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The Modern Scientific Proofs and their Authenticity in Criminal Evidence: Literature Review

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Abstract

This research seeks to review the growing literature on modern criminal evidence and the role of technological advancement in forensic science. We reviewed 114 forensic science studies based on a systematic literature review approach. The studies provide supporting evidence that technological advancement has permitted improved progress on modern criminal evidence. The analysis cybercrime and related offenses pose a global danger to many private and corporate entities around the world. Some nations (e.g., Algeria) have adopted the notion of proof-free prosecution, which means that there is no exception to the rule in modern criminal legislation comparison as a result of the necessity to adapt and cope with changes in all parts of one's existence. Also, conventional crimes, such as fraud and money laundering, have been creatively changed into new forms by the rising popularity of the Internet. Fruitful directions for further studies and implications for policymakers were discussed.

Keywords: Modern Forensic Evidence, Forensic Evidence, Criminal Evidence, Identification.

Introduction

The term "evidence" refers to the body of accessible data demonstrating whether a belief in a certain statement is warranted. When individuals refer to a case's 'evidence,' they often refer to the evidentiary data or critical sources of evidence. The reasoner perceives this evidentiary material, which is sometimes referred to as items of evidence, pieces of evidence, or sources of evidence, using his or her own senses (Bex et al., 2010). Criminal evidence is broadly defined as any information about a crime on which an investigator can base a

judgment or make a determination. It is made up of facts and knowledge about a particular crime or culprit. Evidence is gathered as a result of investigation actions; investigative activities are conducted in order to uncover and collect evidence. In turn, evidence is utilized to establish proof of (1) a crime being committed and (2) the identity of the perpetrator.

With the advancement social and technological transformation of the world, it becomes practically unavoidable that public safety concerns have become a focal point. This technological advancement of modern criminal evidence, methods, and techniques was previously unavailable to criminal investigators, including the use of different types of fingerprints or lie detectors, which enabled the monitoring and control of criminals electronically, in addition to the extraction of digital evidence from their modern tools and devices or from crime scenes. In recent years, scholars have focused their attention on the dynamic interplay between investigators and criminal evidence (Ask et al., 2011). However, there is a small group of researchers who focus on modern criminal evidence. In line with these advancements, new investigative techniques and methods for expediting the transmission of data, information, and evidence between prosecuting authorities in accordance with the "principle of availability" have evolved as a result of rapid technical and scientific advancements (Ruggeri, 2015). When examined closely, technological advancements have aided this issue in at least two ways: by enabling new types of invasive investigation (e.g., web search) and by enabling "direct, reciprocal access to national databases utilizing the whole spectrum of modern technology" (Ruggeri, 2015).

There is little doubt that such methods can violate individual rights in such a subtle manner that the term "coercion" in its classic sense has become increasingly unsuitable in the context of global investigations than in domestic proceedings. Hence, modern technology might have advantages and disadvantages in criminal evidence and courtroom practices. In this view, a large empirical literature has developed to explore the modern criminal evidence such as digital evidence (Grigaliunas & Toldinas, 2020; Wang, 2006, 2007; Woods, 2017; Xiu & Li, 2014), forensic crime scene images (Senkyire & Kester, 2019), iPhone forensic evidence? (Lee & Park, 2012), video evidence (Ellison & Munro, 2014; Grose, 2013; Gudjonsson & Mackeith, 1994; Winne et al., 2002, 2003), vehicle video recorders (Hsu et al., 2013), electronic evidence (Manova et al., 2019; Mason, 2014), and authentication of video surveillance (Chen & Leung, 2005; Winne et al., 2003). This research, therefore, seeks to review the growing literature on this topic and the role of technological advancement on forensic science. Chalfin & McCrary (2017) argued that, in crime literature, a challenge is to assess the pattern of empirical findings and making recommendations for future research.

We present a comprehensive review of the available literature on contemporary criminal evidence in order to rationalize numerous seemingly contradictory findings. To the best of the authors' knowledge, we are the first to review this topic using a systematic literature review (SLR). The existing review studies have concentrated on a topic such as cognitive biases in criminal cases (Meterko & Cooper, 2021) and criminal deterrence (Chalfin & McCrary, 2017). Following the SLR process applied in several studies (i.e., Khatib et al., 2022; Sahi et al., 2021), a final set of 114 articles was included in this investigation. Finally, in this review, we cover topics that have been commonly investigated in the empirical literature, such as biological forensic evidences, modern technical and digital forensics, psychological forensic evidence, and other related issues. As such, we have made every effort to include references to the most recent and cutting-edge research and several suggestions for future work.

The following sections comprise the article: The second section discusses the methodology used to collect the sample studies. Section 3 summarises the review's findings and suggests some areas for future research. Section 4 conclude the study.

Research Methodology

We performed a thorough analysis of modern criminal evidence, using a systematic review that combines qualitative and quantitative methodologies (Hazaea, et al., 2021; Hendrawaty, et al., 2021). Systematic reviews are a frequently used technique for organizing and synthesizing research results. They are especially beneficial when dealing with vast and complicated bodies of research, such as forensic science. While narrative approaches may be beneficial, they have been criticized for their high degree of subjectivity and lack of generalizability (Zamil et al., 2021), while systematic reviews have defined methodologies for conducting a full literature review. The fundamental ideas of systematic reviews are as follows: specific objectives, reproducibility, a wide and comprehensive search based on merit, hence minimizing reviewer bias, and the incorporation of a synthesized technique to organize the literature (Block & Fisch, 2020; Khatib et al., 2021). Given that the purpose of this study is to perform a systematic evaluation of criminal evidence, phrases such as "criminal evidence*" OR "Criminal Procedure" OR "Criminal law" OR "Criminal Justice System" were used. To discover all published research in the field, data mining was performed using the Scopus database. This database is often regarded as the most comprehensive, including research from a wide variety of subjects. At this point, the sample size was 325 documents.

At this stage, any studies that were deemed irrelevant were removed from the original sample. Due to the author's limited linguistic proficiency, we restricted the search to materials published in the English language exclusively, and 18 studies were excluded. Following that, the sample literature was revised, and publicly available papers were excluded. This results in a sample size of 307 distinct research papers. Following that, we reviewed the titles and abstracts of this research for irrelevant work. We omitted studies that did not expressly focus on the modern proofs in criminal evidence as to the primary component. A final set of article availability exclusion criteria was applied to the remaining 114 articles. Finally, to eliminate author subjectivity, we adopted a structured data extraction procedure. This approach has been widely applied in similar systematic literature review research (Hazaea et al., 2021; Khatib et al., 2021; Linnenluecke et al., 2020).

Result and Discussion

In this section, we describe and synthesize the sample literature that is included in our study. Overall, the annual pattern of publications indicates that the interest to study this subject has grown in the last ten years. In our sampled literature, the earliest document goes all the way back to the 1980s, when Khan (1984) discussed the police and criminal evidence bill. Indeed, before 2010, there were few published research, with an average of less than five each year (Figure 1). Due to the continuous technological advancement in all aspects, it is expected to see more work on criminal evidence in the coming years.
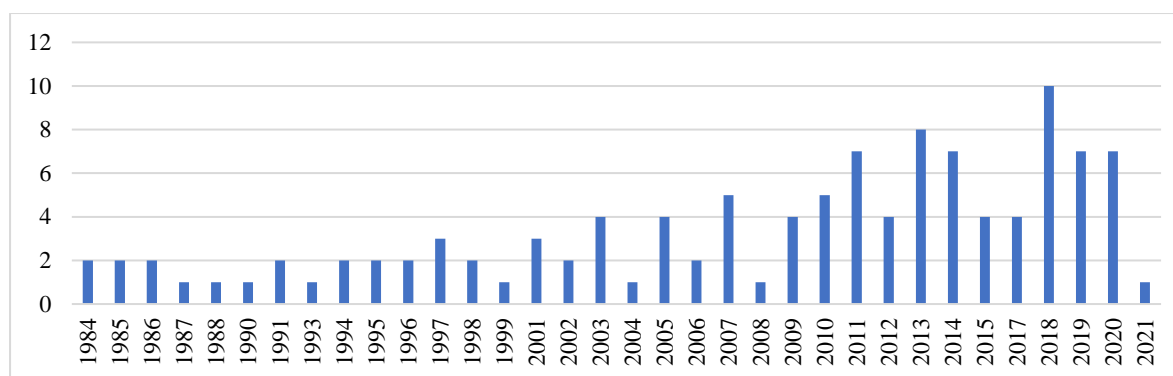
Figure 1: The number of studies per year

Modern Biological Forensic Evidence

Evidences also refer to the information that can be tracked back into a dependable and accurate individual biological database, which can be utilized to collect evidence and identify individuals. Particularly when the court is unable to get confessions or testimony from ordinary witnesses, the forensic medical examiner's role becomes effective in the majority of criminal cases. With the advancement and reform of social transformation, it becomes practically unavoidable that public safety concerns have become a focal point. Criminal evidence technology has advanced significantly since its inception and continues to expand at a healthy clip (Zhu et al., 2018). Studies in the sample literature have discussed DNA sampling (Brockman & Humphreys, 1998; Brownlee, 1998; Pai et al., 2006), modern biotechnology (Mohammadi et al., 2020), development of forensic medicine (Al Madani et al., 2012), voice identification evidence (Robson, 2018), and fingerprints and biometric technologies (Al-Alawi et al., 2015; Zhu et al., 2018). It has been shown that judges are increasingly relying on evidence obtained by biotechnological technologies to achieve certainty and persuasion (Mohammadi et al., 2020). Additionally, biometric technology enables the effective prevention of infringement, the acquisition of criminal evidence, and the maintenance of public safety (Zhu et al., 2018). Al-Al-Alawi et al (2015) suggested that fingerprinting was the most effective method of border port control. It is worth noting that biometric identification will allow for more efficient development. However, unimodal biometrics may be insufficient to meet public security requirements, particularly for criminals in the civilian law enforcement setting. This biometric identification includes fingerprint and palmprint, genetic analysis, face identification, and voiceprint recognition. A recent study by Al-Dahhan et al. (2020) reported that magic lipstick samples taken from the crime scene could be identified accurately using Energy-dispersive X-ray spectroscopy.

Modern Technical and Digital Forensics

This section discusses some evidence gathered from the modern evolution of digital technology. With the advent of digital crimes, the field of digital forensic science continues to expand, necessitating the quest for faster and more accurate solutions to assist in the investigative process. For instance, Myers (1991) observed that information technology permits not just the storage and manipulation of records from a single workstation but also the storage and cross-referencing of volumes in hitherto impracticable ways. However, with this development in digital technology and with the explosive growth of the Internet, network crimes appear more frequently (Wang et al., 2010). It is, therefore, not improbable that in the future, we will be able to give evidence via a mobile phone with a video picture being transmitted. Artificial monitoring is no longer sufficient to keep up with the rapid growth of

cybercrime; therefore, it is critical to developing a new spatial analysis technology that enables emergency events to be quickly and accurately locked in the real world, as well as to establish a correlative analysis model for cybercrime prevention strategies (Xiu & Li, 2014). Conventional crimes such as fraud and money laundering have been artistically re-imagined as a result of the Internet's growing popularity. If we continue to ignore cyber crime, we will promote attackers' ambition and avarice, and we will face increasingly serious criminal activities (Wang, 2007).

Researchers have investigated the topics such as digital evidence (Grigaliunas & Toldinas, 2020; Wang, 2006, 2007; Woods, 2017; Xiu & Li, 2014), forensic Crime Scene Images (Senkyire & Kester, 2019), iPhone forensic (Lee & Park, 2012), video evidence (Ellison & Munro, 2014; Grose, 2013; Gudjonsson & Mackeith, 1994; Winne et al., 2002, 2003), vehicle video recorders (Hsu et al., 2013), electronic evidence (Manova et al., 2019; Mason, 2014), and authentication of video surveillance (Chen & Leung, 2005; Winne et al., 2003).

Digital forensics, which includes photographs and videos, is the examination of digital media in a forensic way with the objective of extracting, identifying, preserving, recovering, analyzing, and presenting digital evidence hidden within the digital data. Hsu et al. (2013) illustrate the algorithm's efficacy and applicability to video forensics applications. The reliability of incriminating and exonerating evidence has been demonstrated to vary according to the type of evidence (DNA and photograph) (Ask et al., 2008).

Modern Psychological Forensic Evidence
In recent years, the role of the crime victim in the criminal justice system has risen to unparalleled importance in the minds of researchers and policymakers in a variety of jurisdictions. Scholars have evaluated the issues related to the police tactic of 'stop and search' (Miller et al., 2001), the complexity of the questions asked (Henderson & Lamb, 2019), Vulnerable the witnesses (Hall, 2007), and eyewitness evidence (Horvath, 2009). Prior research has established a link between the capacity to think rationally and a superior judgment of criminal evidence (Rassin, 2018). On a philosophical and ethical level, debates over the nature of proof are as complicated and contentious as those over the nature of knowledge itself (Ligertwood, 2013). Henderson and Lamb (2019) offered data about the influence of declarative provocative and challenging questions on the accuracy of children's replies when it comes to young alleged victims. Additionally, Marjuni et al (2009) demonstrate that the verb and noun are the primary parts of speech elements that convey criminal conceptions in chat utterances.

Criminal Evidence Related Issues
While there are tight standards limiting the access, use, and interpretation of evidence during a criminal trial, same laws do not apply beyond the completion of the proceedings. After the trial concludes, the judge issues orders regarding the distribution, preservation, or destruction of evidentiary material, and some exhibits continue to circulate in cultural contexts, arousing the interest of artists, writers, scholars, collectors, and curators. In our sample, two studies have explored the afterlife of criminal evidence (Biber, 2013, 2018). However, objects record the changing technology of evidential documentation is still full of opportunities for further investigations. Furthermore, Tahmasebi (2015) reported that modern evidence like electronic evidences is among the differences between the two legal evidences of Iran and Egypt. Due to the lack of such, future research is encouraged to conduct comparative research between countries.

Conclusion

In line with the evolution of technology and digital crimes, digital forensic science is growing exponentially, and with this expansion comes the need for faster and more accurate solutions to aid in the investigative process. This work also contributes to the growing literature on this topic and the role of technological advancement in forensic science. Given that the purpose of this study is to perform a systematic evaluation of criminal evidence, phrases such as "criminal evidence*" OR "Criminal Procedure" OR "Criminal law" OR "Criminal Justice System" were used. Data mining was performed using the Scopus database to identify all published research in the field. Out of 325 documents, 114 articles that explicitly address the topic of interest were included in this review's final sample.

The study discovered that cybercrime and related offenses pose a global danger to many private and corporate entities around the world. Some nations (e.g., Algeria) have adopted the notion of proof-free prosecution, which means that there is no exception to the rule in modern criminal legislation comparison as a result of the necessity to adapt and cope with changes in all parts of one's existence. Further, a huge amount of information is typically found in the collected media, whereas leads (valuable evidence that aids in the investigation of a crime) are typically found in specific files. It is possible that the analyst will need to verify all of the information before he or she can find a single lead. Furthermore, the analyst typically has access to the material only a few days before a judge makes a decision, resulting in a limited amount of time accessible to the analysts. As a result, the speed with which criminal evidence is investigated and processed is extremely important. An automated system that notifies analysts of files that may include leads, such as suspicious photos, is required in this context, as is a system that produces results more quickly than is now available. The advancement of hardware and software technology has made it possible to make significant advances in computer graphics and criminal evidence techniques. This review provides fruitful recommendations for further studies and implications for policymakers towards building cases for a future justice process.

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