COMPARATIVE STUDY OF LEGAL AND SCIENTIFIC ASPECTS OF USING FINGERPRINTS IN CRIME DETECTION: IRAN AND IRAQ

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Abstract

Background and Objective: Fingerprints, as one of the key biometric tools, play a decisive role in the process of identifying identity and scientifically detecting crime. The unique characteristics of fingerprints - such as uniqueness and immutability throughout life - have made this technology find an irreplaceable place in many criminal justice systems. In the Middle East region, and especially in the countries of Iran and Iraq, this tool has not only a technical dimension, but also has security, legal and social importance. The aim of this research is to comparative study of these two paths and identify the capacities for promotion and joint cooperation.

Method: This study was conducted using a descriptive-comparative method and a combination of documentary and field data collection. Documentary sources included regulations, criminal laws, official and technical reports, and statistical data on biometric systems. Field sources were collected through semi-structured interviews with 15 expert experts (8 from Iran and 7 from Iraq).

Findings: The findings showed that Iran has been able to standardize and integrate the fingerprint identification process to a large extent by integrating national databases and gradually developing the systems, although challenges such as hardware upgrades and cyber threats still remain. Despite having access to advanced equipment and international standards, Iraq faces difficulties in the continuous and secure operation of the systems due to the dispersion of the databases and dependence on external support.

Results: The results of the study indicate that exchanging experiences, establishing a joint working group, designing regional security protocols, and launching a joint database can improve efficiency and increase security in the use of fingerprints in both countries.

Keywords: Fingerprint, Scientific Crime Detection, Iran, Iraq, Biometrics, Data Security

Introduction and Problem Statement

Fingerprints have long been one of the key and reliable evidence in crime detection and identification of individuals. The uniqueness and stability of the patterns of depressions and protrusions in the skin of the fingertips, along with the possibility of long-term recording and preservation of these patterns, have caused fingerprints to have a central position in all periods of the history of forensic science. Experimental and empirical findings show that even in various environmental and physical conditions, key components of fingerprint patterns can be identified and matched; which has strengthened the confidence of legislators and experts in this type of evidence.

With the advent of new digital technologies, traditional methods of recording and examining fingerprints have been transformed (Hajizadeh, 2010: 80). Converting analog documents into digital images, using feature extraction algorithms, and also networking databases have enabled automatic comparisons and rapid searches among millions of samples. This development has not only increased the speed and accuracy of identification, but also facilitated inter-organizational and international access to information, an issue that has become increasingly important in the face of organized crime and border crossings.

The practical dimensions of fingerprinting have also gone beyond purely police frameworks. Today, fingerprint-based biometric identification is used in the issuance of identity documents, border control, banking processes and financial services, as well as employee management systems. As a result, the quality and reliability of fingerprint systems directly affect issues such as citizen rights, personal information protection, and security risk management. The way these systems are designed, implemented, and operated reflects the balance between security requirements, legal constraints, and social concerns (Karimi, 2010: 3).

Iran and Iraq, although they have numerous historical and cultural links, have shown significant differences in the development of fingerprint systems. In Iran, a relatively structured process based on continuous investment in IT infrastructure and efforts to localize systems is observed; a strategy that has led to increased coordination between institutions and the development of domestic capacities. This gradual policy, along with the development of national regulations and standards, has paved the way for the creation of centralized databases and improving the quality of compliance processes. In Iraq, the post-2003 structural transformation and the rapid introduction of new technologies from abroad have accelerated the development of biometric systems; but this acceleration has been accompanied by institutional challenges and political and security fluctuations. Dependence on foreign products and services, insufficient coordination between responsible institutions, and a shortage of local experts are among the obstacles that have affected the effectiveness and sustainability of these systems. Therefore, technological achievements may be significant at the functional level, but their long-term sustainability and maintenance depend on institutional capacities and regulatory frameworks (Ahmadi, 1401: 96).

A comparative study of fingerprint systems in Iran and Iraq can achieve several practical and theoretical goals: first, to identify successful models and practices that can be transferred or adapted to local conditions; second, to clarify institutional and technological gaps that prevent the full exploitation of biometric capabilities; and third, to provide policy recommendations to strengthen regional cooperation in the field of information exchange and the promotion of technical and legal standards. These goals, in addition to the strategic importance of the subject for internal and regional security, also make the present study a priority from an applied perspective (Hosseini, 1401: 90). This study, using a descriptive-comparative method and using documentary sources, policy analysis, and field observation, seeks to represent the actual map of the fingerprint system in both countries. Data are collected from official documents, technical reports, and previous studies and will be analyzed based on performance indicators such as accuracy of implementation, inter-agency interoperability, technological independence, and legal frameworks. Finally, the study provides operational and strategic suggestions for decision-makers to improve the efficiency and sustainability of fingerprint systems while protecting citizens' rights.

Background and Theoretical Basis

Research Background:

The scientific background of the present study shows that the use of fingerprint recognition systems and other biometric technologies has not only revolutionized the scientific crime detection process, but also directly affects public security and the management of organized crime in sensitive geographical areas. Studies conducted in Iran and around the world have examined various aspects of these technologies; from the technical aspects and software localization to the areas of security policymaking, human resource training, cybersecurity, and management of biometric data of foreign nationals. A review of these works, in addition to revealing existing capacities, also reveals scientific and practical gaps, which the present study seeks to address in part.

Eskandari and Fakhruz (1403) in their scientific research entitled "Identification and Prioritization of Methods for the Appearance of Invisible Fingerprints on Bodies for Use in Police Investigations" published in the Detective Journal, have examined the complex challenge of revealing hidden fingerprints on human tissues, especially corpses, with a systematic approach. This field and laboratory study, which was conducted in Qazvin Province, compared the performance of methods such as fluorescent powders, nihydrin, and modern laser technologies. The results of the research showed that environmental parameters such as humidity, temperature, and tissue surface degradation have a direct effect on the quality and clarity of the remaining fingerprints. Finally, the proposed research model facilitates the process of selecting the optimal method for police experts and is adaptable to climatic conditions and criminal processes in neighboring countries such as Iraq.

Roshan Qalb Deylami, Hendiani, Fakhruz, and Talebian (1400) The study "Biometric-Based Crime Evidence Collection" published in the Journal of Detective presents a comprehensive and multidimensional framework for utilizing biometric technologies in the process of scientific crime detection. The authors, with a special focus on fingerprints as the most common and reliable biometric indicator, have examined the processes of collecting, recording, and analyzing biometric data from a technical and legal perspective. This article has revealed the strengths and weaknesses of each by comparative analysis of traditional (such as manual fingerprinting) and modern (such as digital scanning and artificial intelligence-based systems) methods. In addition, legal considerations such as privacy, data protection, and chain of custody are also discussed in detail. The research findings indicate that coordination between the police, laboratory experts, and judicial authorities is essential for the evaluation and acceptance of this evidence in court. Also, its results can be used in joint cooperation between Iran and Iraq for the exchange of biometric data and standardization of crime detection procedures.

Badiei, Roustaei Sadrabadi and Motvalizadeh (1403) The research "The Nature and Validation of Biometrics in Crime Detection" published in the Quarterly Journal of Medical Law attempts to clarify the boundary between forensic science and criminal law in the field of using biometric technology. The authors have categorized various biometric indicators including fingerprints, facial recognition, iris scanning, and DNA analysis, and have examined the accuracy, reliability, and potential security threats for each. In the section related to fingerprints, the research emphasizes that this indicator has high evidentiary power in legal situations due to its

unique individual characteristics, lifelong stability, and very low error rate. However, limitations such as the possibility of contamination or distortion of the traces at the crime scene are also mentioned. This study proposes that a single legal framework for the cross-border use of biometric evidence be established between Iran and Iraq to both reduce procedural differences and increase the capacity for police cooperation.

Eskandari and Fakhruz (1403) article "Comparative study of fingerprint appearance methods on difficult surfaces in crime detection" in the Detective Journal is a response to one of the common problems of crime scene experts, namely the detection of fingerprints on surfaces that, due to their physical or chemical properties, are highly resistant to conventional methods. These surfaces include polished metals (such as bullet casings and knife blades), clean glass, and hard plastics, which usually prevent fingerprint powders from remaining stable or adhering sufficiently. The research, by testing five different methods - including magnetic powders, iodine vapor, cyanoacrylate, and fluorescent pigments - and measuring the image quality index, concluded that combining chemical and physical steps in a short period of time can be most effective. The proposed algorithm of the research is a method classified based on surface type and environmental conditions that can also be transferred and localized in the Iraqi scientific police.

Farhadi (1401) in his book "Fingerprints and Their Application in Identifying Criminals" introduces fingerprints as a unique biological identity card based on both historical and technical perspectives. The author first describes the path of fingerprint discovery from archaeologists' research on clay tablets to the development of the Henry and Woskit classification systems in the 20th century. He then discusses contemporary detection methods, including nanopowders, vacuum techniques, and ultraviolet imaging, and documents the advantages and limitations of each. The book examines the role of this evidence in increasing the speed and accuracy of police investigations by citing examples of important cases in Iran that have led to the discovery of crimes through fingerprints. Also, due to cultural and structural similarities with Iraq, the author suggests that software systems and technical standards be harmonized between the two countries to increase data exchange capability and judicial legitimacy of fingerprints.

Theoretical foundations
-1Fingerprinting (dactyloscopy)

Fingerprinting refers to a set of scientific operations that begins with the recording, cleaning, extraction, and documentation of fingerprint patterns and ends with the analysis and comparison of these patterns to determine the identity of individuals (Omid, 2010: 10). In criminal applications, fingerprints left at crime scenes are recovered by chemical or physical techniques, then their digitized image is entered into matching systems. The uniqueness and stability of finger patterns (largely constant throughout life) have made fingerprinting one of the most reliable biometric methods; however, its practical accuracy depends on the quality of the sample, the conditions of the crime scene, and the skill of the experts (Zarei Mahmoudabadi, 2016). In legal systems, fingerprints are usually admitted as "material scientific evidence," but their evidentiary weight can vary depending on legal standards and judicial practice.
 -2Minusia

Minusia are the microstructural features of fingerprints that, in their number, type, and arrangement, distinguish identity; well-known examples include ridge endings, bifurcations, Iceland islands, and small rings. Matching algorithms operate primarily on the alignment and matching of the coordinates of these points; the greater the number of matched minusia and the higher their quality (Gibb, C., & Riemen, J. (2023).), the greater the degree of confidence in the match. Technical standards and specialized organizations such as SWGFAST propose criteria for the minimum number of points required to declare a "match" to reduce possible errors; In practice, the expert report should report the quality of the images, the criteria used, and the uncertainty limits in addition to the matching result.

) -3 Automated Fingerprint Information System(

An automated fingerprint information system is a system based on a database and automated comparison algorithms that is capable of storing, indexing, and searching millions of fingerprint records in a fraction of the time (Meuwly, D., & Baker, N. (2020)). These systems significantly increase the speed of the identification process and reduce human error in browsing banks (Karimi, 2010: 15), but their output is a function of the input quality (image resolution, noise, clipping) and algorithm parameters. In addition, the size of the database and how it is updated (e.g., coverage of population groups or criminal categories) affect the probability of finding a correct match. From a legal perspective, the results of an automated fingerprint information system are usually presented as initial clues and require human expert review for final confirmation.

-4 Judicial Validity of Scientific Evidence

Judicial credibility refers to the mechanism of accepting, weighing, and reasoning about scientific evidence in courts. In some systems (including the perceptions that are common in Iran), scientific evidence can be easily cited under the title of "judge's knowledge" (Hosseini, 1400: 50); but in other systems, the judge is required to accept international standards, transparency in the experts' working methods, and providing accuracy indicators (such as error rates). The lack of uniform procedures and criteria for measuring the quality of fingerprint expertise (including test protocols and expert training records) can lead to a decrease in the acceptance or value of evidence in court. Therefore, improving the procedural frameworks and expert guidelines plays a decisive role in strengthening the judicial credibility of this type of evidence.

-5 Matching error and accuracy indicators

Any fingerprint matching system, whether human or machine, faces the possibility of error; These errors are divided into two main types: false positives, in which two different effects are mistakenly matched, and false negatives, in which a true match is not detected. For operational evaluation, metrics such as false positive rate, false negative rate, overall error rate, and probability of correct identification are used. These indicators are especially important in comparisons between countries because differences in expert training, equipment quality, sampling protocols, and database size directly affect the error rate (Authors' Field Research, 1403; SWGFAST, 2020). Accurate reporting of error rates in expert reports helps the judge to more accurately determine the weight of evidence and reduce the likelihood of an incorrect verdict.

Research Methodology

This study was designed and implemented with a descriptive-comparative approach. This approach is considered quite appropriate and accepted for research that aims to draw a true picture of a phenomenon and systematically compare it in different environments. The rationale for choosing this method is that the subject under study – namely, "the use of fingerprints in the scientific detection of crime" – is inherently a current and established issue within the context of the official and security systems of the two countries of Iran and Iraq; a condition that the researcher does not have the right or the possibility to directly manipulate. On the other hand, studying this phenomenon requires accurate recording of the current situation and finding similarities and differences in various cultural, legal, and technological contexts.

In this research, a theoretical and conceptual framework was first extracted that included the scientific definition of fingerprints, its place in criminology, and successful global experiences in using this tool. These frameworks acted as a roadmap and guided all stages of data collection and comparison. Establishing basic concepts from the beginning allowed the perceptions and data collected in both countries to be measured with a common standard and provided the possibility of scientific comparison.

The statistical population of this study consisted of two main categories: first, documentary sources including official laws and regulations, police intelligence reports, biometric databases, and official statistics published in Iran and Iraq. Second, specialists and experts in the field who were selected based on their work history, field experience, and practical familiarity with fingerprint systems. The selection of experts was purposeful, with 8 people from Iran and 7 from Iraq invited to participate and participate in semi-structured interviews. In the data collection section, two paths were taken simultaneously. The first path was to collect information through library study and content analysis of documents and evidence. These documents included internal regulations, operational guidelines, annual reports of the police and ministries, scientific articles published in specialized journals, and technical documents of the systems used. The second path was to conduct semi-structured interviews with experts and field experts. These interviews were conducted by designing open-ended questions in four main areas: technical infrastructure, legal framework, training and empowerment of forces, and security measures related to data protection. Each question area was designed to provide, in addition to receiving general information, the opportunity to express objective experiences and case examples.

The interviews were mainly conducted in person, except in cases where distance or security conditions did not allow, and the conversation was conducted as an encrypted video call. Each interview was recorded in the form of an audio file and then converted into a written text to be used in the subsequent stages of qualitative analysis. In the process of implementing the texts, an effort was made to leave the original tone and content unchanged in order to maintain the validity of the data.

To ensure the validity of the research, the data triangulation method was used. This means that any information received from one source – whether documentary or field – was matched with data from other sources to check its accuracy and consistency. For example, if an Iranian expert stated that a particular technology had entered the identity recognition cycle in a certain year, this claim would be verified by official documents and reports from that year. Similarly, if a

technical problem was mentioned in written sources, the expert's opinion could confirm or supplement its operational aspects.

To increase the reliability of the analysis, two researchers independently coded the interview transcripts. After that, the coding results were compared and disagreements were resolved through discussion and final consensus. This made the results less influenced by the individual bias of the analysts and more objective.

The data analysis was conducted in two stages. First, for each country, the data was organized in a descriptive and independent manner. In this stage, each finding was categorized and observable patterns, strengths and weaknesses, and main challenges were extracted. In the second stage, the categorized data from the two countries were compared based on the four aforementioned axes. This comparison not only revealed similarities and differences, but also showed which strengths of one country could be a potential solution to the weaknesses of the other.

The characteristic of this approach is that cultural, political, and economic contexts played a central role in the analysis. For example, when discussing data security in Iraq, in addition to the technical explanation, the political conditions after 2003 and their impact on the integrity of the databases were examined. In Iran, the impact of technology localization policies and international restrictions on the development process of the systems was also considered. This attention to the contexts caused the comparisons to be not superficial and merely numerical, but rather analytical and explanatory.

In addition to responding to the research need, the choice of this method also provides the necessary basis for complementary research. Future researchers can use the same framework for a comparative study of other biometric tools or to evaluate the performance of new systems. Also, the extracted findings are organized in such a way that they are directly applicable to policymakers and executives and can be used in the development of regional cooperation protocols.

Overall, this methodology combines systematic accuracy in data collection, flexibility in interaction with human resources, and simultaneous contextual and comparative analysis. The result of this approach is a realistic and scientific picture of the use of fingerprints in the scientific detection of crime in the two countries of Iran and Iraq, which has both a theoretical basis, empirical support, and the capacity to provide executive solutions for future improvement.

Research findings

In Iran, the role of fingerprints in the scientific detection of crimes has reached a point of maturity that can be considered one of the main pillars of the process of identifying criminals. The infrastructure of this field was formed in the past decades based on the needs of the police and the judicial system and was gradually strengthened with the introduction of new digital technologies and advanced indigenous software. Almost all Iranian citizens have registered their fingerprints in the system, whether by issuing a smart national card and passport or through administrative processes (Hasiti, 1400: 52). This volume of biometric data is stored in the National Fingerprint Bank, which allows for online searches and quick comparisons across millions of records. The bank is connected to the police and judicial authorities' network in

such a way that whenever a fingerprint is found at a crime scene, it can be checked within minutes whether it matches the existing data or not.

An important part of Iran's success in this field is related to its organized approach to training identity recognition experts. Training courses in this country are not limited to scientific fundamentals and explaining fingerprint patterns, but also include working with systems, analyzing distorted or manipulated prints, and even recognizing fake fingerprints (Sadeghi, 1400: 27). This training is mainly designed by the University of Law Enforcement Sciences and specialized centers for scientific police and follows a phased planning that ensures that each expert is not only capable of recognizing classic patterns, but also of understanding new technologies.

In important cases, the role of these systems and experts is clearly evident. For example, a case in which a serial murder in Tehran was solved by identifying a fingerprint on a plastic bottle, or an armed robbery case in Khuzestan, where a 3D fingerprint scanner on a bullet identified the identity of a criminal who had previously operated under false names (Baharloo, 1402: 15). These successes have not only established the system's capabilities, but also the judicial system's confidence in the probative value of this evidence. Of course, there are also challenges. As the volume of data grows, the need for more powerful servers and more secure storage systems is acutely felt. Cyber threats, sometimes originating from outside and sometimes even from within the systems, are among the main concerns of managers in this sector. Although the National Fingerprint Bank is not connected to the global internet, sharing data between provinces and the need to send it to the center still allows for security breaches (Baharloo, 1402: 20). In addition, some deprived or border areas still use old scanning equipment, and the poor quality of the data can reduce the accuracy of matching.

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All these strengths and weaknesses indicate that Iran is on the path to creating a comprehensive and efficient fingerprinting system, but it needs to continuously invest in new equipment and update software and protocols to narrow the gap between national standards and leading global examples.

However, the findings show that Iraq has a different story, but in line with Iran. Fingerprinting in Iraq has a history, but it can be said that its modern and scientific form practically began after 2003 and the extensive political and security developments. With the beginning of the reconstruction of various types of police, international organizations, especially Western security agencies, played a key role in the introduction of modern equipment and automated fingerprint information systems to the country (UNODC. (2020).). In the early years, the main focus was on large cities such as Baghdad, Basra and Erbil, and advanced fingerprint scanning and analysis equipment was first widely introduced into the scientific police centers of these cities.

Over time, fingerprint databases in Iraq have expanded, but this expansion has not been sufficiently integrated. There are now three or four main databases, each operating under the supervision of a different institution, such as the criminal police, the passport office, and the border guards. This fragmented structure has led to the process of matching data between databases being often done manually and in some cases, the identification of suspects is accompanied by significant delays (Sulaimani, 1400: 120). For example, an individual's fingerprints may be present in the passport database, but because they have not been transferred

to the criminal police database, they are not identified in the criminal file until after lengthy administrative correspondence. Nevertheless, Iraq also has notable cases that demonstrate the effectiveness of these systems. One such example was the operation to combat human trafficking on the northern borders, where fingerprints left on the smugglers' personal belongings, when compared with the passport office database, provided important clues to identify the network. Or in 2019, Baghdad police were able to use fingerprints on a bullet casing to track down a career criminal who had managed to evade prosecution several times by changing his name and identity. Iraq's challenges, however, are unique. Heavy reliance on foreign technology means that any disruption in political relations or sanctions will directly impact the ability to repair and upgrade equipment. Many Iraqi experts also receive their training in the form of short-term foreign courses, and this training, while useful, does not have sufficient continuity to fully transfer experience (Al-Zaabi, M (2021)). (. In addition, in some systems, connection to Internet-enabled networks has been chosen as a way to quickly update software, which itself increases the risk of external intrusions.

In general, Iraq has been remarkably fast in using modern technologies, but the lack of organizational coordination and comprehensive laws has prevented the full implementation of existing capabilities. The country has great potential for improvement, provided that it can integrate scattered bases and reduce its dependence on foreign sources.

Conclusion

Comparing the situation of Iran and Iraq in the field of using fingerprint recognition systems and related biometric technologies presents us with a multi-layered picture of the capacities, limitations, and different paths of development of these technologies. Although both countries have many similarities from a geographical, cultural, and security perspective, differences in policies, investments, and environmental conditions have paved the way for the formation of two distinct patterns in this area. Over the past two decades, Iran has been gradually and The planned effort has been to provide the necessary technical and administrative infrastructure and reduce its dependence on imports by localizing parts of software systems. In contrast, Iraq has been forced to rely more on imported technologies due to political and security instability after 2003, and institutional coordination between the relevant agencies in the country has not yet reached an efficient level. By creating centralized databases under the control of law enforcement and judicial institutions, Iran has been able to shorten the identification process and significantly reduce the error rate. The gradual connection of these databases to operational systems throughout the country has reduced the identification time in some operations from several days to less than a day. In Iraq, however, the data structure is scattered and dependent on separate systems in ministries and provinces, which causes a significant slowdown in the response to security incidents. This dispersion has not only reduced the efficiency of identification systems but also increased the risk Adaptive errors have also occurred.

The role of human resources in the success of these systems is undeniable. Iran has followed up on the process of improving the skills of biometric system operators by holding periodic training courses, especially in provincial centers, and has been able to control some of the human errors. However, global experiences show that this training should be upgraded to a more advanced and specialized level so that operators are not only familiar with the technical operations of the devices but also have the ability to analyze data and make quick decisions in

complex situations. In Iraq, the lack of special training centers and simulation equipment has limited employees to basic knowledge, and this limitation has increased the rate of execution errors and response times. A model such as Japan's extensive training programs, which are accompanied by long-term practical training, could have significant benefits for both countries. In the area of cybersecurity and data protection, Iran and Iraq also face serious challenges. In Iran, the use of indigenous encryption algorithms and the use of semi-autonomous networks for data exchange is an important step in increasing the security factor, but there are still some vulnerabilities to targeted attacks. Iraq is more exposed to threats of intrusion and data destruction due to the lack of a national coordinating center for cybersecurity and the use of distributed systems. Successful international models, such as the UAE's multi-layered security model using multi-factor authentication and smart firewalls, can be exploited by both countries, especially Iraq.

The challenges related to managing migration and transnational crime are also clearly visible in both countries. Iran is in a position where it is considered a passage for illegal migration from East to West, and Iraq, as a passage country to Europe, is under pressure from illegal immigrants and smuggling networks. The simultaneous use of several biometric technologies, including a combination of fingerprints and facial recognition, has been introduced in international reports as an effective method that can reduce the detection rate of immigration crimes. Iran has used such a combination in parts of its eastern borders and achieved positive results, but Iraq is still in the experimental and limited stage.

In the meantime, the opportunities for bilateral cooperation between Iran and Iraq are of particular importance. The creation of a joint biometric bank that allows for online exchange of information could not only significantly increase the speed of identifying border criminals, but also strengthen the field of operational coordination between the two countries. By taking advantage of Iran's experience in localizing and managing extensive databases and Iraq's access to fresh data from crisis-hit areas, this cooperation could be a model for other countries in the region.

Ultimately, a forward-looking view of the development of these systems shows that their evolution will not be achieved by technological advancements alone, but will require a combination of aligned policymaking, investment in specialized training, and advanced data protection. Although Iran and Iraq are currently at different points in their development path, common threats and the need to streamline scientific crime detection processes place them on a common forward-looking path. The simultaneous implementation of technological, organizational, and educational solutions can bring these two countries to a level where they not only strengthen their internal security, but also play a more active role in confronting complex regional threats. This adaptive approach, by relying on existing strengths and correcting weaknesses, provides a practical and realistic path for decision-makers in both countries to enhance their defense and prevention capabilities to the highest possible level in the sensitive geopolitical conditions of the Middle East.

Suggestions

-1Given the existing technical and legal differences, it is suggested that a common framework be developed between Iran and Iraq in which the criteria for collecting, registering, storing, and

evaluating fingerprints are defined as a single standard so that the issuance of sentences and judicial cooperation are not subject to doubt.

-2Establishing a secure platform for exchanging fingerprints and other biometric data in criminal cases can increase the speed of detecting cross-border crimes and reduce the possibility of errors or duplication of investigations.

-3Using advanced automated fingerprint information systems, algorithmic analysis, and artificial intelligence in fingerprint matching will increase accuracy and reduce time in the identification process and significantly improve the performance of forensic experts and bailiffs.

Sources:

Ahmadi, M. (1401). Cybercrimes and Digital Identification Technologies (First Edition, Volume 1). Tehran: Allameh Tabatabaei University Press.

Eskandari, M., and Fakhrz, M. (1403). Identification and prioritization of methods for the appearance of invisible fingerprint traces on bodies for use in police investigations (case study of Qazvin province). Detective Journal, (66), 27.
https://det.jrl.police.ir/article_706276.html

Badiei, S. A., Roustaei Sadrabadi, H., and Motvalizadeh, N. (1403). The nature and validation of biometrics in crime detection. Medical Law Quarterly, (59), 305–320.https://ijml.ir/article_165172.html

Hajizadeh, M. (1399). Application of fingerprint science in scientific police (First Edition, Volume 1). Tehran: University of Law Enforcement Sciences Press.

Hosseini, M., and Tabatabaei, S. M. (1401). New Information Security Technologies (First Edition, Volume 1). Tehran: University of Law Enforcement Sciences Press.

Rahmani, N. (1402). Scientific Police and Digital Evidence (First Edition, Volume 1). Tehran: University of Law Enforcement Sciences Press.

Roshan-Qalb Deylami, A., Hendiani, A., Fakhrz, M., and Talebian, H. (1400). Biometric-Based Crime Evidence Collection. Detective Journal, (54), 143–162.
https://det.jrl.police.ir/article_706204.html

Soleimani, R. (1400). Biometric Data Management and Privacy (First Edition, Volume 1). Tehran: Shahid Beheshti University Press.

Ghasemi, F. (1400). Identity Recognition and National Security (First Edition, Volume 1). Tehran: Tehran University Press.

Karimi, A. (2012). Principles and Applications of Biometric Authentication Systems (First Edition, Volume 1). Isfahan: Isfahan University of Technology.

- Khan, M. A., Usman, M., & Alqaralleh, B. (2025). Optimized fingerprint crime detection using robust algorithms and AI-based forensic analysis. *Knowledge-Based* https://www.sciencedirect.com/science/article/abs/pii/S0950705125003892

Bhatia, R., Singh, S., & Gupta, P. (2024). A robust fingerprint identification approach using a fuzzy matching system for forensic applications. *Pattern Recognition*,: https://www.sciencedirect.com/science/article/pii/S0031320324008859

Patel, H., Shah, R., & Kwon, S. (2025). A review on fingerprint-based authentication: Challenges and forensic advancements. *Pattern Recognition Letters*: https://www.sciencedirect.com/science/article/abs/pii/S1574013725000127

Zhang, Y., Wang, L., & Chen, F. (2020). Fingerprint classification and identification algorithms for forensic and security applications. *Future Generation*https://www.sciencedirect.com/science/article/abs/pii/S0167739X19315109