteria used in South Africa and globally. Following this exploration, the chapter addresses the first research question: "What does fingerprint identification entail?"

2.2 THE FUNCTIONS OF THE SOUTH AFRICAN POLICE SERVICE

According to the Constitution of the Republic of South Africa (South Africa, 1996) and the SAPS strategic plan of 2010 to 2014 (SAPS, 2010:3), the functions of the SAPS are to:

- Prevent crime;
- Combat and investigate crime;
- Maintain public order;
- Protect and secure the inhabitants of the Republic and their property; and
- Uphold and enforce the law.

In the interviews, each member of the study sample was asked the question: “What are the functions of the SAPS according to the Constitution of the Republic of South Africa?” The sample responded as follows:

- To protect and serve the public (6 participants);
- To investigate crime and protect the community (8 participants);
- To maintain law and order and investigation of crime (7 participants);
- To prevent crime (4 participants); and
- To give service to the community (3 participants).

The answers showed that all participants understood the functions of the SAPS, with all of the participants providing relevant information. The researcher asked this question to provide a context for the need to identify fingerprints.

2.3 THE ROLE OF THE CRIMINAL RECORD CENTRE (CRC)

The role of the CRC is not limited to what is contained in the SAPS strategic plan but includes all activities that deal with suspect/offender profiling and previous convictions. Furthermore, according to the SAPS strategic plan (SAPS, 2010:16), the other role of the CRC is to ensure that all arrested/convicted people’s fingerprints are taken and stored in the national database and that all SAPS personnel are vetted via fingerprint testing (Terry, 2011; see also South Africa, 2010). The Criminal Law (Forensic Procedures) Amendment Act 6 of 2010, sections 2 and 3 allow the CRC to manage

the national fingerprint databases and to ensure that fingerprints of convicted suspects are stored on the AFIS database (South Africa, 2010).

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

In response to the question: "What is the role of the CRC?" the participants answered as follows:

- To provide previous convictions (19 participants);
- To cancel previous convictions/records (4 participants);
- To keep criminal records (3 participants); and
- To manage the AFIS database and offender profiling (2 participants).

The researcher established that the responses from participants showed an awareness of the legislation and SAPS strategic plan and also supported each other. All their answers were correct and in line with the literature reviewed.

2.4 FUNCTIONS OF THE CRIMINAL RECORD CENTRE

According to the SAPS strategic plan of 2010 to 2014 (SAPS, 2010:15-16), one of the functions of the CRC is to give support to the SAPS function of investigating crime.

Other functions of the CRC are:

- To improve the collection of evidence at crime scenes by crime scene experts;
- To improve the procedure for updating records of offenders;
- To ensure that bail-opposing reports are issued before bail hearings are held;
- To share databases; e.g. access to the Department of Home Affairs' database will strengthen the capacity of the SAPS to identify individuals involved in crime; and
- To ensure that all provinces are more effective in linking suspects to crimes.

In response to the directive: “Explain how the functions of the CRC support the functions of the SAPS” the participants responded as follows:

- To provide the SAPS with previous records (14 participants);
- To collect fingerprints from and take photographs of the scene (5 participants);
- To keep/update criminal records (4 participants); and
- To render a support service to the SAPS (5 participants).

Based on the researcher’s experience, the functions of the CRC is generally involves the keeping or updating of criminal records, issuing of police clearance certificates, etc. The participants have knowledge as they mentioned some of the CRC functions (Terry, 2011). However, their answers were similar to each other and also supported the SAPS strategic plan.

2.5 MEANING OF “INVESTIGATION”

According to Thibault, Lynch and McBride (2007:232), investigation is the apprehension of criminals by gathering evidence that leads to their arrest and the collection and presentation of evidence and testimony for the purpose of obtaining a conviction. Investigation is a matter of making observations and enquiries to obtain factual information about allegations, circumstances and relationships (van Heerden, 1986:182). For Osterburg and Ward (2010:5), the investigation of crime encompasses “the collection of information and evidence for identifying, apprehending and convicting suspected offenders”. Gilbert (2010:46) also points out that investigation of crime is a legal inquiry that is based on logic and objectives.

In response to the question: “What is your understanding of the concept ‘investigation’?” the participants answered as follows:

- It is to collect information about the crime committed in order to bring suspects to court (13 participants);
- It is to search for the truth or evidence through scientific ways (4 participants);
- It is to interview complainants with the purpose of collecting information about the suspects (6 participants); and
- It is to arrest suspects and bring them before court (5 participants).

Although there are some differences in the participants' responses, all the responses are relevant to the meaning of the term "investigation" as defined by van Heerden (1986:182), who describes an investigation as the collection and handing over of facts to courts for prosecution. All of the participants had a good understanding of the meaning of "investigation".

2.6 OBJECTIVES OF INVESTIGATION

According to du Preez (1996a:4-7), "investigation takes place with clear objectives in mind." Becker (2000:8) shares du Preez's (1996a:4-7) view that the objectives of an investigation are:

- Identification of the crime;
- Gathering of evidence;
- Individualisation of the crime;
- Arresting of the criminals;
- Recovery of stolen property; and
- Involvement in the prosecution process.

These objectives require a commitment from the police detectives. An investigation must be applied within an appointed time and must be in accordance with a specified standard (van Heerden, 1986:182; du Preez, 1996a:4). Thibault et al. (2007:233) emphasise that cases would not be solved and offenders would not be arrested if criminal investigators are not willing and able to use preliminary investigation skills.

2.7 DEFINITION OF "FINGERPRINT"

A fingerprint consists of the imprint of the friction ridge skin of the end joint of each finger, taken from cuticle to cuticle (Siegel, 2011:52). According to Nath (2010:1), the skin covering the anterior surface of the human hand and planter (sole of the foot) surface of the human foot is different in texture and appearance than the skin that covers the rest of the human body, because human foot have friction ridges. Pepper (2010:81) mentions two types of prints that are likely to be left on a surface touched by the anterior surface of the hand: visible and latent (invisible) prints (see also Gilbert, 2010:456). A fingerprint is defined as "the reproduction of the ridge area of the first or

nail joint of the finger in any manner whatever and it also includes the ridge area of the remaining joint of the finger” (James & Nordby, 2009:356; Saferstein, 2011:539).

Fingerprints belong to one of the oldest and most important evidence categories in all forensic sciences. James and Nordby (2009:355) argue 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).

In response to the question: “What is a fingerprint?” the sample answered as follows:

- It is a reproduction of the ridge area, of the first joint of the finger, including the remaining joints (12 participants);
- It is a reproduction of the ridge of the first joint of the finger, including the footprint and palm print (9 participants); and
- It is the reproduction of the ridge of the first joint of the finger but excluding palm and footprints (7 participants).

The 28 members of the sample understood the question and their responses support the definitions obtained in the literature consulted.

According to Swanson, Chamelin and Territo (1992:85), fingerprints, which are a fairly common form of physical evidence, are one of the most valuable types of evidence. Fingerprints of the suspect of a crime are found on different types of surfaces and in various conditions as they are made under unfavourable conditions. The fact that a fingerprint is found on a crime scene proves that the suspect was at the crime scene and/or he or she touched the surface or object thereof. Unfavourable conditions for clear and complete fingerprints exist when suspects/offenders leave their fingerprints at a crime scene. Such prints cannot be the same as those taken on an inked pad and rolled properly. According to du Preez (1996a:24), prints made under unfavourable conditions make it difficult for fingerprint technicians to locate these prints during investigation by means of fingerprint powders with a brush.

2.8 FINGERPRINT IDENTIFICATION

Fingerprint identification is a process where prints (found at a crime scene or on an object and taken from a suspect) are compared until seven identical points are found which are similar in all respects (in relation, size, position, direction and without any unexplainable differences) (Siegel, 2011:56; du Preez, 1996a:25).

Physical evidence can be divided into four major categories: drugs and chemicals, trace, biological and pattern evidence (James & Nordby, 2009:355). According to James and Nordby (2009:355), fingerprints are members of the pattern category along with tool marks. The use of fingerprints from crime scenes to identify suspects has been accepted as an investigative technique since 1900. Fisher et al. (2009:56-57) state that because fingerprints are unique they are used to identify people. In forensic science, fingerprint experts use fingerprints primarily to help locate and identify suspects in criminal cases and also to eliminate suspects from criminal cases (James & Nordby, 2009:355; Ogle, 2012:126). Fingerprints are also important in making unequivocal identification of human remains when more conventional methods of post-mortem identification cannot be used (James & Nordby, 2009:355-6). The Criminal Law (Forensic Procedures) Amendment Act 6 of 2010, section 36B makes it compulsory for the fingerprints of any person suspected of or arrested for any offence or crime to be taken (South Africa, 2010).

Untrained people are not competent to give evidence on the identity of fingerprints and the court is not usually qualified to form its own opinion (Zeffertt & Paizes, 2010:23):

- In Zeffertt and Paizes (2010:194), the court decided that circumstantial identification by a fingerprint will, for instance, tend to be more reliable than the direct evidence of a witness who identifies the accused as the person he saw.
- The court stressed that where a print is disputed the usual procedure is for a fingerprint expert to produce photographs (court chart) of the disputed print and of a genuine print obtained from the accused (Zeffertt & Paizes, 2010:194).
- The judge rejected arguments that the taking of a suspect's fingerprints by some measure of improper compulsion violated either the right to silence or the dignity of the suspect (Zeffertt & Paizes, 2010:194).

Nath (2010:11) suggests that fingerprint identification is also used in the following areas:

- As security features to help avoid problems associated with forged identification documents (see also James & Nordby, 2009:356);
- In government departments as an access control; and
- To set traps for unauthorised employees (see also Sennewald & Tsukayama, 2006:146).

In response to the question: “What is fingerprint identification?” the sample answered as follows:

- The connection of all the corresponding ridge features, by ridge tracing and counting (2 participants);
- When two prints are identical in relation to size, position and direction (13 participants);
- When fingerprints of suspects are matched or linked to a crime scene (8 participants);
- When one compares fingerprints, and they are identical without any unexplainable differences (1 participant);
- The comparison between two identical fingerprints (2 participants); and
- The reproduction of the ridge surface of the first nail joint, including the remaining joints of the finger (2 participants).

The participants understood the question and their answers corroborate the explanations provided in literature consulted, such as Fisher et al. (2009:56-57). Most of the interviewees talked about matching, linking, comparing, reproducing, etc. fingerprints; all these words involve a similar process.

2.9 WHAT DOES FINGERPRINT IDENTIFICATION ENTAIL?

According to Saferstein (2011:357), the acceptance of fingerprint evidence by the court has always been predicated on the assumption that no two individuals have identical fingerprints. The two features of fingerprints most important for their use as a means of personal identification are:

- Every fingerprint is unique (to an individual). Nath (2010:13) writes that a fingerprint is an individual characteristic: “No two fingers have yet been observed to possess identical ridge characteristics”; and
- Fingerprints do not change during an individual’s life time, unless damage is caused to the dermis skin layer (James & Nordby, 2009:356).

According to Nath (2010:15), fingerprints have general ridge patterns that permit them to be systematically classified.

In response to the question: “What does fingerprint identification entail?” the participants answered as follows:

- It entails that no two people have the same identical fingerprints (15 participants);
- It is the comparing of the ridge characteristic of one print with another until enough similarities are found (3 participants);
- It entails establishing that the prints left at crime scene are identified as those of a particular person (6 participants);
- It entails the matching of two sets of latent prints for identification (3 participants); and
- It entails the matching of fingerprints (1 participant).

The participants’ answers do not support each other but they corroborate the literature consulted. The answers are not the same. The participants mentioned that identification deals with the matching of two fingerprints while the other participants mentioned that identification deals with the fact that there are no two persons with the same fingerprints.

2.10 HOW CAN FINGERPRINTS BE IDENTIFIED?

Osterburg and Ward (2010:54) specify that different features of the friction ridge are significant in the classification and the individualisation of fingerprints. Identification deals with ridge characteristics, ridge line patterns, line ridge deviation details and individual characteristics of fingerprints. Osterburg and Ward (2010:54) emphasise that identification must always be made by a final visual comparison of suspects’ and

scene prints' ridge characteristics and that only the ridge features can impart individuality to a fingerprint. Once a print that is a latent print is evacuated or lifted by means of tape lifter and determined to be "suitable" for comparison, it is then compared to known prints (James & Nordby, 2009:72). Although the ridge pattern imparts class characteristics to the print and the type, the position of the ridge characteristics gives the print its individual character (Saferstein, 2011:544). James and Nordby (2009:72) use the word "evacuating" instead of "lifting", which is commonly used in South Africa.

According to Osterburg and Ward (2014:51-52), identifying a latent fingerprint means scrutinising it for any discernible class characteristics to eliminate comparison prints that are not of the same pattern type; then the next step is to find a cluster of individual (ridge) characteristics – two or three points (ridge characteristics) bunched together. This grouping is chosen as a landmark to be searched for in the known comparison print; if the groupings do not correspond, the known print is eliminated. If a correspondence is noted, the third step is to examine the latent print for the point of identification closest to the landmark cluster; then it is compared to the print to see if that (ridge) characteristic is present in the same location, based on ridge counting. If it is, the latent print is further examined for yet another individual (ridge) characteristic, and the known print is checked to see if there is a match. When all points of identification (ridge characteristics) in each print are established as being of the same type (bifurcation, island, spur, etc.) in the same unit relationship (same location) and no unexplainable differences are noted in either print, a conclusion that both impressions were made by the same person may be justified (Osterburg & Ward, 2014:52).

In response to the question: "How can a fingerprint be identified?" the sample provided the following answers:

- Through ridge tracing or land ridge counting or ridgeology or ACE-V (ACE-V is another tool or aid used in the identification of suspects through fingerprints and stands for "Analyse, Compare, Evaluate and Verify") (4 participants);
- Through ridge tracing and counting and looking at fingerprint patterns and flow of ridge (7 participants);
- By ridge tracing and/or ridge counting (10 participants);

- By means of AFIS or manual search (5 participants);
- By means of first-, second- or third-level detail (1 participant); and
- By establishing correspondence concerning type, size, direction, place position and relation, with no unexplainable differences found between the two prints (1 participant).

According to the responses of the participants, there are many ways of identifying fingerprints. Five participants only mentioned the instrument used without indicating how it is used to make a fingerprint identification, which indicates that they have limited knowledge about how fingerprints are identified. The participants' descriptions support those given in the consulted literature.

2.11 RIDGE CHARACTERISTICS IN FINGERPRINTS

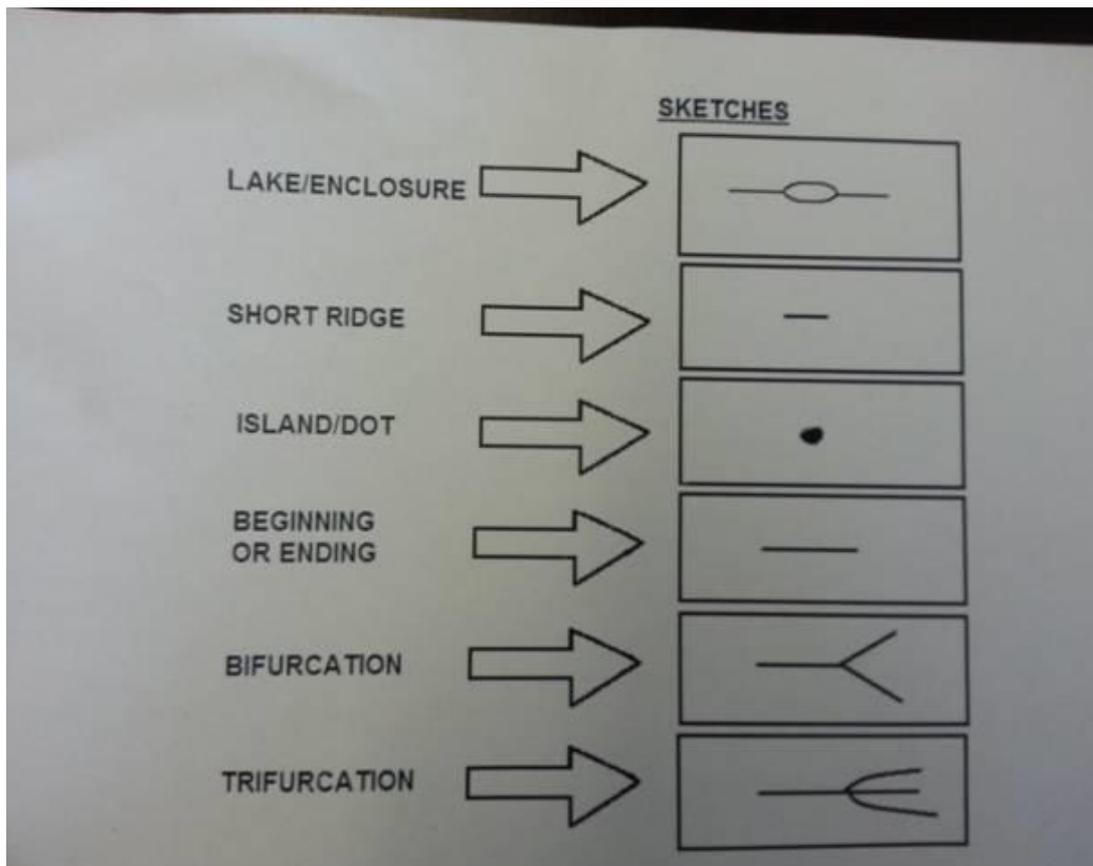
According to du Preez (1996b:247), the ridge characteristics of a fingerprint are the details of ridge structure, formation and elements that differentiate one fingerprint from another and that make each fingerprint unique. Ridge characteristics are referred to as "minutiae". Saferstein (2011:164) writes that the individuality of a fingerprint is not determined by its general shape or pattern but by a careful study of its ridge. The identity, number and relative location of characteristics give individuality to a fingerprint (Saferstein, 2011:537; du Preez, 1996a:24). According to Saferstein (2011:537), for two prints to match, they must reveal characteristics that are identical and have the same relative location to one another in a print. Nath (2010:95) is of the view that a single fingerprint may possess as many as 150 individual ridges. This view is supported by Saferstein (2011:538).

A fingerprint has individual characteristics and no two fingers have yet been found to possess identical ridge characteristics (Swanson et al., 1992:85; Saferstein, 2011:541). In a judicial proceeding, a point-by-point comparison must be demonstrated by an expert, using charts called court charts (SAPS 333) in order to prove the identity of an offender (Graham, 1993:7; Saferstein, 2011:537). The commonly used ridge characteristics as defined by Marais (1992:172) are as follows:

- Short ridge – is a ridge that is shorter than 2 mm; the ridge is the same size as adjacent ridges (Saferstein, 2011:537);

- Island/dot – when the width and length are of the same size;
- Bifurcation – the separation of a single ridge to form two ridges;
- Trifurcation – the separation of a single ridge to form three ridges; and
- Lake (enclosure) – when two bifurcations meet each other but the enclosure is not more than 2 mm.

Figure 2.01: Different ridge characteristics



(Source: Sketches by researcher, based on experience)

To the question: “What are the ridge characteristics in fingerprint science?” the sample provided the following answers:

- Islands, lakes, short ridge, bifurcation, beginning or ending of a ridge (17 participants);
- Portion, place in relation to ridge flows etc. of certain points in the fingerprints (5 participants);
- Outflows of ridge sizes and distances between the ridges, which include lake, island, short ridge etc. (4 participants); and

- Ending or beginning, bifurcation, island, short ridge (2 participants).

A few ridge characteristics that are not mentioned by most of the literature and the participants and are only mentioned by Saferstein (2011:141) are spur, bridge, crossover and over-lapping ridges. Twenty-three participants gave answers that corroborate information found in the literature.

While the responses of the remaining five participants referred to ridgeology in that they mentioned portion and place in relation to ridge flows of certain points in the fingerprints, they did not mention the ridge characteristics. This indicates that these five participants also have experience in the field of fingerprint science because ridgeology is the study of the uniqueness of friction ridge structures and their use for personal identification (Vanderkolk, 1999:251).

2.12 MINUTIAE

All fingerprint types have many distinguishing characteristics in the ridge details, collectively termed “minutiae” (Saferstein, 2013:164; see also Fisher et al., 2009:61). Saferstein (2011:537), along with Fisher et al. (2009:61), believes that the individuality of a fingerprint is not determined by its general shape or pattern but by a careful study of its ridge characteristics or minutiae.

To the request to: “Define the concept ‘minutiae’ according to your experience”, the sample responded as follows:

- They refers to ridge characteristics of a fingerprint (19 participants);
- It means ridge characteristics or Galton’s details (Galton’s details refers to the ridge characteristics) (4 participants);
- It refers to lakes, forks, islands etc.– ridge characteristics (2 participants);
- It refers to beginning or ending of ridges or Galton’s details, bifurcation, island, lake (1 participant);
- It refers to green markers that AFIS marks out (1 participant); and
- It is the peculiarities or ridges, which include bifurcations, lakes etc. (1 participant).

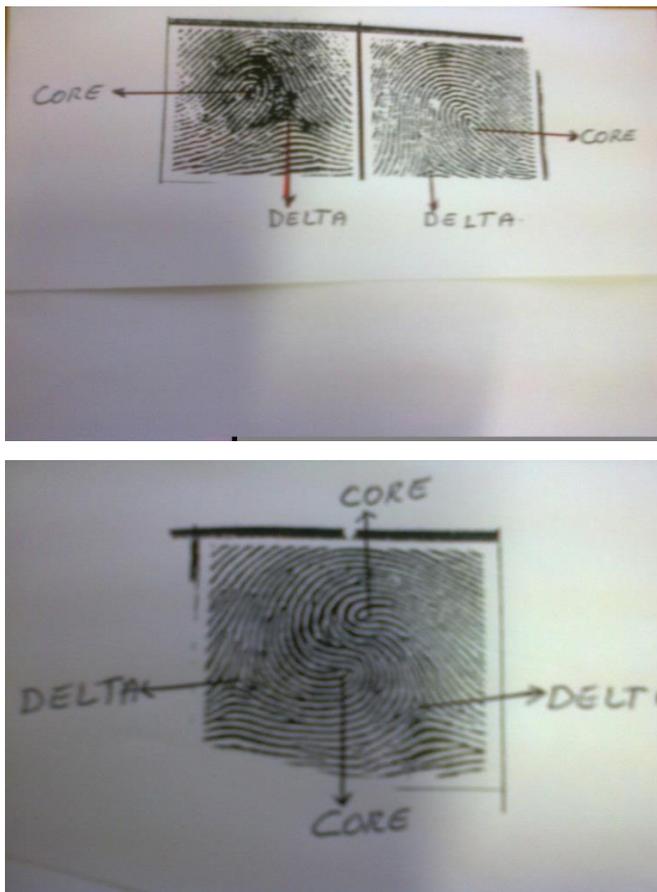
The answers provided by the sample members show that they have an understanding of the similarities between minutiae and ridge characteristics and their answers support the literature consulted, such as Fisher et al. (2009:61) and Saferstein (2011:537).

The position of all the ridge characteristics is determined in the same way in order to make comparison possible. A single fingerprint may contain as many as 150 or more minutiae that can be used for identification purposes (Saferstein, 2013:164). It is very important as an expert to know that two fingerprints may both possess the same ridge characteristics and seem to be identical but on closer examination with a magnifying glass or on AFIS may reveal that the same ridge characteristics are at different positions or face different directions on the fingers (Saferstein, 2011:140; see also Siegel, 2011:57). Vanderkolk (1999:246) mentions that the uniqueness of the morphology, or shape, of the structure of friction ridge units and arrangements found in the friction ridge skin will not be reproduced on any other skin. The participants' answers revealed that they had the knowledge required to make fingerprint comparisons using ridge characteristics. See Figure 2.01 above.

2.13 DELTA AND CORES

According to Nath (2010:22), the delta and cores are defined as the fixed points of an impression and make their appearances only in such patterns as loops and whorls but cannot be found in arch patterns (see Figure 2.02 below).

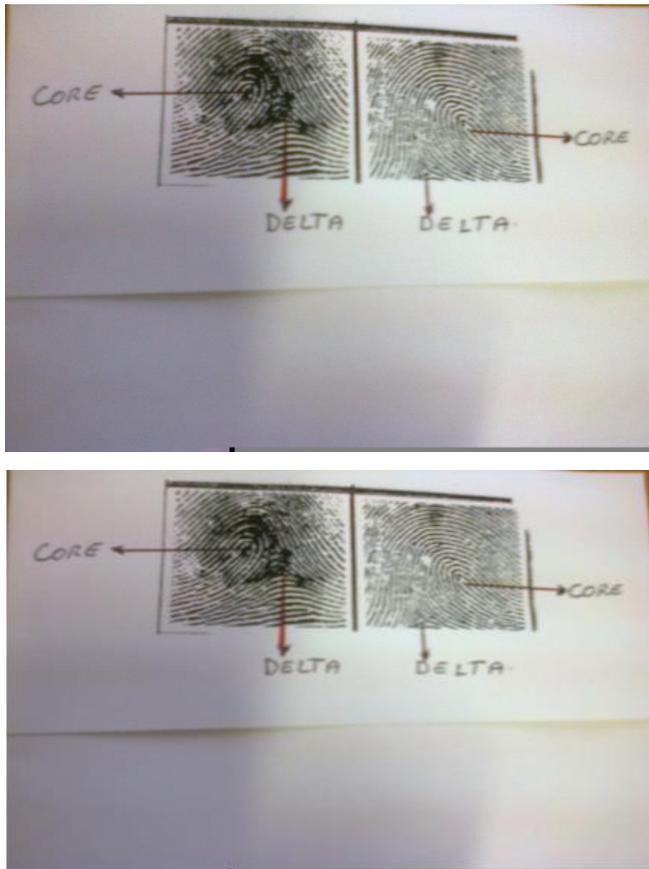
Figure 2.02: Loop and whorl patterns with delta and core indicated



(Source: Swanson et al., 1992:86 and researcher's initiative based on his experience)

The figures were taken from Swanson et al. (1992:86) and the researcher added the labels. The core is the inner terminus or central point of the pattern while the delta is the outer terminus (Gilbert, 2010:457; Nath, 2010:23). The delta can be formed in two ways: by the bifurcation of a single ridge or the divergence of two parallel ridges, while the cores may consist of rods, staples or a combination of these that are located in the rounding of the core staples (du Preez, 1996a:18-19; Gilbert, 2010:457; Nath, 2010:22). Cores of the loop and whorl patterns differ according to the pattern and flow of the ridges (du Preez, 1996a:18-19). (See Figure 2.03 below for illustration.)

Figure 2.03: Loop patterns with core and delta indicated



(Source: Swanson et al., 1992:86; labels added by the researcher)

2.14 LATENT PRINTS

Fisher et al. (2009:65) refer to latent prints as impressions that are left at a scene of crime that are not readily visible to the naked eye. Nath (2010:55) further emphasises that there are many procedures available for developing latent prints (see also Osterburg & Ward, 2010:50). Latent fingerprints are often of great importance in an investigation and presentation (Gilbert, 2010:459). Whether latent prints are left at a crime scene depends on physiology (does the person perspire?) and what substances are present on the fingers, the nature of the surface touched and the manner in which it was touched, among other things (Osterburg & Ward, 2010:48). Nath (2010:38) refers to latent prints as prints that are left at the crime scene by a suspect while for Lyman (2013:57) latent prints are impressions produced by the ridged skin on human fingers, palms and soles of the feet.

In response to the request: “Explain, according to your experience, the term ‘latent print’”, the sample answered as follows:

- It is an invisible print not yet developed with powder or reagents (23 participants);
- They are prints that were left at crime scenes (3 participants);
- They are full hand prints and fingers (1 participant); and
- It is an impression left at the scene of crime (1 participant).

All crime scene prints left behind by the perpetrators that are not visible are regarded as latent prints, but not all scene prints are invisible. All latent prints are regarded as made under unfavourable conditions and as such mostly are not visible to the naked eye. The participants have the knowledge of latent prints because they develop them by means of fingerprint powders or chemicals in the laboratories they work in to make them more visible. All full hand prints and prints made by friction skin found at a crime scene that are invisible are regarded as latent impressions (Nath, 2010:55). Although the responses showed a number of differences, the participants’ answers were similar (see also Nath, 2010:55).

2.15 RIDGE TRACING

The ridges of the skin on the hands and feet of human beings and various types of apes are friction ridges, which facilitate contact and the handling of objects. Ridges are granular elements arranged in rows and form part of the epidermis or outermost layer of skin (Marais, 1992:170).

Ridge tracing is the following of the ridge on a fingerprint from the left to the right delta (du Preez, 1996a:28). The procedure of ridge tracing involves the tracing of the ridge that emerges from the lower side of the left delta until the point nearest or opposite the extreme right delta is reached (Nath, 2010:36). The traced ridge will either meet the right delta or pass it on the inside or outside. An accidental whorl is a whorl pattern consisting of a combination of two different types of patterns, except plain arch, having two or more delta formations (Nath, 2010:34). Accidents are traced from the extreme left to the extreme right delta, but, if normal tracing is impossible because of recurving to the ridge, the tracing is considered to be an M-tracing (du Preez, 1996a:28).

According to (Nath, 2010:50-51) the significance of an M-tracing is when a finger is deformed, missing or in case of a whorl patterns if both or either of the two deltas are missing from the recorded impression.

2.15.1 The procedure applied to ridge tracing

The ridge that originates from the left delta or, if no ridge originates from it, the ridge directly on the outside of the delta is traced to a point alongside the right delta, such as when a ridge bifurcates, the outside leg/ridge of the bifurcation is followed (du Preez, 1996a:28; Pepper, 2010:99; Nath, 2010:36).

In response to the request: “Based on your experience, define the concept ‘ridge tracing’” the sample answered as follows:

- Ridge tracing is when a ridge is followed until another ridge characteristic is found or bifurcation is followed (21 participants); and
- Ridge tracing is when a ridge from left to right delta is followed until another one is found (7 participants).

All the answers given by the participants correlate with the literature consulted. This shows that the participants have a practical understanding of the procedure (see also Nath, 2010:36).

2.16 PATTERN AREA

The pattern area is that part of the loops or whorls in which the core details and ridges used for identification appear (Nath, 2010:20). Nath (2010:25) is of the view that fingerprint patterns are determined by the arrangements of the ridges that appear on the first nail joint of the fingers. These patterns consist of delta, core, typed line, shape and the flow of the ridges (Saferstein, 2011:541). A basic understanding of how fingerprints are identified is important for crime scene investigation and to enable the investigator to recover complete undamaged fingerprints at crime scenes (Pepper, 2010:93). Gilbert (2010:456) points out that the pattern area is the only relevant part of the fingerprint for identification as it contains the important ridges of the print such as the deltas and cores.

In response to the request: “Based on your experience, define the concept ‘pattern area’” the sample answered as follows:

- The pattern area includes permanent scar, delta, core, point (9 participants);
- The area that determines the pattern of a finger (10 participants);
- The area that consists of more/many ridge characteristics (4 participants);
- The area that consists of delta and cores (2 participants);
- It explains what type of latent print it is; e.g. radial, ulner, loops, whorls or tented arches (1 participant); and
- The way the fingerprint is formed, through the flow of the ridges; e.g. in circular (2 participants).

The participants’ answers support each other. The results from the literature and participants show great consistency.

2.17 RIDGE COUNTING

Ridge counting is the counting of the number of ridges that touch or are cut by a straight line between the deltas and cores of the finger (du Preez, 1996a:26; see also Nath, 2010:29).

2.17.1 Procedure for ridge counting

To obtain an accurate ridge count, one must use a magnifying glass, which must consist of a glass with a hairline on its foot screen, and also a sharp instrument like a needle. The ridges that touch or are cut by the hairline are counted from the one side of the fingerprint to the other. The delta and core are not included in the count. Both sides of a lake are counted (du Preez, 1996a:26; see also Nath, 2010:29). Islands are only counted if they are prominent and their width corresponds with the width of the surrounding ridges. Underdeveloped and false ridges are not counted (du Preez, 1996a:26).

The participants answered as follows in response to the request: “Based on your experience, define the concept ‘ridge counting’”:

- It is the counting of the ridge from the delta to the core, including the ridge characteristics (13 participants);

- It is the counting of the number of ridges until seven points of ridge characteristics are found/recorded (5 participants);
- An expert must have a magnifying glass with a hairline; the ridges that are cut by the hairline are counted; a lake is counted twice (6 participants); and
- It is when ridges are counted, which include ridge characteristics such as islands, bifurcation, and lakes in order to reach seven points (4 participants).

Twenty-eight of the participants used their experience and produced answers that corroborated information obtained from the literature consulted. The possible reason for this is that most literature does not mention ridge tracing and/or ridge counting apart from the SAPS fingerprint manuals and Nath (2010:20).

2.18 DIFFERENCES BETWEEN RIDGE TRACING AND RIDGE COUNTING

The differences between ridge tracing and ridge counting as taken from literature and interviews with the participants are shown in Table 2.01.

Table 2.01: Differences between ridge tracing and ridge counting

<u>RIDGE TRACING</u>	<u>RIDGE COUNTING</u>
Ridge tracing is the following of a ridge in a fingerprint from the left delta to the right delta (du Preez, 1996a:28; 21 participants).	Ridge counting is the counting of the number of ridges that touch or are cut by a straight line between the deltas and cores of the finger (du Preez, 1996a:26; Nath, 2010:29; 28 participants).
The procedure for ridge tracing involves the tracing of the ridge that emerges from the lower side of the delta until the point nearest or opposite the extreme right delta is reached (Nath, 2010:36).	Both sides of a lake are counted.
When the ridge bifurcates, the outside leg/ridge of the bifurcation is followed.	Underdeveloped and false ridges are not counted (du Preez, 1996a:26).

(Sources: du Preez, 1996a:28; Nath, 2010:29; 28 participants)

According to du Preez (1996a:16), Nath (2010:25) and Saferstein (2011:540), the three basic fingerprint patterns are made up of arches, loops and whorls. Nath (2010:25-26) divides the arch patterns into two types: plain and tented arches. Neither the plain nor tented arch has a delta or a core (see also Pepper, 2010:93; Saferstein, 2011:542; Ogle, 2012:127, Lyman, 2013:59).

The loops are of two sub-types: ulnar and radial loops (Nath, 2010:28). There cannot be a loop unless there is an independent reserve of one or more ridge between a delta and a core (Pepper, 2010:541). Whorl patterns are divided into plain, central pocket loop, double loop, and accidentals (Nath, 2010:30-31; Osterburg & Ward, 2010:54).

In whorl patterns there must be a complete circuit and the whorl must have one, two or three deltas (Pepper, 2010:96). Graham (1993:7) mentions that 65% of people have loop patterns, 30% have whorls and the remaining 5% have arches on their fingertips. These findings are supported by Fisher et al. (2009:59), Nath (2010:15), and Osterburg and Ward (2010:54). It is clear that the expert is likely to encounter a higher percentage of loops than other patterns in fingerprints, followed by the whorl pattern, according to Graham's 1993 study.

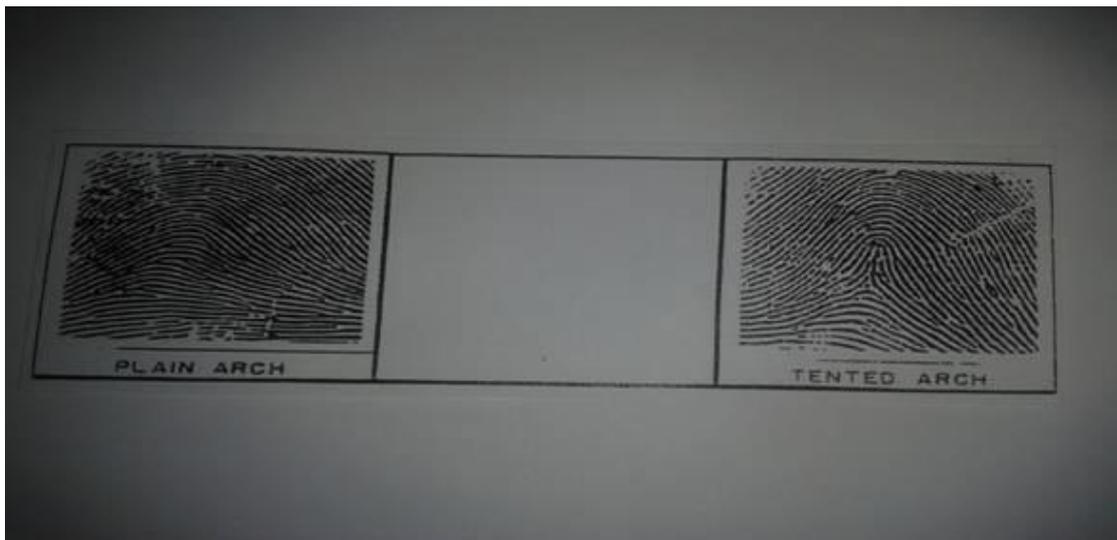
2.19 BASIC FINGERPRINT PATTERNS

As specified above, fingerprint patterns take the form of arches, loops and whorls, with arches consisting of plain arches and tented arches (Nath, 2010:25-26; Lyman, 2013:59). Loop patterns are either ulnar or radial loops. Whorl patterns take different forms such as plain, double loop, central pocket loop, and accidentals (Nath, 2010:30-31; Osterburg & Ward, 2010:54).

2.19.1 Arches

An arch pattern consists of the parallel flow of ridges from one side of the finger to the other without any turning back/re-curve. The arch pattern may take the form of plain/flat or tented-shape arches (Nath, 2010:26-27). In arch patterns there are no cores or deltas (see Figure 2.04).

Figure 2.04: Arches

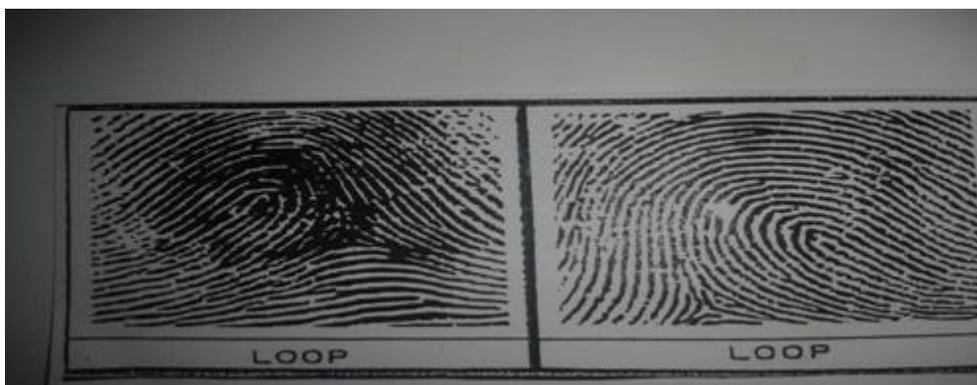


(Source: Swanson et al., 1992:86)

2.19.2 Loops

In a loop pattern at least one of the ridges should make an independent backward turn; there should be one delta and one core and at least one count between the delta and core. Loops can be either ulnar or radial (Nath, 2010:28-29; Pepper, 2010:945); (See Figure 2.05.) Loop patterns are divided into ulnar and radial. In the ulnar loop pattern, ridges flow in the direction of the ulner bone of the forearm in the case of the right-hand finger, towards the right little finger. For the left hand, ridges flow towards the left little finger (Nath, 2010:29). While a radial loop is the opposite of the ulner, ridges flow in the direction of the radius bone of the forearm. For the right hand, the ridges flow towards the left; for the left hand, the ridges flow to the right thumb (du Preez, 1996a:18; see also Nath, 2010:29).

Figure 2.05: Loops

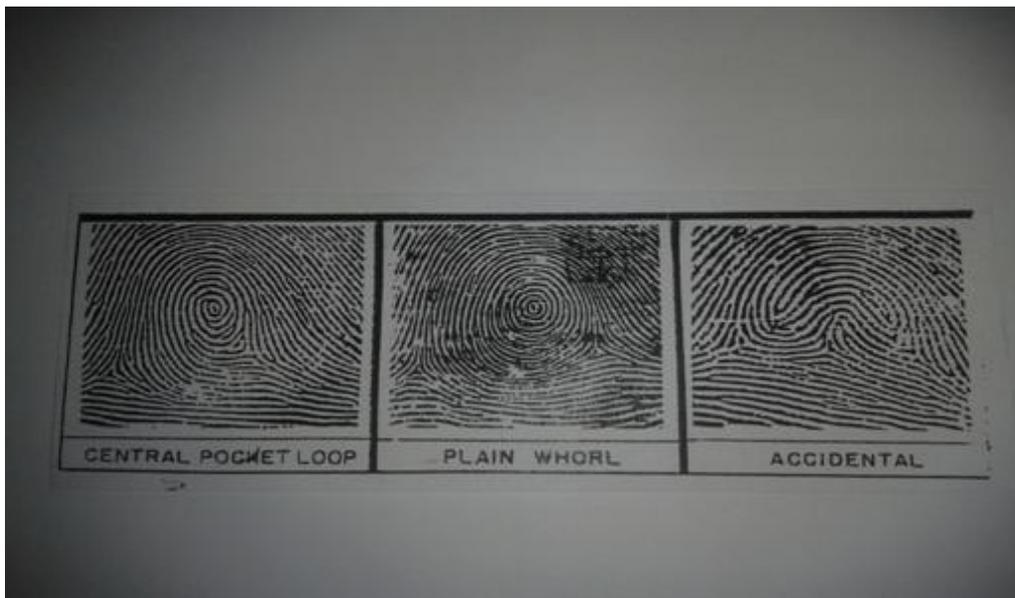


(Source: Swanson et al., 1992:86)

2.19.3 Whorls

In whorl patterns at least one ridge turns until one full circuit is completed. There are two or more deltas and one or more cores in each whorl pattern (James & Nordby, 2009:356; Saferstein, 2011:240-241); (See Figure 2.06.)

Figure 2.06: Whorls



(Source: Swanson et al., 1992:86)

2.20 THE SEVEN-POINT IDENTIFICATION CRITERIA

Marais (1992:173) and Zeffertt, Paizes & Skeen, 2003:310) state that the minimum requirement for a positive comparison and individualisation that is accepted in South African courts is the seven points of similarities. Graham (1993:7) confirms that prints are regarded as coming from the same person if they are identical at a minimum of seven points (see also Saferstein, 2011:538). While this is a South African convention, internationally no specific number of similarities has been set. In a 1973 study about the criteria for a positive comparison, the Standardisation Committee of the International Association for Identification (IAI) found that no valid basis existed at that time for requiring that a pre-determined number of friction ridges be printed in two impressions to establish positive identification. This finding still applies (Osterburg & Ward, 2014:52; Gilbert, 2010; Nath, 2010:14). Saferstein (2011:539) states that the final determination must be based on the experience and knowledge of the expert,

with the understanding that others may provide honest differences of opinion on the uniqueness of a fingerprint when the question of a minimal number of ridge characteristics is involved.

Points are identical characteristics that are found in fingerprints from known and questioned sources but identification cannot be made when an unexplained difference appears regardless of the points of similarities (Swanson et al., 1992:86; Osterburg & Ward, 2010:56). Vanderkolk (1999:253) agrees that if sufficient quality and quantity of information are present in the image, one has to continue with the comparison and, if insufficient, the image is not suitable for a logical (positive) matching. In 1995, members of the international fingerprint community at a conference held in Israel issued the ne'urim declaration, which supported the decision taken in 1973 by the IAI that each country must have its own practices (criteria) (Saferstein, 2011:539).

Siegel (2011:57) mentions that in some countries the minimum number of points is 10, in others it is 12 or 16, and so on. According to Graham (1993:7), Osterburg and Ward (2010:560) and Nath (2010:107), the following number of ridge characteristics is used in various countries:

- South Africa: 7
- France: 17
- Switzerland: 12 – 14
- Austria: 12
- Spain: 10 – 12
- Germany: 8 – 12
- India mysor: 12
- India utter Pradesh: 12
- Britain: 12

For Siegel (2011:57), these many standards from different countries for the same identification mean that no fixed standard exists. Siegel (2011:57) argues that no valid basis exists for requiring a pre-determined minimum number of characteristics that must be present in two prints to establish positive identification. Instead, he claims (as

does Saferstein, 2011:539) that identification must be based on the experience and knowledge of the expert.

In fingerprint science, the criteria for the points are based on the minimal number of ridge characteristics and are not concerned with the maximum. Swanson et al. (1992:86) are of the view that positive fingerprint identification cannot be made when an unexplained difference appears, regardless of the points of similarities. Zeffertt et al. (2003:310) hold a contrasting view and state that points of difference that may have been caused by dirt, distortions or other accidental factors are immaterial. Judge Didcott remarked that “experts can make mistakes, even fingerprint experts, even those whose testimony impresses the courts.” The general practice in South Africa appears to be to accept seven points of identity as sufficient for identifying fingerprints (Zeffertt et al., 2003:310).

In response to the question: “Based on your experience, what is your understanding of the 7-point identification criteria?” the participants answered:

- Criteria adopted and accepted by South African courts, which are a number of points accepted to make a fingerprint identification (6 participants);
- In South Africa seven points are enough to prove a person’s identity (6 participants);
- Each and every country has its own criteria; in South Africa it is 7 points while in other countries such as the United States of America (USA) and Britain it is 12 to 16 points (9 participants);
- It is where seven points are used to compare a fingerprint or first- and second-level details only (3 participants);
- It is the different criteria characteristics accepted in court but it is supplemented by ACE-V and Ridgeology studies. In South Africa it is seven points while in other countries it is more than seven points (2 participants);
- It is no longer necessary for one to use only a point system; but one can integrate ACE-V and their experience (1 participant); and
- It is the ridge features found in the fingerprints and used when making an identification; e.g. how many points/ridges like bifurcation, islands etc. (1 participant).

The responses above provide relevant answers to the question and also support the information provided in the literature. The responses show that the participants understand the criteria used in South Africa.

2.21 IDENTIFICATION

Identification is concerned with the identification of something or somebody belonging to a specific category. Identification is defined by Ogle (2012:9) as “collective aspects of the set of characteristics by which a thing is definitively recognizable or known”. Osterburg and Ward (2010:36) describe identification as the classification process in which an entity is placed in a pre-defined, limited or restricted class, for example, without establishing that the physical evidence originated from one origin only. Saferstein (2011:102) is of the view that “identification means to determine the physical or chemical identity of a substance with the most certainty that existing analytical techniques will permit.” According to du Preez (1996a:06) and van Rooyen (2004:10), identification rests on the theory that everything in the universe is unique in that it has certain distinctive, individual and class characteristics.

Newburn, Williamson and Wright (2007:309) mention that identification is used if a person’s identity is determined by comparing his or her fingerprints (test sample) with the reference (fingerprints) samples of all people in the database.

Personal identification is one of the most important functions of an investigation (Swanson et al., 1992:290). The inability to identify an object or deceased person, for example, severely complicates the investigation process (Swanson et al., 1992:290). Furthermore, the identification process starts at the time that the crime is committed and continues until the offender is found guilty or acquitted in court (van Heerden, 1986:194). It is advisable that investigating officers do not rely only on personal identification by people because human beings are easily influenced by memory failure. As such, an offender might be wrongly implicated in the crime. It is important, instead, that identification is followed by individualisation (see Section 2.22 below) and that these processes complement each other. According to du Preez (1996a:06) and

van Rooyen (2004:10), identification rests on the theory that everything in the universe is unique in that it has certain distinctive, individual and class characteristics.

Identification places objects into specified groups. Identification of objects is regarded as a clarification system where objects with similar characteristics are classified in one class (van Rooyen, 2001:58). Identification is the process of using class characteristics to identify a particular object. One substance could be identified by one test, whereas another may require the combination of five or six different tests to arrive at identification (Saferstein, 2011:102). Each type of fingerprint evidence, for example, requires a unique test, and each test has a different degree of specificity (Saferstein, 2011:102). Osterburg and Ward (2014:34), "identification" is a significant term in criminalistics; it describes the classification process by which an entity is placed in a pre-defined, limited, or restricted class. For example, in a case of a bullet (perhaps in a murder case before a weapon is recovered), the finding might be that it was fired from a .25 calibre automatic pistol. This identification has not established that the physical evidence originated from one singular origin exclusive of all others. Saferstein (2011:102) emphasises that identification requires that the number and type of tests used to identify a substance be sufficient to exclude all other substances and the conclusion will have to be substantiated beyond any reasonable doubt in a court of law.

To the question to: "Explain the meaning of the concept 'identification'", the participants responded as follows:

- It is when fingerprints are compared to identify the suspects (12 participants);
- It is to identify a person as the one who committed a crime (7 participants).
- It is to identify a person as the one who committed a crime (4 participants);
- It is to identify a person as a person and there are no linkages (5 participants).

Twenty-three participants mentioned that identification is achieved when fingerprints are linked or matched to find the perpetrator; they used identification as it is used in the analyses of substances as mentioned by authors such as Saferstein (2011:102). However, five participants mentioned that identification is to identify a person as a person without individualising them. This shows that all participants are familiar with

the concept of identification, possibly because in identification one identifies an object without comparison, e.g. identification parades (see also van Heerden, 1986:200-201; van Rooyen, 2001:58).

2.21.1 Categories of identification

Van Heerden (1986:188-190) specifies the existence of various categories of identification:

- Situation identification relates to the crime situation and identifies the situation by its unlawful nature.
- Witness identification relates to the identification of suspects through the explanation provided by the statements of the complainants or witnesses.
- Victim identification concerns with the identification of a dead victim.
- Imprint identification attempts to achieve individualisation by comparing a disputed imprint with a control imprint of the alleged object or suspect.
- Origin identification is specifically concerned with analysing organic samples, such as blood, saliva, and semen, and inorganic samples, such as soil, vegetables, weapons and fibre of materials, to determine whether the disputed sample and the standard of comparison have a common origin.
- “Action identification” refers to the identification of human action such as disputed handwriting in the case of forgery.
- “Culprit identification” refers to the identification of a person as the offender through voice identification, parade, facial composition, or personal deception. It does not positively identify unlawful conduct.

Cumulative identification deals with different types of identification in the solving of crime. All different specialists are collectively considered within the frame work of the history and relevant circumstances of the crime situation in totality. It is important to use all identification techniques during investigation of crime, before one reaches a conclusion about the guilt or innocence of the offender.

2.22 INDIVIDUALISATION

Individual characteristics are investigated on the basis that evidence exists that can be associated with a common source with an extremely high degree of probability.

Examples of this association are ridge characteristics of two fingerprints (Saferstein, 2011:88; see also Newburn et al., 2007:308-9). "Individualisation" refers to the ability to show that a particular sample is unique, even among members of the same class. Furthermore, individualisation means that an item of evidence comes from a unique source and can be shown to be directly associated with a specific individual source (Ogle, 2004:9). "Individualization begins at the crime scene and ends with the presentation of evidence and positive determination of the victim's identity or to connect the suspects with the crime scene by means of finger prints" (Ogle, 2004:9). In response to the question: "Explain the meaning of the concept 'individualisation'" the sample answered as follows:

- It deals with the comparison of scene prints with the known prints (of suspects) (11 participants);
- It is when samples are analysed to find their origin (6 participants);
- It establishes that certain things (e.g. prints) are from one specific unit (4 participants);
- It identifies a person as one who has committed crime (5 participants); and
- Individualisation deals with uniqueness (2 participants).

The researcher established that the answers by the participants explain the meaning of "individualisation" accurately and support information discovered in the literature. The answers and literature show consistency.

2.23 DIFFERENCES BETWEEN "IDENTIFICATION" AND "INDIVIDUALISATION"

It is important to know and understand that clear distinctions exist between the concepts of identification and individualisation (Chisum & Turvey, 2000:6). However, in fingerprint identification, the concepts correlate with and supplement one another. Saferstein (2011:86) regards identification and individualisation both as means of comparison in fingerprint science (also see Newburn et al., 2007:308-9). In this view he is supported by the participants of the study, who did not distinguish between the concepts in their responses. To the question: "Explain the difference between 'identification' and 'individualisation'" the participants responded as follows:

- Identification is when fingerprints are linked or matched to find the suspects, which is similar to individualisation in fingerprint study (16 participants);
- Identification deals with identifying a person as a person without linkages while individualisation deals with the comparison and it identifies a person as the one who has committed crime (7 participants); and
- Identification is when fingerprints are linked or matched to find the suspects and is similar to individualisation, which establishes that certain things (e.g. prints) are from a specific unit (5 participants).

The researcher established that the answers of the 28 participants showed consistency with each other. The participants generally regarded both concepts as having similar meanings while seven participants referred to “identification” as identifying a person as a person without linkages in contrast to “individualisation”, which, they explained, deals with comparison. This view also supported the views established in the literature consulted.

According to the researcher’s personal experience, the 28 participants’ answers are accurate. Table 2.02 below provides a list of differences between identification and individualisation as provided by participants and also found from literatures, such as (Saferstein, 2011:86; Newburn et al., 2007:308-9 and Chisum & Turvey, 2000:6).

Table 2.02: Differences between “identification” and “individualisation”

Identification	Individualisation
Identification is when fingerprints are linked/ or matched to find the suspects (16 participants).	Individualisation is similar to identification in fingerprint study on linkages (16 participants).
Identification deals with identifying a person as person without linkages (7 participants).	Individualisation deals with the comparison and it identify a person as the one who has committed crime (7 participants).
Identification is when fingerprints are linked or matched to find the suspects (5 participants).	Individualisation establishes that certain things (e.g.prints) (5 participants).

2.24 SUMMARY

A fingerprint is regarded as the reproduction of the ridge area of the first or nail joint of the finger in any manner whatever and it can also include the ridge area of the remaining joint of the finger. In forensic science, fingerprint experts use fingerprints primarily to locate, identify and eliminate suspects in criminal cases. Fingerprint identification is based on the presumption that no two people have identical fingerprints and that every fingerprint is unique. Fingerprints can be identified through ridge tracing and/or ridge counting; ridgeology; or ACE-V; e.g. by means of first-, second- or third-level details.

Ridge characteristics are the details of the ridge structure, which are referred to as “minutiae” and include the following: island, short ridge, bifurcation, and lake. A latent print is an invisible print at the scene of crime. The three basic fingerprint patterns are made up of arches, loops and whorls. The core is the inner terminus or central point of the pattern while the delta is the outer terminus.

The seven-point identification criteria are adopted by the South African courts but other countries have their own minimum number of points.

CHAPTER 3

THE VALUE OF THE AUTAMATED FINGERPRINT IDENTIFICATION SYSTEM

3.1 INTRODUCTION

Fingerprints are among the best and most probative of all types of physical evidence that link people with a scene of crime or objects (James & Nordby, 2009:37; Hess & Wroblewski, 2006:321). As the collection of fingerprints has continued to grow as a practice in the investigation of crime, the manual search of card files known internationally as “singles” has been greatly enforced and supported by computer search as AFIS is a computerised method of searching for fingerprints (Fisher et al., 2009:72; see also Gilbert, 2010:463).

For one to make an identification or matching of fingerprints, one must be well trained and experienced in the field (James & Nordby, 2009:37). Osterburg and Ward (2010:59) state that several types of expertise training are required for matching fingerprints. Fingerprint comparison course, for example, can be a helpful to the accused in proving his/her innocence if the fingerprints of the accused do not match those obtained at the crime scene (Joubert, 2010:283-4).

In South Africa, the taking of fingerprints is regulated by legislation. Section 225 of the Criminal Procedure Act 51 of 1977 (South Africa, 1977a) provides expressly for the admissibility of certain evidence obtained from the accused by some measure of improper compulsion, such as fingerprints, palm prints, footprints and bodily marks. In *S v Huma and Another* 1995(2) SACR411 (W), the court rejected arguments that the taking of fingerprints by compulsion violates a person’s constitutional rights. In the same case, it was held that: “The taking of fingerprints does not constitute inhuman or degrading treatment of such person.” Section 37 (1) (a) of the Criminal Procedure Act allows a police officer to take the fingerprints of “any person who is suspected to have committed an offence” (South Africa, 1977a).

In this chapter, the researcher discusses the value of the Automated Fingerprint Identification System (AFIS) as a technique in the identification of suspects. The following topics are addressed in the chapter: how fingerprint identifications were

made prior to the implementation of AFIS; the process of making an AFIS identification; and why fingerprint identification needs to be validated and verified. Most importantly the use of AFIS as a database in terms of the Integrated Automated Fingerprint Identification System (IAFIS) in South Africa is discussed.

3.2 AUTOMATED FINGERPRINT IDENTIFICATION (AFIS)

According to the researcher, when AFIS was initially set up in South Africa in 2002, the CRC captured the fingerprint database, which already existed as a manual system, on AFIS. The loading of information on AFIS was carried out by fingerprint experts. Fingerprint experts ensured that quality information was loaded onto the system, which today contains comprehensive and up-to-date fingerprint data, including historical records (Terry, 2011).

All searches in connection with the disclosure of criminal records are conducted using fingerprint analysis at the CRC in Pretoria (Terry, 2011). AFIS only gives the fingerprint expert a possible match and does not act as an identification device. To prevent wrong identifications, the expert compares the prints that appear on the system through ridge tracing and/or ridge counting or both, until seven identical points are marked.

If sets of prints are wrongly captured on the system, this is expected to be detected and rectified during quality control checking and verifications by other experts but this cannot rule out the possibility of any criminals' biometric details being captured incorrectly through human error during the scanning of fingerprints onto AFIS.

Nath (2010:115) refers to "AFIS" as a database of fingerprints taken and stored, as in SA, while other countries such as Canada and the United Kingdom (UK) also have their own AFIS. Ogle (2012:18) defines "AFIS" as a computer software program used to encode individual fingerprints. When a fingerprint is scanned into AFIS, the assigned ridge characteristics are plotted on an X-Y axis. A map that contains the location and direction of all the characteristics of the fingerprint is then created. Treverton, Wollman, Wilke and Lai (2011:134) refer to "AFIS" as a computerised system for matching fingerprint specimens. In South Africa only fingerprints of convicted criminals are stored on a national database.

If this database should be compromised, a manual search system is in place as a backup. According to Pettem (2011:65), one very important point for investigators to remember for biometric systems, such as AFIS, is the limitations of the database. If a known suspect does not produce a hit in the system, a request for a manual comparison can be made.

The sample was posed the question “What is ‘AFIS’?” The sample responded as follows:

- It is an “Automated Fingerprint Identification System” (23 participants);
- Prints on a national database (2 participants); and
- It is computer equipment used in the identification of suspects through the fingerprint (3 participants).

The participants’ answers corroborated the definitions obtained from the literature consulted, which showed that the participants had knowledge about the system and its use. The participants’ answers also complemented each other.

3.3 THE PURPOSE OF AFIS

The purpose of using AFIS is to obtain accurate and fast fingerprint identification. A further purpose is to identify as many suspects as possible (Saferstein, 2011:545).

Dutelle (2011:181) refers to AFIS as an automatic pattern recognition system that consists of three fundamental stages:

- Data acquisition: The fingerprint to be recognised is sensed (detected).
- Feature extraction: A machine representation (pattern) is extracted from the sensed image.
- Decision making: The representations derived from the sensed image are compared with a representation stored in the system.

AFIS significantly increases the accuracy match rate compared to manual comparison (Dutelle, 2011:181; see also Saferstein, 2011:545). The AFIS program is fast and can effectively compare latent prints with more than one hundred thousand file databases

in less than 15 minutes (Gilbert, 2010:464). In comparison, a manual fingerprint identification can take hours to make.

To the question: "What is the purpose of AFIS?" the participants responded as follows:

- The purpose of AFIS is to ensure that many suspects are identified (17 participants);
- To increase the number of fingerprint linkages and convictions in courts (4 participants);
- To store prints of all criminals in the country (5 participants); and
- To speed up the search process and to make the matching in seconds (2 participants).

In line with the researcher's experience, the participants gave accurate and comprehensive answers, which support the ideas of Gilbert (2010:464), Dutelle (2011:181) and Saferstein (2011:545).

3.4 THE IMPLEMENTATION OF AFIS IN SOUTH AFRICA

AFIS was implemented in SAPS CRCs in 2002 (Terry, 2011). It was implemented in certain LCRC offices in all nine provinces. For example, in Limpopo Province, it was installed in the Modimolle, Polokwane, Thohoyandou and Tzaneen LCRCs in 2002. Phalaborwa LCRC, also in Limpopo Province, has been an AFIS office since 16 August 2012 and recently the system has been installed in the Lebowakgomo, Lephallale and Musina LCRCs.

In response to the question: "When was AFIS implemented in South Africa?" the sample responded as follows:

- In the year 2002 (21 participants);
- Between the years 2000 and 2002 (4 participants);
- In the period 2000 to 2003 (2 participants); and
- Between the year 1999 and 2002 (1 participant).

The responses from 21 of the participants were correct and corroborated each other and the data collected from the studied literature. Failure by AFIS experts to give the correct answer is the result of a lack of knowledge and that they have not conducted research on or studied the subject (AFIS). It is important to know when AFIS was implemented in South Africa because it will assist in court during cross-examinations, when the defence tests one's expertise. Seven participants were not sure about the year in which the system was implemented and their answers constituted guesswork.

3.5 REASON FOR IMPLEMENTING AFIS IN SOUTH AFRICA

According to James and Nordby (2009:363), AFIS is valuable to investigators in that it allows criminal cases to be connected by fingerprints that are not related to the cases in an obvious way. Furthermore, AFIS has made it possible for latent fingerprints to be matched with suspects' prints in minutes (Thibault et al., 2007:301). As mentioned above, the system is extremely fast. Using the manual process often took days for a match to be made; the detectives needed to identify suspects to solve cases in court in a limited time, which was not achievable using the manual system (Thibault et al., 2007:301). Gilbert (2010:464) points out that AFIS can effectively compare a latent print with 300,000-file databases in less than 15 minutes. AFIS was implemented in South Africa to increase the number of suspects identified and shorten the time taken to identify them.

In response to the question "Why was AFIS implemented in SA?" the participants elaborated as follows:

- The manual search system was time consuming and also needed more manpower (8 participants);
- It ensures that many suspects are identified through AFIS (10 participants);
- To identify suspects (6 participants);
- To solve all unsolved cases (2 participants);
- To make the process of fingerprint searching easier (1 participant); and
- It is difficult for new recruits to make manual identifications due to the new training procedure (1 participant).

Sufficient consistencies are evident between the participants' answers and the information obtained from the literature. All the responses given are accurate and support the ideas expressed by authors such as James and Nordby (2009:363) and Gilbert (2010:464). It was necessary for AFIS to be implemented in South Africa to reduce crime in general, which is suggested by the participants' answers.

3.6 THE PURPOSE OF AFIS IDENTIFICATION

The main purpose of an AFIS identification is to determine if a person charged with any criminal activity has any previous convictions and also to assist the LCRC in searching for and finding an identity that matches any prints found on a scene of crime with those on the AFIS database (Terry, 2011).

The AFIS system can be regarded as supplementary to the manual identification system (Siegel, 2011:147). AFIS is a supplementary method because AFIS has not been implemented at all LCRC offices while the manual system is available and/or is used at all LCRC offices and can be applied by all, including non-AFIS experts.

An AFIS search can quickly narrow down the number of possible matches to a manageable size (James & Nordby, 2009:171). According to Nath (2010:115), AFIS identification is used for a variety of reasons, including criminal identification, receipt of benefits, background checks (offender profiling) and receipt of credentials. Gilbert (2010:464) is of the view that the purpose of AFIS identification is to detect outstanding warrants or obtain an arrest history. As mentioned above, the AFIS program is fast and can effectively compare a latent print with a 300,000-file database in less than 15 minutes (Gilbert, 2010:464). Saferstein (2011:545) also points out that the system can make thousands of fingerprint comparisons in a second unlike in the past when fingerprint experts were usually restricted to comparing scene prints against those of known suspects (Saferstein, 2011:545).

According to Fisher et al. (2009:72), the purpose of using AFIS for identification is to increase the number of searches and even to search for single, partial prints at high speed. Saferstein (2011:545) mentions that an advantage of AFIS is that it can search for prints at high speed while effective manual searches for partial, single and five

fingerprint classifications have been conducted for many years at LCRCs by fingerprint experts locally and globally (Saferstein, 2013:162-3).

To the question: "Describe the purpose of the AFIS identification process" the participants responded as follows: the question differs, this one deals with AFIS identification process, that is scanning and validation.

- To speed up the process of search, make it simple and search for many wanted suspects (9 participants);
- To ensure that more suspects are identified in a day (7 participants);
- To ensure that fingerprint identifications are not missed and are validated (2 participants);
- To help fingerprint experts match suspects through fingerprints (3 participants);
- To enable scene prints to be scanned and compared with more than a million prints on the database; the experts will do the matching on AFIS (2 participants);
- To ease the process of manual searching and increase fingerprint identification (3 participants); and
- To assist in easing and reducing a lot of concentration because the prints are enlarged (2 participants).

The researcher found that all participants' information supports the views expressed in the literature consulted. The main purpose of AFIS is to make as many fingerprint identifications of suspects as possible (Saferstein, 2011:545). AFIS assist in easing and reducing a lot of concentration because the prints are enlarged.

3.7 THE PROCESS FOLLOWED WHEN MAKING AN IDENTIFICATION AFIS

According to the researcher, a particular process is followed in identifying a fingerprint on AFIS. Recovered or developed scene fingerprints or file record prints are pasted on a giant arch card and scanned on AFIS. Fisher et al. (2009:72) explain that after scene prints have been scanned, the resulting digitised images are mapped for ridge details, such as terminations, bifurcations and islands.

When a new print is recovered, a search algorithm can look through the database for prints that are similar (Saferstein, 2011:544). It will determine the degree of correlation between the location and the relationship of the ridge characteristics for both prints (Fisher et al., 2009:72; see also Saferstein, 2011:545). AFIS provides the possible matching, which may be a match rather than identification. This allows the fingerprint expert to make the final determination as to whether there is or is not a match (Gilbert, 2010:464).

To the question: “Explain the process used when making identification on AFIS”, the participants responded as follows:

- AFIS experts scan giant arches and will automatically search in the database until a hit or a “not hit” is found (9 participants);
- After giant arches are prepared, they are scanned and later, after hours or a day, a possible matching of prints will appear. An expert will then compare the scene prints to those on the database until a linkage is made or a result of “not matching” is obtained (7 participants);
- It must be confirmed by two AFIS experts (2 participants);
- There must be a comparison between two fingerprints or palm prints from the crime scene with the one from the SAPS 76 forms (5 participants);
- Scene prints are scanned and thereafter are compared as they appear on AFIS (4 participants); and
- After scanning both the scene and suspect prints onto AFIS, AFIS will provide possible candidates, which must be verified. This is achieved by marking points of similarity from both sets of prints through ridge tracing or counting from one point to another until seven points are reached (1 participant).

The researcher established that there is a correlation of information provided by the participants and the literature. All information mentioned by the participants supports the ideas expressed by Saferstein (2011:545) in particular.

3.8 THE PURPOSE OF AFIS VALIDATION

According to Soanes and Stevenson (2009:1597) validation refers to checking, proving or confirming the truth or validity of AFIS identification. The purpose of

validation is to confirm AFIS identification. In fingerprint science, validation is undertaken after a hit/matching has been made, at which point another fingerprint expert must validate the fingerprint identification. The rule for fingerprint identification is that when an expert has made an AFIS identification another AFIS expert must validate it. It is clear that no expert may verify or validate his or her own identification.

Another fingerprint expert or several experts can validate the other expert's opinion concerning fingerprint identification to confirm its validity (Morris, 2007:153). According to Morris (2007:152), although validation is carried out, misidentifications are still made, but these are usually not recorded because the experts fear being departmentally charged. How good the expert are can depend on how experienced they are (Morris, 2007:152).

In response to the question: "Explain the purpose of AFIS validation", the participants answered as follows:

- To confirm the AFIS identifications (9 participants);
- Helps to confirm and to avoid wrong/missed identifications (6 participants);
- To prevent wrong fingerprint identifications (3 participants);
- Validation in AFIS means that fingerprint identification must be confirmed by another AFIS expert before it is regarded as an identification/match (3 participants);
- To verify or confirm the fingerprint matching (3 participants); and
- To ensure that the decision that was taken about the matching is correct (4 participants).

The concept of confirmation bias has also been seen as a cause of fingerprint identification error by experts (Morris, 2007:153). According to the participants' responses, validation takes place on AFIS only after another AFIS expert with a similar amount of experience has declared a match between similar prints. This is important for eliminating the possibility of confirmation bias because it gives other experts enough time to make a confirmation.

The answers of the participants are correct and consistent with each other in that they all deal with the idea of the confirmation of a fingerprint identification. The participants further mentioned that every fingerprint identified by a fingerprint examiner goes through a thorough check by his or her peers.

3.9 RIDGE TRACING AND RIDGE COUNTING WHEN MAKING AFIS IDENTIFICATION

When mapping an image placed on AFIS, fingerprint experts make a final comparison. AFIS does not provide a final match; it is up to the fingerprint experts to visually compare both fingerprints through ridge tracing and/or counting to determine the final matching (Osterburg & Ward, 2010:57). No possibility exists that prints can be matched without the use of one or both ridge tracing or counting techniques. A contrasting view is expressed by Pepper (2010:100-1), who argues that in order for fingerprints to be identified as belonging to the same person, the ridge characteristics, rather than just the pattern, are used. But most of the literature consulted does not mention ridge tracing or ridge counting apart from du Preez (1996a:26), Nath (2010:29 & 35), Pepper (2010:100-101) and Osterburg and Ward (2010:57). In the researcher's experience, fingerprint identification can be made by using ridge characteristics, ridge counting and/or tracing.

To the question: "Can you use ridge tracing or ridge counting when making AFIS identification? If yes, give a reason to support your statement" the participants answered as follows:

- Yes (28 participants).

The sample gave the following reasons to support their statements:

- One must use ridge tracing and/or ridge counting (19 participants);
- This should also include the use of ridge characteristics and be guided by the flow of ridges (6 participants); and
- It should also include ridgeology and ACE-V techniques (3 participants).

All participants confirm that one has to use ridge tracing and ridge counting when making AFIS identification. The researcher established that the participants' answers support each other and also support the view of Pepper (2010:100-101) and Nath (2010:29 & 35).

3.10 VERIFICATION OF AFIS IDENTIFICATIONS

According to Newburn et al. (2007:309), in a verification procedure, the test sample is compared only with the reference sample of the person the applicant claims or believes him or her to be. Regardless of the conclusion reached by the applicant, either exclusion or identification, another fingerprint expert must re-examine the print for verification. Under ideal conditions, the fingerprint expert who makes the identification or exclusion should be an analyst who is in no way associated with the case or has any significant knowledge of the case (Dutelle, 2011:179).

Fisher et al. (2009:65) describe "verification" as an independent analysis, comparison and evaluation by a second fingerprint expert of the friction ridge impressions. Fingerprint experts scan suspects' fingerprint forms such as SAPS 76 or 192 into the system. After search results have been received, verification must be undertaken.

A search by the system returns a suspects' list, prints which are the closest match to the search request. The fingerprint expert, during the verification step, will decide if the prints match ("HIT") or not ("no-HIT") (South African Police Service Metamorpho Operators Training, 2010:18). The verification on AFIS is used to prevent misidentifications by having a second fingerprint expert (or possibly more) to verify the match (Morris, 2007:153).

After the SAPS 76, SAPS 192 and other relevant forms are scanned into AFIS by fingerprint experts and/or operators, the forms must be verified for quality control. According to James and Nordby (2009:372), if both prints are compared by an expert or a fingerprint technician and are regarded as a match, it must be concluded by another fingerprint expert that they are identical in all respects.

Verification of conclusions by another fingerprint expert or an officer who is a fingerprint expert is a necessary practice. No fingerprint expert can verify his or her own fingerprint identification. Fisher et al. (2009:62) point out that the verification process is very important in fingerprint identification as the verification will minimise missed identifications or wrong matching (see also Morris, 2007:153).

As mentioned above, misidentifications can take place because experts are vulnerable to the influence of contextual information and because of confirmation bias (Morris, 2007:152-3). Morris (2007:153) further argues that “an expert conducting a verification may sub-consciously at least be [vulnerable to contextual information] less attentive to the work of a 25 year expert who has never apparently made a mis-identification/mistake, when compared to the attention that may be given to the decision of a less experienced expert.”

The verification in the ACE-V methodology is supposed to be used to prevent misidentifications by having a second fingerprint expert (or possibly more) to verify the match (Morris, 2007:153; see also Pepper, 2010:92). Verifications by a second party and/or multiple confirming processes are possible methods (Gogolin, 2013:165).

To the question: “Why is it necessary to verify AFIS identification?” the participants responded as follows:

- To ensure that the fingerprint identification is correct (7 participants);
- To minimise/reduce wrong AFIS identifications (13 participants);
- To make sure it is an identification (2 participants);
- Because AFIS just gives possibilities (5 participants); and
- To ensure that the prints on the SAPS 76 fingerprint form scanned by the Fingerprint Identification Profile System (FIPS) and/or Criminal Record System (CRIM) personnel and the scene prints are the same (1 participant).

The responses show that all the participants are well informed about AFIS and that their answers were accurate and substantive. Their answers support the views of James and Nordby (2009:372), who stress the necessity of verifying the matching prints.

3.11 MANUAL FINGERPRINT IDENTIFICATION PROCESS

The manual system for searching for and identifying previous convictions has been in existence for the best part of a hundred years in South Africa. According to du Preez (1996a:14), the first date for accepting fingerprints in South Africa is 1 April 1925. The manual system has proved to be successful in South Africa. The most talked about case on manual identification in South Africa is a recorded case concerning footprints in *S v Limekayo* in 1968, where the court held that a good print made by a bare foot can be very similar to a fingerprint or palm print and proof of identity is governed by similar principles (Zeffertt & Paizes, 2010:109). In Zeffertt and Paizes, 2010:109) the court lay down that evidence of footprints is also admissible in court the same way as fingerprint evidence. The court decided that a court must be cautious about relying on the evidence of footprints, particularly when it is the only evidence against an accused.

The judgement of Corbett JA (as he then was) provides the comment and guidance about identification by footprints that it will always be better if the court itself is able to make the necessary comparison, and assess its cogency, by means of a photograph, plaster cast, or some other visual medium (court chart) (Zeffertt & Paizes, 2010:109).

Many cases have been solved with the help of the manual system in South Africa and globally. In 1902, through manual identification, the first recorded use of fingerprint evidence was given in England and in a second case, which dealt with the murder of a child, manual fingerprint identification is made by comparing a scene print with a print taken by investigating officers from the suspect (Saferstein, 2011:538). According to Thibault et al. (2007:301), a latent fingerprint (a print lifted from objects at a crime scene) has to be compared manually with suspect's prints, the same applies in SA but in SA a 7 points system is applied. This view is corroborated by Ogle (2012:149-150). This is true in South Africa as experts currently also compare scene prints with suspects' prints manually, until 7 points are found. Fingerprint experts are generally extensively trained and are required to accumulate significant experience before being entrusted with the responsibility of making identification (James & Nordby, 2009:371).

In terms of the tools required for the manual identification process, it is the researcher's experience that a fingerprint expert must have a magnifying glass with a hairline glass at the bottom of it and a sharp pencil when comparing the two fingerprints. Comparison begins always from a prominent ridge characteristic or a delta on the scene prints in comparison with the suspect's prints. When the two prints (scene print and suspect's print) are found to match in relation to the size, shape, position and direction of the ridge characteristics on both fingerprints, then an identification is accomplished (Nath, 2010:11; see also Pepper, 2010;101 and Gilbert, 2010:466). Nath (2010:114) further mentions that when identification is processed, experts tend to demonstrate the identification on the number of ridge characteristics and sometimes the type of ridge.

Characteristic persistence and uniqueness of the ridge characteristics are the foundation on which the science of fingerprints is based and the application of first-, second- and third-identification levels. Osterburg and Ward (2010:56) explain that the first step toward identifying a latent print is to look at the pattern of the fingerprint concerned; the second step is to find a cluster of individual characteristics, e.g. two or three points bunched together (see also Nath, 2010:114). The grouping is chosen as a landmark to be searched for in the known comparison prints. If a corresponding cluster is not matched, the known prints are eliminated.

However, if one print is noted (as corresponding), then the third step is to examine the latent print for the next point of identification closest to the land mark cluster that one must compare it to on the known print to see if that point is present in the same position, location and size, based on ridge counting. According to Nath (2010:114), ACE-V applies the first-, second- and third-identification levels (see also Osterburg & Ward, 2010:56). This identification technique can be used in both manual and AFIS identifications.

To the question: "Describe the manual fingerprint identification process", the participants responded that the process:

- Uses a magnifying glass and starts from scene prints and prominent ridge characteristics, marking all points until seven identical points are reached on both prints (12 participants);

- Searches for similar prints, compared by ridge counting and tracing (1 participant);
- Searches fingerprints with the use of a magnifying glass manually (3 participants);
- Involves an expert using a magnifying glass and a sharp pin to point at the ridge characteristics by ridge tracing or counting until seven points of identicalness are found (5 participants);
- Starts with first- and second-level details; starts from the unknown print to the known print by starting with one ridge characteristic by ridge tracing or ridge counting to the next ridge characteristics until seven points of similarities are found without any unexplainable point (4 participants);
- Compares two fingerprints from the prints taken by the investigating officer, with the prints found at the scene of crime (1 participant); and
- Is very stressful, uses a magnifying glass with a glass at the bottom with a hairline and also a sharp pencil to help in ridge tracing and/or counting (2 participants).

The responses from all the participants support the following literature sources: Thibault et al. (2007:301); Nath (2010:119); Pepper (2010:101) and Ogle (2012:149-150). The researcher further established that the participants' responses corroborate one another and show consistency.

The original classification system, developed by Sir Edward Henry in the 19th century, is the system that is still in use. It simply provides the expert with an organised system of class characteristics from which a list of candidates can be generated (Birzer & Roberson, 2012:106). The identifications in the manual system must always be made and verified by a final, visual comparison of the minutiae of the questioned print and the file print.

The disadvantage of the manual search is that, in 10-print card files, it provides little assistance in cold (old cases) searches for a single fingerprint when the name of a suspect has not been generated in a specific case (Birzer & Roberson, 2012:106-7; see also Thibault et al., 2007:301). When applying this system, a fingerprint expert

must use a magnifying glass and a sharp instrument like a needle to mark the points of similarities that appear on both prints (Pepper, 2010:78; 22 participants).

3.12 DIFFERENCES BETWEEN AFIS AND MANUEL FINGERPRINT IDENTIFICATION

A disadvantage of AFIS that is not shared by the manual fingerprint identification system is that it operates via a computer program, with data stored on a computer database. “The vulnerability of computers to hacker attacks is a constant reminder of security issues surrounding digitally stored data; the fact that computers control most of our critical infrastructure makes technology an appetising target for would-be terrorists” (Saferstein, 2013:463). According to Easttom and Taylor (2011:190), many computer crimes involve a skilled computer hacker compromising the security of the target system. Hacking involves trying to compromise a system’s security to gain unauthorised access, which includes finding some flaws in the operating system that can be exploited and hijacking a legitimate remote session to gain access to the target system (Easttom & Taylor, 2011:10). Hacking can affect the AFIS system where an expert intentionally or negligently discloses his or her two AFIS passwords to a criminal who has computer hacking skills.

An advantage of AFIS over the manual system is that AFIS allows law enforcement agencies to conduct comparisons of applicant and suspect fingerprints with thousands or millions of file prints in minutes. A manual fingerprint search of this size would take hundreds of hours with less chance of success (Swanson et al., 1992:242).

A further advantage is that AFIS prints enlarge automatically while, in the manual system, a fingerprint expert has to use a magnifying glass to enlarge both prints. Although the manual system has proven to be a successful in 10-print card files, it provides little assistance in cold searches for a single fingerprint when the name of a suspect has not been generated in a specific case (Birzer & Roberson, 2012:106-7). While biometric systems such as AFIS are valuable in connecting suspects to a crime scene, if a fingerprint is poorly obtained from the crime scene and cannot be scanned or captured on AFIS, this will delay the prosecution process, especially with the issuing of an SAPS 69 form. According to Lyle (2012:253), criminals rarely leave behind a full

set of prints, maybe one or two fingers or only a single partial print. This proved to be a major obstacle in manual fingerprint identification until computers and the AFIS entered the arena.

According to du Preez (1996a:14), the first date for accepting fingerprints in South Africa was 1 April 1925. The manual system has been successfully used in South Africa, taking into consideration that, in the past, the system helped in providing an accused's previous records or convictions.

To the question: "What are the differences between AFIS and manual identification?" the participants responded as follows:

- AFIS is a recent technology of searching fingerprints on the system (computer) but with the manual method we just compare fingerprints from the scene with one taken from the suspect, compared without scanning on the system (11 participants);
- Prints on AFIS are enlarged and can be seen with the naked eye, while in the manual system prints are small and require enlargements by means of a magnifying glass (6 participants);
- No real differences; the same principle is applied in both fingerprint identification methods (1 participant);
- Manual identifications are more difficult because more prints are searched through files while in AFIS most searching is done electronically and the system gives fewer options to verify (6 participants); and
- AFIS is much easier to use/compare; it does not need more manpower while the manual method is stressful – it takes a lot of concentration (4 participants).

The differences between manual fingerprint identification and AFIS as established from the literature and the participants' review are shown in Table 3.01 below.

Table 3.01: Differences between manual fingerprint identification and AFIS

Manual Fingerprint Identification	AFIS Identification
It uses manual/visual comparison.	It is a computerised system (Treverton et al., 2011:13; 11 participants).
It uses a magnifying glass and an expert marks points of similarities; a sharp instrument is used to mark visible points (Nath, 2010:119; see also Pepper, 2010:101; 6 participants).	The computer system decodes/marks possible ridge characteristics for possible matching (Fisher et al., 2009:72; see also Osterburg & Ward, 2010:57).
Prints are enlarged with the magnifying glass and points of similarities are marked by an expert.	Prints are enlarged by the system to the same size (6 participants).
Matching prints are only verified and confirmed by two fingerprints.	Matching prints are verified and validated by another AFIS expert (Saferstein, 2011:545).
It is very costly and requires lot of expertise and manpower.	It can make many identifications in less than 15 minutes (Saferstein, 2011:544).
It makes few fingerprint identifications after a long time.	It requires computer literacy.
No computer skill is necessary (researcher's experience).	Only trained fingerprint experts are able to scan and make identification on the AFIS system.
It can be undertaken by even a non-fingerprint expert. Before one can become an expert, one must have proven that one can make manual fingerprint comparison and identifications.	Computer skill is needed for fingerprint experts to process the AFIS system. This process is carried out only by experts.

(Sources: Osterburg & Ward, 2010:57; Fisher et al., 2009:72; Nath, 2010:119; Pepper, 2010:101; Saferstein, 2011:545; all study participants)

The researcher established the differences between the two fingerprint methods as revealed by the participants' responses, which indicated that the participants had a clear understanding of the two methods. All the answers were accurate and correlated with the literature consulted.

3.13 MISSED IDENTIFICATION

A missed identification, in the researcher's experience, occurs when the fingerprints from both the crime scene and the suspect are identical or matching but a fingerprint expert has made it a "no match", thus failing to apply his or her skill as an expert. According to SAPS CRC policy letter no. 7/2003, "A missed identification is not tolerated and disciplinary steps will be taken against any member/or an AFIS expert who commits this error." See also Milne (2013:104), who mentions that misidentification is higher when the quality of the scene or suspects' prints is poor. A fingerprint expert must have a zero misidentification record and can expect disciplinary action and dismissal if he or she has a 30% miss rate. As specified by Milne, a misidentification is often caused when crime scene latent prints scanned in for search are relatively poor in quality (Milne, 2013:105).

In response to the question: "Explain the term 'missed identification'", the participants responded as follows:

- Both prints are similar/matching but an examiner fails to make a matching (14 participants);
- When one compares the prints wrongly, not the right print in relation to the size, type, place, position (7 participants); and
- When a hit/match on AFIS is made without being verified/confirmed, which is not identification (7 participants).

The participants' responses are comprehensive and support the literature consulted. The comprehensive answers are an indication that the participants know their work.

3.14 AFIS'S INCREASING INSTRUMENTALITY IN LINKING SUSPECT TO CRIME

In terms of section 36B (3) of the Criminal Law (Forensic Procedures) Amendment Act of 2010 (South Africa, 2010), fingerprints taken in terms of this section must be stored on the National Fingerprint Database. The National Fingerprint Database can be used by the AFIS expert to solve crimes for which criminals were never arrested or found guilty in a court of law. The concern was raised by Police Committee Chairwoman Sandi Chikunga (ANC) about the implementation of the Criminal Law (Forensic

Procedures) Amendment Act, which allowed the police to store the fingerprints of even those who had not been convicted (Merten, 2011). Newburn et al. (2007:389) are of the view that the identification of individuals is central to the criminal justice process, and fingerprint experts are responsible for the identification of offenders and victims of crime.

AFIS compares more than 500,000 fingerprints in less than 15 minutes (Gilbert, 2010:464; Saferstein, 2011:545; see also Breckenridge, 2005:268). With the integration of the Home Affairs National Identification System (HANIS) into the database, there will be no unsolved latent prints on AFIS because all suspects' prints are likely to be on the National Fingerprint Database (Merten, 2011).

AFIS would be a very effective tool if all citizens and legal and illegal immigrants' fingerprints could be loaded and stored on the system as this would be a good tool in eliminating theft of identity documents and passport books and in identifying the suspects of crimes. Identity document theft is on the increase, especially in South Africa. It has also become a concern globally and with the Internet, which is used to defraud banks, it is at a point where it can have an economic impact on businesses and individuals (Merten, 2011; see also Smith, 2013).

If AFIS is used correctly, it will reduce, for example, illegal marriage with illegal immigrants, an act of fraud that is facilitated by government officials employed in the Department of Home Affairs. With approximately 15 million false identity documents in South Africa, there is inevitably a reduction in the numbers of criminals brought to justice (Breckenridge, 2005:271; Maunye,2012; see also Bailey, 2013).

AFIS has the potential to decrease the number of people that are wrongly convicted of crimes they have not committed (Morris, 2007:153). It is, however, very important that experts are trained properly and are kept up to date with all new developments in this field so that the best use is obtained from the AFIS system.

In terms of section 15B (1) of the Criminal Law (Forensic Procedures) Amendment Act of 2010:

“Any fingerprints or photographic images stored in terms of this chapter [Criminal Law (Forensic Procedures) Amendment Act of 2010] may, for purposes related to the detection of crime, the investigation of offences, the identification of missing persons or the conducting of a prosecution, be checked against the databases of the Department of Home Affairs, the Department of Transport or any Department of State in the national sphere of government in South Africa”.

With the formation of the IAFIS in this country, criminal activities are likely to be reduced as is evident with the Federal Bureau of Investigation (FBI) of the USA, which houses more than 66 million civil prints of individuals who have served, or are serving, in the USA military or are employed by the federal government (Breckenridge, 2005).

To the question: “How do you interpret this sentence: ‘The use of a forensic database such as AFIS is increasingly becoming instrumental in linking suspects to crimes?’” the participants responded as follows:

- The use of AFIS together with other fingerprint agencies or departments such as Home Affairs will reduce crime (22 participants);
- AFIS has already made an impact in linking suspects to crime scenes (5 participants); and
- Fingerprints of all South Africans should be included in the national fingerprint database and a database should also be set up for foreigners (1 participant).

The researcher has established that the use of AFIS is increasingly becoming instrumental in linking suspects to crimes. Although AFIS is effective, if fingerprints of suspects are wrongly scanned and captured on the system with the wrong names, whether intentionally or not, the wrong person will be identified and convicted. Other influences which may cause mistakes to occur on AFIS are factors such as social pressure (peer or otherwise), expectations, or group dynamics (Morris, 2007:153). If mistakes occur, the justice system is discredited and liable to civil claims.

According to the participants' views, all national fingerprint agencies such as the Department of Home Affairs should be linked to AFIS to form an IAFIS for the reduction of crime.

3.15 PRACTICES TO IMPROVE AFIS IN THE IDENTIFICATION SUSPECTS

According to Pepper (2010:102), good practices exist that if implemented can improve fingerprint identifications:

- The first is that all AFIS experts scan all positive fingerprint cases found at the scene of crime immediately or within 24 hours after investigation (Pepper, 2010:102). This will increase the chances of apprehending the suspect immediately after the commission of crime.
- Secondly, the investigating officers must be informed about the importance of AFIS. According to Pepper (2010:93), sometimes a latent print does not match a file print because the suspect's prints are not properly obtained. To avoid these potential problems, investigators must obtain good quality prints.
- Thirdly, as Saferstein (2011:547) points out, it is advisable to link AFIS with other investigation/fingerprint identification agencies such as the HANIS system to form an IAFIS database.
- Fourthly, fingerprints collected from crime scenes link more suspects to the crimes committed, even first offenders (Saferstein, 2011:544). AFIS generates more evidence for use in court than all other forensic techniques combined (Nath, 2010:2). As such, all crime scenes must be properly safe guarded to prevent interference with and/or contamination of physical evidence.
- As a fifth practice, according to Pepper (2010:102), the police or forensic science units should introduce a mobile AFIS device in the form of a laptop to be used at crime scenes for recording fingerprints electronically. This will lead to the swift identification of offenders.
- A sixth practice is for the police in conjunction with the Department of Home Affairs to ensure that all foreigners coming into the country whether (legally) officially or not are finger printed. This will also help in reducing many unsolved cases because these fingerprints will be stored on the National Fingerprint Database.

To the question: “What suggestions for good practice do you have to improve AFIS in the identification of suspects?” the participants responded as follows:

- To link AFIS with Home Affairs (9 participants);
- Fingerprint database to be implemented, including the one from Home Affairs and the Department of Works (7 participants);
- AFIS should be able to make invisible prints’ ridge characteristics visible/enhance both prints from crime scene and suspects (5 participants);
- Combine all national fingerprint databases to assist in the identification of first offenders (3 participants); and
- Scan a lot of quality latent prints and take more time working on the system (4 participants).

According to the researcher’s experience, all the answers given by the participants support each other. The answers correlate with literature such as Saferstein (2011:547).

3.16 SUGGESTION FOR IMPROVING TRAINING OF AFIS EXPERTS

To the question: “Do you have any suggestions to improve the training for AFIS experts?” the participants responded as follows:

- Two weeks of training is not enough (7 participants);
- All non-experts must be trained on AFIS to scan their own work (9 participants);
- AFIS experts must be compensated and enough work stations be made available (5 participants);
- Send AFIS experts to attend the Advanced AFIS Course to explore new techniques (4 participants); and
- Yes, AFIS experts must work daily on AFIS since practice makes perfect (3 participants).

The question was open ended and sought to obtain the opinions of the participants; all the responses were relevant. The researcher was attracted by the submission of

James and Nordby (2009:371). The 9 participants mentioned that enough training is needed and also to include non AFIS experts in their training plan.

Fingerprint experts must always keep up to date with new developments in the field of fingerprints, especially by reading publications related to current research about fingerprints. James and Nordby (2009:371) mention that, in a law enforcement context, fingerprint identifications are always made by trained and certified experts, which suggests that AFIS experts must continuously enhance their skills through further studies.

Regular courses, workshops or sessions should be held where members/fingerprint experts can discuss AFIS and its challenges. The CR & CSM Unit should make relevant courses available to AFIS experts regularly. Furthermore, in order to capacitate the institution, non-AFIS experts should also be trained as AFIS operators. Non-AFIS experts are fingerprint experts who are used to the manual system only rather than AFIS. Non-AFIS experts can be trained to scan all positive cases (cases where fingerprints are found at crime scenes) immediately because they are trained to use manual system of comparison (9 participants).

3.17 IMPORTANCE OF TRAINING INVESTIGATORS AND PROSECUTORS ON AFIS

According to the researcher, it is not necessary to train investigating officers or public prosecutors on how to use AFIS; however, these officials should be informed during justice meetings about the importance of (physical evidence) fingerprints at scenes of crime. A “justice meeting” is the name given to the meeting is where the police investigating officers and court officials meet to discuss issues to court proceedings; the elements of crimes; and other evidence-related matters. Sennewald and Tsukayama (2006:146) mention that crime investigators in the private sector are very knowledgeable about the science and mechanics of fingerprints. The justice department officials, especially those in courts, also need to be informed in the AFIS process as questions may arise in criminal cases where knowledge can make a difference to the outcome of a case. This indicates that everybody in the justice system needs to have information about fingerprints. Prosecutors should have knowledge

about AFIS so that they understand the value of the system and stop withdrawing cases that contain AFIS experts' statements inside police dockets without consulting the fingerprint experts.

In the foreword to his book on fingerprint identification, Nath (2010:ii) expects a wide range of people to find the book important. He writes:

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

To the question: “Do you think, based on your experience, that investigators and prosecutors should also be trained on AFIS?” the participants responded as follows:

- Yes (10 participants);
- No, but they should have information about the system and knowledge about fingerprint identification (7 participants);
- No, this could limit the imposing of sanction to suspects (1 participant);
- No (7 participants);
- Yes, they can be work shopped and given a clue of what AFIS is all about (2 participants); and
- Yes, but they must know how AFIS experts make fingerprint identifications in AFIS (1 participant).

The researcher established that there are some differences in the responses from the participants, with only two participants suggesting that investigators and prosecutors should be given workshops and informed about the process while seven participants believe that they should be given information about the system and about fingerprint identification. In support of such training are Sennewald and Tsukayama (2006:146), who indicate that most private investigators and prosecutors must be conversant with AFIS activities. From analysing the answers, the researcher was able to establish that there is support for prosecutors and criminal investigators receiving some form of in-service training on AFIS.

3.18 CRIMINAL LAW (FORENSIC PROCEDURES) AMENDMENT ACT, 2010 AND THE CRIMINAL PROCEDURE ACT OF 1977

Section 212A of the Act and Regulations, Act 51 of 1977 (South Africa, 1977b) deals with proof of certain facts by affidavit from a person in a foreign country. Section 212B deals with proof of undisputed facts (subsection 1):

If an accused has appointed a legal adviser and, at any stage during the proceedings, it appears to a public prosecutor that a particular fact or facts which must be proved in a charge against an accused is or is not in issue or will not be placed in issue in criminal proceedings against the accused, he or she may, notwithstanding section 220, forward or hand a notice to the accused or his or her legal adviser setting out that fact or those facts and stating that such fact or facts shall be deemed to have been proved at the proceedings unless notice is given that any such fact will be placed in issue.

Subsection 6 stipulates that the court may on its own initiative or at the request of the accused order oral evidence to be adduced regarding any fact contemplated in subsection 4. According to du Toit, de Jager, Paizes, Skeen and van der Merwe (2006:24-27), affidavits or certificates are frequently used as vehicles for adducing expert testimony. Section 213 deals with proof of written statement by consent.

All testimony of witnesses at a trial must normally be given orally but there are exceptions to this general rule. This exception includes section 213 of the Criminal Procedure Act, which, subject to certain requirements and there being no application by a party that the witness be called, allows a written statement by a person to be admitted into evidence (Zeffertt & Paizes, 2010:285).

According to Zeffertt and Paizes (2010:285), a written statement, generally but not invariably, has less value than oral evidence given under oath and subject to cross-examination. The judge ruled in terms of section 213 of the Act that, after the agreement, a mere production of a written statement at the criminal proceedings be admissible as evidence. The Act and the sections referred to above relate to AFIS in the same way as the statement under section 212b made by any expert in this regard.

In response to the question: “What is the Criminal Procedure Act or Criminal Law (Forensic Procedures) Amendment Act saying about AFIS in terms of sections 212 and 213?” the participants answered as follows:

- Sections 212 and 213 deal with the submission of affidavits by any expert in any field without him/her appearing in court physically (23 participants);
- Section 213 of the Act deals with the submission of a statement by the accused to court through his/her legal representatives as an admission to crime (4 participants); and
- Both sections 212 and 213 deal with experts’ affidavits or evidence in written statements (1 participant).

The participants’ responses all show an understanding of the Acts in question and of sections 212 and 213 of the Criminal Procedure Act. The answers show consistency and support sources consulted, such as du Toit et al. (2006:24-27) and Zeffertt and Paizes (2010:285).

3.19 THE VALUE OF AFIS AS A TECHNIQUE IN THE IDENTIFICATION OF SUSPECTS

The AFIS system can be regarded as a supplementary tool to the manual identification system (Siegel, 2011:147). Lyle (2012:253) mentions that with the growing numbers of print sets on the national fingerprint database, the manual method became inefficient and a method such as a computer program for storing, retrieving, and matching became a necessity. AFIS is a very valuable computerised system that connects suspects to crime scenes globally. It contains comprehensive and up-to-date fingerprint data, but also includes historical records.

According to Thibault et al. (2007:301), computerised fingerprint identification systems such as AFIS have made it possible for latent fingerprints to be matched with a suspect’s prints in minutes. Ogle (2012:126) mentions that with the implementation of AFIS, the value of crime scene identifications has risen dramatically. Statistics from the South African FIPS indicate that the fingerprint identification rate in Tzaneen

increased by 25% through the use of AFIS. From April 2000 to March 2001 a total of 100 fingerprint identifications were made in the Tzaneen LCRC through manual identifications while there was a dramatic increase, amounting to 180 fingerprint identifications, from April 2006 to March 2007, by means of AFIS identifications, which shows a 90% increase in suspect identification. This is an indication that AFIS provides value in the identification of suspects (as compiled by researcher himself).

There are, however, certain challenges that operators of AFIS face. A serious challenge faced by AFIS is that of computer crime. Science can be a powerful tool but its use must be coordinated and continually advanced to keep up with modern criminals and their crimes (Siegel, 2011:147). As computers are vulnerable to hacker attacks security issues surround digitally stored data (Saferstein, 2013:463).

According to Easttom and Taylor (2011:190), many computer crimes involve a skilled computer hacker compromising the security of the target system. Hacking involves trying to compromise a system's security to gain unauthorised access, which includes finding flaws in the operating system that can be exploited or hijacking a legitimate remote session to gain access to the target system (Easttom & Taylor, 2011:10).

A second challenge faced by AFIS operators is dealing with prints of poor quality. While the AFIS system is much faster than the manual system in getting possible matches, the system is very slow in creating an SAPS 69, especially where the set of fingerprints is of poor quality. This can take up to two months to obtain, especially in cases where fingerprints have to be sent back to the police stations of origin for a retake (where prints are not correctly taken or ridges are not visible) (Van der Kolk, 1999:252-253; Researcher' own experience).

A third and related problem faced by AFIS operators occurs when investigating officers do not retake suspects' prints in time. The results of the delay in the provisioning of an SAPS 69 can have negative effects on service delivery and the justice system and on private sectors that use the system for appointing candidates to vacant posts and there is a danger that critical posts are not filled in the required time (Terry, 2011; Researcher' own experience).

The justice system also needs results as soon as possible to sentence guilty criminals. If a set of prints from a suspect is poorly taken by police officials, an expert will check it for quality control. This also applies to fingerprints that are not taken in sequence on the SAPS 76 or 192 forms. The forms will be taken back to the station of origin for a retake; in this case an expert must place the prints in order, looking at the plain impression, which will be in sequence (Terry, 2011; Researcher' own experience).¹ According to Pettem (2011:65), if the AFIS system does not make a comparison, such a print must be handed to a fingerprint expert to compare it manually because it might happen that the suspect is not on the AFIS database or the scene print is not visible enough to be scanned on AFIS.

A fourth problem is that AFIS can search for only one scanned fingerprint at a time. Even if several scene prints are taken, the expert can only identify one visibly clear impression as prescribed by the AFIS policy letter (Breckenridge, 2005:271; Ulery, Hicklin, Buscaglia & Roberts, 2011:7733; see also Saferstein, 2011:544).

The last problem concerns the fact that AFIS is not applied across all government departments. AFIS is designed to protect the whole of society by detecting criminals, who do not want their fingerprints recognised (Nath, 2010:139). All searches in connection with criminal records disclosure are conducted using fingerprint analysis at the CR & CSM in Pretoria (Terry, 2011). The integration of other departments into AFIS will ensure that thousands of unsolved files will be connected in seconds (SAPS, 2012:8).

In response to the question: "What is, according to your experience, the value of AFIS as a technique in the identification of suspects?" the participants gave the following answers:

¹Plain impressions are prints placed on the SAPS form, four of them simultaneously. If AFIS does not make a match or comparison, this means that a fingerprint pattern was wrongly scanned or a fingerprint was in a wrong sequence when scanned or it has been wrongly scanned on AFIS. An AFIS expert must check plain impressions when doing quality control to assign the rolled impressions (single impressions) to the correct position (column) on AFIS.

- It has increased the number of identifications of suspects in South Africa (16 participants);
- It is much faster in making fingerprint identifications (8 participants);
- It is of high value as AFIS has a big database and not only local criminals are recorded (1 participant); and
- It makes identification easier and quicker; more suspects can be linked in a short space of time (3 participants).

This question is the core of the research and it forms part of the research questions. As such, the researcher conducted a thorough comparison of the responses of different participants and researched the available literature extensively. Sufficient corroborating data has been recorded by the researcher, especially from the submissions of Thibault et al. (2007:301) and Ogle (2012:126), to indicate that AFIS can identify many cases and in minutes.

Any biometrical fingerprint system will always rely on human interface no matter how well the system has been designed. Human factors can never be taken out of the equation in any biometric system. Although preventative measures to prevent human factors can be put in place, the problems outlined below can occur in biometric evaluation.

During the process of scanning a person's fingerprints, a person or people can collaborate with the operator of the system and manipulate the sequence or the process when the fingerprints are scanned (Easttom & Taylor, 2011:10). Two or more individuals can scan their fingerprints together to form a new set of prints. Even with the controlled finger process in place, they only need to know which fingers were used and in which order; thus, the control process is also flawed.

Two individuals can scan five fingers each and create a totally new person on a system with the help of the operator or investigator (Easttom & Taylor, 2011:190; Researcher's own experience). During the process of comparison on a biometric system, such as AFIS, the system will only present the operator with probable matches of a set of fingerprints scanned (captured). These probabilities must then be physically

eliminated by the expert. This is achieved by matching the fingerprint comparisons with each other. If the operator should make a mistake in the matching of the two sets of fingerprints, it creates huge negative implications for the system. The system has been designed to merge matched sets of fingerprints and keep the best quality print of the two sets. The poor quality fingerprint will be discarded and deleted from the system forever. This in essence means that a new person has been created on the system, whom in future might not be found on the system when the rightful owner of the prints is searched for (Swanson et al. 1992:242-243; Researcher' own experience).

This effect can lead to criminals not being identified with previous convictions and can have detrimental effects on a criminal case if the accused argues against previous convictions and just one of the fingerprints in a set presented as evidence is proved not to belong to the accused. This will result in criminal charges being withdrawn or the matter being struck from the roll, as the evidence has been corrupted by the biometric system. Biometric matching only presents probable matches and the final decision rests with the operator. Inadequate training and less than total commitment to detail, coupled with operator inexperience and lethargy, exposes the entire process to failure (researcher's own experience).

3.20 SUMMARY

Manual fingerprint identification was first used in South Africa in early 1900. In order for one to carry out identifications manually, one has to know the fingerprint patterns and ridge characteristics. It is very important that the expert must have a magnifying glass and a sharp pencil or pin to mark the points of similarities. An expert must start with the marking of a prominent ridge characteristic, going through ridge tracing or ridge counting on both prints until seven points are found.

“AFIS” is the abbreviation of the term “Automated Fingerprint Identification System” and is the common way of referring to the system. The purpose of AFIS is to ensure that many suspects are linked by means of fingerprints to crime scenes from which their prints have been taken as quickly as possible. AFIS was implemented first in South Africa in the year 2002 because manual searches were slow and ineffective.

The justice department also needs to be trained in AFIS, as an operating system in the fight against crime is a very competent tool if all the right procedures and functions are used and combined. It would be a hugely effective tool if all citizens and legal and illegal immigrants' fingerprints could be loaded and stored on the system as this would contribute to eliminating identity document theft and to identifying suspects in crimes. Identity document theft has become a major problem all over the world, which can have an economic impact on businesses and individuals. It is very important that experts are trained properly and are kept up to date with all new developments in this field so that the best use is obtained from the AFIS system.

Although manual searches are slow and the AFIS system is much faster in getting possible matches for a set of fingerprints, the system is very slow in creating an SAPS 69, and this can take up to two months to obtain. This can have negative effects on the justice system and on the private sector where the system is used for appointing suitable candidates to vacant posts. Delays in obtaining an SAPS 69 form can mean that applicants who are waiting for fingerprint confirmation are not appointed as the posts they have applied for need to be filled as soon as possible. The justice system also needs results as soon as possible to sentence guilty criminals.

Regarding training in AFIS, the justice department needs to be trained in the AFIS process as questions may arise in criminal cases where knowledge can make a difference to the outcome of a case. The purpose of the AFIS identification process is to ensure that scene prints are correctly scanned and linked to the suspects in as many cases as possible.

CHAPTER 4

RESEARCH FINDINGS AND RECOMMENDATIONS

4.1 INTRODUCTION

Leedy and Ormrod (2001:4) define research as a systematic process of collecting and analysing data in order to increase the understanding of the phenomenon under question, and communicating that which is discovered to the larger scientific community. This communication is undertaken in a systematic way by putting all correlating data together to reach the conclusions. According to Fisher et al. (2009:72), in all crime scenes where fingerprints are found, fingerprint experts must scan the scene prints on AFIS for comparison purposes. This chapter summarises the findings made and conclusions reached by the study and makes recommendations for practitioners in the fingerprint identification field. The aim of the research was to evaluate the significance of AFIS as a technique in the identification of suspects. To address this aim, two research questions were asked:

- What does fingerprint identification entail?
- What is the value of the Automated Fingerprint Identification System in the identification of suspects?

4.2 FINDINGS

This chapter summarises findings from the data that was collected from the following sources: literature, interviews and docket analysis. The findings are set out according to whether they are primary or secondary findings and as they relate to each research question.

4.2.1 Primary findings

Research question 1: What does fingerprint identification entail?

On the basis of the literature and the interviews conducted with participants, the researcher established that:

- Fingerprint identification is based on the fact that no two fingerprints are the same or identical and that fingerprints do not change during an individual's life time, unless change is caused to the dermis layer.

- The researcher also established from these sources that fingerprint identification in forensic science involves identifying unknown fingerprints and matching them to fingerprints of suspects in crimes being investigated.

Research question 2: What is the value of the AFIS in the identification of suspects?

- The researcher established that the literature consulted and answers provided by the participants agree that AFIS is a computerised system that is valuable in that it can connect suspects to crime scenes via the identification of fingerprints in seconds.
- From statistics obtained from South African documents and the participants' responses, the researcher established that since the implementation of AFIS, identification of suspects by means of fingerprints has increased and has, in some areas, doubled the number of fingerprints identified using the manual system in the same length of time.
- It was established further that although AFIS has shown some successes, the manual (traditional) search system must still be utilised because if a scene print is not matched by AFIS, it might be found that the culprit is not on the National Fingerprint Database, and the unmatched print must be searched for manually.

4.2.2 Secondary findings: Research question 1

Research question 1: What does fingerprint identification entail?

4.2.2.1 What is a fingerprint?: It is commonly accepted by the literature reviewed and the participants interviewed that a fingerprint is the reproduction of the ridge area of the first or nail joint of the finger in any manner whatever and it also includes the ridge area of the remaining joint of the finger.

4.2.2.2 What is fingerprint identification?: The researcher established from interviewing the participants and reviewing South African literature that fingerprint identification is a process where prints (scene and suspects') are compared until seven identical points are found that are similar in all respects (in relation, size, position, direction and without any unexplainable differences). According to the literature consulted, the required number of identical points differs from country to country. In

other countries they start from 9 or 12 while in South Africa 7 identical points are acceptable.

4.2.2.3 How can a fingerprint be identified?: The researcher established from the literature and participants that fingerprint identification is a process where a suspect's prints and scene prints are compared until seven identical points are found that are similar in all respects (in relation, size, position, direction and without any unexplainable differences).

4.2.2.4 What are the ridge characteristics in fingerprint science?: From the literature and participants, the researcher was able to establish that the ridge characteristics of a fingerprint are the ridge structure, formation and elements that differentiate one fingerprint from another and that impart individualisation to each fingerprint. These ridge characteristics are as follows: lake, island, short ridge, bifurcation, trifurcation, crossover, spur, overlapping, and beginning or ending of a ridge.

4.2.2.5 What is ridge tracing?: Based on his review of the literature and the understanding of the participants interviewed, the researcher established that ridge tracing takes place when a ridge on a fingerprint is followed (traced with a pin or pen) from the left delta to the right delta.

4.2.2.6 What is ridge counting?: Based on a detailed review of the literature and answers obtained from the participants, the researcher established that ridge counting is the counting of the number of ridges that touch or are cut by a straight line between the deltas and cores of a finger. The researcher established further that both sides of the lake are counted but the delta and core are not included in the count.

4.2.2.7 What are the "seven" point identification criteria?: Both the literature reviewed and the participants refer to minimum criteria for fingerprint identification. The researcher established that the "seven" point identification criteria in fingerprint science are based on the minimal number of ridge characteristics that appear on the impression and are not concerned with the maximum. The seven points are the minimum number of criteria used in South Africa. From the literature and participants, the researcher established that the "seven" point criteria must be supplemented by

using the Analyse, Compare, Evaluate and Verify (ACE-V) procedure and by the knowledge and experience of the fingerprint experts.

4.2.3 Secondary findings: Research question 2

Research question 2: What is the value of the Automated Fingerprint Identification System in a suspect's identification?

4.2.3.1 What is the purpose of AFIS?: Based on a comprehensive review of literature from across the globe and on the interviews with the participants, the researcher established that the purpose of AFIS is to ensure that as many criminals are identified as quickly as possible.

4.2.3.2 Why was AFIS implemented in South Africa?: From the literature review and interviews, the researcher established that the reason for implementing AFIS in South Africa was to ensure that an increased number of suspects were identified through fingerprint identification. The literature review revealed that AFIS provides possible matches, AFIS experts are doing comparison.

4.2.3.3 Describe the purpose of the AFIS identification process. The literature review and participants' responses allowed the researcher to conclude that the main purpose of AFIS is to match the prints left at a crime scene with the prints of the person suspected of committing the crime. The researcher further established from the literature review that AFIS can quickly narrow down the number of possible matches from scene print to suspect's prints to a manageable size.

4.2.3.4 Why is it necessary to verify AFIS identifications? Both the literature reviewed and participants interviewed stressed the importance of AFIS identification verifications. Regardless of the conclusion reached, either exclusion or identification, another fingerprint expert needs to re-examine the print for verification.

Based on information received from the literature and participants, the researcher was also able to establish that no fingerprint expert must verify his or her own fingerprint identification.

4.2.3.5 Explain the term "missed identification": Data provided by the participants interviewed and the literature reviewed revealed that a missed identification can occur when a scene print and a suspect's print are identical in all respects and with no unexplainable differences but an expert reaches a no-hit/not identical conclusion.

4.2.3.6 Interpretation of the sentence: “the use of forensic database such as AFIS is increasingly becoming instrumental in linking suspects crime”: Based on the data gathered from the literature and the study participants, the researcher established that if all South Africans and legal and illegal immigrants’ fingerprints are loaded and stored on AFIS, this is likely to increase the number of suspect identifications in the country.

4.2.3.7 Information session with investigators and prosecutors on AFIS: Both the literature and participants revealed that justice department officials, especially those working in the courts, need to be informed in the AFIS process about how the process works as questions may arise in criminal cases where knowledge can make a difference to the outcome of a case.

4.3 RECOMMENDATIONS

On the basis of the findings and conclusions detailed above, the following recommendations are made:

- That fingerprint investigators be encouraged to lift quality prints at scenes of crime so that they can be scanned on AFIS for identification purposes;
- That steps be taken to improve the quality of suspects’ prints taken;
- That attention be paid to speeding up the process of dealing with the relevant SAPS 69 records;
- That although AFIS shown some successes, manual (traditional) search system must still be utilised because if a scene print is not matched by AFIS, it might be found that the culprit is not on the National Fingerprint Database, and unmatched print must be searched for manually;
- That all South Africans and legal and illegal immigrants’ fingerprints are loaded and stored on AFIS; this is likely to increase the number of suspect identifications in the country;
- That justice department officials, especially those working in the courts, be trained in the AFIS process or at least be informed about how the process works as questions might arise in criminal cases where knowledge can make a difference to the outcome of a case.

4.4 CONCLUSION

AFIS is regarded as currently the most successful instrument in the identification of suspects globally. The system (AFIS) has not been implemented to replace the manual fingerprint search because if a print cannot be matched through AFIS, it must be compared manually with suspects' prints. Poorly taken prints or prints that are not taken in sequence must be avoided and consequently cannot be searched for on AFIS can be manually searched. AFIS as a biometric system has the shortcoming also of being vulnerable to hacking.

It is important that all suspects' fingerprints are correctly taken during the arrest as this will assist during the comparison and will make the work easier for experts to identify the suspects with the crime scenes. The delay in the provisioning of SAPS 69 will be reduced and cases will be finalised speedily. Fingerprint experts are encouraged to take time at crime scenes to lift clear and visible prints.

Complainants, witnesses or anyone residing on the premises near the crime scene need to be eliminated as suspects. This will minimise the search on AFIS and/or for manual comparisons. As such quality fingerprints will be scanned on AFIS and correct suspects will be identified as quickly as possible.

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DECIDED CASES

- S v Huma and Another 1995(2) SACR 411 (W).
- S v Limekayo 1968(1) SA 540 (E).

ANNEXURE A: INTERVIEW SCHEDULE

TOPIC

The value of the Automated Fingerprint Identification System as a technique in the identification of suspects.

RESEARCH AIMS

The aim of this research is to evaluate the significance of AFIS as a technique in the identification of suspects.

RESEARCH QUESTIONS

1. What does fingerprint identification entail?
2. What is the value of the Automated Fingerprint Identification System in the identification of suspects?

My name is Madimetja Edward Mokwele, a Lieutenant Colonel in the South African Police Service stationed at Tzaneen Local Criminal Record Centre as a Criminalistics expert and Commander. I am doing research on the Value of Automated Fingerprint Identification System as a technique in the identification of suspects.

You are kindly requested to answer the following questions in this interview schedule in order to determine the value of AFIS in the identification of suspects.

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

The analysed and processed report will be published in a research report.

Your answers will be noted by me on paper and please ask for clarification if any. There are no limitations on the number of questions; it will only depend on questions asked. When answering the questions, it is very important to elaborate and give your own opinion as an expert in this field.

I have also obtained a written permission from the South African Police Service to conduct these interviews and analysis of dockets.

Do you give permission to be interviewed and that your information be supplied to me to be used in this research?

YES / NO

INTERVIEW SCHEDULE

**AFIS EXPERTS: TZANEEN LOCAL CRIMINAL RECORD CENTRE
LIMPOPO PROVINCE
SOUTH AFRICAN POLICE SERVICE**

**THE VALUE OF THE AUTOMATED FINGERPRINT IDENTIFICATION SYSTEM AS
A TECHNIQUE IN THE IDENTIFICATION OF SUSPECTS**

RESPONDENT:

DATE OF INTERVIEW:

SECTION A: HISTORICAL INFORMATION

A.1 Are you a fingerprint expert?

YES / NO

A.2 How long have you been a fingerprint expert?

1-5yrs 5-10yrs 10yrs and above

A.3 Did you undergo a fingerprint course?

YES / NO

A.4 How long does it take to complete a fingerprint course?

6 weeks 12 weeks 15 weeks

- A.5 Which of these courses did you undergo?
- A.6 Are you a criminalistics expert?
YES / NO
- A.7 What qualifications or training do you need to become to be a criminalistics expert?
- A.8 Did you receive training in Automated Fingerprint Identification System?
YES / NO
- A.9 How long was the course you attended?
- A.10 Are you an AFIS expert?
YES / NO
- A.11 How long have you been an AFIS expert?
1-5 yrs 5-10 yrs 10 yrs and above
- A.12 Did you undergo basic police training?
YES / NO
- A.13 Did you give evidence concerning a fingerprint case recently?
YES / NO
- A.14 How many AFIS experts are there at your office?
1-5 5-10 10 and above

SECTION B: WHAT DOES FINGERPRINT IDENTIFICATION ENTAIL?

- B.1 What are the functions of the SAPS according to the SA Constitution?
- B.2 What is the role of the CRC?
- B.3 Explain how the functions of the CRC support the functions of the SAPS?
- B.4 What is your understanding of the concept “investigation”?
- B.5 What is a fingerprint?
- B.6 What is fingerprint identification?

- B.7 What does fingerprint identification entail?
- B.8 How can a fingerprint be identified?
- B.9 What are the ridge characteristics in fingerprint science?
- B.10 Define the concept “Minutiae” according to your experience.
- B.11 Explain according to your experience the term “latent print”.
- B.12 Based on your experience define the concept “ridge tracing”.
- B.13 Based on your experience define the concept “pattern area”.
- B.14 Based on your experience, define the concept “ridge counting”.
- B.15 Based on your experience, what is your understanding of the “7 Point Identification Criteria”?
- B.16 Explain the meaning of the concept “identification”.
- B.17 Explain the meaning of the concept “individualisation”.
- B.18 Explain the differences between the two concepts “identification” and “individualisation”.

SECTION C: WHAT IS THE VALUE OF THE AUTOMATED FINGERPRINT IDENTIFICATION SYSTEM IN THE IDENTIFICATION OF SUSPECTS?

- C.1 What is AFIS?
- C.2 What is the purpose of AFIS?
- C.3 When was AFIS implemented in SA?
- C.4 Why was AFIS implemented in SA?
- C.5 Describe the purpose of the AFIS identification process.
- C.6 Explain the process when making identification on AFIS.
- C.7 Explain the purpose of AFIS validation.
- C.8 Can you use ridge tracing or ridge counting when making AFIS identification?
YES / NO. If yes, give reasons to support your statement.

- C.9 Why is it necessary to verify AFIS identifications?
- C.10 Describe the manual Fingerprint Identification Process.
- C.11 What are the differences between AFIS and manual identifications?
- C.12 Explain the term “missed identification”.
- C.13 How do you interpret this sentence “The use of forensic database such as AFIS is increasingly becoming instrumental in linking suspects to crimes”?
- C.14 What suggestions or good practice do you have to improve AFIS in the identification of suspects?
- C.15 Do you have any suggestions to improve the training for AFIS experts?
- C.16 Do you think, based on your experience, that investigators and prosecutors should also be trained on AFIS? Motivate your answer to the question above.
- C.17 What is the Criminal Procedure Act or Criminal law (Forensic Procedures) Amended Act, saying about AFIS in terms of sections 212 and 213? (Statements)
- C.18 What is according to your experience, the value of AFIS as a technique in the identification of suspects?

Thank you very much for your participation

Closing remarks:

Is there anything else you think I did not mention which may be of help to me?

Thank you!

ANNEXURE B: APPROVAL TO CONDUCT RESEARCH

Privaatsak/Private Bag
Posbus/Post Office Box 9428

Verwysing Reference	2/1/2/1
Navrae Enquiries	Colonel Mashile
Telefoon Telephone	015-290-6090
Faksnommer Fax number	015-230-1023

THE PROVINCIAL HEAD
ORGANIZATIONAL DEVELOPMENT &
STRATEGIC MANAGEMENT
LIMPOPO PROVINCE
POLOKWANE
0700

- A. The National Commissioner
South African Police Service
Private Bag x94
PRETORIA
0001
- B. Mr M E Mokwele
Local Criminal Record Centre
3rd Floor Dannie Joubert Building
Tzaneen
0850

(Att: Maj.Gen. Menziwa)

RE: RESEARCH REQUEST: THE VALUE OF THE AUTOMATED FINGERPRINT IDENTIFICATION SYSTEM AS A TECHNIQUE IN THE IDENTIFICATION OF SUSPECTS: MASTERS IN FORENSIC INVESTIGATION: UNISA: RESEARCHER: LT -COL. ME MOKWELE

- A1. Copy for your information.
- B1. Your application for an authority to conduct research on the above topic has reference.
2. Permission has been granted to conduct your research within SAPS in Limpopo Province.
3. You are therefore permitted to proceed with your research and please adhere to recommendations made by National Commissioner and the provision of National Instruction 1/2006 on Research in the service.


LT.GENERAL
PROVINCIAL COMMISSIONER
LIMPOPO PROVINCE
TS MPEMBE

RESEARCH: Mokwele-ARIB 01/01/2012 granted

DATE: 2012-05-29