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Forensic Criminology, Crime Investigation, and Internal Security Forces: The Indian Perspective

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ABSTRACT

The evolving landscape of crime and security threats in India necessitates scientific, multidisciplinary, and evidence-based approaches to criminal investigation. Contemporary investigations increasingly involve complex crimes that are shaped by technological developments, digital evidence, and behavioural factors, highlighting the need for integrated criminological, forensic, and psychological expertise. Forensic criminology thus emerges as an interdisciplinary paradigm linking criminology with forensic science, forensic psychology, digital forensics, and investigative practice. This paper investigates the role and rising importance of forensic criminology in crime investigation and its potential contributions to internal security forces and investigative agencies in India. Emphasis is given to forensic psychology, specifically behavioural analysis, investigative psychology, victimology, eyewitness testimony, and psychological techniques in investigation. The discussion extends to India's expanding forensic infrastructure and institutional initiatives, such as the National Forensic Infrastructure Enhancement Scheme (NFIES), the advancement of DNA and cyber-forensic capabilities, and the growth of forensic education and training. The study uses a qualitative, conceptual-analytical method, based on a narrative review of scholarly literature from secondary sources (including government reports and legislative documents), to explore how forensic criminology relates to the process of investigating crimes and maintaining internal security in India; and proposes the Integrated Forensic Criminological Investigation Model (IFCIM) as an organizational structure for coordinating multiple disciplines. The analysis further identifies challenges related to forensic capacity, technological requirements, inter-agency collaboration, professional training, and cognitive biases in investigation. Ultimately, the paper argues that a multidisciplinary forensic-criminological framework can reinforce current investigative mechanisms and promote more systematic, evidence-based strategies for crime investigation and internal security in India.

Keywords: Forensic Criminology; Crime Investigation; Internal Security Forces; Forensic Psychology; Criminal Investigation; Digital Forensics; Behavioural Analysis; Internal Security; India; Law and Order

INTRODUCTION

The challenge of crime and the threat to internal security is complex, further complicated by the emergence of organised criminal gangs, technology crimes, cybercrimes, terrorism, trafficking, financial crimes, etc. These crimes can occur both in the physical world and in cyberspace, and they have challenged criminal investigators and law enforcement bodies in all countries, including India, in collecting, preserving, and interpreting facts and evidence. As crimes become more complex, investigations are becoming interdisciplinary, requiring input from criminology, forensic science, psychology, digital technology, and investigative techniques.

Internal security is an institutionalised process managed through the Government of India, state governments, police organisations, Central Armed Police Forces (CAPFs), intelligence and investigative agencies, and forensics and related institutions. For the Ministry of Home Affairs (MHA), maintenance of internal security

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and law and order, terrorism, insurgency, terrorist financing, etc., comes under its internal security division. Concurrently, since 'police' and 'public order' are state subjects under the constitutional scheme, the responsibility of the state government is to register, prevent, detect, and investigate crimes, and to prosecute offenders. In contrast, the Union Government acts as a facilitator to the state government, assisting it with intelligence, resources, guidance, and expertise in connection with the prevention, detection, and investigation of crime.

The increasingly complex nature of crime has placed greater importance on the forensic approach to criminal investigation. In the criminal justice system, forensic science has helped scrutinise facts and identify physical or digital traces through scientific investigation. At the same time, criminology provides insight into crimes, criminals, victims, criminal motives, behavioural patterns, their locations, and the impact of crimes on society. Another dimension, termed forensic psychology as part of a forensic investigation, would bring in, among other things, scientific investigation, aspects involving behaviour, and forensic assessment, including eyewitness memory, interviewing, and victimology.

All these fields of enquiry can inform a holistic approach to crime investigation. This can be viewed from a perspective of "Forensic Criminology". Forensic Criminology bridges the domains of criminal behaviour/criminology and forensic practice/investigation, focusing on crime and its investigative context rather than treating them as separate and independent areas of enquiry. The Indian system is witnessing increased institutional focus on forensic investigation. It is worth noting that the Bharatiya Nagarik Suraksha Sanhita, 2023 now provides for the mandatory forensic examination of crime scenes in specified serious offences.

Institutional development can be further understood through a series of modernisation efforts by the Ministry of Home Affairs to update forensic laboratories across states and to improve DNA and cyber forensics, along with training personnel and developing mobile forensic tools. The "National Forensic Infrastructure Enhancement Scheme" was approved by the Cabinet Committee with a total financial outlay of Rs.2254.43 crore to build additional campuses of National Forensic Sciences University, new CFSLs, and capacity building, as such, to bridge the gap in the trained workforce and to clear the pending cases in the laboratories.

The forensic laboratory infrastructure is increasingly becoming relevant to many contemporary investigations. In many state-level forensic science laboratories, steps to strengthen DNA analysis and cyber forensics have been initiated, and, in the context of investigating cyber-related offences, sexual offences, etc., this is considered relevant for scientific and timely crime investigation. The move also aims to procure mobile forensic vans to enable on-site examinations and assistance. This has shown the necessity of more specialised professionals having scientific and technical knowledge.

However, forensic investigation should not limit its scope and domain to laboratories alone. There is a human element to criminal activities, as, to an offender, there is a mindset of offending, victimisation, the memory involved, and many behavioural aspects of witnesses/victims/investigation officers/different stakeholders in a criminal justice setup. Forensic psychology, therefore, can play its part within the broader scope of forensic criminology, which can be applied to provide balanced, soundly evidenced insight into issues in victimology, interviewing and interrogation, investigative psychology, and forensic decision-making, without supplanting empirical findings. It is important to note that we need to examine behavioural evidence with scientific rigour, without giving in to any form of criminal profiling that is not empirically grounded.

Today, in many cases, an investigator has much information to deal with, which is also in vast quantity and from diverse sources, including biological traces, forensic serology, fingerprinting and dactylography, CCTV footage, mobile usage information, the internet, digital social media presence, mobile internet usage data, financial transactions, location, and metadata. The Automated Fingerprint Identification System (AFIS) has been developed to create a centralised, national-level, searchable database of crime-related fingerprints from States and Union Territories, and to support new technologies and the systematic use of databases in investigations. An investigator therefore today needs to be one who can connect these dots.

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Research Rationale

This paper argues that forensic criminology can support a more integrated, evidence-based approach to crime investigation and internal security in India through integrating criminological analysis, forensic science, forensic psychology, digital forensics, and investigative practices. This cross-disciplinary approach can support investigations into complex crimes while strengthening the capacity of relevant security and law-enforcement establishments to respond to developing threats.

Research Objectives

The present study will examine the contribution of forensic criminology to crime investigation and its relevance to internal security forces and law enforcement agencies in India. The particular objectives of the present study are:

1. To examine the concept, scope, and increasing importance of forensic criminology from an Indian perspective.
2. To analyse the relevance of forensic criminology to internal security forces and specialised investigative agencies such as the NIA and the ATS in countering emerging crimes.
3. To identify the institutional, technological, professional, and procedural challenges for effective application of forensic criminology in India.
4. To recommend measures to strengthen forensic science, forensic psychology, criminology, and investigative practices within internal security forces and law-and-order agencies.

RESEARCH METHODOLOGY

Research Design

The study used a qualitative, descriptive, and conceptual-analytical approach based on a narrative review of secondary sources. This was done to investigate how relevant forensic criminology is to criminal investigation and internal security in India; to identify institutional and methodological barriers to using forensic criminology in criminal investigations and internal security; and to develop an Integrated Forensic Criminological Investigation Model (IFCIM). Unlike studies that test hypotheses using primary data, this study synthesizes existing literature, laws and institutional changes to create a conceptual framework for interdisciplinary investigation.

Source Selection and Sources of Data

Secondary sources were used in this study. The search for these sources was conducted using Google Scholar as well as relevant government reports, official publications of institutions and legislative documents. Literature related to criminology, forensic science, forensic psychology, digital forensics, investigative techniques, internal security and the Indian criminal justice system was reviewed. Laws and regulations were used to help understand the legal and institutional environment. Literature from scholars helped inform the conceptual discussion of forensic evidence, investigative reasoning, behavior analysis, victimology and interdisciplinary investigation. Sources were chosen for their relevance to the research objectives and because they contributed to understanding the relationship between forensic criminology, criminal investigation and internal security in India. The source selection process occurred while developing the paper and not through a pre-determined systematic review protocol. There were no publication date restrictions placed on the sources. International literature that provided theoretical or comparative context for the Indian discussion was also included. The search and selection process was not documented in a standardized screening log. Therefore, the total number of records identified, screened, excluded and finally included can't be reported reliably. This study does not represent itself as a systematic review or an exhaustive accounting of all available literature.

Analytical Process

The selected material was analyzed using thematic and conceptual analysis. Recurring themes related to the

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research objectives — the conceptual scope of forensic criminology; the contributions and limitations of forensic science, forensic psychology and digital forensics; the institutional structure of criminal investigation and internal security in India; and the legal, ethical, technological and procedural obstacles to interdisciplinary investigation — formed the basis for organizing the discussion. These themes helped form the basis for creating the IFCIM. The model is presented as a proposed conceptual framework designed to organize the interactions between investigative reasoning, forensic examinations, criminological and victimological interpretations, corroborating evidence and investigative outcomes. The model's stages and safeguards were created conceptually and not through statistical modeling, empirical testing, practitioner interviews or pilot implementation. As a result, the model is intended to serve as a foundation for further research and evaluation and not to demonstrate improvements in investigative effectiveness.

Scope of Study

The geographic focus of the study is India, specifically the relationship between forensic criminology, criminal investigation and internal security institutions. Some international literature is considered to provide theoretical and comparative context; however, discussions about Indian laws, investigative agencies, institutional responsibilities and developments in forensic science are confined to the Indian legal and administrative framework. The subject matter includes serious and complex crimes that contain physical, biological, digital, behavioral, testimonial and contextual information. Emphasis will be placed on the potential contributions of forensic psychology, behavior analysis, victimology, investigative interviews, digital forensics and forensic intelligence. Limitations of these approaches will be acknowledged including uncertainty in interpretation, cognitive bias, institutional coordination, evidentiary requirements, privacy and professional independence.

Ethics and Limitations

The study relies on secondary sources and does not require collection of primary data from human subjects or institutions. Its primary methodological limitation is that the process for identifying and selecting literature was not documented through a reproducible search protocol. No formal screening counts or systematic quality appraisal procedures were performed. As a result, the selection of material may reflect the scope and availability of sources consulted during development of the paper and should not be interpreted as exhaustive. Another limitation is that the proposed IFCIM has not been empirically verified through case file analysis, institutional databases, practitioner interviews, expert validation or pilot implementation. Therefore, its potential contribution must be differentiated from empirically supported improvements in investigative effectiveness. Future research could evaluate the model through structured case studies, comparative evaluations, consultations with practitioners and clearly defined measures of investigative quality, evidentiary corroboration, information sharing efficiency and procedural compliance. Additionally, the analysis recognizes that forensic and behavioral findings may be uncertain or contested and that different disciplines use different methods and standards for making inferences. Therefore, the proposed framework emphasizes corroboration, documentation of uncertainty, consideration of alternative explanations for findings, legal use of information and maintaining institutional and professional independence.

Conceptualising Forensic Criminology

Understanding Criminology

Criminology is an interdisciplinary study of crime and crime causation, victimisation, and the criminal justice system. It draws on knowledge from other fields, such as law, sociology, political science, anthropology, biology, and psychology, to study the origins of criminal behaviour, the motives of offenders, and the implications of crime for society. Unlike many criminal justice courses, which tend to be offender-focused and focus on what motivates someone to commit a crime, criminological research regularly explores the social, psychological, environmental, and organisational factors associated with crime and the criminal justice system.

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This criminological insight is thus relevant to the investigation of crime, since investigation often does not take place independently of the crime's context. Any information relating to the causation of offending, victimisation, offender behavioural research, and the offender-environment interaction may be useful in developing investigative theories and crime-control strategies. In addition, modern courses on criminology have become receptive to interdisciplinary research approaches for appreciating complex forms of crime and criminal justice processes.

Understanding Forensic Science

Forensic science is the application of science to answer questions of interest to the justice system. Forensic science encompasses scientific disciplines such as forensic biology and DNA testing, toxicology, forensic pathology, fingerprinting, firearms and tool mark examination, questioned documents, trace evidence, and digital evidence (NIJ, n.d.).

Whether as a means of solving an investigation or providing scientific evidence for use during proceedings, forensic science owes much of its importance to its capacity to turn tangible or digital evidence into scientifically usable evidence that can help investigators and, where admissible, the court. But forensic evidence must be used within its scientific context and not as self-evident proof of guilt.

Understanding Forensic Psychology

Another essential aspect of this all-encompassing forensic model is forensic psychology. An organisation that specialises in this field, the American Psychological Association, describes it as the use of psychological knowledge and methods to address issues affecting civil and criminal law and the legal system. Its use is in assessment, intervention, expert witness testimony, policy development, and research on eyewitness testimony, offender risk assessment, interrogation, and investigatory techniques. (APA, n.d.)

Given that crime and investigation are essentially human activities, forensic psychology applies to criminal investigation. Offenders make decisions; victims and witnesses remember and encode experiences; suspects are questioned; and investigators evaluate evidence and circumstances under conditions of uncertainty. This has led to the suggestion that knowledge from psychology could be of assistance.

Topics in forensic psychology related to forensic police work are investigative psychology, victim and offender behaviour, eyewitness testimony, deception, interviewing, admissions, and investigative decision-making. This is a major area of forensic psychology practice, according to the APA Handbook of Forensic Psychology, and includes sections on investigative psychology, eyewitness memory, deception, and admissions (Zapf & Cutler, 2014).

Criminal profiling is an important aspect of forensic psychology yet should be separated from the discipline of forensic psychology itself. Psychology can provide information about processes such as communication, memory and behaviour, but this information is limited.

Defining Forensic Criminology

Forensic criminology is an interdisciplinary science, sitting at the crossroads of criminology, forensic science, psychology and criminal investigation. Forensic criminology is defined as, "the application of the knowledge of criminology and science to questions of investigation and the law, carrying the scientific and criminological enterprise into the investigations and proceedings." (Turvey & Petherick, 2010.)

The importance of this differentiation is that forensic criminology has a wider scope than forensic science. Although the use of scientific techniques to analyse evidence is characteristic of forensic science, forensic criminology adds a dimension of theory, analysis, and scientific methods. It will likely include the study of criminal behaviour, crime pattern analysis, victimology, crime reconstruction, methodology of investigations and experts, and interpretation of forensic findings.

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So, the core idea is that forensic criminology is more like an interdisciplinary application of a collection of methodologies. It is a method that blends what might have been isolated pieces of knowledge from different professional fields. This approach can be especially useful in an investigation that involves different types of evidence or needs to analyse the physical features of a crime and of a criminal event.

The Interdisciplinary Nature of Forensic Criminology

The range of forensic criminology is shown through the interrelated components:

- **Criminology:** An introduction to crime, criminal behaviour, victimisation, and crime trends
- **Forensics:** Scientific analysis and interpretation of physical and digital evidence.
- **Forensic Psychology:** Explores the behavioural, cognitive, and psychological aspects of the investigation and law.
- **Criminal Investigation:** Collection, collation, and analysis of evidence to define what, where, and how an offence occurred.

Altogether, the four components are likely to produce a more complete framework for investigative activities. Forensic science offers science-based evidence, criminology offers rich context and theory, forensic psychology offers insight into how the human mind works, and criminal investigation offers value to the investigative process.

Forensic Criminology: The Modern Investigatory Process

The modern investigative environment is becoming one of multiple physical, biological, psychological and digital forms of information. The nature of a single investigation may comprise forensic evidence at the scene, DNA, fingerprints, CCTV footage, digital data from mobile devices, online footprints, financial data, witness and victim testimony, and behavioural data. The problem is not simply collecting more evidence; rather, it is about synthesising and correlating different forms of evidence.

One way this possible integration might occur is through forensic criminology, which could situate forensic evidence within a wider criminological and investigative context. For instance, DNA evidence could be used to demonstrate an association between a person and a place or object. At the same time, victimological and behavioural analysis could help place the crime in context. Likewise, digital evidence may reveal interactions or behaviours that only become meaningful when read in conjunction with other contextual forensic and investigative work.

This concept fits within the "...wider sphere of forensic intelligence." Forensic intelligence treats forensic data as being analysed for investigative value and linkages rather than being viewed solely as case evidence (Lopez et al., 2020).

Although the disciplines of forensic science, forensic intelligence, and forensic psychology are integrated, they do not have the same functions. Forensic science uses scientific methodologies to analyze physical evidence; forensic intelligence analyzes forensic data to develop leads for investigations and potential relationships between suspects/victims/crime scenes etc.; and forensic psychology contributes knowledge on human memory, interview techniques, suspect/witness behavior, and how investigators make decisions. Conventional criminal investigation continues to be the responsibility of legally authorized investigative personnel. For purposes of this study, forensic criminology is defined as the broader criminological framework that allows for the interpretation and coordination of the distinct contributions made by each of the aforementioned disciplines. This framework will allow for the coordination of these disciplines without compromising either their respective professional responsibilities or evidentiary standards. The proposed Integrated Forensic Criminological Investigation Model (IFCIM) has been developed to provide a more defined method of coordinating these disciplines during complex investigations conducted in India. The uniqueness of the proposed model is based upon the proposed structure of integration and safeguards, not on the claim that inter-disciplinary investigation is a novel concept.

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Forensic Criminology in the Indian Context

The Indian forensic landscape, as well as the country's evolving investigative and scientific field, accentuates the potential relevance of forensic criminology in India. The continued development of forensic education and training, as well as forensic research and intervention, would likely lead to the institutionalization of a variety of cross-disciplinary approaches, such as forensic criminology. For example, the National Forensic Sciences University offers a master's program in forensic criminology and criminal justice that combines criminology and forensic psychology.

This provides conceptual knowledge of psychology and criminal behaviour, as well as practical knowledge of criminal investigation and the criminal justice system.

Additionally, in recent years, the Indian forensic space has seen a move towards a greater statutory and institutional focus on forensic evidence. The amendments to the Criminal Procedure Code (CrPC), the expansion of the forensic infrastructure, DNA testing and analysis, and increasing capabilities in cyber-forensics all seem to indicate a direction of travel towards a greater appreciation of the role of scientific evidence in investigations. Such measures enable forensic criminology to forge links among information, forensic disciplines, criminology, forensic psychology, the investigation, and the law. In this work, forensic criminology can be understood as a multidisciplinary, practical paradigm for understanding and investigating the criminal world.

It combines the domains of criminology, forensic science, forensic psychology, digital evidence, and investigation to answer an investigative and legal question.

Its value does not lie in replacing the investigation but in the general understanding of, and connection between, the information and material available to investigators.

Internal Security Forces and Crime Investigation in India

India’s internal security system involves a multi-layered institutional framework including the Union Government, State Governments, police organisations, CAPFs, intelligence agencies, specialised investigative organisations, and forensic institutions. It seems that the primary responsibility in matters of internal security, border management, CAPFs, Centre-State relations, etc., in the Union Government will come under the Ministry of Home Affairs (MHA). The Department of Internal Security will handle issues such as internal security, law and order, terrorism, insurgency, Left-Wing Extremism, terrorist financing, security clearance, and national integration (MHA, n.d.).

In the same manner, the Indian Constitution vests the maintenance of police and public order exclusively with the States under the State List in the Seventh Schedule. Still, the Union Government also has important responsibilities under Article 355, including maintaining internal security by protecting States from external aggression and internal disturbances (MHA, 2014). Therefore, the Union Ministry of Home Affairs (MHA) lends assistance to State Governments via intelligence, technical and operational guidance and advice, workforce, financial assistance, and training (MHA, 2014).

This institutional set-up has consequences for criminal investigation. Since the bulk of regular criminal investigations will be carried out by State police and investigative agencies, and many specialised national-security concerns may involve a Central authority or force as a participant, successful investigation is likely to require inter-institutional cooperation. Forensic criminology fits in this environment by conceptualising the various sources of behavioural criminal intelligence and forensic evidence necessary to understand the wider puzzle of special-security cases.

Forensic Criminology and Internal Security

The potential conjunction of internal security and forensic criminology becomes more apparent when investigations are complex and have a bearing on terrorism, organised crime, cyber-enabled offences,

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trafficking, explosives and arms-related offences, and offences with wider security implications. Here, investigators may need to identify not just an offender or offenders, but also the links between individuals, the techniques adopted, sources of material or financial assistance, modes of communication, and the circumstances behind the offence. Scientific evidence can help to identify physical and digital connections, while criminological and psychological approaches can illuminate the context and give insights into the behaviour of those involved.

Hence, forensic criminology plays an important and underappreciated role in India's internal security set-up. It combines the scientific analysis of evidence with criminology-derived understanding of crime and criminal networks, psychological knowledge of criminal behaviour and context, and the operational necessities of investigations. It is thus not relevant solely to a single crime scene, but potentially also to the interconnections and patterns of related crimes.

This grows even more evident where crime emerges not only in the physical world but also in the digital domain.

In every investigation involving biological samples, online content, financial data, witness testimony, and behavioural evidence, there must be not only the expertise of each field but also effective mechanisms for relating those fields to one another.

India's internal security institutions already provide one institutional context for exploring the role of forensic criminology in consolidating separate investigative agencies. The many mechanisms available for cooperation between internal security and forensic agencies suggest that forensic criminology can offer an important conceptual basis for bringing them together without undermining their own legal authority and professional standards of expertise and proof.

Forensic Criminology and Modern-Day Crime Investigation

Changing Nature of Criminal Investigation

Crime investigation has shifted from detecting a perpetrator through traditional techniques to gathering, analysing, and integrating multiple forms of evidence. A modern investigation may include evidence such as blood, other biological samples, fingerprints, marks on firearms, marks made by tools, trace evidence, CCTV footage, the victims' and witnesses' mobile phones and other online activity, financial and other data, and many others. This growing array of evidence types implies a potential demand for more specialised expertise in scientific and technological areas.

In the past, forensic science tended to focus on examinations of evidence to support a criminal trial. In contrast, recent researchers speculate that forensic science information can be useful for investigative intelligence or for a time series of crimes. Forensic science can also be defined as a paradigm that links 'intelligence, investigation and evaluation' rather than as a form of evidence ultimately presented in court. Forensic intelligence approaches also attempt to apply forensic information across cases to facilitate linkages, patterns, and leads for investigation.

This aspect is especially relevant to forensic criminology, since it seeks to contextualise scientific evidence within a framework of information about crime, criminality, and investigation. Forensic criminology may provide the means through which each forensic report can be understood in the context of the totality of an event.

Forensic Intelligence and Cross-Case Comparison

Another recent development in forensic investigation concerns the use of forensic information as investigative intelligence. Another perspective on this topic is the analysis and application of forensic information to establish links, patterns, and associations that could be useful in the investigation and crime detection and prevention processes.

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The concept of this point emerged in response to the argument that forensic information did not add to the analysis or intelligence gathered through the various investigative and crime analysis processes. Similarly, some also argue that mining forensic case data across cases could contribute greatly to the intelligence process. Recent research has also associated the use of forensic information with cross-case and cross-crime investigations. A scoping review of forensic intelligence in Australia and New Zealand in 2024 identified information management as an important resource and saw forensic intelligence as an active approach to conducting cross-case and cross-crime analysis. The review also identified a partnership with the police as a means of helping public safety through cross-case and cross-crime analysis, information management, and operational implementation.

The potential application of forensic intelligence is particularly relevant in more serious forms of crime, such as hierarchical organised crime and serial crimes. The usefulness of a forensic finding from one case increases when comparing it with results from other cases, which can reveal whether there are consistent methods, materials, locations, or links.

Integration of Forensic Information within the Criminal Justice System

The importance of using forensic information also relates to its access and incorporation into the wider criminal justice system. In India, the establishment of the Integrated Criminal Justice System (ICJS) has been described as an integration of the three primary pillars of criminal justice, namely, the police, the courts, and the prisons, along with the forensic laboratories and the prosecution. This system is designed to promote data connectivity and the ability to use information across the various elements of the criminal justice system (MHA, n.d.).

The combination of forensic information with other criminal justice databases could potentially decrease information gaps and simplify access to relevant investigative material. However, the process raises considerations regarding the data's verifiability, accuracy, privacy, access limitations, evidentiary reliability, and interpretative knowledge.

The development of systems such as ICJS therefore indicates an important transition from narrow, institution-specific databases to interoperable criminal justice information systems that bring together an array of entities and systems. From the perspective of forensic criminology, this raises the prospect of combining scientific knowledge with the broader body of criminological and investigation-related information.

Forensic Psychology and Behavioural Approaches to Investigation

Forensic Psychology and Criminal Investigation

Criminal investigation is inherently a human process, in which investigators make use of and interact with victims, witnesses, suspects, and many other human beings, with the information they gather being inevitably affected by processes involving memory, communication, cognition, emotion, and decision-making. Psychological approaches can contribute to forensic investigation by providing theory and evidence to investigations and legal proceedings. Contemporary forensic psychology includes research and practice concerning investigative psychology, eyewitness memory, interviewing, deception, confessions, and offender behaviour (Zapf & Cutler, 2014).

The utility of forensic psychology to forensic criminology lies primarily in its ability to supplement the physical and digital evidence available at a scene with an understanding of human behaviour. Where science is likely to establish what physical and digital evidence is present, psychological approaches can contribute to understanding how individuals attend to, remember, communicate and respond to investigative conditions. This in no way implies that psychologically derived statements about individuals will, by themselves, be sufficient to determine guilt, but rather that they are likely to help generate and evaluate investigative hypotheses, so long as they are used in conjunction with corroborating evidence.

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The use of a psychological approach in investigation would be particularly useful in the context of complex cases, in which investigators need to discern among several competing pieces of information obtained from multiple human sources, such as eyewitnesses, victims, and suspects, as well as data concerning relationships between individuals and offensive modus operandi.

Victimology and Psychological Principles of Victims

Victimology is another significant area where psychology and criminology intersect. An understanding of victims' environments, vulnerabilities, relationships and experiences may aid the investigation of crimes and the development of investigative hypotheses. Psychological expertise is of particular use when working with victims of distressing or violent crime.

The influence of trauma is likely to affect memory, communication, emotional expression and willingness to provide information.

Investigators should avoid assuming that a victim's emotional presentation necessarily reflects the truthfulness or seriousness of their account.

Applying psychologically informed interviewing techniques can help the investigators obtain information while minimising unnecessary distress and avoiding contamination of memory. Research on vulnerable witnesses has pointed to the importance of having an understanding of memory, trauma and individual differences in the conduct of forensic interviews (Danby, 2024).

Victimological analysis can also support the understanding of victim-offender relationships and of who may have been chosen as a target. Such analysis, however, must not imply blame of the victim for an offence. The intent is to understand why an offence happened and to support investigation, not to blame.

Forensic Psychology and Radicalisation

The link between psychology and radicalisation has become relevant in recent internal-security research. Radicals are likely to undergo a multidimensional process shaped by a combination of social, psychological, political, and contextual influences rather than by the presence of a single psychological characteristic.

In this respect, forensic psychologists can contribute to the study of processes of identity, group influence, grievance, social belonging, cognition, recruitment and escalation of behaviour. This knowledge could be beneficial in prevention and risk-assessment strategies when used in conjunction with other sources of intelligence and contextual information. However, psychological theories of radicalisation must avoid reductionist claims that a specific set of psychological factors necessarily lead to terrorism. Radicalisation is a heterogeneous process, and a particular psychological profile cannot narrowly explain the progression from ideological beliefs or grievances to violent acts.

Ethical and Scientific Limitations

The use of psychology in a criminal investigation raises important ethical and scientific responsibilities, as psychological techniques are likely to influence the conduct of the investigation and potentially affect individual rights. Professionals must be able to distinguish between methods based on a strong scientific foundation and those that are not yet established. Criminal profiling provides an example of this, as it is a highly debated technique that has been shown to face ongoing challenges in empirical validation when subjected to systematic reviews (Fox & Farrington, 2018; Ribeiro & Soeiro, 2021).

Similarly, research has shown that even when memory-enhanced interview techniques, such as the cognitive interview, improve both the quantity and quality of information reported by witnesses, they may also increase false reports (Köhnken et. al., 1999). The science of psychology should guide forensic practitioners and investigators, while results from the other forensic sciences should be taken into account during investigations. The implications of the limits of psychological assessment, such as the potential for increased

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error during interviews, should not be ignored when forming conclusions or making decisions. This highlights the need for forensic psychology to adopt a multidisciplinary approach to investigation. Psychological results should be considered alongside information derived from the physical, biological, digital, and documentary sciences, and any conclusions should be proportional to the evidence.

Contribution of Forensic Psychology to Forensic Criminology

In summary, forensic psychology contributes to forensic criminology by systematically applying psychological principles to understand critical human factors in investigations—such as behaviour, interviewing, credibility assessment, and decision-making—while recognising that these contributions must always be supported by and integrated with robust evidentiary procedures. When integrated with other scientific disciplines (such as forensic scientists, criminal scientists, digital forensic experts, and criminological theorists) and with the intelligence provided in an investigation, psychological information can add value. This is particularly true in complex criminal investigations, where the interpretation of evidence depends on an understanding of how people remember, communicate, and behave. The relevance of forensic psychology is thus most important within the multidisciplinary context of forensic criminology in the study that is presented herein. The correct application of psychological principles may inform investigation, while the limits emphasise the need for multidisciplinary corroboration and scientifically informed investigative procedures.

Area	Potential Contribution
Offender Behaviour	Understanding behavioural patterns and investigative hypotheses.
Investigative Interviewing	Improving information gathering and reducing interviewer bias.
Eyewitness Evidence	Understanding memory limitations and suggestibility.
Victimology	Understanding victim circumstances and victim-offender relationships.
Criminal Profiling	Generating investigative hypotheses, subject to empirical limitations.
Credibility Assessment	Applying evidence-based approaches to evaluating information.
Threat Assessment	Structured examination of concerning behavioural patterns.
Radicalisation	Understanding psychological and social processes associated with mobilisation toward violence.
Investigative Decision-making	Identifying and reducing cognitive and contextual biases.
Vulnerable Witnesses	Adapting interviewing approaches to psychological and developmental needs.

Forensic Criminology and Emerging Internal Security Challenges

Forensic Criminology and Internal Security

The current internal-security environment is characterised by threats that are global, technological, and organisational in nature, transcending borders. Terrorism, organised crime, cyber-enabled crime, human trafficking, illicit financial flows, and extremist recruitment and other forms of transnational crime are likely to involve multiple offenders, multiple locations, multiple forms of evidence, and multiple law enforcement and other intervention processes.

The NIA notes that in terrorism investigations, investigations may include inter-state and international linkages, links with activities such as arms and drug smuggling, counterfeiting currency, and cross-border networks. This has important implications for the investigation of criminal activity, as a complex security-related crime may require simultaneous examination of multiple forms of physical, biological, digital, documentary, financial, and behavioural evidence. Forensic criminology may offer an integrated approach to combining these forms of information, criminological analysis, and investigative intelligence. It is thus not the application of any specific forensic technique, but the integration of multiple forms of forensic evidence, that makes forensic criminology relevant to this field. Forensic examination may help establish links and

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reconstruct events; digital forensic analysis may identify technological traces; criminological analysis may contribute to understanding crime types and networks; while forensic-psychological analysis may inform

human and behavioural aspects.

Role of Forensic Psychology in Internal Security Investigations

There are numerous areas in which forensic psychology can enhance any internal-security investigation – beyond the conventional approach of offender profiling. Psychological knowledge may assist in predicting recruitment, radicalisation, behaviour, interviews, and communication. In relation to terrorism- and extremism-related investigations, investigators may come into contact with individuals at varying stages of radicalisation or recruitment. Psychological information on mechanisms such as social identity, group-member behaviour, persuasion, and perceived grievance may prove useful. However, these factors are neither sufficient nor necessary precursors of violent behaviour in every case. Similarly, the Interviewing of witnesses, victims, and suspects is often particularly relevant in complex investigations involving multiple suspects, witnesses, and victims. Understanding communication, forgetting, and interviewer influence may help investigators avoid contamination of evidence and obtain reliable information. Psychology may therefore aid the investigation process without sacrificing the important standards of evidence, scientific rigour, and privacy examined in the previous chapter.

Proposed Application of Forensic Criminology to Internal Security

Based on the above discussion, a model of application of forensic criminology to internal-security investigation may be as follows:



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Under this model, the role of forensic psychology and behavioural analysis is best understood as being situated within, rather than separate from, the collection and interpretation of forensic evidence. This holistic approach may be particularly useful in crimes involving multiple offences, multiple jurisdictions, and multiple types of evidence.

An Integrated Forensic Criminological Approach to Complex Crime Investigation

Rationale for an Integrated Approach

Modern criminal investigations are often characterised by multiple types of evidence, overlapping offences and different individuals working in the physical and digital worlds. In an investigation, evidence for any single case- physical traces, biological samples, digital accounts, financial transactions, witnesses, characteristics of victims, criminal groups, and behavioural evidence could all be gathered at the same time. The relatedness between the evidence and contextual understanding of this offence needs to be quantified.

Generally, forensic science provides scientific analysis of evidence, while criminology helps us understand offenders, victims, crime, and crime patterns. Forensic psychology may allow us to understand behavioural processes, memory, interviewing, victimisation, and decision-making processes. Digital forensics provides methods for recovering and analysing electronic data. A combination of these areas, then, can provide a more holistic perspective for complex case analysis.

India's emerging criminal justice infrastructure provides an institutional foundation for such integration. Interoperable Criminal Justice System (ICJS) connects the police, courts, prisons, forensic laboratories and prosecution via interoperable digital systems to eliminate information silos and facilitate the shared use of criminal justice data.

The Bharatiya Nagarik Suraksha Sanhita, 2023 has reinforced the statutory focus on forensic investigation, with sections like 176(3) requiring forensic experts to visit the crime scene and gather forensic evidence in offences that attract a seven-year or more prison sentence (from the date prescribed by the State Government), complete with videography of the process.

This paper, therefore, presents the Integrated Forensic Criminological Investigation Model (IFCIM) as a theoretical construct for integrating the various investigative, forensic, criminological and psychological expertise in complex cases.

In contrast to other models which have focused on either forensic intelligence and/or investigative reasoning, IFCIM will attempt to link these various perspectives at each stage of the investigation process while maintaining the integrity of each profession's independence, evidentiary standards and legal protections. The model is not intended to be an alternative to existing investigative agencies nor does it represent a claim that interdisciplinary investigations are novel; rather, its intent is to provide a structured method of incorporating the various components of this type of investigation into the Indian system.

Proposed Integrated Forensic Criminological Investigation Model (IFCIM)

The proposed model is a network of interconnected phases through which an investigation can progress from the detection of a crime or security event to evidence-based investigation, prosecution, and prevention.

The model also intentionally illustrates a connected rather than purely linear process. For instance, new forensic evidence may change an investigative hypothesis, or intelligence may suggest new lines of enquiry for forensic specialists to follow. Similarly, behavioural information may assist investigators in identifying relevant lines of enquiry, but guilt should not be postulated without corroborated evidence.

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Stage I: Investigation-Initial Intelligence and Crime Evaluation

The first step in this stage is to define the incident to understand its nature and criteria. For instance, investigators can focus on aspects of the incident, such as the nature of the crime, the range and region, victims, known offenders, reasons, previously committed incidents, geography, and intelligence data. When internal security crimes are involved, this aspect also takes into account that the incident might be linked to organised crime groups, trafficking, terrorism, cybercrimes, and money laundering, among others.

This phase is not about proving guilt, but about developing an initial investigative hypothesis. Therefore, existing intelligence may be treated as information that requires validation rather than as evidence. This is especially important where intelligence is incomplete, classified, probabilistic, or of human origin.

The suggested model invites investigators to record the assumptions and hypotheses they formulated at thispoint. Such a record of assumptions may later help investigators and forensic practitioners determine whether evidence substantiates an investigative hypothesis or whether information was selectively interpreted.

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Stage II: Crime Scene Preservation and Management

The management of a crime scene is the first step in the forensic investigative process. Evidence can become meaningless due to contamination, poor handling, lack of documentation, or failure to maintain the chain of custody. The first step in a criminal investigation should be to secure and document the scene, and to identify, collect, package, and preserve evidence.

The statutory focus on Forensic Crime Scene examination under section 176(3) of the BNSS is a significant institutional context for this stage. The provision requires a forensic expert and videography of the evidence collection for relevant offences when the provision is notified to be effective by the State.

In the model presented here, for example, crime scene examination might not be simply a matter of gathering material. Instead, investigators should record the scene's location, time, and circumstances; where relevant, photograph, video, sketch, and note environmental conditions; and identify relevant digital devices, evidence, biological material, trace evidence, or other items holistically.

Stage III: Scientific and Digital Forensic Examination

A body of evidence that has been collected is sent to be analysed in the lab and/or digitally. This step may incorporate forensic disciplines such as DNA, fingerprints, toxicology, questioned documents, firearms, trace evidence, and explosives, as well as other forensic fields, depending on the type of crime involved.

Digital evidence has taken an important place in modern-day investigation, given the abundance of information now available across mobile phones, computers, the cloud, social media accounts, other communication media, financial transactions, and digital platforms. The Indian criminal justice system has also expanded digital access through CCTNS and ICJS. As outlined by the Ministry of Home Affairs, ICJS consolidates the police, courts, prisons, forensic laboratories and prosecution. At the same time, e-Forensics is an online case registration and tracking system for forensic reports.

The model states that scientific and digital results should be written in isolation before being integrated into an investigative narrative. This approach will ultimately ensure that the investigative narrative does not precondition scientific evidence.

Stage IV: Criminological, Victimological and Behavioural Analysis

Having considered relevant scientific and digital evidence, criminological inquiry can help to provide insights into the wider context of the incident. This may involve the investigation of factors such as the method of offending, victimisation factors, modus operandi, location, and relationships between defendants and victims, or between defendants and the third-party defendant.

Victimological analysis is particularly useful in complex cases. Traits of the victim, circumstances of victimisation, previous threats, relationships, routine activities, and presence in certain environments may help detectives formulate investigative questions. Victimological analysis must not be victim-blaming, or used to impose liability on the victims of a crime.

Forensic psychology can serve as an adjunct at this stage, addressing the relevant psychological processes. These may include, but are not limited to, memory and eyewitness testimony, investigative interviewing, offending behaviour, victim reactions, threat assessment, and any other phenomena that are defined by behaviour. The boundaries of scientific evidence and competence should constrain psychological input.

Crucially, behavioural analysis, or the formulation of a behavioural hypothesis, should not be accepted as evidence of a suspect's identity or guilt, but merely as a form of guidance in an investigation. Studies on criminal profiling have shown the methodological and validity limitations of behavioural analysis (Fox & Farrington, 2018; Ribeiro & Soeiro, 2021).

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Stage V: Formulation of an Integrated Investigative Hypothesis

The fifth step in the suggested model is the core of the analysis, where data from different investigative fields are integrated to generate one or more quantifiable hypotheses. The fifth step implies integrative processing. For example, an investigation could reveal evidence like:

- Evidence related to a person or thing's position.
- Digital communications between pertinent actors;
- Financial transactions related to the incident;
- Victimological data indicating particular relationships or patterns;
- Behavioural information suggesting potential investigative leads; and
- Comparator – including the similarities.

Researchers should not consider each finding in isolation but rather evaluate whether the evidence streams are mutually consistent, mutually inconsistent, or unrelated.

Another important concept at this point is the plurality of hypotheses. The investigator is discouraged from proposing a single explanation for the case and then interpreting all other data through that filter. When possible, propose several reasonable hypotheses and then test each one against the evidence.

This approach is consistent with the broader literature on forensic reasoning, which recommends iterative, hypothetico-deductive reasoning rather than a step-by-step linear process.

Stage VI: Evidence Verification and Cognitive-Bias Mitigation

Stage six incorporates overt steps to prevent the influence of cognitive and confirmation bias. Human decision-makers, investigators and forensic practitioners are vulnerable to being influenced by cues from their environment, expectations, or developing hypotheses. For example, Dror et al. (2015) describe the use of context-management techniques, such as Linear Sequential Unmasking, to prevent interference from extraneous contextual information in forensic decisions. Accordingly, the proposed framework incorporates several safeguards:

- **Separation between Observation and Interpretation:** All factual observations should be made independently of the investigation interpretation.
- **Objective Forensic Evaluation:** Scientific results are evaluated in the context of existing forensic knowledge, rather than being artificially skewed by the expectations of the investigation.
- **Hypothesis Testing**: Evidence should be examined for both supporting and contradictory information.
- **Context Management**: Limiting unnecessary context that could feed bias if learned.
- **Corroboration:** Where feasible, other important conclusions of the investigation are supported by independent evidence streams.
- **Documentation of Uncertainty:** Documenting what is unknown, including limitations, alternative explanations and inconclusive results.

Findings are to be documented including but not limited to the evidentiary basis for each finding, its limitations, degree of uncertainty, and any contradictions found. To ensure that investigators do not confuse potential intelligence leads with confirmed evidence, they will need to maintain an objective evaluation of forensic specialist's reports. In the event that a gap or inconsistency is identified in the verification process, investigators should revert back to prior steps in order to modify their initial hypotheses, gather more evidence, and/or investigate further, while adhering to all appropriate laws.

Stage VII: Outcomes in Investigation, Prosecution, and Prevention

The final step involves converting the results of investigations and research that have been verified through sufficient corroboration into legally permitted investigative and/or criminal justice responses. These responses

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could include additional evidence collection, identifying a suspect, identifying a victim, or prosecuting an individual. Investigative leads, intelligence assessments, and expert opinion must each maintain their own separate evidentiary value; no one alone can establish guilt. Following an investigation, lawfully shareable information may provide support for cross-case intelligence and prevention initiatives focused on organized crime, human trafficking, terrorism, and cybercrime. The application of this type of information must adhere to existing statutory requirements concerning data access limitations, personal data protection standards, and inter-agency data sharing procedures. New patterns or conflicting results may require a review of previous assumptions/hypotheses.

Model Application in Complex Investigations

The usefulness of the IFCIM can be illustrated through application to different types of complex cases. As the table shows, this does not create a new forensic technique for every crime. Its real power is in integration. Combining the current investigative and forensic expertise into a single analytical framework allows all this information to be brought together, compared, and substantiated.

Investigation Challenge	Conventional Investigative Difficulty	Potential Contribution of IFCIM
Complex Crime Scene	Large volume of physical and contextual information.	Structured scene documentation and multidisciplinary forensic examination.
Unknown Offender	Limited direct investigative leads.	Combination of physical, digital, victimological and behavioural information.
Multiple Suspects	Conflicting narratives and evidence.	Comparative hypothesis testing and corroboration.
Terror-related Incident	Multiple scenes, victims and evidence streams.	Integration of forensic, digital, intelligence and network information.
Cyber-enabled Crime	Evidence distributed across digital environments.	Digital forensics combined with criminological and behavioural analysis.
Organised Crime	Multiple actors and interconnected offences.	Cross-case and network-oriented analysis.
Eyewitness Inconsistency	Memory limitations and suggestibility.	Application of evidence-based interviewing and memory research.
Unidentified Victims	Limited direct identification information.	DNA, biometric, digital and victimological integration.
Investigator Bias	Risk of premature conclusions.	Explicit hypothesis testing and context-management procedures.
Mass-casualty Incident	Large number of victims and evidence items.	Coordinated forensic identification and evidence management.

Illustrative Hypothetical Application of IFCIM to a Cyber-Enabled Human Trafficking and Financial Fraud Case

A hypothetical application of the IFCIM is presented here in order to illustrate how it can be utilized in the context of a potential cyber-enabled human trafficking and financial fraud network operating in multiple locations within India. It should be noted that the following hypothetical example is purely illustrative; it does not represent an actual investigation or demonstrate the validity of the proposed model.

Stage I: Initial Intelligence and Crime Evaluation

An authorized law enforcement agency receives reports from a number of individuals alleging that they have been deceived through online recruitment methods and that they are likely victims of exploitation. The initial

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reports suggest possible connections between the reported incidents, the online profiles/accounts referenced by the complainants, the telephone numbers provided by the complainants, and the financial transactions reported by the complainants. The investigators record the preliminary information and develop preliminary hypotheses based on the information received, but do not treat the preliminary information as verifiable evidence.

Stage II: Crime-Scene and Evidence Management

In the event that a physical location(s), device(s), or document(s) are identified as potentially relevant to the investigation, the authorized personnel will document and preserve such items in accordance with all applicable laws. Authorized personnel will identify digital devices, financial records, and victim-related material for appropriate examination and will maintain records that demonstrate evidentiary continuity for purposes of prosecution.

Stage III: Scientific and Digital Forensic Examination:

Authorized personnel who specialize in digital forensics will conduct forensic examinations of lawfully obtained digital materials including, but not limited to, relevant communications, account records, and device data. Authorized personnel who specialize in financial forensics will review available transaction records. Other forensic examinations will be conducted as warranted based upon the evidence available to the examiners. All examiners will document the methodologies employed, findings identified during the examination, limitations associated with the examination, and uncertainties related to the examination. An online account or transaction cannot serve as definitive evidence regarding the identity or actions of a particular individual.

Stage IV: Criminological, Victimological, and Behavioral Analysis

Investigators will analyze the reported circumstances of recruitment, victimization, relationships among relevant parties, and possible patterns across various incidents. Investigators will utilize appropriate interviewing techniques and victim-sensitive procedures. Although behavioral observations may lead investigators to ask additional questions, such observations will not be considered independent proof of guilt.

Stage V: Hypothesis Development and Cross-Case Analysis

Investigators will compare the findings obtained from Stage I through Stage IV to determine whether separate complaints appear to be related. Investigators will consider alternative explanations for the apparent relationships among complaints including legitimate transactions, joint ownership of devices or accounts, mistaken identity, and unrelated incidents. If investigators continue to have doubts concerning apparent relationships among complaints, investigators may pursue additional lawful inquiries or independent forensic examinations.

Stage VI: Corroboration and Evidentiary Evaluation

Investigators will collectively evaluate all relevant digital, financial, documentary, physical, and testimonial evidence while recognizing the inherent limitations of each type of evidence. Investigators will identify contradictory evidence, gaps in evidence, and alternative explanations. Investigators will revise their conclusions when new findings contradict prior assumptions and will make decisions consistent with all applicable evidentiary and procedural requirements.

Stage VII: Investigative, Prosecutorial, and Preventive Outcomes

Investigators will communicate findings to appropriate authorized decision-makers for further investigation and, if warranted, for evaluation for prosecutorial action. Decision-makers may consider victim protection and support measures in accordance with all applicable laws. Any subsequent cross-case analyses or prevention-

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oriented uses of information must comply with all applicable legal requirements regarding access to information, privacy, data governance, and institutional authority.

The hypothetical application of the IFCIM presented above illustrates how it can provide a framework for coordinating activities among investigative personnel, forensic specialists, and other authorized professionals while maintaining their respective roles. The primary benefit of using IFCIM is that it provides a structured method for evaluating different types of evidence, competing hypotheses, uncertainty, and safeguards throughout the investigative process. It remains an open empirical question as to whether the use of IFCIM results in higher quality investigations, more efficient investigations, or better evidentiary outcomes.

Interaction of Institution with India's Criminal Justice System

The proposed Integrated Forensic Criminological Investigation Model (IFCIM) is designed to facilitate coordination amongst existing institutions rather than create an additional investigative agency. This model will operate in conjunction with the existing legal authority, professional obligations and evidentiary standards of each of the institutions that are involved in the investigation.

Police and authorized investigating agencies: Most offenses in India are investigated by the police department of the state or union territory where the crime occurred. There are several specialized agencies including the National Investigation Agency (NIA), which investigates cases based on their respective statutory mandates. State Anti-Terrorism Squads (ATS) also exist under the purview of their respective state laws. While IFCIM may assist these agencies in organizing evidence, developing alternative hypotheses and facilitating consultation with experts, it does not give them the authority to expand their jurisdiction or investigative capabilities.

Central Armed Police Forces (CAPFs): They have been provided with specific duties and responsibilities through their governing legal and administrative frameworks. These duties include providing security and supporting law enforcement operations. The extent to which CAPFs participate in a particular investigation depends on the circumstances surrounding the investigation and the applicable authority. CAPFs cannot be considered equivalent to either the police force or the specialized investigating agencies.

Forensic Science Laboratories and Technical Specialists: FSLs and their qualified specialists analyze physical, biological, digital, and other forms of evidence related to crimes within their areas of expertise. All analyses conducted by forensic science laboratories must be documented to show the methodology used, limitations, and levels of uncertainty associated with their results. Additionally, forensic science laboratories must conduct their scientific interpretations free of influence from investigative expectations. Lastly, forensic science laboratories must never substitute unverified behavioral assessments or intelligence information for forensic science conclusions.

Intelligence Agencies: They gather, evaluate, and distribute information consistent with their legal and ethical obligations. Intelligence may provide leads or establish priorities for an investigation; however, it cannot automatically serve as admissible evidence or as proof of guilt. Any intelligence used in a criminal investigation must be obtained legally, evaluated properly, and comply with all applicable evidentiary requirements.

Prosecution Authorities: Prosecutors evaluate the evidence and legal issues associated with prosecutions under the applicable procedural framework. Investigators and forensic examiners are separate entities from prosecutors. Early and lawful cooperation between investigators and prosecutors may help identify evidentiary gaps and disclosure requirements while preserving investigative independence and ensuring that all parties receive fair treatment during legal proceedings.

Coordination and Information Governance: India's digital initiatives, such as the Crime and Criminal Tracking Network and Systems (CCTNS) and the Inter-Operable Criminal Justice System (ICJS), provide a framework for managing and sharing certain types of criminal justice-related data. IFCIM may serve as a conceptual model for coordinating findings across multiple streams of evidence; however, it should not be viewed as an autonomous database or as authorization for unlimited access to information. Access to information must remain role-based and lawful and include safeguards for protecting privacy and confidentiality, safeguarding data security, maintaining evidentiary continuity, and holding individuals accountable for accessing information without proper authorization.

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Therefore, the contributions of forensic criminology within IFCIM relate solely to facilitating communication and integrating knowledge across disciplines. Forensic criminology does not replace the responsibilities of any participating institution. To achieve success, IFCIM will require clearly defined roles for each participating institution, sufficient training for personnel performing those roles, a written record of decisions made during investigations, an objective evaluation of scientific assessments performed during investigations, and adherence to relevant legal safeguards. Ultimately, whether IFCIM proves effective will be determined through empirical evaluations.

Expected Benefits of the Proposed Framework

The Integrated Forensic Criminological Investigation Model (IFCIM) can potentially aid in combining and integrating various sources of data, including physical, biological, digital, behavioral, and contextual information. Additionally, it could facilitate the generation and evaluation of alternative investigative theories. Cross-case analysis is another area where IFCIM may provide assistance. Finally, IFCIM can assist investigators in systematically documenting their findings, uncertainties, and evidence. Additionally, it can link investigative learning to the development of prevention and security plans. However, these are potential benefits rather than confirmed outcomes, and their real-world application will need to be evaluated empirically.

Limitations of the Proposed Model

The IFCIM is a conceptual model that has been developed to describe the process of conducting forensic investigations but has not yet been supported by empirical data from actual investigation processes. The successful application of this model will rely heavily on an institution's ability to coordinate effectively with other institutions, use consistent professional standards, and share information legally. In addition to these factors, the use of several different sources of evidence could create conflicting interpretations or support previous ideas and beliefs about the investigation. Therefore, even though the model does not provide a way to reduce uncertainty or eliminate the need for human judgment during the investigative process, it is important to evaluate the effectiveness of the model using real-world examples, input from investigators, and quantitative measures prior to determining if the model is effective.

CHALLENGES AND LIMITATIONS

Despite its growing significance, integrating forensic science, digital investigation, criminology, and forensic psychology into criminal investigations presents numerous institutional, legal, technological, scientific, and ethical challenges. Forensic criminology, therefore, does not operate independently of evidentiary quality; its efficacy depends on how evidentiary quality is collected, examined, evaluated, and integrated.

Forensic Infrastructure and Capacity Building Challenges

Capacity constraints must expand in equal measure to the increasing caseload, case complexity, and evolving needs of forensic capabilities. This has been acknowledged in the Government of India’s National Forensic Infrastructure Enhancement Scheme (NFIES), which seeks to strengthen forensic infrastructure, pilot Centres of Excellence, establish new Central Forensic Science Laboratories, new NGFSLs, and new NFUs, and address shortages of forensic-trained personnel. Forensic investigation capabilities may now encompass several technological specialisations, such as DNA analysis, cyber forensics, mobile phone examination, and specialised fields of operational science. This extension must include not only physical laboratories and equipment but also hands-on training, validated methods, quality standards, and effective evidence management systems.

Shortage of Forensic Personnel and Training in Interdisciplinary Forensic Disciplines

Investigators, forensic scientists, criminologists, behaviourists, cyber forensics specialists, and prosecutors working together can be advantageous in forensic criminology.

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However, cross-disciplinary professional differences (such as training, vocabulary, and standards of inference) may constitute an obstacle. Recognising the need to expand forensic infrastructure, the Government of India's National Forensic Infrastructure Enhancement Scheme (NFIES) aims to address the shortage of forensic professionals. In addition to increasing the number of professionals, the course must include interdisciplinary training to help investigators understand the scope and limitations of digital, scientific, and behavioural evidence. This is all the more necessary in forensic psychology, where behavioural analysis is complex and intuitive recommendations should be avoided.

Forensic Delays and Evidentiary Gaps

Diagnostic delays in forensic examinations may hinder the progress of investigations. DNA analysis, toxicology, digital device examination, and firearms analysis are examples of specialisations that often require significant time and resources. However, every effort must be made to achieve the required speed without compromising scientific reliability. The goal, therefore, must be to enhance laboratory capacity, staffing, the queue management system, and workflow to match the scale, workload, and technology, while maintaining adequate quality standards. Equally important is the requirement to properly preserve the evidence, document each stage of handling and preservation, and maintain a proper chain of continuity of possession. Improperly handled evidence may serve to lessen the material value of digital and other physical samples.

Forensic Technology Challenges and Digital Evidence

Digital communications are more than any other recent phenomenon, except digital evidence scattered across mobile phones, social media accounts, cloud storage, financial transactions, and proprietary messaging platforms. The newly created Indian Cybercrime Coordination Centre (I4C) works in cybercrime reporting, investigation, cyber forensic support, cyber forensic training, and threat indicator analysis, underscoring the growing institutional importance of specialist cyber capabilities. However, encryption, rapidly evolving messaging applications, and Big Data can complicate digital evidence collection and analysis across many institutional jurisdictions. Digital forensic units would be required for ongoing tactical updates and technical training, particularly as challenges such as cloud storage, video/visual/audio-based communications, encrypted and generalised digital storage, and analytics-driven digital material are foreseeable.

Inter-Agency Coordination and Overcoming Institutional Silos

Investigations may involve police departments, specialised agencies, intelligence agencies, forensic laboratories, prosecution units, and different geographic jurisdictions. Enhanced forensic science needs to cross jurisdictional boundaries and integrate diverse databases, procedures, and access mechanisms. This is an evolving requirement, with the Central Government's Inter-Operable Criminal Justice System (ICJS) currently enhancing interoperability among police, prosecutions, courts, forensic laboratories, and prisons. Specific technical capabilities will still be needed in digital forensics to read and understand various information formats, such as cloud-based storage, storage beyond national borders, and end-to-end encrypted mobile data. Despite technological connectivity, an institutional framework is unavoidable; technical monitoring, standardised formats, and dedicated personnel and expertise are thus crucial. In forensic psychology, the question of independent institutional responsibility must be considered simultaneously. Factors such as different procedures, specialities, and specific case-handling rights must be kept in mind to guide planning among relevant authorities.

Legal, Ethical, and Privacy Challenges

The use of biometric, digital, forensic, and behavioural knowledge will necessarily raise concerns about individual privacy and Personal Data Protection, the admissibility of digital and behavioural evidence, and forensic professional ethics. This is all the more evident in contexts where sources such as digital databases and behavioural information are combined. The presence of data alone is not sufficient to generate an intervention; lawful collection and safeguarding, as well as proportional retention, must be in place. Even in the context of digital forensic analysis, analysts must be careful not to jump to hasty associations or base their

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evidence analysis on subjective assumptions; tangible communicators and evidence must be distinguished from interpretation. Appropriate professional distance must be maintained in the behaviour analysis case.

Cognitive Bias and Misinterpretation of Evidence

Cognitive bias is an important consideration in investigation and forensic interpretation. Investigators and forensic science experts may harbour prior hypotheses, information, or expectations about an offender's or victim's personality traits. As highlighted by Dror et al. (2015), contextual information could have a substantial effect on forensic decision-making. Still, it is best mitigated by approaches such as Linear Sequential Unmasking, which are designed to limit avoidable cognitive bias. Such concern is central to forensic criminology because integrating various types of evidence can enhance investigators' efficacy but also lead them to interpret subsequent evidence in light of a pre-existing narrative. Investigation best practices should therefore distinguish between observations and opinions, bearing in mind possible alternative hypotheses, and actively seek out contradictory data.

Limitations of Behavioural Approaches and Criminal Profiling

Although forensic psychology can advance investigations, behavioural approaches are limited, and criminal profiling does not provide conclusive evidence of an unidentifiable offender's origin. Fox and Farrington (2018), in a systematic review and meta-analysis, identified marked limitations in the empirical evidence base of offender profiling. Moreover, the external validity of profiles has also been questioned (Ribeiro & Soeiro, 2021). Hence, for investigative purposes, behavioural analysis should be used mainly as a tool for hypothesis generation and testing, to support advocates of physical, biological, and digital evidence.

FUTURE DIRECTIONS AND RECOMMENDATIONS

Owing to the increasing complexity of crimes and internal security challenges, forensic scientific, technical, and multidisciplinary investigative mechanisms must keep pace in the future. Through the conceptual analysis performed, a few areas have been highlighted which, if focused on, might strengthen the use of forensic criminology in the Indian context.

Improving Forensic Infrastructure

Continuing to focus on infrastructure and human resources in Forensic Science Laboratories, particularly for their establishment and upgrade, particularly in the domains of DNA investigation, digital/cyber forensics, and other specialised areas, would enhance the investigative capabilities of the police and other enforcement agencies. The ongoing initiatives, such as the "National Forensic Infrastructure Enhancement Scheme," appear to be headed in the right direction.

Fostering Interdisciplinary Forensic Professionals

Inculcating a greater degree of interdisciplinary education and vocational training in areas such as criminology, forensic science, forensic psychology, digital forensics, and the investigative domain is recommended. The intention of such an interdisciplinary orientation could be to improve communication between professionals at the field and lab levels, while acknowledging the inherent domain-specific standards and responsibilities.

Strengthening Integration of Forensic Psychology in Investigation

Then, psychological aspects should be integrated with formal protocols and specific evidentiary criteria at the investigative level, such as Investigative Interviewing, Eyewitness Evidence, Victimology, and Behavioural/Threat Assessments. These interventions can be scientifically oriented and practised on the basis of empirical evidence.

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Increasing Focus on Digital and Cyber-Forensic Investigations

With cybercrimes showing a rising trend, enhancing the capacities of digital forensic labs and building a specialised workforce in investigation, evidentiary integrity, and tech platforms would remain a key challenge. Initiatives along the lines of the "Indian Cybercrime Coordination Centre (I4C)" underscore the growing institutional recognition of specialised cybercrime investigative needs. Future investigative systems may need a structured focus on technical aspects and related policy issues concerning encryption, cloud evidence, AI-based content, and the nature of platforms and digital anonymity.

Enhancing Cohesion and Coordination between Agencies

Forensic criminology is, in essence, a systemic effort. The structured effort by the police, forensic laboratories, specialised investigative and intelligence agencies, and the prosecution is essential. Efforts towards the ICJS and similar interoperable mechanisms at the institutional and technological levels can lay a stronger foundation. This needs to be matched with structured communication and information-sharing protocols that define professional responsibilities, evidentiary access, and analytical requirements.

Institutionalising Evidence-Based Investigative Protocols

There might be a case for pushing structured scientific approaches to formulating investigative hypotheses, analysing evidence, and corroborating facts rather than mere conjecture. Investigators may clearly categorise findings into corroborated, hypothetical, or under investigation status. It might be prudent to integrate methods to mitigate confirmation bias through deliberate cross-hypothesis testing, proper documentation, and techniques such as "Context Management" at various stages of the forensic and investigative decision-making process (Dror et. al., 2015).

Enabling Forensic Intelligence and Cross-Case Analysis

Forensic evidence might have untapped potential through intelligence-led policing in contexts permitted by law and policy. Creating systems that enable evaluation of potential patterns in DNA evidence, fingerprints, ballistic data, digital findings, MO, and behavioural clues across multiple investigations might assist in linking seemingly unrelated yet potentially connected organised crime, terrorist, and trafficking networks.

Ensuring Responsible Use of Advanced Technologies

Artificial intelligence, big data analytics and automated forensics will increasingly supplement investigators. However, the use of such advanced technologies requires appropriate validation, transparency, human-in-the-loop oversight, proper data governance, and mitigation of potential biases inherent in such systems. Technologies are thus supposed to remain decision-support tools for human professionals rather than standalone sources of authority.

Empirically Assessing the Proposed Framework

The suggested "Integrated Forensic Criminological Investigation Model" needs to be tested as a hypothesis in field or academic contexts before moving towards implementation. Small-scale pilot studies, analysing cases using institutional datasets and multidisciplinary feedback, are a way to test such models for incremental gains in efficiency, the veracity of analysis, and cross-case evidence synthesis.

Strengthening Research and Institutional Collaboration

Future researchers can conduct practical studies on the adoption of forensic criminology in the Indian investigative landscape. Joint efforts by Universities, Central and State forensic institutions, Police organisations, specialised investigating agencies, and prosecution departments would likely help in the evidence-based framing of investigative methodology and human capacity building. Future research might

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further examine empirical research in forensic psychology, investigative interviewing, cognitive biases, digital/cyber-forensic trends, forensic intelligence, and multidisciplinary investigation methodologies.

CONCLUSION

This study has examined how forensic criminology relates to Indian criminal investigations and internal security, specifically focusing on the connections between criminological analysis, forensic science, forensic psychology, digital forensics, and investigative methods. The study also identified several institutional, technological, procedural, and ethical barriers to using forensic criminology in Indian criminal investigations and internal security; these include: insufficient forensic capabilities; lack of interagency coordination; issues related to privacy; and cognitive biases. To overcome the need for structured collaboration among the current areas of expertise, this paper proposes an Integrated Forensic Criminological Investigation Model (IFCIM). This model provides a conceptual basis for linking investigative data, scientific and digital evidence, criminological and psychological analysis, hypotheses formation, and evidence verification while maintaining professional autonomy and legal protections. The model is not intended to create a new investigative agency or supplant current institutional authority. Since the IFCIM is conceptual in nature and has yet to be empirically evaluated, it cannot be determined at this time if the model will be effective in practice. Therefore, additional research is required to determine the usefulness of the model in real-world settings via case studies, feedback from practitioners, and quantitative assessments.

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