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Underutilisation of Fingerprints to Identify Suspects in Business Robbery

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Abstract: The success or failure of any criminal investigation often depends on the search for and collection of physical evidence left at a crime scene, as well as the proper analysis of that evidence. Identifying criminal suspects by means of fingerprints has proven to be one of the most effective methods to apprehend persons who might otherwise go undetected and continue their criminal activities. Therefore, more cases might be solved by means of fingerprints than by any other single type of physical evidence. This article provides a qualitative empirical analysis to determine the maximum level of utilisation of fingerprints as a technique to identify suspects in business robbery cases, to find new knowledge that could improve the use of fingerprints, and suggest ways to apply this knowledge to enhance the performance of crime scene investigators and the prosecution in courts of law. A multi-method approach to data collection was used for this article, with the researchers using a literature review, docket analysis and interviews to collect data from the relevant departments in the Eastern Cape Province of South Africa. It was found that crime scene investigators (CSIs) do not always optimally utilise light sources when searching for fingerprints, fluorescent powders to develop the fingerprints, or imprint photograph, and they do not always lift valuable prints. Crime scenes are often not properly secured, and evidence is not handled correctly, leading to the contamination and destruction of fingerprint evidence. Continuous refresher training and workshops for CSIs on the latest techniques and best practices in fingerprint collection and analysis are recommended. This will help maximise the benefits obtained from fingerprint evidence. With findings and recommendations, the article contribute significantly to solving business robberies.

Keywords: crime scene, forensic investigation, fingerprints, identification, individualisation, automated fingerprint identification system, fingerprint expert

Introduction

From the cradle to the grave, every human being carries with them certain physical marks that do not change, and by which they can always be identified (Dutelle, 2010:157). The use of fingerprinting has proven to be one of the most effective methods in identifying criminals who might otherwise go undetected and continue their criminal activities (Lyman, 2012:57). In fact, more cases are solved by means of fingerprints than by any other single type of physical evidence (Stuart & Nordby, 2009:273). Palmiotto (2012:107) contends that fingerprints are a valuable form of physical evidence often found at the scene of a crime, and that solving crimes depends on the expertise of crime scene investigators (CSIs) in searching, collecting and securing fingerprints for identification. Fingerprints are regarded as one of the most probative types of evidence and, as such, they should be searched for and gathered whenever possible. A crime scene investigator should consider all prints as potentially identifiable and should call upon his/her training and experience to determine the best method for processing latent prints at the scene of the crime (Dutelle, 2010:185).

The first problem associated with the utilisation of fingerprints is that crime scenes are not properly secured, evidence is tampered with and, worst of all, there are cases where CSIs are not summoned to the crime scene immediately, resulting in fingerprints being exposed and damaged. Dutelle (2010:163) emphasises that once a crime has been committed, it is essential to initiate a search for latent prints as soon as possible, and to protect areas to be processed for prints against adverse weather conditions. The author continues to note that fingerprints are primarily composed

of water, body fats and oils. These could evaporate or be destroyed if not processed in a timely manner, or if exposed to sun, heat or wind. Prints may also be washed away by rain or dew if not protected.

The second problem associated with the underutilisation of fingerprints, is the failure of CSIs to optimally utilise light sources when searching for fingerprints. They also do not use fluorescent powders optimally to develop the fingerprints, nor do they make the best use of imprint photograph, and they often do not lift valuable prints. As a result, the poor quality of the fingerprints lifted makes it difficult to scan the fingerprints into the Automated Fingerprint Identification System (AFIS).

Furthermore, CSIs do not take fingerprints of the complainants and employees immediately after an investigation for elimination purposes, which means that fingerprints taken at the scene of the crime cannot be compared to known prints. According to Stuart and Nordby (2009:355), the identification of a suspect is a process which involves the comparison of fingerprints found at the scene of the crime with those of arrested suspects (or previous records, if the suspect has not yet been arrested), and a fingerprint match is widely accepted as certain evidence that identifies a particular person.

The aim of the article

The researchers wished to investigate the value of training crime scene investigators (CSIs) on quick action, securing crime scenes, the utilisation of light sources, fluorescent powders and imprint photography, as well as fingerprint elimination in order to maximise the identification of suspects and secure a high conviction rate in court.

Preliminary literature review

The primary task of criminal investigation is to identify the suspects involved in the crime (Gilbert, 2010:455). Many cases reported to investigating officers involve unknown suspects, where the suspect's actions are known, but a personal identification has not been made (Gilbert, 2010:455). The underutilisation of fingerprints could mean that suspects are never identified and that cases are closed or withdrawn by the prosecutor. The role of CSIs is to provide the specialist evidence-collection expertise required for certain priority crimes, or to attend to complicated crime scenes, where evidence is not immediately visible (SAPS, 2015:2).

Before exploring the underutilisation of fingerprints, it is vital to understand the characteristics of fingerprints. Siegel (2011:52) understands a 'fingerprint' to be an imprint of the "friction ridge skin of the end joint of each finger, taken from cuticle to cuticle". Girard (2011:137) and Saferstein (2011:537-541) agree on the following three characteristics of fingerprints:

- A fingerprint is unique to a particular individual, and no two fingerprints possess exactly the same set of characteristics.
- Fingerprints do not change over the course of a person's lifetime (even after superficial injury to the fingers).
- Fingerprint patterns can be classified, and those classifications can be used to narrow the range of suspects.

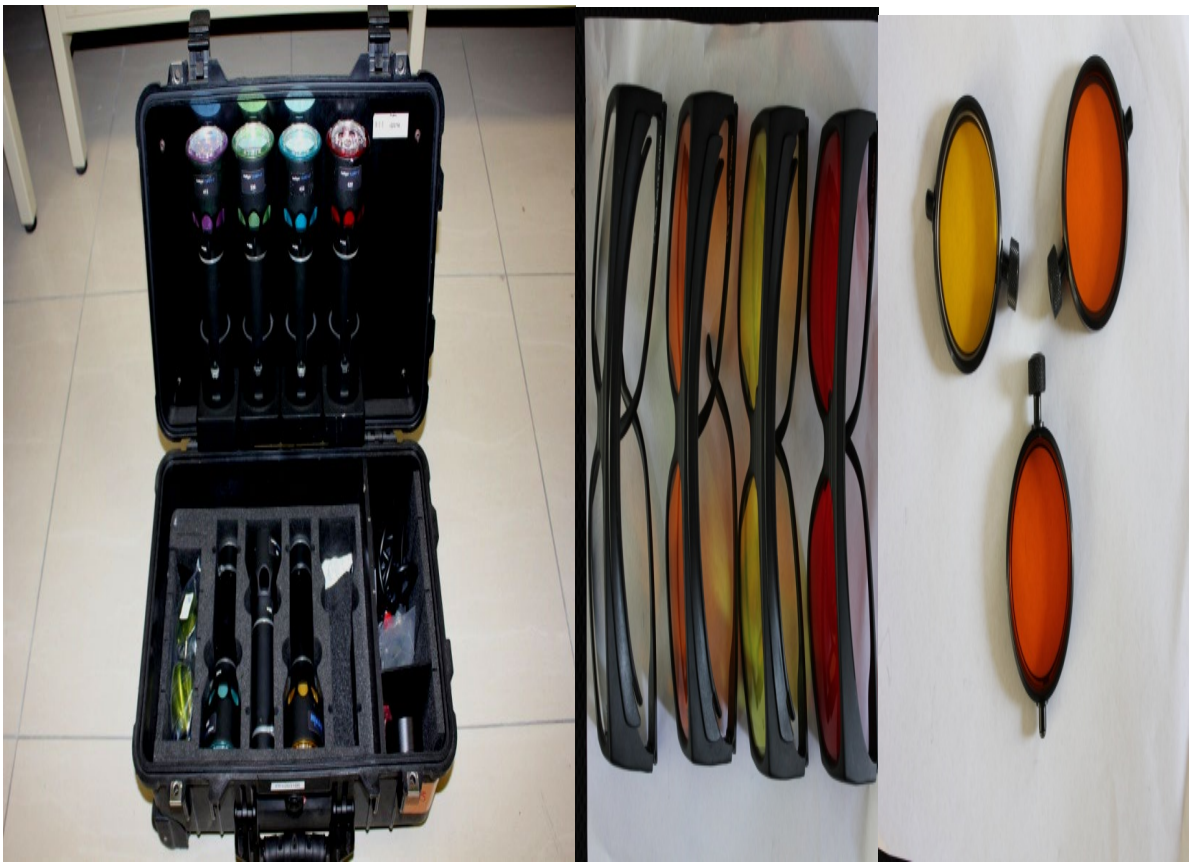
The aforementioned characteristics make fingerprints a valuable form of evidence in the identification of suspects. Palmiotto (2012:107) emphasises that such identification depends on the expertise of crime scene investigators to search, collect and secure fingerprints for identification.

However, the researchers argues that to maximise fingerprint utilisation, the duties of the first responder and other role players at the crime scene must be taken into account, because evidence can only be properly collected if the crime scene is handled in an organised and objective manner. It is the responsibility of the first police official who arrives at the crime scene to control the activities at the scene with due regard to evidence, in order to protect and preserve the crime scene. At outdoor scenes, the weather conditions such as heat, wind, rain, snow or sleet could alter or destroy physical evidence (Orthmann & Hess, 2013:18), which makes it essential for the responding officer to proceed to the scene as quickly as is safely possible (Orthmann & Hess 2013:16). Adverse weather conditions may destroy fingerprints because fingerprints consist of approximately 98% water, while the remaining 2% is a combination of grease, oil, salts and amino acids (Gardner, 2012:29).

Every crime scene represents an individual challenge, each with its own unique problems and its own unique characteristics, and the scene technician must approach these with a mixture of skill and knowledge (Gardner, 2012:239). For this purpose, in recent years researchers have explored a variety of new processes such as the visualisation of latent fingerprints by using a laser light (Saferstein, 2011:554). A variety of alternative light sources are available to the crime scene technician (Gardner, 2012:251). These light sources are suitable for all fingerprint and other trace evidence detection techniques (*SAPS Poliflare and Photography Training Manual*, 2017:13). If a

fingerprint is clearly visible after treatment with a powder or a chemical, a photograph of the fingerprint can be taken by using a white light source, such as a tungsten light bulb (Girard, 2011:145). Indeed, Gardner (2012:239) suggests that clean white light is the most important tool that a crime scene technician can use in any crime scene. Baxter (2015:124), in turn, points out that any time an Alternative Light Source (ALS) is used as the light source for photography, care must be taken to use the correct lighting technique, so that 'hot spots' in the image may be avoided. Ultimately, a white light is used best to illuminate a black fingerprint on a white surface, because the light striking the white surface between the ridges and minutiae is reflected back to the camera as white light (Girard, 2011:145). Figure 1 illustrates a portable suitcase with various light sources, different-coloured goggles, and different-coloured filters.

Figure 1: Useful technology in maximising the detection of fingerprints



Source: Pictures by researchers, based on experience

Occasionally, partially visible latent or patent fingerprints are evident to the naked eye, particularly when using oblique lighting as a search tool (Gardner, 2012:258). A coloured fingerprint that appears on a coloured surface is much more difficult to see, therefore, to photograph the coloured fingerprint surface, an excitation filter is placed in front of the white light source. Many different filters are available that transmit only one colour of light and filter out other colours (Girard, 2011:147). Table 1 below shows which filters are used with which light sources for fluorescence purposes

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Table 1: Best combination methods of utilizing light sources and filters

LIGHT	USUAL FILTER	SELDOM-USED FILTER
Violet	Green/Yellow/Yellow	Orange
Blue	Orange	Green/Yellow/Yellow
Blue/Green	Orange	Blue/Green
Green	Orange/Red	Green
Green/Yellow	Red	Green/Yellow

Source: Table compiled by researchers, based on experience

Methods and materials

Salkind (2010:2) describes research design as a plan that provides a logical structure that guides researchers to address research problems and answer questions. A qualitative approach was adopted for the research, being the non-numerical examination and interpretation of observations, for the purpose of discovering underlying meanings and the patterns of relationships. Leedy and Ormrod (2005:133) recommend qualitative research for researchers who are concerned with explaining people's behaviour. For this article, the behaviour of crime scene examiners during business robbery investigations was at issue. Leedy and Ormrod (2013:140) emphasise the advantages of qualitative design, saying that it enables researchers to gain new insights about a particular phenomenon, and allows them to test the validity of certain assumptions, claims, theories or generalisations within the context of the real world.

This research followed an empirical design. Denscombe (2012:6) states that an empirical design requires of researchers to go out of the office and purposefully seek the necessary information. An interview schedule was used to conduct interviews with crime scene investigators as participants. The researchers studied sources from the literature, as well as cases reported on by the SAPS's Local Crime Record Centre (LCRC), and drew from personal experience in order to obtain information on the subject matter. The researchers obtained permission from SAPS and ethical clearance certificate from University of South Africa for this purpose. Crime scene examiners constituted the research sample and face-to-face interviews were conducted with them. Owing to their experience and knowledge in the field, these experts added value to the article.

Discussion

Crime scene investigators and the relevant authorities are strongly urged to adhere to the following best practices for the collection and processing of fingerprints:

The use of powders to develop fingerprints

The SAPS *Module on powders and reagents* (2016:1) emphasises that no fingerprint investigator can function effectively if they do not have a sound knowledge of different powders and reagents suitable to be used on different surfaces. It is therefore important for fingerprint investigators to be abreast of the applications of the different powders and reagents (SAPS *Module on powders and reagents*, 2016:1). An illustrative application of different powders, on different surfaces, using different methods is shown below, based on the work experience of the researchers.

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Table 2: Application of different powders on different surfaces.

Powder	Surface	Application method
1.Black powder	A smooth surface which is not black, wet or sticky	Use of an animal hair brush
2. Aluminium powder	A smooth surface which is not silver coloured, wet or sticky	Use of a fibreglass brush
3. White powder	For oily and fatty prints, irrespective of the surface	Poured onto prints and left for 30 minutes
4. Black and white magnetic powder	For porous surfaces like paper, cardboard, untreated wood, PVA-painted surfaces and objects	Use of a magnetic brush
5. Fluorescent powder	For any surface with intricate patterns or detail like paper money, gift wrap and embossed glass	Sprinkle and vibrate
6. Gold and copper powder	For old porcelain, synthetic leather, fingernails, smooth leaves, fruit and stems	Use of an animal hair brush
7. Dragon's blood powder	For metal, corrugated iron, smooth untreated wood, bamboo, leather, rubber and smooth stones	Sprinkle and vibrate
8. Oxide powder	For polystyrene, soap, synthetic leather, plastic, tea bags and bricks	Sprinkle and vibrate

Source: Table drawn up by researchers, based on experience

Pekker (2010:82) points out that in some instances a powder must be applied to the surface using a soft animal hair brush in a gentle brushing motion. By doing this, the researchers managed to develop good identifiable fingerprints at the crime scene, allowing the fingerprints to be photographed.

Fingerprints almost always begin as a search and the surface characteristics determine the fingerprint methods that have to be employed on a scene (Gardner, 2012:258-259)

Guidelines for using powders: The SAPS *Module on Powders and Reagents* (2016:36) indicates that when prints are old and dried out, the fingerprint investigator can breathe or blow steam over the prints to make them moist again. The salt in the sweat in the prints absorbs the moisture which enables the powder to adhere to the prints. Care should be taken to allow excess moisture to dry before the powder is applied. Lifting oily and fatty print(s) a few times with new folien before applying powder obtains better results. This will work in cases where the print is exceptionally oily and fatty, for example prints made with Vaseline (see white powder). Different powders can be mixed to produce better results, for example, 1/3 black powder may be mixed with 2/3 aluminium powder, to lend other characteristics to them. It is important to never try to apply powder to very fatty, oily, sticky or wet surfaces with a brush. The bristles of the brush will smudge the fattiness, oiliness, stickiness or wetness and destroy any latent prints. The residue on the bristles of the brush will also reduce the effectiveness of the brush.

Identification by means of fingerprints

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". Newburn, Williamson and Wright (2007:309) say that identification takes placed if a person's identity is determined by comparing their fingerprints (the test sample) with the reference samples (fingerprints) of all people in the database. The identification process starts at the time that the crime is committed and continues until the offender is found guilty or acquitted in court – hence, the CSI should consider all prints as being potentially identifiable and should call upon his/her training and experience to determine the best method for processing latent prints at the scene of crime (Dutelle, 2010:185). The underutilisation of fingerprints may mean that suspects are never identified and that cases are closed or withdrawn by the prosecutor.

The value of automated fingerprint identification

Nath (2010:115) refers to AFIS (the Automated Fingerprint Identification system) as the database of fingerprints taken and stored in SA, just as other countries like Canada and the United Kingdom (UK) use AFIS databases. Ogle (2012:18) defines 'AFIS' as a computer software program used to encode individual fingerprints. In South Africa only the fingerprints of convicted criminals are stored on a national database. In S v Nala 1965 (4) SA 360 (A) the trial court was, however, correct in its approach to the opinion evidence given by a fingerprint expert. When a trial court hears the evidence of an expert regarding fingerprints, it does so not only to satisfy itself that there are the requisite number of points to identify the person, but also to satisfy itself that the expert's opinion about the identity of disputed fingerprints may safely be relied upon. AFIS serves as a forensic tool to aid such identification.

Empirical inputs

The ideal population of this article would have been all CSIs of the South African Police Service in South Africa, but constraints related to distance, time, finance, and the vast number of participants to cover meant that it was necessary for the researchers to focus on a specific, smaller target population. The researchers used only CSIs from the Eastern Cape as his target population because that is the province where the problem was identified. The researchers focused particularly on Eastern Cape Province because this is where he works, which made it economically viable, as well as accessible and convenient for the researchers to conduct the research in this province. The current CSIs are directly involved in attending business robbery cases and their experience was crucial in providing information for the research.

The researchers selected from among CSIs who are stationed at the following LCRC Offices in: Port Elizabeth (5), Port Alfred (5), East London (5), Grahamstown (5), King Williams Town (5), Butterworth (5), Queenstown (5), Elliot (5), Umtata (5) and Flagstaff (5). This range of offices serves the population of the EC. The total number of CSIs is 50, spread among the LCRCs (See SAPS Forensic Services Structure 2016). On each LCRC, the names of the participants were compiled in alphabetical order, and each piece of paper was folded and placed in a hat. The contents were shaken, and the names were taken out one by one until 16 participants were drawn.

The Following Five Questions Were asked

1. Did you receive training on fingerprint science?
2. How many years of experience do you have on fingerprint science?
3. What is a fingerprint?
4. What is identification?
5. What are the best practices of fingerprint identification in business robbery cases?

Findings

- The researchers discovered that all sixteen participants have undergone a formal training of crime scene examiner learning programme, however only nine participants have undergone further training to become fingerprint experts. Secondly only the four experienced experts have done proficiency test to maintain their expertise.
- The researchers discovered that the tried and tested experienced CSIs have left the service as a result only four participants have more than twenty years and the twelve participants have less than five years of experience. Secondly, experience, knowledge of application of lifting techniques plays a crucial role during investigation of business robbery cases.
- The literature reviewed and the participants interviewed generally accepted that a fingerprint is the reproduction of the ridge area of the first or nail joint of the finger and it also includes the ridge area of the remaining joint of the finger and fingerprints are unique to each individual, comparable and can be used in the identification of suspects.
- The researchers established from interviewing the participants and reviewing the literature that identification is a process where fingerprints from the crime scene are compared manually to the fingerprints of the suspect until seven identical points (according to SA courts) are found that are similar in all respects (in relation, size, position, direction and without any unexplainable differences) and has been proven to be one valuable sources of evidence through which suspects can be identified.
- The literature reviewed and the participants interviewed generally accepted that there are best practices based on techniques that can be used to maximize the use of fingerprints during forensic investigation in business robbery cases, which includes, the use of light sources as detection tools, fluorescent fingerprint developing powders, and the best collection methods for fingerprints during the investigation of crime.

Recommendations

As a result of the findings and conclusions detailed above, the following recommendations are made:

- That the newly appointed CSIs should undergo further training to reach the level of being recognized as fingerprint experts and SAPS and participate in proficiency tests in order to sharpen their skills, knowledge and expertise.
- That SAPS should utilise the experienced experts to mentor and transfer knowledge and experience to the newly appointed CSI and should increase the scarce skills allowance as a retaining strategy of fingerprint experts.
- That a refresher course be arranged for the newly appointed CSIs to be exposed on both manual and AFIS methods of identification.

That all the CSIs should be trained to conduct research nationally and internationally on fingerprint science and submit the research at-least twice annually.

Conclusion

Fingerprints play a critical role in suspect identification and prosecution, and their effective utilisation is essential for successful investigations. The article highlights the need for improvement in fingerprint-based investigations, including training, resources, and crime scene management. In forensic science, fingerprint experts use fingerprints primarily to locate, identify and eliminate suspects in criminal cases. Identifying criminal suspects through the use of fingerprinting has proven to be one of the most effective methods for apprehending persons who might otherwise go undetected and continue their criminal activities. The primary quality of fingerprints is their uniqueness to a particular individual – no two fingerprints possess exactly the same set of characteristics, and they do not change over the course of a person's lifetime. Providing regular training and workshops for Crime Scene Investigators (CSIs) on the latest techniques and best practices in fingerprint collection, analysis, and utilisation is crucial. This will enhance their skills and knowledge and help to maximise the usefulness of fingerprint evidence. In addition is further recommended that Standard Operating Procedures (SOPs) for crime scene management, fingerprint collection, and analysis be developed and implemented. This will ensure consistency and quality in the handling of fingerprint evidence. It is also necessary to foster collaboration and information-sharing between law enforcement agencies, forensic laboratories, and other stakeholders to enhance the effectiveness of fingerprint-based investigations. The use of fingerprints to identify the suspects has proved to be one of the most valuable sources of evidence in court. The crime scene must be cordoned off not only to secure the integrity of the scene but also to protect the fingerprints from being tampered with. The CSI must utilize the modern technology, including the crime scene light sources, fluorescent powders and photography to search, develop and lift fingerprints at the crime scene in order to acquire quality prints to be scanned at AFIS.

It is important that all suspects' fingerprints are taken correctly during the arrest, as this will be of help during the comparison and will make the work easier for the experts to link the suspects with the crime scenes. Poorly taken prints or prints that are not taken in sequence must be avoided and consequently cannot be searched for on AFIS but will have to be manually searched for. Training of CSIs in respect of crime scene processing, identification and presentation of fingerprint evidence in court plays a pivotal role in the maximum utilization of fingerprints in business robbery cases.

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