



The Role of Fingerprint Analysis in Crime Investigation and Legal Frameworks

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ABSTRACT

The field of forensic science has witnessed significant advancements over the years, with fingerprint analysis emerging as a crucial tool in both crime investigation and legal frameworks. This research paper delves into the evolution of fingerprint analysis, tracing its journey from traditional manual comparison methods to the sophisticated Automated Fingerprint Identification Systems (AFIS) that are widely used today. Fingerprints, being unique and immutable to every individual, have long been regarded as one of the most reliable forms of biometric identification. The study explores the importance of fingerprint evidence in criminal investigations, emphasizing how its accuracy aids in identifying suspects, linking individuals to crime scenes, and exonerating the innocent. In addition, the paper critically analyzes the role of fingerprint analysis within legal systems, focusing on its admissibility in courts and the standards required to ensure its credibility. Recent advancements, such as digital enhancement techniques and 3D fingerprint imaging, have further revolutionized the way fingerprints are collected, analyzed, and interpreted, making the process more efficient and reliable. However, these advancements also present challenges, including concerns over privacy, potential human error, and the need for standardized procedures across jurisdictions. The research highlights the ongoing relevance of fingerprint analysis in modern forensic science and the justice system, while also pointing to future innovations that could further enhance its role in solving crimes and supporting legal proceedings.

INTRODUCTION

Forensic science has undergone significant advancements over the past century, transforming the way crimes are investigated and prosecuted. Among its many tools, fingerprint analysis stands as one of the most reliable and widely used methods of personal identification. The uniqueness, permanence, and individuality of fingerprints have made them a cornerstone in forensic investigations. As technology progresses, fingerprint analysis has evolved from basic manual comparison methods to highly sophisticated automated systems, enhancing both the accuracy and efficiency of criminal investigations. This research paper delves into the role of fingerprint analysis in modern forensic science, highlighting its contributions to crime scene investigations and legal frameworks. It explores the historical development of fingerprint analysis, technological advancements in detection and identification techniques, and its pivotal role in linking suspects to crime scenes. Additionally, the paper examines how fingerprint evidence is integrated within legal processes, focusing on its admissibility, reliability, and challenges in contemporary judicial systems.

By analyzing both the scientific and legal dimensions of fingerprint analysis, this paper aims to provide a comprehensive understanding of its enduring relevance and evolving significance in the realm of crime investigation. A fingerprint in its narrow sense is "an impression left by the friction ridges of a human finger." It is "a reproduction of the ridge formation of a finger on a surface". Fingerprints are easily deposited on suitable surfaces (such as glass or metal or polished stone) by the natural secretions of sweat from the eccrine glands that are present in epidermal ridges. These are sometimes referred to as "Chanced Impressions".

FINGERPRINTS

Each individual possesses friction ridges on their hands and feet. The skin that covers the palms and soles is distinct from that of other body areas, as it is raised into tiny ridges that typically align in specific patterns. This type of skin is known as 'friction skin,' and the ridges are commonly identified as papillary ridges. At the fingertips, these papillary ridges create distinct patterns that may be consistent across all fingers of both hands or may vary from one finger to another, with multiple recognized patterns potentially present within the same person.¹

Role of Fingerprints:

¹ Dr. S.R. Myneni's, Forensic Science, 84 (1st ed.,2019)

invisible and require special techniques like powdering or chemical treatment to make them visible. Patent prints are visible to the naked eye, often left when fingers are stained with substances such as blood or ink. Plastic prints are impressions left on soft surfaces like clay or wax.

FINGERPRINTING IN CRIME INVESTIGATION⁷

Fingerprint analysis plays a crucial role in criminal investigations, especially in cases where a suspect has left behind fingerprints at the crime scene. The technique helps investigators establish the presence of individuals at crime scenes, which can either inculcate or exonerate suspects. One of the primary uses of fingerprint analysis is to establish the identity of unknown individuals. In cases of burglary, homicide, or other crimes, investigators can retrieve prints from various surfaces, leading to the identification of suspects through database matches.

Fingerprint analysis helps link multiple crimes by identifying the same individual at different crime scenes, enabling law enforcement agencies to track serial offenders or identify patterns. In many jurisdictions, latent prints recovered from cold cases are periodically re-analyzed with new fingerprint databases or advanced technology, sometimes solving decades-old crimes. Fingerprints can corroborate or refute suspects' claims about their whereabouts. For instance, if a suspect claims they never entered a building where a crime occurred, but their fingerprints are found on a doorknob or other surface, it provides critical evidence contradicting their statement.

LEGAL ASPECTS OF FINGERPRINT ANALYSIS IN INDIAN

The Indian Penal Code (IPC) of 1860, being a comprehensive criminal code, does not directly address forensic evidence like fingerprint analysis since these techniques were not prevalent at the time. However, the legal aspects of fingerprint analysis in India are governed under various other laws, procedures, and case precedents that work alongside the IPC. Here's an overview of how fingerprint analysis is integrated into the Indian legal system, particularly in relation to the IPC:

❖ Indian Evidence Act, 1872

While the IPC focuses on defining crimes and prescribing punishments, the Indian Evidence Act, 1872 governs the admissibility of evidence, including fingerprint evidence. Under the Evidence Act:⁸

- **Section 45:** Opinions of experts, including fingerprint experts, can be used in courts. A fingerprint expert's testimony is admissible, provided they have been qualified as an expert and their testimony is deemed relevant.
- **Section 73:** A court may direct a person to provide their fingerprints for comparison purposes. This provision enables the court to compare the fingerprints in question with known samples.

❖ Identification of Prisoners Act, 1920

This Act provides the legal framework for the taking of fingerprints in India. It allows law enforcement authorities to take the fingerprints of individuals:

- **Section 3:** Permits the collection of fingerprints of convicted individuals, those arrested for certain crimes, and under trial prisoners.
- **Section 4:** Empowers a magistrate to direct any person to submit their fingerprints for investigation.

The Identification of Prisoners Act plays a crucial role in allowing law enforcement to collect and use fingerprints as evidence, which can then be used under the provisions of the IPC during criminal trials.⁹

❖ Admissibility of Fingerprint Evidence in Courts

Though the IPC does not directly deal with fingerprints, crimes such as murder, theft, forgery, and others defined under the IPC can be solved using fingerprint analysis. The admissibility of fingerprint evidence has evolved over time through various court judgments. Indian courts generally accept fingerprint analysis as reliable scientific evidence if certain conditions are met:

- **Chain of Custody:** The collection, preservation, and analysis of fingerprints must maintain an unbroken chain of custody.
- **Expert Testimony:** As per Section 45 of the Evidence Act, the opinion of fingerprint experts is crucial, and their analysis must be presented through expert testimony.
- **Scientific Validity:** Courts require that fingerprint evidence be based on scientifically recognized and standardized methods.

⁷ <https://www.legalserviceindia.com/legal/article-2463-fingerprints-a-forensic-tool-for-criminal-investigation.html>

⁸ Dr. S.R. Myneni's, Forensic Science, 113 (1st ed.,2019)

⁹ Dr. S.R. Myneni's, Forensic Science, 114 (1st ed.,2019)

CASE LAWS

Several judgments have upheld the use of fingerprint evidence in criminal cases, often in connection with IPC-defined crimes. Some important precedents include:

1) Mahamood v. State of U.P.¹⁰

It has been held by the Supreme Court that it would be highly unsafe to convict on a capital charge without any independent corroboration of the opinion of the fingerprint expert.

2) State of M.P. v. Sitaram¹¹

It has been held that the court must satisfy itself about the correctness of the conclusions by comparisons of the prints, it cannot be laid down as a rule of law that it is unsafe to have conviction on the uncorroborated testimony of a fingerprint expert.

3) Mohan Lal v. Ajit Singh¹²

It was held as follows Similarly it is for a competent technician to examine and give his opinion whether the identity can be established and if so whether this can be done on eight or even less identical characteristics in an appropriate case.

4) H.P. Administration v. Om Prakash¹³

It has been held that the report of the Director, Fingerprint Bureau is treated as evidence without examining him because the comparison and identification of fingerprints have developed by now into a science and the results derived therefrom have reached a stage of exactitude. It has further commented that as long as the report shows that the opinion was based on observation, which led to a conclusion, that opinion can be accepted.

5) State of M.P. v. Sitaram Gajraj Singh¹⁴

It has been held that where it is proved by competent expert testimony that two fingerprints contain several points of agreement and no points of disagreements in minutiae, no further evidence is necessary to prove that they were made by the same finger.

6) In Jaspal Singh v. State of Punjab¹⁵

The Court has held that science of fingerprint identification is an exact science and does not admit of any mistake or doubt.

CONCLUSION

In conclusion, advancements in forensic science, particularly in fingerprint analysis, have significantly enhanced the precision and reliability of crime investigations. The evolution of fingerprint technology, from manual identification to automated systems like AFIS (Automated Fingerprint Identification System), has accelerated the process of matching prints and improved the accuracy of criminal profiling. These advancements not only aid in solving cases more efficiently but also strengthen the evidentiary value of fingerprint analysis in legal proceedings. Fingerprint analysis remains a cornerstone in forensic science due to its uniqueness, permanence, and consistency. Its ability to link individuals to crime scenes has led to higher conviction rates and the resolution of cold cases. However, as technology continues to evolve, so too must the legal frameworks that govern its use. Ensuring that ethical considerations, privacy rights, and the potential for errors are addressed is vital to maintaining public trust in forensic processes.

As we look forward, the integration of artificial intelligence, machine learning, and further refinement in imaging technologies promises to enhance fingerprint analysis even more. These innovations will likely reduce human error and allow for more robust cross-referencing of fingerprint databases across jurisdictions, reinforcing the critical role of fingerprints in modern crime investigation and the judicial system. Thus, the continuous development of both forensic science and legal standards is essential to uphold the integrity and effectiveness of fingerprint analysis in crime solving.

¹⁰ AIR 1976 SC 69

¹¹ (1970) MPLJ 197

¹² AIR 1978 SC 1183

¹³ AIR 1972 SC 975

¹⁴ Criminal Law Journal 1978 M.P. 1220

¹⁵ AIR 1979 SC 1708