FORENSIC SCIENCE MODERNISATION IN NEW CRIMINAL LAWS: CAPACITY, QUALITY ASSURANCE, AND ADMISSIBILITY CHALLENGES

Marripalli Vishwanath Vasudevudu[1*]

[1]PhD scholar, Karnavati University, Ahmedabad, Gujarat.*

ABSTRACT:
The purpose of this study is to explore the changing nature of forensic sciences that now exist under the New Criminal Law 2020, i.e. under Bharatiya Nyaya Sanhita & Bharatiya Nagarik Suraksha Sanhita within India. In particular, this study focuses on the three main aspects of forensic science's place in the above legislations, i.e. the capacity, quality assurance, and admissibility. Through this analysis, the author argues that while this change in the statutes of Indian criminal law is an attempt to institutionalise an evidence-based approach to the investigation of crime as well as to strengthen the scientific discipline of criminal justice, the new criminal laws have not resolved several root causes of the systemic challenges as outlined in this research. Specifically, a weak forensic infrastructure, a lack of suitably trained forensic professionals, and lengthy case backlogs impede the timely analysis of evidence. Furthermore, there are numerous inconsistencies regarding quality assurance. There exists a lack of standardisation in accreditation, no uniform practices for conducting forensic analyses, and contamination issues that create uncertainty regarding the reliability of forensic results. Finally, there continue to be challenges associated with the admissibility of forensic results. Judges are continuing to scrutinise forensic evidence by assessing issues regarding the chain of custody, the validity of the analytical method used, and adherence to legal requirements. Without addressing the interdependencies of these challenges, there is a high possibility that the full transformative potential of forensic science to deliver justice to the people of India is unlikely to occur.

KEYWORDS: *Bharatiya Nyaya Sanhita, Bharatiya Nagarik Suraksha Sanhita, Forensic Science, Criminal Law.*

I. INTRODUCTION:

India has moved forward significantly from colonial foundations through a new Criminal Justice System that has developed modern standards of operation for the Courts, Judges and Police Departments. In 2023, India replaced the Indian Penal Code 1860 and Criminal Procedure Code 1973 with the Bharatiya Nyaya Sanhita (BNS) and Bharatiya Nagarik Suraksha Sanhita (BNSS). The changes to the criminal law of India will not simply be cosmetic; they represent a complete reorganisation of how a more scientific, evidence-based and technologically trained system of criminal justice will operate. The BNS and BNSS integrate forensic science into the legal framework to enable improved investigative policies by reducing reliance on confessions or witness statements, and they will improve the integrity of the adjudication process, creating greater confidence in the ability of the judicial system to adjudicate in accordance with established laws and evidence.

For decades, forensic science has been recognized throughout the globe as a critical component of a modern criminal justice system. Methods such as DNA Analysis, Fingerprint Analysis, Digital Forensics, Ballistics Analysis and Toxicological Analysis provide objective (scientific) data to verify or disprove witness statements. The implementation of these types of forensic techniques into the Indian Criminal Justice System is relevant because India has a lengthy history of delayed investigations, low conviction rates and high rates of wrongful prosecutions. Forensic science can help create a standardised process that provides accurate and reliable results that will ultimately lead to a higher conviction rate and, therefore, better public confidence in the criminal justice system.

This study aims to provide a critical evaluation of whether current legislation regarding criminal law has been able to incorporate forensic science into the notion of justice and the justice system in a meaningful way. Through this critical evaluation, three primary, interrelated factors continue to impact the effectiveness of the integration of forensic science into the criminal justice system. The first of these challenges is capacity constraints relating to infrastructure, trained personnel and laboratory facilities that limit the ability for investigators throughout the nation to apply forensic methods of physical evidence consistently across the nation. Second, quality assurance issues, including the absence of uniform standards, accreditation processes and oversight, continue to raise issues regarding the reliability of forensic evidence. Finally, the issue of admissibility and the relationship between evidential and legal doctrines, such as the chain of custody, expert testimony and the fact that judges may not have sufficient knowledge or technical understanding of the methods, results and application of scientific evidence, continues to create barriers to successful admission of forensic evidence into the courts of India. This analysis suggests that despite the progressive and forward-thinking intent of the new legislative framework of the BNS and BNSS, there are significant systemic barriers that will inhibit the full realisation of the true potential of forensic science in India. The legislative framework provides a foundation for modernising the criminal justice system, but without equitable or parallel investments in infrastructure, training of personnel and judicial education regarding forensic science and its relevance to the justice process, forensic science may be under-utilised as a resource. By framing these challenges within a larger perspective, this paper will seek to determine whether the Indian system of law can fulfil its commitments to the use of forensic science in delivering justice.

II. LITERATURE REVIEW:

India's scholarly study of forensic science has revealed an ongoing tension between aspirations of legislation and the limitations of the institutions responsible for carrying out those laws. Thus, early criminological studies showed that there was a lack of reliance on forensic evidence due to both the limited ability and generally inadequate training among law enforcement officers to properly process the evidence into usable form.

In the Journal of Forensic Justice (JFJ), Vol. 4, Issue 2, July–December 2025- Comparative analysis of forensic evidence admissibility in India vs. USA by **Shubham Sharma and** ***Biranchi Narayan Sarangi***[1]**,** the authors have discussed how important forensic science is to the criminal justice system in both the United States and India, but the two countries do not have the same methods for supporting the use of forensic science in court during an investigation. The authors state that both jurisdictions rely on scientific principles; however, U.S. courts follow jurisprudential methods along established standards of admissibility, such as the Frye test and the Daubert standard, which require the scientific evidence to be accepted as a general principle by practitioners as well as to have reliability in methodology. On the other hand, the courts in India have been slow to adopt standards in the form of jurisprudential guides and often rely on the judge to determine whether a particular piece of evidence has sufficient compiled facts and/or case-related precedents to allow it to be admissible or used as a basis for a decision. The research identifies numerous barriers that exist within the forensic science system of India, including a lack of adequate infrastructure, standardised operating procedures for the forensic community to follow, and potential contamination and/or bias when handling forensic evidence. According to Sharma and Sarangi, these obstacles have decreased the reliability of forensic reports and have prevented justice from being rendered in a timely manner. This is in contrast to the U.S., where there are standards in place to ensure stringent accreditation and proficiency testing requirements for laboratories providing forensic services, and ensure a higher degree of uniformity and reliability than in India. Additionally, the authors also point out how forensic experts are not always able to provide independent testimony in India because, many times, courts will disallow the introduction of forensic evidence due to a lack of proper chain of custody and/or protocols being adhered to when utilising or gathering the evidence.

The role of forensic science in criminal investigations has received renewed emphasis under the ***Bharatiya Nagarik Suraksha Sanhita***, 2023. Existing scholarship highlights that Section 176(3) marks a significant procedural development by mandating the involvement of forensic experts at crime scenes in cases involving offences punishable with seven years or more. The provision further requires videography and systematic scientific collection of evidence, reflecting an institutional effort to enhance evidentiary reliability. Scholars interpret this shift as indicative of a broader transition within Indian criminal procedure, from a traditional reliance on oral testimony toward greater incorporation of scientific methods. Scholars note that Section 176(3) represents a notable shift, requiring forensic experts to attend crime scenes in cases involving offences punishable with seven years or more, along with mandatory videography and scientific collection of evidence. This provision reflects a move away from reliance on oral testimony toward greater evidentiary precision, embedding forensic practices more firmly within statutory procedure. However, some commentators caution that the effectiveness of this mandate will depend on infrastructural capacity, availability of trained personnel, and implementation at the ground level[2]. Complementing these developments, the ***Bharatiya Sakshya Adhiniyam, 2023*** [3]updates evidentiary rules by reaffirming the admissibility of electronic records, digital communications, and video recordings, building upon the framework established under the Indian Evidence Act. This shift reflects an increasing recognition of digital forms of proof in contemporary adjudication. The Bharatiya Nagarik Suraksha Sanhita further introduces procedural safeguards aimed at strengthening the integrity of evidence collection. Section 105 mandates audio-video recording of searches and seizures, while provisions relating to forensic investigation and documentation seek to enhance transparency and accountability in investigative processes. Additionally, Section 349 empowers magistrates to order the collection of forensic samples, including fingerprints, voice samples, and DNA, even in the absence of prior arrest, thereby expanding investigative flexibility beyond the framework of the Code of Criminal Procedure. Scholars view these provisions as indicative of a broader attempt to institutionalise forensic science within routine investigative practice. Furthermore, Section 329 permits reliance on reports from government-certified scientific experts, reflecting a modest expansion beyond the narrower approach under the earlier regime.

The article ***"New Criminal Laws 2023 and the Status of Forensic Science in India" by J. R. Gaur*** provides a comprehensive examination of the transformative impact of India's new criminal law framework particularly the Bharatiya Nagarik Suraksha Sanhita, 2023 (BNSS) on the role and capacity of forensic science within the criminal justice system. Forensic Science has a long history in helping to solve crimes. This paper examines the historical evolution from an over-reliance upon oral and eyewitness evidence, which has too often been deemed unreliable due to the possibility of coercion, to a reliance upon scientific evidence obtained through investigation and analysis. The paper reviews the evolution of forensic science in India from its colonial origins with the establishment of chemical examiner laboratories and fingerprint bureaus, to the present-day network of central, state, and regional forensic laboratories and the establishment of specialised institutions such as the National Forensic Sciences University. An important part of this paper

is the statutory changes that were made by the introduction of the new framework established under the Criminal Code of India, following the enactment of the BNSS. The BNSS requires that forensic evidence be routinely collected in respect of serious offences for which imprisonment is for five years or more. The author provides information on certain changes contained in legislation, such as section 176(3), which provides for the forensic expert's attendance at the crime scene, wider provisions for the collection of evidentiary material (such as voice samples), and accepts expert reports without the need to have oral evidence provided by the expert witness. The author outlines that these legislative amendments constitute a paradigm change to the technology-based criminal justice system with the intention of improving the quality of investigation and the conviction rate by ensuring the reliability of the evidence provided. However, the literature reveals substantial challenges from a practical perspective to the implementation of such changes. The literature indicates that there are significant systemic deficiencies, including a lack of suitable infrastructure, a lack of trained forensic expertise, and a backlog of evidence that is capable of being analysed and reported upon, which create significant challenges for the implementation of those legislative changes. Empirical references such as tens of thousands of pending cases in laboratories across Delhi and Maharashtra paint a picture demonstrating the severity of the concern. The author contends that the imposition of a mandatory forensic examination will greatly increase the volume of work to be completed, which will result in a potentially exponential increase in the number of existing requests for forensic examinations, and will require the urgent development of both manpower and physical resources. The author describes governmental programmes aimed at addressing these shortages. These programmes include the National Forensic Infrastructure Enhancement Scheme (NFIES), which seeks to eliminate these shortages by providing additional funding, establishing additional laboratories, and developing educational institutions to train skilled forensic examiners. While acknowledging these programmes as positive steps, the author stresses that effective implementation will require the development of capacity for cooperation among all stakeholders, including law enforcement, forensic analysts, judges, and health care providers. A key finding of the study is that forensic science is an essential tool for ensuring fair trials and protecting human rights, as forensic evidence can help to reduce wrongful convictions and provide an objective means of assessing evidence. The article recommends that forensic science education be integrated into a legal education curriculum and that the development of interdisciplinary training be enhanced in order to meet the changing demands on the criminal justice system. Finally, the article concludes that while the new criminal justice laws represent a paradigm shift toward scientific investigation of crime, their ultimate success is contingent upon correcting structural barriers and ensuring that the appropriate institutional preparation for implementing these new laws is in place[4].

The use of police manuals or investigative practices tends to rely more heavily on eyewitnesses or confessions than upon scientific corroboration, which is also the reason many scholars believe that subjectivity remains a major factor when numerous criminal cases go to trial; however, the rise of more recent studies indicates that there is an increased interest in utilizing forensic science in a statutory framework as well as a new procedural framework. India, having such a large population, coupled with the high rate of crime per capita, has an extensive number of jurisdictions suffering from an inordinate lack of forensic laboratories. In fact, many states use only a very small number of regional forensic science laboratories (FSLs), and therefore, there tends to be very long periods during which the processing of evidence is delayed. Furthermore, according to other recent studies, researchers have argued that the new mandatory forensic requirements included in the Bharatiya Nyaya Sanhita (BNS) and in the Bharatiya Nagarik Suraksha Sanhita (BNSS), are likely to exacerbate existing backlogs of cases unless investments are made in expanding the overall capacity (both in terms of equipment and personnel).

There are inconsistencies and a lack of standardisation in the way that different laboratories conduct forensic testing. Systems that provide laboratories with accreditation are not equally enforced among forensic labs. Without standardised testing, testing results can vary due to differences in methodologies and raise concerns about the scientific reliability of the testing conducted at the laboratories. Countries such as the United States and the United Kingdom have created formal accreditation processes and routine proficiency tests to provide laboratories and courts with assurance about the consistency and validity of forensic evidence.

In recent years, courts have increasingly scrutinised testimony given by forensic experts with respect to the chain of custody, the procedures used to obtain the evidence and the validity of the scientific principles upon which forensic reports rely. The courts have taken a very cautious view towards accepting forensic reports where the appropriate procedures have not been closely followed. Indian scholars also argue that rules on admissibility should be established in India to reduce the risk of wrongful convictions. Commentary on the BNS and BNSS indicates that these legislative schemes are trying to establish a systematic approach to ensure that forensic testing will be conducted in serious crimes.

III.METHODOLOGY:

This research uses qualitative doctrinal methodology, as well as policy analysis, to provide a thorough and critical evaluation of required changes in forensic science's place in India's reformed criminal justice system. This study conducts a doctrinal analysis of statutory provisions created under the Bharatiya Nyaya Sanhita (BNS) and the Bharatiya Nagarik Suraksha Sanhita (BNSS). The analysis focuses primarily on provisions relating to forensic investigations, scientific collection of evidence, expert involvement on crime scenes, and protections against unfair or untrustworthy use of forensic evidence in criminal trials.

A doctrinal approach will include reading and interpretation of legislative text in order to understand both the intent behind and the practical impact of these newly introduced legal requirements. In addition to primary legal sources, this study depends heavily on secondary data to develop a well-rounded analytical framework. For example, peer-reviewed journals will provide theoretical and empirical insights into forensic science and criminal law, while reports from the Law Commission of India will offer recommendations for necessary reforms relating to evidentiary and procedural rules. Government and government agency reports and policy documents will provide information about implementation initiatives, and judicial decisions will indicate how the courts have interpreted and applied forensic evidence in practise.

The research provides an overview of selected international standards and practices for forensic science governance and governance for forensic services in jurisdictions where the integration of forensic services into law enforcement investigations has developed further than in India. A comparison with these other international jurisdictions will help to identify structural and procedural gaps in the Indian forensic service governance framework, with best practice examples that might be transferred to strengthen the Indian forensic governance framework. The thematic analysis will organise the study through the categories of institutional capacity, quality assurance of forensic services, and the use of forensic evidence in the legal system. The themes will be used to measure the overall effectiveness, feasibility, and potential impact of recently enacted legislative reforms on the Indian forensic governance framework. By using both doctrinal interpretation and a review of policy and thematic evaluation, the research intends to provide insight into the opportunities and challenges posed by an expanding reliance on forensic science in India's criminal justice system.

IV. RESULTS:

The analysis provides insights into three critical areas, i.e. capacity, quality assurance, and admissibility and illustrates the discrepancy between the intent of legislation and its application in practice under India's forensic regime. The analysis will show that while there has been a major push from the legislature to use science to investigate crimes through the Bharatiya Nagarik Suraksha Sanhita, the physical capacity of current forensic infrastructure to handle these increased demands is inadequate, both in terms of the number of forensic laboratories as compared to the number of cases that require forensic examination, and in relation to the serious lack of qualified forensic experts and forensic technicians. In addition, there are substantial backlogs of unfinished cases waiting for respective forensic reports to be submitted to the courts. Therefore, the lack of both institutional capacity and resources is preventing forensic sections of the law from being implemented effectively, even though the laws require that certain types of serious crimes must be investigated forensically.

The research identified long-standing challenges related to ensuring quality assurance and the reliability of forensic findings due to ongoing substantial variations in forensic science practices among jurisdictions, including inequitable accreditation of laboratories, lack of consistently applied standard operating procedures across laboratories or providers of related services. Deficiencies in evidence collection, evidence preservation, and evidence handling, including contamination or inadequate preservation of evidence, significantly compromise the evidentiary value of forensic evidence and raise broader concerns regarding the credibility and scientific reliability of the overall forensic system.

The issue of evidence admissibility continues to be an important element in the Indian Judicial process; courts apply a cautious and often sceptical evaluation of forensic evidence due to the systemic weaknesses previously outlined. Judicial scrutiny is particularly rigorous regarding the chain of custody, the scientific validity and reliability of the methodologies used, and the appropriate application of the procedural safeguards. This caution illustrates the judiciary's central role in ensuring that only scientific evidence meeting scientific and evidentiary standards is relied upon to adjudicate criminal matters. The evidence admitted by the courts illustrates the continuing and urgent need for more robust institutional mechanisms for defining standards and compliance with those standards to increase the judiciary's confidence in forensic evidence.

V. DISCUSSION:

In response to modernising criminal justice, India launched a significant national reform effort with three primary objectives: to focus on the role of forensic science in improving the accuracy, efficiency, and fairness of criminal investigations; to create a forensic infrastructure investment program that establishes the requirements for many criminal cases to be resolved using accurately analysed forensic evidence; and to continue enhancing access to and reliability of justice through innovative legal mechanisms, such as e-FIRs and electronic charge sheets, to improve the individual who is the victim of a crime.

Through these laws, the government is pursuing expanded forensic capabilities nationwide by supporting substantial forensic infrastructure (new laboratories) and training (nationwide training programmes for police and other law enforcement personnel). As a result, there are improved methods for the collection of evidence, improved speed of analysis of evidence, and improved outcomes for criminal cases.

The new laws also promote the interests of victims, particularly victims of violent crime perpetrated against women and children, by making use of the forensic examination of the crime scene (forensic investigation) as the basis for establishing the facts that are necessary for criminally prosecuting perpetrators of such crimes. The elimination of, or at least the reduction of, reliance on victim testimony to prove the perpetrator's guilt may reduce the trauma that victims experience during a criminal prosecution and enhance the successful prosecution of suspects who perpetrated crimes against these victims.

Although challenges arise from shortages of resources and skilled personnel to carry out forensic investigations, the enactment of the 2024 amendments is a significant step towards the development of a modern, efficient, and technologically advanced criminal justice system in India. This will improve both the public's confidence in the justice system and the delivery of justice to the public.

The findings indicate that the modernisation of forensic science within India's new criminal law framework constitutes an aspirational goal rather than a fully realised goal; there exists a large disconnect between the legislators' vision and the preparedness needed from the institutions, due to the potential systemic and wide-ranging effects on all facets of a forensic investigation.

Another major finding includes that the challenges discussed are interrelated with each other, specifically regarding the issue of capacity, quality, and admissibility of forensic science. They do not exist independently, but instead, if one of these factors is deficient, the remaining factors will also suffer failure. For example, if an agency has inadequate forensic facilities and a lack of adequate personnel, then this will result in delays in analyses and reports being provided and subsequently diminish the integrity of evidence presented in court and thus diminish the ability to admit such evidence into court. Similarly, without standardised operating procedures among laboratories, variations exist within laboratories' forensic practices, and this creates a reduction in the judicial confidence afforded to science-based evidence.

This interrelatedness also represents a larger disconnect between legislators' intent and reality, as seen by the intent of the Bharatiya Nyaya Sanhita and the Bharatiya Nagarik Suraksha Sanhita, both of which express an intent for a significant paradigm shift from traditional police methods to scientific/technology-based methods; however due to the non-existence of corresponding reform within the institutions that would allow for this systemic change to take place, it has resulted in various examples of the inability to fully realise these goals before the passage of even one of the aforementioned laws. While the statutory mandate that serious offences are subject to forensic investigations represents a forward-thinking piece of legislation, without sufficient infrastructure, personnel, and support from either the legislative level or the executive level, it will cause an already overburdened forensic system to collapse into itself. The misalignment between the statutory mandate and the institution's ability to support its integration raises questions about the sustainability and feasibility of the expected laws and the expectations of the legal system related to the forensic system as a direct consequence of these new criminal laws.

The research highlights how critical it is that there should be a thorough overhaul of the university system as a way of aiding the introduction of forensic science into the criminal justice system. Specifically, there is an urgent need for the establishment of more forensic facilities through additional laboratories; increased investment in training and education focused on the development of qualified personnel; and the implementation of a set of uniform accreditation standards to guarantee consistency and reliability in forensic practices will create clarity and cohesion with respect to evidentiary guidelines that establish uniform procedures for the collection, preservation, and presentation of forensic evidence in different jurisdiction.

The role of judges, in developing forensic law, is equally important in assuring that evidence is admitted into court based on strict rules of admissibility, as well as by holding to the standards to ensure scientific reliability; therefore, holding to a standard of fairness in trial also means improving forensic practice through their review of investigative techniques by providing a standard of review for all investigatory practices.

In addition, the value of cross-jurisdictional comparisons reinforces the need for structural and regulatory consistency in forensic systems. The most developed forensic systems typically include a separate forensic agency, specific standard operating procedures, and an adequate level of oversight as a measure of accountability and quality. Implementing these types of improvements into India's system would ameliorate India's ability to make meaningful contributions to the development of forensic science globally.

VI.CONCLUSION:

India's new criminal law framework incorporates forensic science, a significant step forward in modernising the justice system that highlights the emphasis placed on the scientific basis for investigations. Nevertheless, reforms will be effective only if system-wide impediments are resolved, especially those associated with institutional capacity, quality assurance, and the admissibility of forensic evidence. An analysis shows that while the Bharatiya Nyaya Sanhita and the Bharatiya Nagarik Suraksha Sanhita made meaningful progress in their legislative advancements, without adequate institutional readiness and operational support, these measures will not be effective.

The conclusion reached by this research is that legislative reform alone will not result in real change unless parallel progress is made in areas such as infrastructure and administrative capacity. Forensic laboratories are severely understaffed, lack modern equipment and trained professionals, which hinders the effective implementation of required forensic investigations. Additionally, the lack of consistent and uniform standards and accreditation across forensic institutions reduces the consistency, reliability and credibility of forensic products, which hurts the judiciary's confidence in those products. The problem of admissibility is compounded by the fact that courts scrutinise forensic evidence to such an extreme degree that they often uncover significant issues with respect to the authenticity of the evidence itself.

Based on these results, the study recommends that to realise the complete transformative potential of forensics science in India, a comprehensive and multi-faceted reform strategy is required. This would involve significant investment into expanding and upgrading forensic facilities, developing skilled workforce through specialised training and education, and establishing uniform standards and accreditation systems for quality assurance & consistency. In addition to these reforms, there is a need for increased clarity and robustness of the legal and procedural framework around the use of forensics

evidence in order to ensure that such evidence is admissible and establishes evidentiary value in courts. It is only through full collaboration on all of these reform initiatives that the ability of forensics to play a role in the provision of timely, accurate, and fair justice can be maximised within India's evolving criminal justice system.

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