Xournals

Academic Journal of Forensic Sciences

ISSN: 2581-4273 | Volume 02 | Issue 01 | January-2019

The Role and Utility of Fingerprints in the Investigation of Outdoor Robbery Scenes

Malvika Mehta[1]

Available online at: www.xournals.com

Received 5th November 2018 | Revised 18th November 2018 | Accepted 13th December 2018

Abstract:

Fingerprint are considered as the versatile and easily encountered type of evidence on the field of forensic investigation. Fingerprint investigation can help to link the offender to the crime because of the basic characteristic of fingerprints which includes uniqueness, permanency and consistency. The fingerprints can be encountered in different number of cases such as burglary, murder, accidents, sexual assault and robbery. The present paper basically involves the role of fingerprint found in the cases related to outdoor robbery crime scene. The current work focus on the aim to estimate whether fingermarks or fingerprints serve as one of the important and significant techniques used for the purpose to investigate outdoor robbery scenes. The role of fingerprint on outdoor robbery cases provide ample information and help the investigator to provide a linkage and connection with the suspect, victim and scene of crime.

Keywords: *Fingerprint, Robbery, Uniqueness, Permanency, Investigator*

Authors:

1. *Cranfield University, Cranfield, England, UNITED KINGDOM*

Declaration: I hereby declare that this report titled "The Role and Utility of Fingerprints in Investigation of Outdoor Robbery Scenes" is uniquely prepared by me, Malvika Mehta). The charts, tables have been solely prepared by me and have not been copied from anywhere.

Introduction

General Introduction:

The present study aims to evaluate whether fingermarks serve as one of the important techniques used to investigate outdoor robbery scenes. "Robbery is defined as the illegal taking of something of value from the control, custody, or person of another by threatening, putting in fear, or using force." (Swanson, 2000, p-365). Fingerprint investigation can help to link the offender to the crime. There are two types of robbery- Personal and Business (Flatley. J, 2017, p-2). Planned robberies follow strategies to mitigate the possibilities of being caught. Unplanned robberies often leave behind finger marks as they are not prepared to attempt the crime. Figure 1 and 2 illustrate the types of robbery further showing divisions of theft from the person. This report aims to study the role of fingerprints with several case studies in the investigation of outdoor robbery scenes.

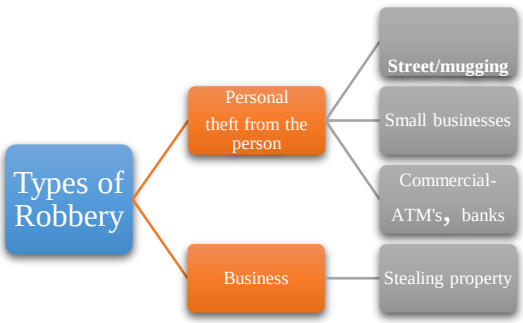


Figure 1: Types of Robbery (Swanson, 2000, p-365)

Figure 2: Types of Theft (Flatley. J, Overview of robbery and theft from the person: England and Wales, 2017, p-2)

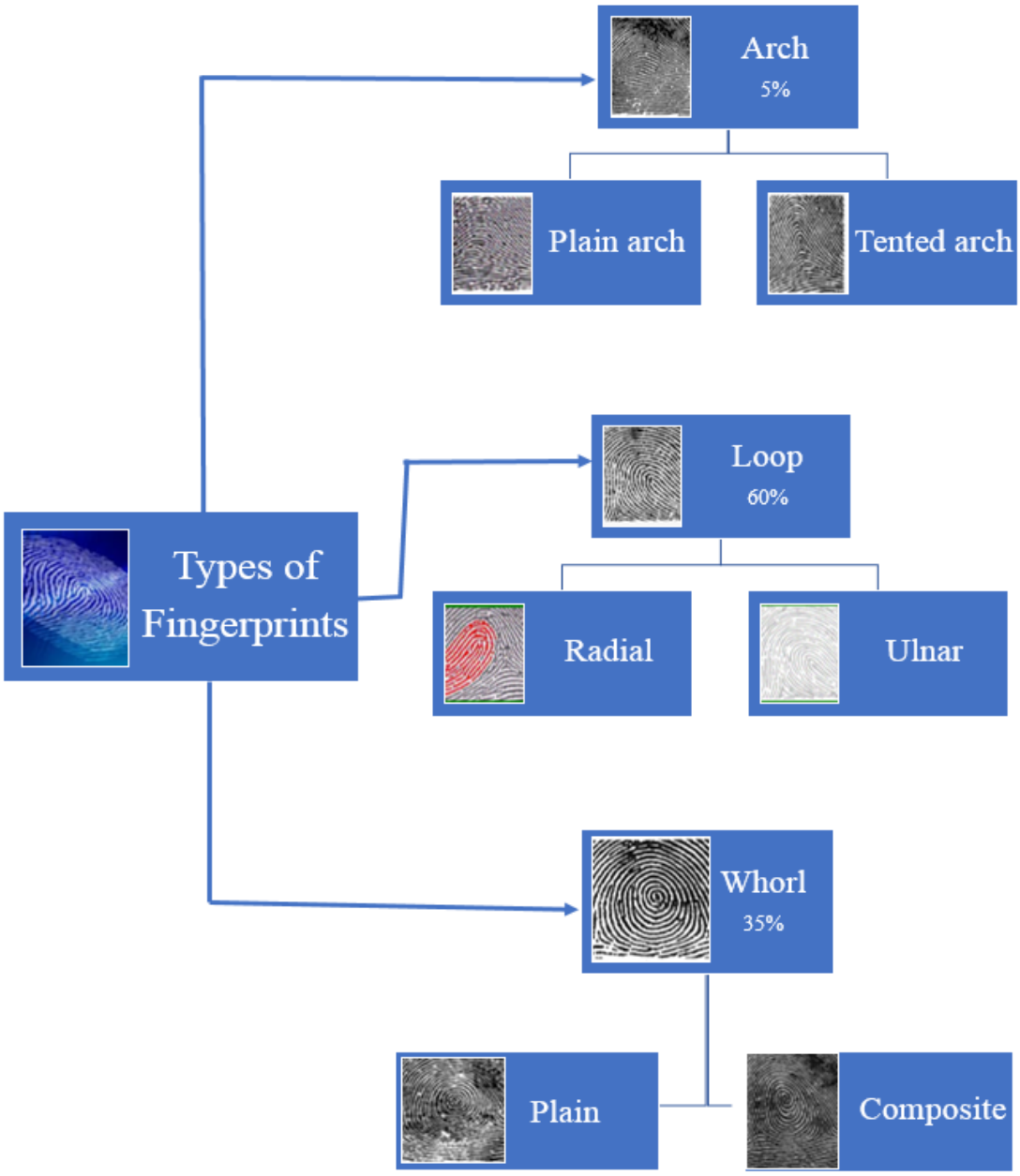
Nature of Fingerprints as evidence:

Definition: "An impression or mark made on a surface by a person's fingertip, able to be used for identifying individuals from the unique pattern of whorls and lines on the fingertips." (Oxford dictionary) There are 3 main types of fingerprints: arches, loops and whorls (ENFSI, 2015).

Class characteristics of fingerprints:

A person may have a combination or any of these patterns (McRoberts, 2012). They are further classified as shown in figure 3. These aid for primary examination of fingerprints.

Class Characteristics:



Individual characteristics: Minutiae (Galton. F, 1892, p-66-88)

Figure 3: Class characteristics of Fingerprints and percentage of their existence. (Galton. F, 1892)(Wang. L, 2014, Minutiae help in further comparison, they are major features hidden inside the prints and aid the secondary examination.

Individual characteristics: Minutiae (Galton. F, 1892, p-66-88)

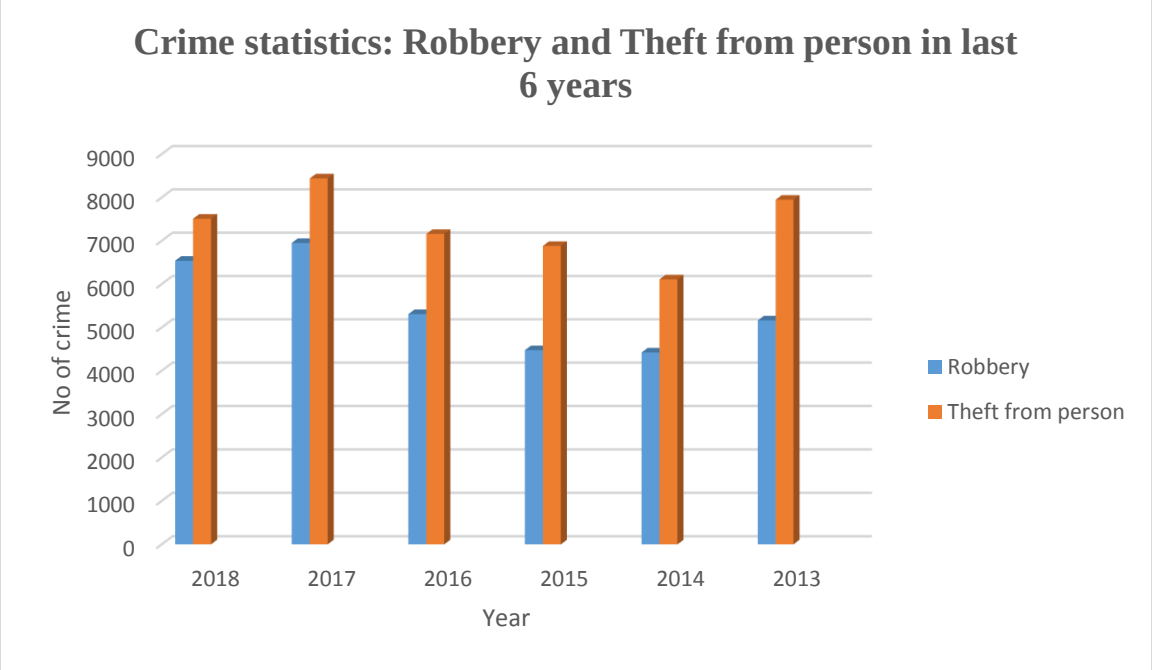
Minutiae help in further comparison, they are major features hidden inside the prints and aid the secondary examination.

Figure 4: Few individual characteristics of fingerprints (Source: Mark lifted from the mock crime scene at Cranfield University). With the help of individual characteristics, an expert examiner can make a match even with partial prints (Hoover .J, 2006).

Abundance and nature of its occurrence at a Robbery scene:

Fingerprints are most commonly retrieved at robbery scenes (Coupe and Griffiths, 1996) and is of great importance in criminal cases. In another research it has been seen that fingerprints are found up to 71% of the times in such cases (Bradbury. S, 2005). It can be used to rule out the presence of individuals and narrow the search to link individuals to the robbery. Fingerprints are lifted, processed for preliminary screening, laboratory processing and identification using the fingerprint database (Galton. F, 1892). Large archive of millions of fingerprints is maintained for example: IDENT1 can be used to compare fingerprints. It is the National database of fingerprints in the UK.

In a 'typical' outdoor robbery scene, recovered items could be identified as the victim's (such as a dropped mobile phone or wallet), the offender(s) (any weapons used to aid the offence) or indeed be irrelevant to the scene (such as litter). In such circumstances, the crime scene investigator should consider the likely origin of such items to inform the determination of evidential value. For example, a library card bearing offender(s) fingerprints found within the victim's empty wallet would confer high evidential value in linking the offender to the scene of the crime. . "From an offender's perspective, street robbery is favored for being quick and profitable – it nets cash as well as goods and drugs. Through interviews with offenders it has been found that they largely make rational decisions in the crime event, based on cost-benefit reasoning" (Tompson. L, 2012). In the year 2016, fingerprint evidence helped the police solve a year-old robbery case, the offender was armed with a pistol and entered a convenience store. He robbed the money but left a piece of paper which fell from his pocket on the ground. Police recovered that paper and sent it to the laboratory for analysis. They could get a positive identification from the fingerprints and as a result the culprit was charged with robbery (Keegan. H, 2017).



Total number of overall crime until August 2018: 546,310

Figure 5: (Based on Research police crime statistics of England and Wales: UKCrimeStats)

Figure 5 illustrates information of the recorded number of crime of robbery and theft from a person in the United Kingdom between 2013 to ending of Sept,2018. In the year 2017 both were reported maximum of about 6959 and 8438 cases respectively. On the other hand, in 2014 and 2015, Robbery was minimum at about 4421 and 4474 respectively. While, theft from the person in 2014 recorded offence was the lowest at 6880. From 2013 onwards, a U-shaped curve is seen, there is a gradual decrease from 2013 to 2015, then rising steadily by 2017. The total number of recorded crime in 2018 is approximately 546,310. In 2018 it is evident that Robbery constitutes about 1.19% and Theft from the person constitutes about 1.37% i.e. less than 1.5% of the total crimes in the UK. (UK crime stats, 2018)

A comparative study was done on the recorded number of crimes of robbery and theft from India between 2014 to 2016 as shown in figure 6. A total of 38071 cases were reported in 2014, in a span of 2 years, the number of cases reported in 2016 has reduced to 31906, a significant drop by approximately 6000 cases. As compared to other forms of crime, 1-2% of crimes come under robbery(Crime Statistics India, 2016).

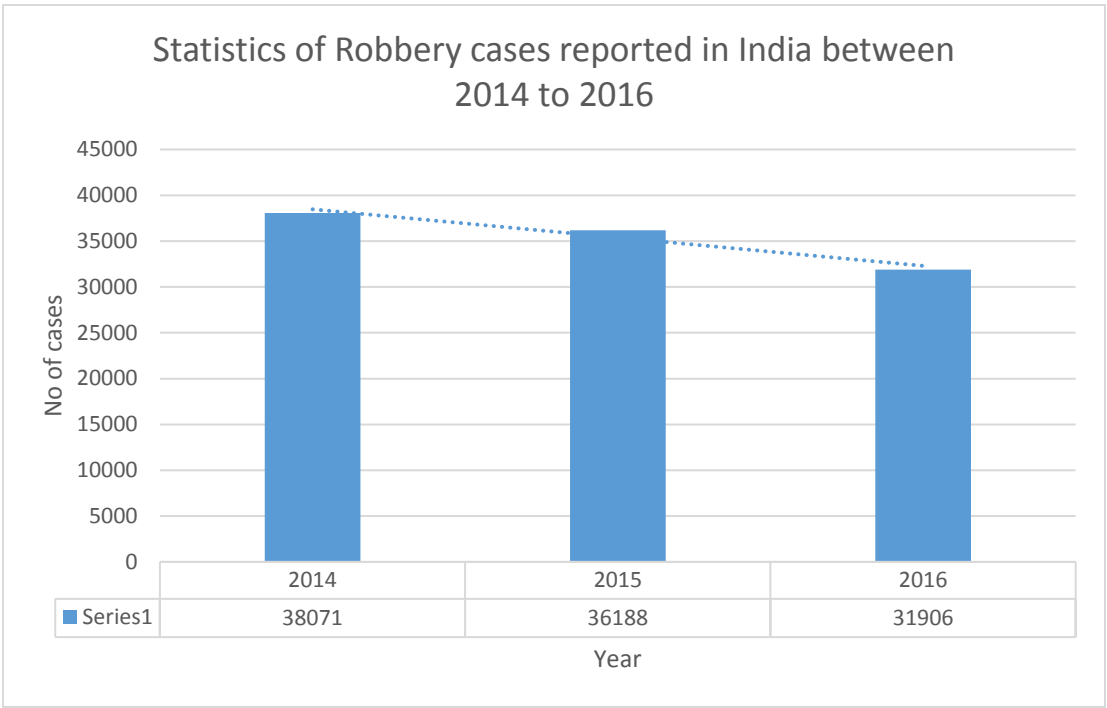


Figure 5A: Robbery cases between 2014 to 2016 in India (NCRB, Crime Statistics India, 2016)

Hence robbery is a low volume offence in the UK and in India, varying between 1% to 3% of crimes covered by CSEW and NCRB respectively.

With increase in awareness about fingerprint analysis robbers tend to wear gloves as a precautionary measure. This could be a drawback giving us no finger prints for comparison. A futuristic approach to such cases would involve intelligent use of glove prints (Sawer. P, 2008)

Where robbery incidents occurred, year ending March 2007 to year ending March 2017 CSEW[1]

England and Wales — **Personal incidents, percentages**

	Apr '06 to Mar '07	Apr '07 to Mar '08	Apr '08 to Mar '09	Apr '09 to Mar '10	Apr '10 to Mar '11	Apr '11 to Mar '12	Apr '12 to Mar '13[2]	Apr '13 to Mar '14	Apr '14 to Mar '15	Apr '15 to Mar '16	Apr '16 to Mar '17	April 2016 to March 2017 compared with: Apr '06 to Mar '07	Apr '15 to Mar '16
												Statistically significant difference	
Around the home[3]	27	16	18	25	25	18	21	15	14	19	17	..	
Around work[4]	1	2	3	4	4	0	1	8	20	8	21	..	
Street[5]	50	52	54	47	55	53	43	42	37	33	32	..	
Pub or club[6]	2	3	3	1	1	3	5	5	1	7	6	..	
Transport	6	14	8	8	2	7	5	1	8	5	2	..	
Other location	14	13	14	15	13	19	25	29	21	29	23	..	
Unweighted base - number of adults	216	197	189	193	168	167	96	92	57	85	80		

Source: Crime Survey for England and Wales, Office for National Statistics

1. Includes attempted robbery

2. From April 2012, a new location variable was introduced which means the data is not comparable across these years. 'Other location' includes car parks, inside or grounds of a shop/supermarket, a school/college/university, a friends home, a place of entertainment, sports centre or somewhere else

3. Includes home premises, whether inside/outside or garage/shed, home car park or nearby street to home.

4. Includes work premises, whether inside/outside or work garage/car parks.

5. Includes streets near work/college/sports ground/public entertainment/train or tube stations etc., subway, park/open spaces, waste grounds, and street markets.

6. Includes pub/club premises, whether inside or nearby street/car parks.

.. Denotes not available

Figure 6: (Source: Office for National Statistics, Robbery, 2017)

According to the statistics of robbery cases in UK, it is observed that majority of these offences have taken place at streets including places near work, college, grounds, entertainment locations, parks, markets etc. The number has reduced by 36% in 2017 since 2006.

The fundamental principle behind fingerprints and its forensic value: Fingerprints are formed during the Gestation period of the fetus between 11-20 weeks (McRoberts (ed), 2012). The palmar side of the hand from the fingers, palm to the wrist and the plantar surface of the feet from the toes to the heel contain minute friction skin ridges which make complicated ridge (raised) patterns along with furrows (recessed), enclosures, bifurcations with their maximum presence at the tips of the fingers and toes. These papillary ridges perspire, exude and leave a mark whenever they are in contact with any article. The main function of the finger's is gripping. Fingerprints are unique to every individual because of the pattern enciphered between the dermis and the epidermis layer of the skin (Fauld's, 2015). Its existence cannot be destroyed by superficial injuries. Fingerprints were one of the first and earliest methods used for personal identification and is based on two fundamental principles (McRoberts (ed), 2012).

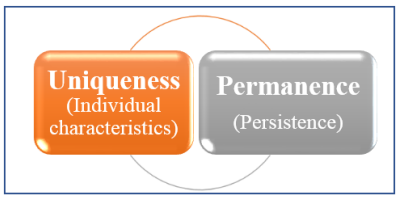
Fingerprints can be a good source of evidence in robbery scenes, as every individual has its own unique ridge characteristics, no two fingers can have the same ridge pattern making it fundamental on its own.

There are three types of fingerprints as follows (Lyle, Forensic Science (ABA Fundamentals), 2012):

Patent prints: prints which are visible to the naked eye. These prints are seen if the person has some substance on his fingers like: grease, blood, ink etc…

Plastic prints: they are seen when someone touches wax, soap or any object where the fingerprints appear 3D.

Latent prints: The natural oils on the fingers leave trace marks on the object replicating its minutiae. It is most commonly found, and it is invisible. Powder techniques are used to develop these prints, as the powder adheres to the natural oils of the skin thereby making it visible and easy to lift.



According to Galton (1892), only one in 64 million have the probability of two people having the identical fingerprint, the probability is extremely low, so it is a reliable form of evidence to prove the identity of the person. In situations where the skin has been removed, cut or rubbed off, the skin still grows back and gives the same prints as before. In fact, scar marks will make the prints all the more unique. It cannot be altered; therefore, it is permanent. (Dr. Henry Fauld, 1880). Only a severe 2nd or 3rd degree burn can damage the fingerprints, or if the tip of the finger has been cut off. These leave behind permanent scars which also demonstrate uniqueness on its own. In majority of cases the robber usually takes the cash and articles of value, he leaves behind things of lesser importance like the bag, wallet, membership cards found inside the wallet or the weapon which he used to threaten the victim. The examination of fingerprints will tell us who else was present at the crime scene and whether he/she could be linked to the crime or not. When fingerprints are compared to the other types of evidence in a public place fingerprint is considered a reliable physical evidence.

Comparing other types of evidences that maybe recovered, for example footprints may be present in all directions in an outdoor scene. Therefore, it is impossible to evaluate and identify the offender. In situations where, physical violence has happened there are comparatively better chances to find blood, it can be used for DNA analysis, otherwise, relatively low chances to find as compared to fingerprints. There are relatively low chances to find other sources of DNA (eg: hair). Even if found, the analysis is expensive and time consuming. CCTV can provide valuable information during investigation, but absence is likely to serve no digital evidence. Fiber analysis may be possible if there are known suspects and cloth fragments are found. In most of the crime scenes there is a presence of physical evidence and in about 50% of them, they are latent fingerprints (Greenwood, 1975, p-25). Remaining 50% are in the form of trace evidence such as hair, fiber etc. DNA material, foot prints or digital evidence.

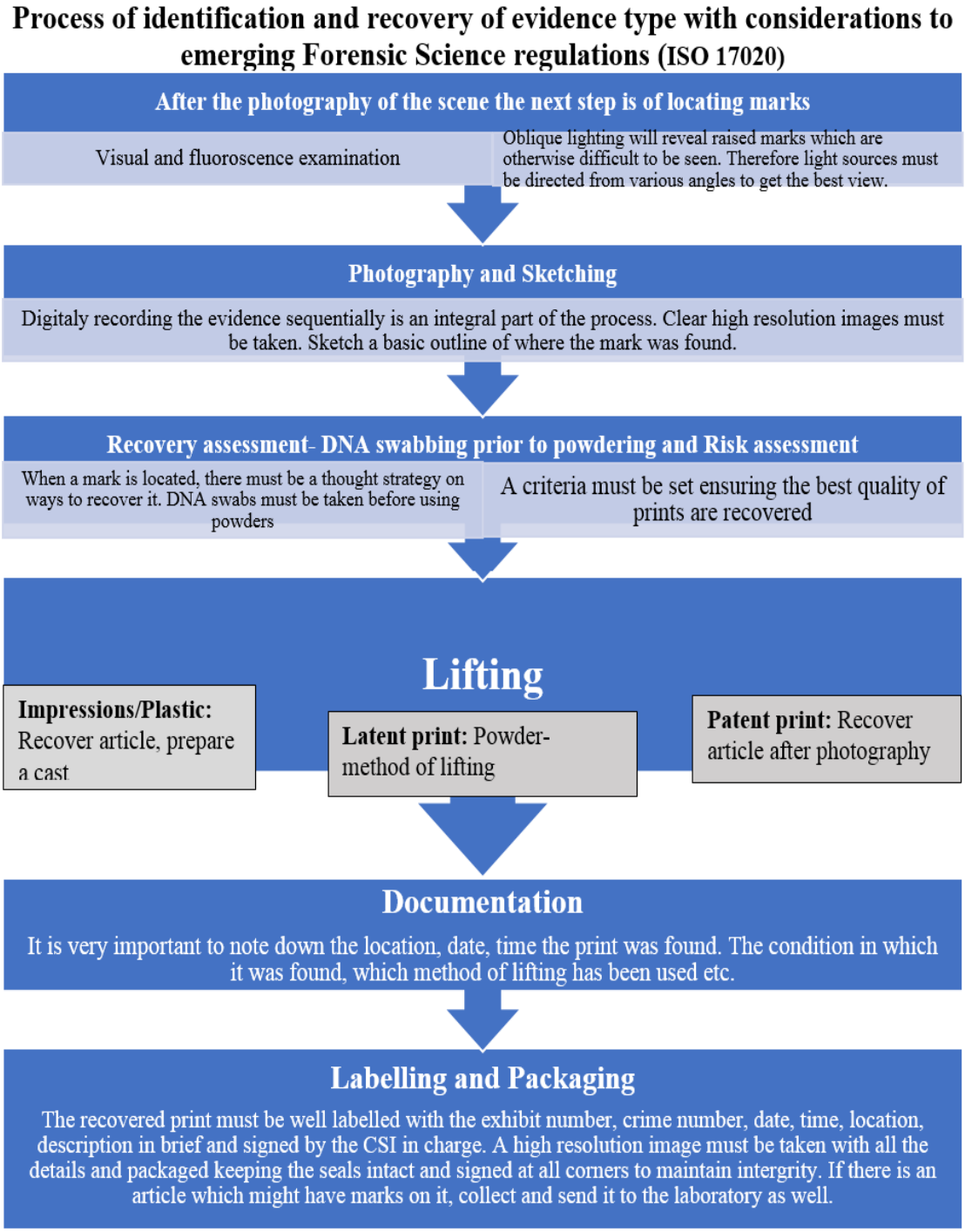


Figure 7: Procedure based on the standard guidelines for fingerprint lifting

The label should be legible with chain of custody maintained. This is sent to laboratory. The seal should be thoroughly checked for any inconsistencies or discrepancies which would question the integrity of the recovered evidence. Only then it should be processed for further

examination. The process should follow the use of non-invasive to invasive methods. Further steps to the investigation: **Analysis, Comparison, Evaluation and Verification**. According to the Forensic Science Regulator, there must be a standardized procedure to maintain the integrity and value of the evidence. With ISO 17020 all forensic serviced providers must adhere to the rules and regulations set out under this standard. The qualifications of practitioners, the tools and equipment's used for analysis all must be accredited and used in loop with the protocol (Tully, Forensic Science Regulator, 2017).

Limitations:

Risks associated with its use in Forensic Science:

Clearing of the scene even before the CSE's have arrived

Contamination of the print considering the weather (rains, snow) risk of losing evidence at outdoor scenes. Risk for losing DNA evidences by powdering first.

Multiple prints on public articles.

Human error by over-powdering or over-brushing.

Quality and amount of distortion in the mark, incomplete, superficial marks or the ones that are too dark or smudgy will complicate viewing the ridge patterns.

Cognitive bias, the mental process of knowing something and judging. Any bias caused due to the examiner's state of mind.

Aluminum powder used to lift prints is a flammable substance.

Fingerprint analysts are exposed to the entire background of the person linked- prior knowledge can influence the decision-making process of the analyst.

Contamination by using the same fingerprint developing brush from one crime scene to the other may sometimes leave traces of DNA evidences. Therefore, use of disposable brushes is recommended.

Conclusion:

"Fingerprints have been central to fighting crime for more than 100 years." (Rebecca, BBC news, 2014). Robbery is a low volume crime, varying between 1% to 3% of the total crimes in the UK and India, but they are considered violent crimes hence has optimal priority. Majority of robbery scenes take place in the open for example: streets, parks, gardens etc. Fingerprints have their own limitations, but a forensic investigator must lift whatever material is available at the crime scene for analysis of possible marks which may have high evidential value. These fingerprints may be stored, searched and compared to latest data in the fingerprint database. There is a high predominant presence of latent fingerprints in such types of crime scenes as the offender is unprepared to protect themselves from being caught. Considering all the above facts, it shows that fingerprints are unique, permanent and fundamental in nature and can be found in abundance in outdoor Robbery scenes. Therefore, it can be used as an investigation technique to solve similar crimes. However, in outdoor crime scenes where the area is accessible to other public, chances are relatively low to search for the prints that we wish to find.

References:

Bleay, S., Sears, V., Downham, V., Bandey, H., Gibson, A., Bowman, V., Fitzgerald, L., Ciuksza, T., Ramadan, J., Selway, C., 2017. Fingerprint Source Book. 2nd ed. UK: CAST.

Bradbury. S, Feist. A, (2005), The use of forensic science in volume crime investigations: a review of the research literature, Home office ONLINE report 43/50, Available at: http://www.homeoffice.gov.uk/rds, UK, [Accessed 29 October 2018].

Coupe, T. and Griffiths, M**.** (1996) Solving Residential Burglary. RDS Crime Detection and Prevention Series Paper 77. London: Home Office.

European Network of Forensic Science Institutes (ENFSI), 2015. Best Practice Manual for Fingerprint Examination. 1st ed. Europe: ENFSI.

Faulds, H., 2015. Dactylography or The Study of Fingerprints. Online ed: Chris Curnow, Thiers Halliwell.

Federal Rules of Criminal Procedure. The Committee on the Judiciary, House of Representatives; U.S. Government Printing Office: Washington, DC, 2004.

Flatley, J, 2017. Overview of robbery and theft from the person: England and Wales. Office for National Statistics, [Online]., 1-14. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/crimeandjustice/articles/overviewofrobberyandtheftfromtheperson/2017-07-20 [Accessed 27 October 2018].

Forensic Magazine. 2010. Bacon Burglar Identified Through Forensics. [ONLINE] Available at: https://www.forensicmag.com/news/2010/07/bacon-burglar-identified-through-forensics. [Accessed 27 October 2018].

Forensic Magazine. 2012. Fingerprints from Demand Note ID Bank Robber. [ONLINE] Available at: https://www.forensicmag.com/search/site/robbery%20fingerprint. [Accessed 27 October 2018].

Forensic Magazine. 2013. Fingerprints Lead to Arrest in Robbery. [ONLINE] Available at: https://www.forensicmag.com/news/2013/11/fingerprints-lead-arrest-robbery. [Accessed 27 October 2018].

Forensic Magazine. 2017. New Fingerprint Searches in Unsolved Cases Can Solve Violent Crimes. [ONLINE] Available at: https://www.forensicmag.com/news/2017/03/new-fingerprint-searches-unsolved-cases-can-solve-violent-crimes. [Accessed 27 October 2018].

Forensic Magazine. 2018. Jurors Trust Expert Testimony and Match Probabilities Equally—Up to a Point. [ONLINE] Available at: https://www.forensicmag.com/news/2018/04/jurors-trust-expert-testimony-and-match-probabilities-equally-point. [Accessed 27 October 2018].

Galton, F., 1892. Fingerprints. 1st ed. London: Macmillan and Co.

Garette, B, Mitchell, G, 2013. How Jurors Evaluate Fingerprint Evidence: The Relative Importance of Match Language, Method Information, and Error Acknowledgment. Journal of Empirical Legal Studies, [Online]. Volume 10, Issue 3, 484-511. Available at: https://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=6548&context=faculty_scholarship [Accessed 27 October 2018].

Greenwood, P, Petersilia, J, 1975. The criminal investigation process volume 1: Sum. Department of Justice, Law Enforcement Assistance Administration, National Institute of Law Enforcement and Criminal Justice, Vol 1, p-1-48.

Henry. L, Gaensslen. R. 2013, Advancements in Fingerprint Technology. 2nd ed. The United States: CRC Press

Home Office. 2016. IDENT1. [ONLINE] Available at: https://data.gov.uk/dataset/a61d73a0-6935-4821-86da-c6f0988eaa1d/ident1. [Accessed 28 October 2018]

Hoover, J., 2006. The Science of Fingerprints, Classification and Uses. US: Jason Isbell, Linda Cantoni and online. Available at: https://www.ijcsmc.com/docs/papers/August2016/V5I8201617.pdf [Accessed 27 October 2018].

International Association for Identification, et al., 2011, Fingerprint source book, National Institute of Justice, US, NIJ

Joint EA-ENFSI working group, 2015, Guidance for Implementation of ISO/IEC 17020 in the field of Crime Scene Investigation, European Co-operation for Accreditation, p-1-22.

Kanbar, A, 2016. Fingerprint Identification for Forensic Crime Scene Investigation. International Journal of Computer Science and Mobile Computing, Vol. 5, Issue. 8, 60-65. Available at: https://www.ijcsmc.com/docs/papers/August2016/V5I8201617.pdf

Keegan, H, 2017. Fingerprint helps Springfield police solve year-old robbery, documents say. Springfield news leader, 30 November 2017.

Kiely, T., 2015. Forensic Evidence: Science and The Criminal Law. US: Taylor & Francis Group, LLC, CRC Press.

Lidong Wang, and Cheryl Ann Alexander, "Fingerprint Patterns and the Analysis of Gender Differences in the Patterns Based on the U Test." International Transaction of Electrical and Computer Engineers System, vol. 2, no. 3 (2014): 88-92.

McRoberts (ed), A., 2012. The fingerprint sourcebook. US: U.S. Department of Justice Office of Justice Programs.

Met police. 2018. Year and Crime stats 2017-2018. [ONLINE] Available at: https://www.met.police.uk/sd/stats-and-data/met/year-end-crime-statistics/. [Accessed 27 October 2018].

National Association of Testing Authorities, 2013, ISO/IEC 17020:2012 Inspection Standard Application Document, Australia, NATA, p-1-31

NFSTC, 2013. Crime Scene Investigation-A Guide for Law Enforcement. US: National Forensic Science Technology Center.

Ons Gov UK, Crime in England and Wales (pdf) 2018. [ONLINE] Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/crimeandjustice/methodologies/userguidetocrimestatisticsforenglandandwales. [Accessed 27 October 2018].

Rebecca, BBC news. 2014. Fingerprints give police new clues for solving crime. [ONLINE] Available at: https://www.bbc.co.uk/news/science-environment-26668838. [Accessed 28 October 2018].

Sawer. P. 2008. Police use glove prints to catch criminals. [ONLINE] Available at: https://www.telegraph.co.uk/news/uknews/law-and-order/3740688/Police-use-glove-prints-to-catch-criminals.html. [Accessed 28 October 2018].

Shaikh, M, 2013. BSC A Novel Scheme for Providing Security using Biometric Smart Card. International Journal of Computer Applications (0975 – 8887), [Online]. Volume 80 – No1, 43-51. Available at: https://www.researchgate.net/publication/272864148_BSC_A_Novel_Scheme_for_Providing_Security_using_Biometric_Smart_Card [Accessed 27 October 2018].

Sheridan S. 2013. Techniques for Collecting and Analyzing Fingerprints. [ONLINE] Available at: https://ncforensics.wordpress.com/2013/06/20/techniques-for-collecting-and-analyzing-fingerprints/. [Accessed 29 October 2018].

Swanson. S, Chamelin. N, Territo. L, 2000, Criminal Investigation.7th ed. The United States:MC-Graw Hill

Thompson, C, 2010. No fingerprints? They have many ways of disappearing. The Arizona Republic, [Online]. Available at: http://archive.azcentral.com/arizonarepublic/news/articles/20100219clay0220.html [Accessed 27 October 2018].

Tillmann S, William L, 2015. IAFIS Fingerprint Search Solves 45-Year-Old Double Police Officer Murder. Proquest, [Online]. Vol 65, Iss 4, p-1,2. Available at: https://search.proquest.com/openview/d6fda6d2f684a70c5adac6cb79d78e1a/1?pq-origsite=gscholar&cbl=29772 [Accessed 28 October 2018]

Tully, Dr G, 2017. Codes of Practice and Conduct. Forensic Science Regulator, Issue 4, 1-67.

UK crime stats. 2011. The 4 different types of Robbery. [ONLINE] Available at: http://ukcrimestats.com/blog/2011/07/27/the-4-different-types-of-robbery/. [Accessed 22 October 2018]

UK crime stats. 2018. National Picture. [ONLINE] Available at: http://www.ukcrimestats.com/National_Picture/. [Accessed 27 October 2018].

UK crime stats. All Police Forces. [ONLINE] Available at: http://www.ukcrimestats.com/Police_Forces/. [Accessed 27 October 2018].

UKAS. 2010. SO/IEC 17020 Accreditation for Crime Scene Investigation – Expression of Interest Notice. [ONLINE] Available at: https://www.ukas.com/news/isoiec-17020-accreditation-for-crime-scene-investigation-expression-of-interest-notice/. [Accessed 27 October 2018].

UKAS. 2016. Forensic science providers: codes of practice and conduct, 2016. [ONLINE] Available at: https://www.gov.uk/government/publications/forensic-science-providers-codes-of-practice-and-conduct-2016. [Accessed 27 October 2018].

UKAS. Forensic Science: Accreditation. [ONLINE] Available at: https://www.ukas.com/sectors/forensic-science/. [Accessed 27 October 2018].

Ulery, B., Hicklin, A., Buscaglia, J., and Roberts, M., 2011. Accuracy and reliability of forensic latent fingerprint decisions. Proceedings of the National Academy of Sciences of The United States of America, [Online]. Available at: http://www.pnas.org/content/108/19/7733 [Accessed 27 October 2018].

www.ons.gov.uk. 2017. Overview of robbery and theft from the person: England and Wales. [ONLINE] Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/crimeandjustice/articles/overviewofrobberyandtheftfromtheperson/2017-07-20. [Accessed 24 October 2018].