

# Rise of Digital Forensics and Its Impact on Criminal Justice: A Study of Tools and Techniques Involved

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## Abstract

With the technological advancement in various fields, the digital forensics technology has also been revolutionized and as a result, criminal justice system has been substantially changed. However, various information technologies has not just enabled the researchers to find out the criminals but also helped them to identify the root cause for crimes. Along with that, there has been a growth in justice system as a result of the technological advancements. In the study, various aspects of digital forensics have been identified and described effectively.

In India, the numbers of crimes are growing faster and their techniques are changing as well. That is creating challenges to make justice against it without adequate evidence. In that case, which kinds of evidence can be collected and from which resources, have been discussed here with clear information. How the technological changes are impacting the criminal investigation procedures and bringing more efficiency, have been discussed as well.

## Keywords

Criminal Activities, Criminal Justice, Digital Forensic Technologies, Evidence, Justice System.

## INTRODUCTION

With the ongoing technological advancement, focus of criminal forensics has extended abruptly and recovery of evidence is duly performed through digital platforms. As a result of this, investigations of all crimes are performed on devices that have digital storage capacity or digital processors. However, recovery of the network, images or any document, indication of activity of an individual and all other types of investigation are performed through satellite navigation system, car engine management and cell phones. Purpose of this study is to identify the impact of digital forensics on the criminal justice system along with some necessary tools and techniques.

### Current state of criminal justice in India

The Criminal Justice System followed by the Indian government is a very decades-old system that is somehow fostering the growth of crimes and keeping the population in uncertainties regarding various life-living aspects. Surveys have said that the capital city of India is found with maximum criminal activities that are gradually growing in current dates while the number of crimes is found comparatively less in Kolkata [10]. In sum, the Indian Criminal Justice System is in heavy need of judge courts' physically presence in which presenting proper evidence is required. Therefore, technologies are being positively adopted by the administrative system to improve the judgements of the courts and prevent crimes in no time. Today's generation is taking an interest to have a piece of core knowledge about crimes and their root causes so that criminal activities can be improved. In this digital edge, the number of cybercrimes is high for which digital forensic technologies are found beneficial.

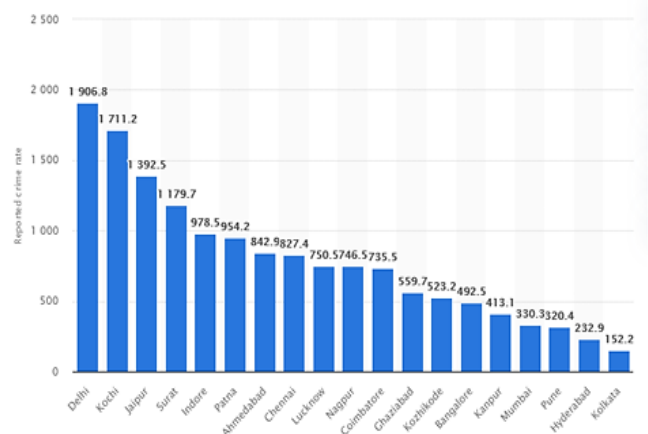


Figure 1: Crime rate in India- State wise [10]

### Branches of digital forensic process

As the technologies are bringing changes in every digital gadget, network forensic and mobile forensic have been found to be used most nowadays as maximum people are using mobiles and storing data in those that work as evidence. As per Beebe, Liu, & Ye (2017), disk forensic is a lengthy process though useful to identify, acquire, authentic, preserve, analyse and report the evidence against crimes. With the RAM requiring analysis technique, database forensic has become popular in police departments of India. Personal Digital Assistants (PDAs) are also being used with the standard personal information management features by information security experts, IT auditors and system administrators.[1]

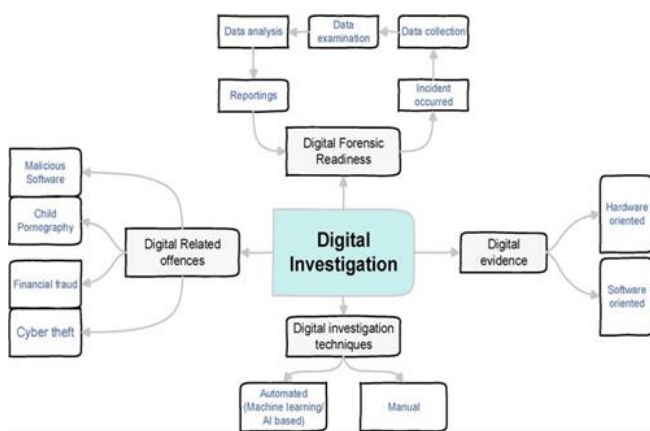
### Sources of digital forensic evidence

The platform of digital information is huge and can easily connect one with another for collecting a wider range of

criminal evidence. Criminal investigation departments are now focused on monitoring storage devices such as removable drive, hard disk, internet browsing history, chat logs, buddy list, along with portable devices- GPS, digital camera for criminal prosecution. Peripheral resources are also found helpful to know how criminal activities are being performed from fax number, incoming and outgoing calls, scanned database, fingerprint, DNA and other resources [11]. The computer system is a valuable information resource for collecting email, images, files, videos, attachment and other databases.

**Growing role of technology in forensic investigation and criminal justice**

The technologies are infiltrating daily lives with maximum futuristic advantages that are undoubtedly helping the criminal investigation department as well. The real forensic techniques in India are integrating so fast with the similar way of criminal activities enhancement. From trace evidence chemistry to retinal scanning, every possible tracking process has been introduced in the criminal investigation department for addressing crimes and criminals with solid proof [3]. Criminals are introducing new techniques to commit crimes and killing people. With the help of new technologies, crime department officers have been able to find out the processes that have been adopted by the criminal for doing anything wrong.



**Figure 2:** Digital criminal investigation and new technologies [2]

In this era of robotics, criminal justice professionals are seeking efficient techniques that would not only help in defining the criminal activities and procedures but the initial tracking that can prevent the number of crimes across Indian regions. In this 21st century, various new technologies have been profound such as alternative light photography, forensic carbon-14 dating, 3D forensic facial recognition and Laser Ablation Reluctantly Coupled Plasma Mass Spectrometry (LA-ICP-MS). Police officers, crime investigators, judges, lawyers and other criminal legal professionals are adopting technological investigation procedure in their fields for controlling any kind of crime up to an extent.

**METHODS**

A qualitative method has been conducted to know how digital forensic analysis is helping Indian regions to monitor and control the crimes that are promoting crime prevention as well. In that case, the data have been collected from online secondary resources, especially those published after 2017 and on legally reliable sites that have made a clear sense about the current scenario of the nation and challenges faced by the technicians to adopt digital criminal justice technologies. With the help of positivism philosophy, most compatible with secondary qualitative research works, the research and findings have been analysed in this study (Sherif, 2018). The deductive approach found it beneficial to omit all the unnecessary measures that can weaken the discussion and its relevance to the chosen topic. All the recent data has been collected that can privilege the need for technological changes for bringing justice against crimes. Alongside, several times of filtration have been done by the researcher, before integrating data in the article so that no further issues can be claimed. Hence, the chosen methodological tools have added an extra value to the overall study for making it sensible.[9]

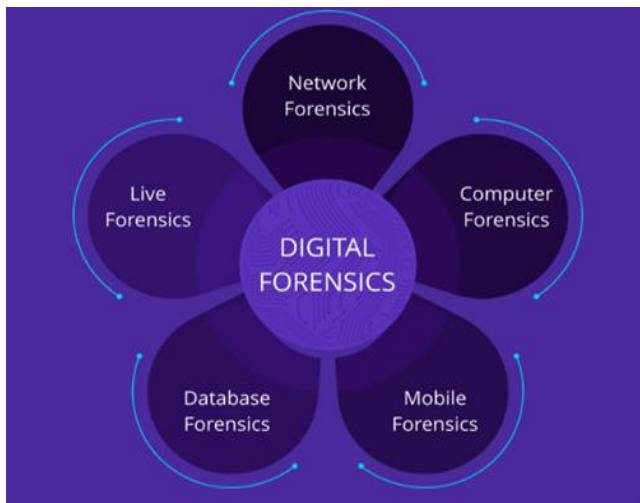
**RESULTS**

Information and technology plays a pivotal role for transition of various scientific findings and deep understanding of innovations. In the present scenario, modern technological equipment is used for advanced forensic studies for increasing efficacy and speed of the criminal justice system. As opined by Caviglione, Wendzel & Mazurczyk (2017), the digital forensic investigation is the overall procedure of identification, preservation, extraction and documentation of computer evidence that can be utilized in court of law. Along with that, digital forensic investigations are applied in the corporate arena including internal corporate investigations and computer hacking investigations. Moreover, the rapidly expanding field of contemporary digital forensics includes investigation of system hack, illegal network intrusion, firewalls, databases and network forensics.[4]

As technology has impacted the life of every individual, it is no wonder that technology will become the future of any research work. From trace evidence chemistry to retinal scanning, contemporary forensic techniques have become so advanced that they seem to be science fiction [6]. Along with that, DNA mapping, recreating the face of a skull, making a complete image from mere pieces, distinguishing mixed chemicals in blood and many other implications have become easier with the help of modern information and technology. Thus, the pattern of gathering information to verify the evidence has abruptly changed with the advanced use of digital technology.

However, with the invention of various technologies, forensic experts have started implementing them in laboratories, legal offices and courts. Therefore, robots, drones, GPS and GIS systems, computer aided dispatch, GDS

system, 3D imaging, information exchange are effectively used by the experts for forensic investigations and criminal identifications. As per the suggestions of Karampidis, Kavallieratou & Papadourakis (2018), it has enabled the researchers, police officers, investigators, lawyers and judges to stay one step ahead from the criminals. So, the impact of information and technology on digital forensics has been realized by Indian researchers while experiencing the guaranteed success in criminal justice.[7]



**Figure 3:** Digital Forensics and its Branches [4]

Some **advantages** of digital forensics include:

- Through computer forensics it is easier to track IP address, packet sniffing, email tracing, fingerprint scanning, examining post mortem report and distinguishing chemicals from blood.
- Sex determination of primates.
- Identification of alcohol content in the body through urine or saliva test.
- Identifying cause of accident through calculating vehicle speed, condition of vehicles and other marks.
- Mobile record tracking, speech enhancement, tape authentication and speech coding in phonology.
- Identifying fraud in payments, forgery, lie detection, digital imaging, voice analysis and foot print marks.
- Identifying wounds of molestation, child abuse, sexual assault, defensive wounds, domestic violence and gunshot wounds or self-inflicted injury.

Some **disadvantages** of the process in India are as follows:

- DNA mapping is against human morality as it reveals personal information.
- Delayed verdict because of the time consuming process of experiments.
- Varying results with different processes, expensive equipment and risk of misleading in analysis for any ignorance or misconception of data.
- Political or financial influence over manipulating results, maintaining privacy and shortage of tools are some disadvantages in India.
- There are no specific standards for verifying the results of experiments.

- Replication and volume of data change in technology, and admissibility in courts.

However, digital forensics is generally used in various fields such as archaeology, photographic and art for estimating the original data and real information. Despite the advantages there are still some issues which must be mitigated with more advanced technology and modern use of equipment. As per the opinions of Li *et al.* (2021), managing the evidence of digital forensics is crucial as any mislead can lead to varied results. Accordingly, securing the device and preparing for more storage devices is essential as they are crucial for maintaining the huge amount of data.[8]

Along with that, people metrics must be maintained for assessing the results of investigation. As political forces and strong economic factors have abilities to mislead the evidence in the country, the facts must be maintained so that no mislead can occur in the criminal justice system. In the words of Ellison, Venter & Adeyemi (2017), government funding is an essential factor in this sector as the tools are not only expensive but also need proper maintenance. Along with that, more computerized security systems should be implemented to avoid any mislead or hacking in data.[5]

## CONCLUSION

With all the technological advancement, it is no wonder that digital forensics is growing abruptly and the pattern of criminal justice is evolving day by day. However, it is crucial to realize that the advancement of information and technology has opened new classes of tracing evidence. Previously, these clauses were not taken into consideration as there were no methods available for examining them. Contradictorily, technological advancement has shown various possible ways of analyzing the results for more advanced and error free results.

Nowadays, digital professionals routinely focus on various tools for not only convicting the attacker, but also understanding the overall lacking in the security system that led to plugging the hole. However, various impacts of information and technology have been described in the study with respect to India. Along with that, some other aspects have also been elaborated so that the overall aspect of digital forensic can be identified in a more effective manner. Therefore, it is important for the forensic service suppliers to analyze and obtain the traces and identify effective results with the application of digital sources.

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