

Opportunities In Ensuring Forensic Science Reliability in Criminal Proceedings In India

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Abstract

One of the most important aspects of a criminal investigation is forensic science since it is exact, accurate, and increases the likelihood of passing a preliminary examination or test. Due to its scientific nature, it plays a key part in the criminal equity system. Forensic science is an umbrella term that includes several scientific subjects and almost all clinical specializations; it is most definitely not one topic. The wider corpus of laws serve as the framework under which the discipline of forensic evidence functions. Since it is significantly less accessible to the general public, addressed report assessment (QDE) is one of the less commonly investigated subjects in the exploration function area. The proposed essay makes an intentional effort to understand the validity of the methods used to ensure the legitimacy of addressed documents in Indian Official courtrooms as a result. A subjective and quantitative exploratory technique is used to support the examination of 200 respondents, who effectively function as front specialists and judges/justices in India. The evaluation's results show a clear image of the questionable archive's sufficiency with a manual of factual results.

Keywords: Opportunities, Ensuring, Forensic Science, Reliability, Criminal Proceedings, India

1. Introduction

The term "forensic science" refers to the study of legal difficulties using rational, physical, and social ideas. Regardless of their respective fields of expertise, the majority of forensic professionals agree that the inquiry should begin at the site. Whether the evidence consists of bloodstains, human remains, hard drives, records, and papers, or clinical records, the proper inspection, collection, and safeguarding of the evidence is essential for establishing reality and assuring accurate evaluation and translation of the evidence.

Scene examinations are focused with locating, maintaining, and evaluating a site where a criminal demonstration may have taken place as well as any applicable evidence in the vicinity in order to recreate events using the logical approach. It's crucial to precisely record a scenario, gather the evidence, compile it, and be able to back it up afterwards. Evidence must be acquired in a way that preserves its credibility while avoiding pain, contamination, and negative change. Supporting the evidence's chain of custody from the scene to the laboratory or storage is crucial. The chain of guardianship refers to the relationship between examiners who preserve evidence during a case. It includes information on who gathered the evidence, how it was gathered, who claimed it after it was gathered, and the date and time of the incident.

The law changes along with society because contemporary society is dynamic rather than static. The legal executive interprets the law in light of current circumstances, and the law safeguards the broader public. Finding evidence of injustice, investigating it, and organizing equity are not new ideas in India. Due to advances in science and technology, crimes have evolved in nature. Despite this, a lot of people are unaware of how important science is in identifying wrongdoers and guilty parties. The available activity space is vast and varied. It is known as "forensic science" when it is used to the administration of justice. A specialist's opinion was sought in order to determine the cause of death of an individual, both in the case of normal death and unnatural death, because true medicine was what first entered the field of science in the past.² New developments and methods are causing a fast change in the field of forensic science. Researchers now use DNA testing, high-performance liquid chromatography, mass spectrometry, three-dimensional computers, and other cutting-edge technology to study crime and its occurrence. Modern forensic science can distinguish up to 200 or 300 small components and natural material particles.

A key element of the criminal justice system, modern forensic science is a highly developed logical approach used in criminal and civil investigations that can yield important discoveries. In this regard, forensic science is a novel idea in India.⁴ In an effort to uphold fairness and advance justice, science and regulation—two apparent callings—have intertwined more and more. The challenges faced by regulation have been made more onerous by the requirement that current rules often accord with fresh logical findings. The fundamental differences between the legal approach and the logical strategy are the foundation of many of these issues. The difficulties are obvious. According to one viewpoint, the logical proof presents the exciting possibility of a highly accurate, verifiable analysis and a decrease of the uncertainty that commonly penetrates the legal dynamic cycle. But logical ideologies frequently introduce risks related to uncertainty that the body of laws as a whole cannot tolerate.

A former member of the legal community is now a forensic scientist. It is urgent and widely required that forensic science be used in the criminal equity conveyance system. The social environment is changing quickly. India has evolved from a country of pilgrims to a republic that was established by popular demand. The spread of equity now depends heavily on forensic science because of the failure of the prior request, the dependability of its instruments and approaches, and the location's exceptionally long-lasting accessibility with all of its assistance. If it really meets societal goals, it ought to be used considerably more widely than it is currently under our criminal equity system.

2. Literature Review

The paper "Difficulties and Opportunities in Forensic Science in India" by Dutta and Bhattacharya (2019) was presented at the International Conference on Information Science and The Board. The authors highlight the significant challenges faced by forensic science in India, including an out-of-date legal framework, little funding, and limited collaboration between forensic experts and law enforcement. They stress the urgent need to address these issues and suggest a few areas for improvement, such as updating forensic labs, improving programs for forensic professionals, and promoting integrated interdisciplinary examination efforts.

A contextual analysis led by Kaur and Rani (2020) with the title "Ensuring reliability of forensic science in criminal proceedings: A contextual investigation of India" was published in the Diary of Forensic

Exploration and Examination. The authors focus on a specific contextual inquiry in India to examine the factors that affect the validity of forensic science evidence in legal procedures. They identify problems include poor proof collection and preservation, a lack of standardization in forensic procedures, and difficulties in explaining intricate logical concepts to uninformed audiences. In order to ensure credibility in criminal proceedings, the review discusses the importance of adhering to standard procedures, creating proof handling techniques, and improving the correspondence of forensic discoveries.

In the Global Diary of Applied Science and Innovation, Singh and Sharma's (2018) article titled "Forensic science in criminal proceedings: Difficulties and techniques for reliability in India" is available. The authors look at the challenges faced by forensic science in India, such as the lack of quality control methods, the lack of training opportunities for forensic specialists, and the limited awareness of the role and limitations of forensic proof among legitimate professionals. They suggest methods to strengthen reliability, such as establishing frameworks for accreditation for forensic research institutions, enhancing preparation and schooling programs, and increasing greater coordination between forensic specialists and legal experts.

In the Indian Journal of Criminal science and Criminalistics, Raghavan's article from 2021 titled "Ensuring Forensic Science Reliability in Criminal Proceedings in India: Legal and Institutional Perspectives" was published. The author focuses on the institutional and legal factors that affect the validity of forensic science evidence in India. Raghavan discusses the challenges involved in the acceptance and interpretation of forensic evidence in court, including concerns about the logical validity, dependability, and skill of forensic professionals. In order to ensure the validity of forensic evidence in judicial processes, the paper discusses the need for strong legal frameworks, training programs for forensic professionals, and increased collaboration between forensic researchers and the broader body of laws.

A 2019 paper by Dhingra and Dhillon titled "Reinforcing Forensic Science Reliability in India's Criminal Equity Framework: A Guide for Change" was published in the Journal of Indian Regulation and Society. The authors offer a comprehensive manual for revamping India's forensic science system in order to increase its dependability in legal processes. They are aware of important issues such the lack of value control, inadequate assets, and limited access to cutting-edge forensic developments. The paper suggests methods for strengthening the forensic science framework, such as the establishment of frameworks for the licensing of forensic labs, advancements in the practices for gathering and safeguarding evidence, and the promotion of interdisciplinary collaboration among forensic specialists, researchers, and legal experts.

It was published in the Journal of Forensic Sciences under the title "Improving Forensic Science Reliability in Criminal Proceedings: Opportunities for Mechanical Headways in India" by Gupta and Reddy in 2022. The focus of the creators is on how mechanical advancements might improve the validity of forensic science in India. They look at many possibilities, such as the application of cutting-edge perceptive techniques like DNA profiling, distinctive mark analysis, and advanced forensics. The importance of investing resources in creative work, training forensic experts to use these innovations,

and setting up workable rules for their execution are all discussed in the study. These mechanical developments offer great potential for enhancing the precision and dependability of forensic scientific evidence in legal processes.

In Forensic Science Global: Reports, Sharma and Chatterjee's article titled "Reinforcing forensic science reliability in criminal proceedings: Job of value the board frameworks in Indian forensic labs" is available. The focus of the creators is on the role that quality management systems (QMS) play in advancing India's forensic scientific reliability. They emphasize the importance of implementing globally recognized QMS, such as ISO/IEC 17025, in forensic research facilities. The potential for developing standardized conventions, quality affirmation methods, and capacity testing programs is discussed in the article. By adopting QMS, Indian forensic labs can increase their credibility, ensure the accuracy of forensic evidence, and improve how forensic science generally functions in legal procedures.

In the Global Diary of Computerized Wrongdoing and Forensics, Roy and Joshi's article from 2020 titled "Utilizing computerized advancements for ensuring forensic science reliability in criminal examinations in India" is published. The authors look on the possibilities offered by technological developments in assuring the accuracy of forensic science in criminal investigations in India. They discuss how to handle and analyze computerized evidence using cutting-edge forensics tools, information analysis techniques, and artificial intelligence. The study highlights how these developments can improve the competence, accuracy, and dependability of forensic evaluations in criminal proceedings. The authors emphasize that in order to take use of these mechanical opportunities, forensic specialists must receive specialized training, and dedicated computerized forensics research facilities must be established.

3. Research Methodology

Both subjective and quantitative methodologies are used in the review. Over the course of five months, fieldwork was carried out in the Indian region of Karnataka's Hubli Dharwad. The belief that both qualitative and quantitative methodologies may contribute to a complete comprehension of the study themes of forensic assessment and the acceptability of addressed reports as evidence in court makes the use of a blended research strategy conceivable.

The suggested study ensures that about 200 respondents will be involved in the review. Judges, Senior Backers, and Forensic Specialists are the assessment's respondents; they are randomly selected individuals from the universe. There are 120 respondents who are Hubli-Dharwad-based Senior Backers and Judges.

3.1. Case Study

The Bombay High Court supported the legality of the use of narcoanalysis and lie detector testing in Ramchandra Reddy and Ors. v. State of Maharashtra. In Selvi and Ors. v. State of Karnataka and Anr., the court determined that comments from brain mapping or narco-analysis tests are inconclusive, making their obligatory investigation illegal.

According to Section 53 of the Criminal Procedure Code, the accused may be subjected to a medical examination if the authorities believe it may uncover any proof of the crime. In 2005, improvements to criminal procedure were made to enable the analysis of blood stains, DNA profiles, semen tests, swabs, hair samples, etc.; nevertheless, these modifications only applied to rape cases. Similar to this, the Criminal Procedure Act's Section 164A allows the medical examiner to speak with the rape victim within 24 hours after the crime. The ability of all practitioners to get DNA samples is questionable, though. The collecting of samples cannot be tainted because it would render them unusable, as is common known.

According to Section 45 of the Indian Evidence Act, when the court must form an opinion on a matter of science, art, or foreign law, or as to the identity of handwriting or finger impressions, relevant facts include the opinions of people who are specifically skilled in such foreign law, science, or art, or in questions as to the identity of handwriting or finger impressions. They are referred to as specialists. Additionally, when expert opinions are crucial, Section 46 of the Indian Evidence Act states that facts that are not ordinarily relevant become relevant if they support or refute such opinions. The court in Mohd. Aman v. State of Rajasthan noted that because the science of footprint identification is not yet fully developed, if evidence pertaining to it is found to be sufficient in a particular case, it may only be used to support the identification of a perpetrator that has already been made based on other evidence.

3.2.Hypothesis of the study

The following are the null hypothesis for the study:

H01: The currently used technology for document analysis is incredibly ineffective.

H02: Document Under Question The evidence is not uniform.

H03: The level of education, professional experience, necessary abilities, and certification for the experts are gravely inadequate.

4. Data Analysis and Result

This section provides a thorough description of the assumptions made by SPSS instruments while using a variety of measurable strategies. The standard deviation of the variables utilized to support the goals of this assessment is also provided. The sample size for the current study is 200 respondents. The terrific pressure is to understand about addressed reports, keeping in mind the specialist has tried to produce a determination with specific measuring devices to arrive at the resolution. Despite the fact that many scientists employ it for research information collection.

Table 1:Technology Adoption: A Descriptive Analysis

Description Analysis	Mean	SD
Modern QD analysis techniques rely more on computer expertise.	2.46	.963
When the most recent technology are employed, the likelihood that QD will be admitted as valid evidence in a court of law is great.	2.84	.848

The fascinating outcome of lawful innovation that is incorporated in the analysis of Addressed Reports is shown in Table 1. The outcome demonstrates the mesmerizing measurements of mean and standard deviation, where it is very likely to be seen that cutting-edge developments of addressed records are

more dependent on processing capabilities, saving time and increasing examination efficiency. When the most recent innovation is used as routine methods are more in line with human capabilities, there is a high likelihood that QD will be accepted as authentic evidence in a case.

Table 2:Technology Adoption ANOVA Test in QDE

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	3.044	6	2.125	2.471	.352
Within Groups	26.731	34	.624		
Total	29.775	40			

Table 2 looks at the actual findings of the change inquiry. The outcome demonstrates that, at 5% Degree of Importance, the defined traits are higher than the table qualities. A five-point rating system was used to collect the data.

Table 3:Technology Adoption Chi-Square Test in QDE

Chi-Square Test	P value	Null Hypothesis
		Accepted/Rejected
Modern QD analysis techniques rely more on computer expertise.	.000	Accepted
When the most recent technology are employed, the likelihood that QD will be admitted as valid evidence in a court of law is great.	.000	Accepted

Table 3 includes information on the validity of the invention when applied to the analysis of Addressed Records. To determine whether or whether significant innovation is pursued in that state of mind of the Addressed Record, a Chi-Square dependence test was conducted. The results, which are shown in the above table, demonstrate that the determined traits are not precisely those listed in the table at the 5% Degree of Importance. A five-point rating system was used to collect the data. It is generally assumed that invalid supposition is acknowledged based on the above-mentioned measurable test. The innovation now used to examine the addressed report is essentially wasteful. Therefore, it might be said that no significant innovations are made during the analysis of the addressed archives.

Table 4:Descriptive Analysis to Standardize Documents

Description Analysis	Mean	SD
Quality Control	37.56	152.332
Insufficient forensic evidence reduces the admissibility of the evidence.	22.25	84.145

Whether or not the Addressed Record evidence is normalized, Table 4 presents the insightful conclusion for the investigation. The outcome displays the instructive mean and standard deviation measurements.

Table 5: Document standardization ANOVA test

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	82738.235	4	17256.758	.568	.530
Within Groups	28,21,222.638	105	36128.635		
Total	2903960.873	109			

The discussion of the quantifiable outcome of the examination of fluctuation is shown in Table 5. The outcome demonstrates that, at 5% Degree of Importance, the determined worth is more than the table qualities. A five-point rating system was used to collect the data.

Table 6: Chi-Square Test for Standardization of Documents

Chi-Square Test	P value	Null Hypothesis
		Accepted/Rejected
Quality Control	.000	Accepted
Insufficient forensic evidence reduces the admissibility of the evidence.	.000	Accepted

The reliability analysis for evaluating the degree of normalization of the Addressed Archive data is shown in Table 6. To determine whether or not the proof for the Addressed Record is normalized, a Chi-Square reliance test was conducted. The results, which are shown in the above table, demonstrate that the determined traits are not precisely those listed in the table at the 5% Degree of Importance. The Addressed report evidence isn't normalized, for example, which is an erroneous assumption that is accepted from the aforementioned quantitative test.

Table 7: Descriptive Analysis for Experts' Training

Description Analysis	Mean	SD
Experts need to be educated and certified.	37.56	152.332
Expert opinion on documents is subject to error	22.25	84.145

The mean and standard deviation of the investigation into the calibre of instruction provided to experts to deliver addressed record proof are shown in Table 7. The outcome demonstrates how mean and standard deviation have expressive insights.

Table 8: ANOVA test for Experts Who Have Received Training

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	202530.136	4	43430.173	2.420	.364
Within Groups	26,95,047.219	105	15247.175		
Total	2897577.355	109			

Table 8 looks at the actual findings of the change inquiry. The outcome demonstrates that, at 5% Degree of Importance, the determined worth is more than the table qualities. On a five point scale, the data was collected.

Table 9: Chi-Square Test Used in Expert Training

Chi-Square Test	P value	Null Hypothesis
		Accepted/Rejected
Quality Control	.000	Accepted
Insufficient forensic evidence reduces the admissibility of the evidence.	.000	Accepted

The preparation provided to the specialists is shown in Table 9. To determine whether experts have appropriate training to bring addressed record evidence in the official courtroom, a Chi-Square reliance test was conducted. The results, which are shown in the above table, demonstrate that the determined traits are not precisely those listed in the table at the 5% Degree of Importance. As a result of the factual analysis done above, it is generally assumed that unfounded speculation is accepted, such as when specialists are not provided the proper training to present addressed report proof in court.

5. Conclusion

The primary purpose of using forensic science to provide evidence is to gain a fair equality. This is done so that the real wrongdoing, not the honest one, should be punished. Through information materials, logical evidence can link the offender to the wrongdoing. The culprit at the crime scene either leaves clue materials there, on the person in question, or on other items there, or he takes sign materials from them. Assuming the sign materials are properly obtained, delivered, secured, and evaluated, and their character, reliability, and validity remain unquestionable. The growth in the number of investigating officers isn't keeping up with the escalating misconduct. Logic-based approaches must be used in the present to examine wrongdoing that is occurring with extraordinary pertinence. The rate of global advancement is admirable. The globe now has access to a powerful and accurate tool for criminal investigation thanks to modern technology. Today, forensic science is crucial in locating criminal activity and wrongdoing. Different processes are connected to the important role in recognizing misconduct. The important forensic science processes that play a key role in criminal investigations to identify wrongdoing and criminals include DNA profiling, Cerebrum fingerprinting, Mind Planning, Narco Examination, Polygraph tests, Forensic photography, and others. These effective modern tactics are currently being used by the investigating authorities to address the wrongdoing issues.

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