Evidence collection and rights protection: the challenges and opportunities of electronic evidence

Long Yan

Law School of Southwest Minzu University, Chengdu, Sichuan, 610041, China

Abstract: *This paper deeply discusses the importance, challenges and opportunities of electronic evidence in evidence collection and rights protection. First, the article introduces the definition and characteristics of electronic evidence, emphasizing its role in the digital age. Secondly, the collection and preservation methods of electronic evidence are discussed in detail, and the countermeasures to meet the legal challenge of electronic evidence are proposed. Meanwhile the article also discusses the application of electronic evidence in dispute resolution and the guiding role of legal system. Finally, the paper prospects the future development trend of electronic evidence and emphasizes the promoting role of electronic evidence in the legal system. Through in-depth analysis, this paper provides a comprehensive understanding of the electronic evidence for the legal community, legal practitioners and decision makers, and provides an important reference for addressing the legal challenges in the digital age.*

Keywords: *evidence collection and rights protection, electronic evidence, law of evidence, legal system, science and technology development*

1. Foreword

In the digital age, the rise of electronic evidence has brought great influence on the legal system and judicial practice. With the rapid development of information technology, people's communication and activities increasingly rely on electronic communication, network platforms and digital tools. This makes electronic data become an indispensable form of evidence in legal cases. For legal practitioners, the generation, collection, preservation and presentation of electronic evidence become an important challenge. At the same time, the use of electronic evidence has also caused a series of legal and ethical issues, such as data privacy, the legitimacy and credibility of evidence, etc. Therefore, we need to carefully balance the development of science and technology with the rule of law principles to ensure the normal operation of the judicial system in the digital age. This paper will explore the context and social significance of electronic evidence, dig deep into the new challenges to legal practice posed by the digital age, and emphasize the importance of understanding and addressing these challenges.

2. Definition and characteristics of electronic evidence

Electronic evidence refers to the information, data or records existing in electronic form, as a form of proving facts in legal cases. This form of evidence covers a variety of digital messages, such as email, text messages, social media messages, electronic files, digital pictures, and audio and video messages. The concept of electronic evidence embodies the impact of social informatization and scientific and technological progress on the legal field, and its scope involves various activities of individuals, enterprises and governments in the digital environment. Its characteristics have dual advantages: digitalization and comprehensiveness, real-time and timeliness, searchability and retrieval, such as saving storage space, digital signature and time stamp, but at the same time include easy to be tampered with, difficult to track the source, large number and other shortcomings. These characteristics have brought new tests to the collection of evidence and rights protection.[1]

Compared with the traditional written evidence, the electronic evidence has more real-time and more comprehensive evidence. It documents all aspects of the various communications and behaviors in the digital age and provides more information for the court to support findings of fact. At the same time, however, the way electronic evidence is produced also increases the complexity of its management and processing, requiring stricter rules and standards to ensure its legitimacy and credibility.

3. Collection and preservation of electronic evidence

3.1 Method of collecting electronic evidence

Electronic evidence collection methods include web monitoring and logging, social media information and digital traces and metadata. Network monitoring and logging can track the network activities of the parties involved; social media information can be used as important evidence to be carefully screened; and digital traces and metadata reveal the source and evolution of documents, crucial to document integrity and authenticity.

These information is crucial for the follow-up investigation and analysis, and will help us to fully understand the network behavior of the parties involved, and provide strong support for the investigation of the case.

3.2 Protection and integrity protection of electronic evidence

3.2.1 Digital signature and hash values

Digitally signing electronic evidence or calculating hashes is a crucial security measure. In the digital world, the completeness of the evidence is crucial, because any tampering can seriously affect the validity and reliability of the evidence. Digital signatures and hashes provide conclusive evidence that electronic evidence has not been tampered with or forged after collection. Digital signatures and hash values use asymmetric encryption to attach a unique tag to the electronic evidence that can only be created by the original sender. Once the evidence is tampered with, the signature fails, thus revealing the tampering behavior. This makes digital signatures an effective means to verify the integrity and source of the data. Together, these two methods provide a strong guarantee for the integrity of the electronic evidence, ensuring the validity and credibility of the evidence in court.

3.2.2 Access control and permission management

To ensure the security and integrity of electronic evidence, effective control and management of their access is essential. Only authorized personnel have access to the evidence, ensuring that only authorized personnel are able to view, use, or modify the data. In addition, every time the electronic evidence is visited, the visitor's information, visit time, visit purpose and so on should be recorded in detail to facilitate tracking and review. This ensures that access to electronic evidence is monitored and managed, thus ensuring its safety and reliability.

3.3 Balance between data privacy and electronic evidence collection

3.3.1 Legal Authorization

When collecting electronic evidence, legal procedures and regulations must be followed to ensure the legality of the collection act and the validity of the evidence. First, the corresponding authorization or legal basis must be obtained. In addition, the principles of neutrality, objectivity and truth must be followed when collecting electronic evidence. This means that the collector must not have any bias or bias and must be based on facts to ensure that the evidence collected is true and reliable. At the same time, the collection process must also strictly abide by the legal procedures and regulations, and no illegal means or methods should be adopted, which should be carried out under a strict legal framework to ensure the legality of the collection act and the validity of the evidence. This is not only conducive to protecting the legitimate rights and interests of the parties concerned, but also helps to safeguard the justice and authority of the law.

3.3.2 Anonymization and desensitization treatment

In handling investigations or analyses involving electronic evidence, we must exercise caution to ensure that privacy is fully respected in the collection, storage, and use of such data. To achieve this goal, "anonymization" techniques can be employed by changing or deleting personal information so that it cannot be used to identify specific individuals. In addition, "desensitization processing" is also an effective method, which involves hiding or removing sensitive information, such as ID number, address, phone number, and so on, to protect personal privacy. Through these two methods, we can effectively hide the identity and sensitive information of individuals, reduce the risk of violation of privacy violations, while ensuring the legitimacy and validity of electronic evidence.

4. Legal challenges to the electronic evidence

4.1 Legality and credibility of electronic evidence

4.1.1 Chain of evidence custody

The chain of custody of evidence involves the whole process from the collection to the presentation, and there can be no break or tampering link in the middle. For electronic evidence, it is especially necessary to ensure the integrity of digital evidence throughout the collection and storage process to ensure the legitimacy of the court's acceptance.

4.1.2 Digital signature and hash values

Digital signatures and hash values can be used to verify the integrity of electronic evidence, but there may vary in court in understanding and acceptance of these techniques. The legal system may need to adapt to these new techniques and ensure that judges and juries can understand their role to ensure the credibility of the evidence.

4.2 Electronic evidence collection and evidence collection issues

4.2.1 Data privacy

In the process of electronic evidence collection, a large amount of personal data involved may involve sensitive information, such as personal identity, financial records, communication content, etc. This poses important challenges to protect the privacy of the respondents. Legal access, use and protection of this data is essential to maintaining personal privacy. The law should specify which data can be collected, used and shared and under which circumstances it can be accessed and processed, while security measures should be taken to ensure that the data is not subject to unauthorized access and abuse.

4.2.2 Difficulties in digital forensics

Compared with the traditional evidence, the digital forensics of electronic evidence is more complex and requires professional technical support and tools. This challenge is particularly acute when the legal system for this respect is still in the early stages of development. Forensics may involve multiple stages of data acquisition, data extraction, data analysis and data interpretation, which require professional digital forensics personnel to operate. In addition, the forensics process needs to ensure the integrity and reliability of the evidence, as well as to ensure that the forensic method adopted complies with the requirements of the law.[2]

4.2.3 Tamper risk

Electronic evidence is vulnerable to tampering, representing another important challenge. Digital data can be easily modified or forged, so ensuring the integrity and authenticity of the evidence is key. Methods such as encryption technology, digital signatures, time stamps can help ensure the integrity of the data, and specialized mechanisms need to be established to verify and ensure the credibility and authenticity of electronic evidence. In addition, the legal system also needs to adapt to this challenge and formulate corresponding regulations and standards to ensure the credibility and effectiveness of electronic evidence in court.

To sum up, the application of electronic evidence in legal system faces legal challenges of legitimacy, credibility and electronic evidence collection, data privacy, digital evidence difficulties and tampering risk. Addressing these challenges requires a combination of technology, laws and policy aspects to ensure the legitimacy, integrity and reliability of electronic evidence, while balancing the relationship between privacy protection and the legitimacy of evidence collection. It requires the continuous adjustment and innovation of the legal system to meet the needs of scientific and technological development.

5. Dispute resolution of the electronic evidence

5.1 Standard of review of electronic evidence in dispute resolution

5.1.1 Examine and judge the authenticity of the electronic evidence

Electronic evidence is easy to be damaged, modified and lost due to human or environmental factors, so its authenticity and reliability have become the top priority of review and judgment. Compared with traditional forms of evidence, judicial staff may need to pay more attention to the external conditions of electronic evidence, storage environment and handover process, restore the complete evidence chain and show the whole process of evidence, including source, collection process, fixed storage method, etc. The flow speed of electronic evidence increases the complexity of the evidence chain, making it more challenging to establish and restore the evidence chain. The evidence chain for reviewing and judging electronic evidence includes: the source and source of electronic evidence, from the residence or possession of the party, or from the third party or other witness keeping the electronic data; the process of electronic evidence collection, that is, which one person, the fixed and storage form of electronic evidence, the handover time, place, method, both parties, the storage environment, etc.[3]

5.1.2 Review and judge the legality of electronic evidence

The legality of evidence includes the subject, procedure, form and content, among which the legality of procedure is the top priority. The intangbility of electronic evidence and its rich information lead to the great expansion of the scope of electronic forensics. Therefore, the public security and judicial organs may be easier to break through the restrictions of procedures, resulting in illegal evidence collection. In electronic forensics, more attention should be paid to the legality of the procedure, the specificity of the object and the limitation of the scope of forensics. The public security judicial organs review the scientificity of electronic technology, the stability of equipment, and the professionalism of operators, ensure that evidence collection, storage, and transmission processes are scrutinized to ensure completeness and non-tampering.

5.1.3 Review and judge the comprehensiveness of collecting and obtaining electronic evidence

Electronic evidence has a massive storage capacity, and the massive information contained in it also poses a great challenge to the review and judgment of evidence. Represented by computers, the storage amount of electronic evidence in various media is not comparable with ordinary evidence. Electric pulses or magnetic materials store hundreds of thousands or thousands of times or even billions of times more of the same size of paper. For traditional evidence, the evidence information contained in a site, object, or document is limited; but for electronic evidence, the amount of information available within the same physical range has expanded geometrically. Judicial personnel should balance the comprehensiveness, integrity and litigation efficiency, identify the relevance of information and determine its proved value, so as to clarify the case contention point, and choose the electronic evidence.

5.2 Integration of electronic evidence and court proceedings

5.2.1 Training of judges and lawyers

With the continuous development of science and technology, electronic evidence is becoming more and more important in the court. Due to the particularity of electronic evidence, judges and lawyers need to have the relevant technical background and knowledge to ensure the accurate understanding and application of electronic evidence. It is very necessary to provide training for judges and lawyers on electronic evidence. Through training, judges and lawyers can learn about the characteristics of electronic evidence, collection methods, storage requirements, and review techniques. This will help them to more accurately judge the authenticity and legality of electronic evidence in court, reduce the miscalculation caused by the lack of technical understanding, and help to safeguard judicial justice and protect the legitimate rights and interests of citizens.

5.2.2 Receipt and presentation of electronic documents

In order to better meet the growing demand for electronic evidence in the modern society, judges and lawyers need to deeply learn and understand the relevant knowledge of electronic evidence. This training covers not only how to collect, preserve and present electronic evidence, but also how it is understood and interpreted. With the continuous advancement of technology, new forms of electronic

evidence are emerging, such as cloud storage data, social media information, and digital images. To ensure the fairness and accuracy of the law, judges and lawyers must keep pace with The Times and improve their review of electronic evidence.

5.2.3 Online court system

As technology evolves, some courts have introduced online court systems, which require the legal system to adapt to the new court process. Online court system is an electronic court that uses modern information technology to realize the functions of remote trial, proof and cross-examination. Through the online court system, parties can submit evidence online, appear in court remotely, and judges can hear cases online, sentencing and so online. Online court systems need to be able to process and protect electronic evidence, ensuring its effectiveness in a virtual court environment. This new court mode not only improves the trial efficiency, reduces the litigation cost, but also provides more convenient and efficient services for the parties.

6. Legal opportunities for electronic evidence

6.1 Promotion of judicial efficiency by electronic evidence

6.1.1 Efficiency of information acquisition and search

Compared with the traditional evidence collection method, the access to electronic evidence is more convenient, which is expected to improve the efficiency of investigation and trial. The storage and retrieval of digital information allows lawyers and judges to obtain the required information faster, thus speeding up the speed of case processing.

6.1.2 Remote participation and convenience

The use of electronic evidence has brought great convenience to witnesses, lawyers and other relevant involved. They no longer need to be present in person, but can participate in the litigation process remotely. This way of remote participation not only saves a lot of time and energy, but also breaks the geographical restrictions, making the litigation process more efficient and convenient. At the same time, the easy preservation and traceability of electronic evidence also make the whole litigation process more just and transparent.

6.1.3 Case management and document handling

With the progress of science and technology, digital documents and case management systems have gradually become efficient file management tools. Compared with the traditional paper file management method, this electronic management system not only saves a lot of space, but also provides faster and more convenient retrieval and query functions. For judges and lawyers, this system greatly simplifies their workflow, making them easier to track the progress of the case. In addition, the electronic case management system can also speed up the processing of documents, avoiding the time delay caused by the traditional delivery of documents. In this way, judges and lawyers can understand the latest developments of the case faster, thus improving work efficiency and providing more efficient and professional legal services for the parties.

6.1.4 Evidence review and analysis

The technical nature of electronic evidence brings unprecedented convenience to the review and analysis of evidence. Because of the essential difference between electronic evidence and traditional paper evidence, its technical characteristics make the review and analysis of electronic evidence more efficient. Using automated tools and software, lawyers and judges can quickly process large amounts of electronic evidence, avoiding the tedious and time-consuming nature of traditional manual review methods. These automated tools and software can not only quickly screen and classify evidence, but also conduct in-depth analysis and mining to help lawyers and judges to have a more comprehensive understanding of the case, and improve the efficiency and quality of the case trial. The technical characteristics of electronic evidence provide strong technical support for lawyers and judges, which makes the case trial more fair and efficient.

6.2 Application of electronic evidence in emerging fields

6.2.1 Artificial intelligence and Big Data

Artificial intelligence and big data technology have reached a whole new stage, and their application in the field of electronic evidence brings unprecedented opportunities. Traditional evidence collection and processing methods are often plagued by the problems of large data volume and high complexity, and artificial intelligence and big data technology can effectively solve these problems. By using these technologies, we can conduct in-depth analysis of the massive data, extract the key information related to the case, and provide strong support for the settlement of the case. Not only that, these technologies can also help us discover the patterns hidden in the data, predict the possible outcomes of cases, and provide a more scientific and accurate basis for decision makers. Therefore, the development of artificial intelligence and big data technology has brought about revolutionary changes to the field of electronic evidence, and provided a more reliable technical support for judicial justice and case solving.

6.2.2 Blockchain technology

The emergence of blockchain technology provides a new guarantee mechanism for the integrity and authenticity of electronic evidence. In the scenarios involving contract performance and intellectual property protection, the application of this technology provides an effective means to solve the trust problem. Through blockchain technology, various transaction records, documents, and data can be securely stored and verified, ensuring that they are not tampered with or forged. This greatly enhances the credibility of electronic evidence, making it a powerful tool for resolving disputes and protecting rights. Therefore, the application of blockchain technology in the field of electronic evidence has brought about revolutionary changes in areas such as contract performance and intellectual property protection.[4]

6.2.3 Cloud computing and remote collaboration

The rapid development of cloud computing technology has brought unprecedented convenience to the storage and sharing of electronic evidence. This technological innovation allows lawyers and judges to handle cases more efficiently, with remote collaboration and the sharing of electronic evidence through cloud platforms. Traditional evidence transmission often requires a lot of time and manpower, while cloud computing technology greatly simplifies this process, lawyers and judges can easily access and share electronic evidence at anytime and anywhere, thus improving work efficiency. In addition, the cloud platform also provides powerful data storage and backup functions to ensure the security and integrity of electronic evidence. The application of this technology not only improves the efficiency of the legal industry, but also provides more fair and transparent legal services for the parties concerned.

7. Summary and outlook of the main findings

7.1 Summary of the main findings

Electronic evidence plays an increasingly important role in the field of law and has a positive impact on the improvement of judicial efficiency. However, it also brings a series of new challenges and opportunities. Through intensive research and exploration, we have found the following key points:

First, the application of electronic evidence has significantly improved the efficiency of the judicial system. This is mainly due to the advantages of electronic evidence in information acquisition, document processing and remote participation. With the continuous development of science and technology, electronic evidence has become an indispensable part of modern judicial procedures, which is able to simplify processes, accelerate case handling, and reduce costs.

Second, emerging technologies bring new opportunities for electronic evidence. The rapid development of technologies such as artificial intelligence, big data and blockchain provides more possibilities for the acquisition, analysis and credibility of electronic evidence. These technologies can not only improve the quality and accuracy of electronic evidence, but also provide more innovative solutions for legal practice.

However, the electronic evidence also poses several challenges. In the application process, we need to balance the convenience of the technology with the fairness of the law. For example, issues such as privacy protection and verification of the authenticity of evidence need to be properly addressed.

Moreover, the legal system also plays a vital role in the acquisition, storage, and use of electronic evidence. In order to ensure the legal and effective application of electronic evidence, we need to constantly improve the relevant laws and regulations, strengthen the guidance and norms of judicial practice, and improve the training and education level of professionals.

To sum up, electronic evidence brings both opportunities and challenges in the field of law. In order to give full play to the advantages of electronic evidence and overcome its limitations, we need to continue to deeply study, improve the relevant legal system, strengthen the application and innovation of technology, and strive to find a balance between technology and law. Only in this way can we ensure that the electronic evidence is of the best value in judicial practice.

7.2 Outlook for future electronic evidence research

Based on the main findings obtained, this paper presents some suggestions and prospects for future electronic evidence research:

7.2.1 In-depth study on the update and improvement of laws and regulations

With the rapid development of science and technology, the formulation and implementation of laws and regulations must keep up with the pace of The Times. In today's society, the role of electronic evidence in various kinds of cases is increasingly prominent, and the development of emerging technologies has posed new challenges to the collection, preservation and application of electronic evidence. Therefore, future research work should explore more in depth how to update and improve laws and regulations to meet these challenges. This includes the review and revision of existing laws and regulations to ensure that they are pace with emerging technology developments and to clarify the standards and procedures for the collection, preservation and application of electronic evidence. In addition, the publicity and training of laws and regulations should be strengthened to improve legal awareness and law enforcement level to ensure that the application of electronic evidence is legal, fair and effective. In short, future research should pay more attention to the update and improvement of laws and regulations, so as to adapt to the impact of emerging technologies on the application of electronic evidence, and provide a strong guarantee for the maintenance of social justice and the rule of law.

7.2.2 Expand the application of emerging technologies in electronic evidence

In future electronic evidence research, we will witness the wider application of emerging technologies such as artificial intelligence, big data and blockchain. These technologies, especially their deep integration, will open new paths for the processing and validation of electronic evidence, thereby enhancing their quality and credibility. The exquisite algorithms and deep learning techniques of artificial intelligence will make the collection and analysis process of electronic evidence more accurate and efficient.By automating processing large amounts of data, AI will greatly improve work efficiency while reducing human errors and omissions. Big data technology will provide a more comprehensive perspective for electronic evidence research. Through the deep mining and analysis of massive data, we will be able to better understand the internal laws of electronic evidence and predict its development trend, so as to provide scientific basis for relevant decisions. The introduction of blockchain technology will provide a strong guarantee for the authenticity and credibility of electronic evidence. The decentralized nature of blockchain and the imtamable nature of data will ensure the safe and reliable storage and verification of electronic evidence, thus reducing the risk of forgery and tampering.

Overall, through the deep integration of these emerging technologies, future electronic evidence research will be more efficient, accurate, and credible. This will not only provide strong support for legal justice and social harmony, but also promote the sustainable development and progress in the field of electronic evidence.

7.2.3 Strengthen research on privacy protection and data security

With the continuous progress of science and technology, electronic evidence is more and more widely used in various litigation cases. However, the resulting privacy issues and data security issues are also increasingly concerned. Therefore, future research work should pay more attention to the privacy protection and data security in electronic evidence, through in-depth research and practice, to ensure the fair and legal application of electronic evidence, while protecting citizens' privacy and data security. This requires interdisciplinary cooperation, combining with the knowledge of law, computer science, psychology and other fields, to jointly explore solutions to contribute to the construction of a

fair and safe digital society.

7.2.4 Promote international cooperation and experience sharing

Due to the cross-border nature of electronic evidence, the legal, technical and practical issues involved have high complexity. Therefore, future research should aim to promote international cooperation and experience sharing, and to promote legal and technological progress worldwide through jointly exploring and addressing the applicability of electronic evidence under different national legal systems. This will not only help to strengthen legal cooperation among countries, but also to promote common development in the field of electronic evidence to better serve the needs of international justice and global governance.

8. Conclusion

Based on the above studies, electronic evidence not only brings challenges in evidence collection and rights protection, but also provides new opportunities for legal practice. Through the formulation of regulations, technical training and enhanced protection measures, various challenges in electronic evidence collection can be better met to ensure the realization of rights protection and judicial justice. By summarizing the main findings and looking forward to the future research direction, we hope to provide useful suggestions for the improvement and development of the legal system, and promote the more reasonable and effective application of electronic evidence in judicial practice. Through the in-depth analysis of the promotion of judicial efficiency by electronic evidence, its application in emerging fields and the positive guidance of the legal system, electronic evidence is not only a challenge in the legal practice, but also a force to promote the continuous progress of the legal system.

References

[1] Shi Xiansheng, Li Meiyan. Application and judicial practice of Internet electronic evidence [J]. Journal of Beijing University of Aeronautics and Astronautics (Social Sciences Edition), 2016, 29 (2): 49-54. (in Chinese)

[2] Xiang Junhua. Forensics methods of electronic Evidence in Cyber crimes in the Information Age [J]. Network security Technology and application, 2023, (12): 141-142.

[3] Liu Pinxin. On the authenticity standard of electronic evidence [J]. Social Science Journal, 2021 (1): 66-78,209.

[4] Liu Xici, Liu Hongyan. Application of blockchain electronic evidence in the context of intelligent justice [J]. Journal of Leshan Normal University, 2023, 38 (09): 104-111+119. DOI:10.16069/ j.Cki.51-1610 /g4.2023.09.015.