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Enhancing Fingerprint System: A Case Study on Bridging Gaps to Improve Efficiency, Standardization and Public Trust

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ABSTRACT

Fingerprint identification remains a cornerstone of modern forensic science, yet systemic challenges hinder its optimal use in various regions. This study aimed to investigate operational, technical, and human factors affecting the implementation of the Automated Fingerprint Identification System AFIS and to identify strategies for improvement within Region 13 (Caraga), Philippines. Employing a qualitative case study design, the research was conducted at the Regional Forensic Unit 13, the primary forensic facility in the region. The study involved twenty (20) purposively selected fingerprint examiners and SOCO investigators currently assigned to the unit. Data collection was carried out using semi-structured interviews guided by a validated forensic-specific interview tool. Thematic analysis was applied to the data to uncover core patterns and gaps in system utilization. The study revealed six key themes: Print Quality and Processing Challenges, Interoperability and Standardization Issues in Fingerprint Systems, Bridging Practice, System, and Coordination Gaps, Strengthening AFIS through Upgrading Systems, Enhancing Training, and Standardizing Processes, Enhancing Investigative Efficiency and Judicial Outcomes, and Promoting Interagency Integration and Public Trust. These findings highlight general limitations that reduce the effectiveness of fingerprint systems and offer a basis for holistic reform. In conclusion, improving AFIS requires a coordinated national strategy integrating technical upgrades, capacity building, and procedural standardization. It may be recommended that policymakers develop and implement an interagency framework to support forensic modernization and foster greater public trust in justice systems.

Keywords: Accountability; Automation; Data; Evidence Integrity; Fingerprint Examiner; Fingerprint System; Interoperability; Public Trust; Standardization; System Efficiency.

1. Introduction

Fingerprints are a cornerstone of forensic science due to their uniqueness, permanence, and ease of collection at crime scenes, making them a highly reliable tool for identifying suspects and victims (Singh, 2021; Bremner, 2023). Modern techniques in fingerprint analysis provide high accuracy, speed, and efficiency, with the ability to analyze complex patterns (Sarraf, 2023), and Automated Fingerprint Identification Systems (AFIS) further streamline identification by digitizing and automating the search and match process (Singla et al., 2020). While AFIS has improved accuracy and speed, it also faces technical, financial, and human challenges such as system maintenance costs, inadequate training, software limitations, and examiner fatigue, especially in countries like the Philippines where resources may be constrained (Alagos et al., 2024; Meuwly & Baker, 2020). Research shows that factors like training disparities, workload, and human error influence examination accuracy, necessitating improved recruitment, ongoing education, and consensus-based practices to reduce subjectivity and error (Gibb & Riemen, 2023; Busey et al., 2022). Forensic examiners play a vital role in both criminal and civil cases by gathering, preserving, analyzing, and testifying about forensic evidence such as fingerprints, DNA, and digital traces, thereby ensuring the integrity of the justice process (Fisher et al., 2022). In the Philippine context, agencies like the PNP and NBI rely heavily on forensic techniques for personal identification in criminal investigations, disaster response, and fraud prevention (PNP, 2023; DOJ, 2022). This study fills a crucial research gap by examining the specific challenges that fingerprint examiners—particularly forensic examiners and SOCO investigators—face in using the Automated Fingerprint Identification System (AFIS). It investigates not only the

technical and operational problems encountered but also the coping mechanisms employed to manage these difficulties. Recognizing and understanding these challenges is essential for effective problem-solving, as it enables the development of targeted, context-sensitive strategies that external actors may not fully grasp. By focusing on firsthand experiences, this study offers valuable insights into both machine-related and human-related errors in AFIS usage, ultimately aiming to improve operational effectiveness. The findings are expected to enhance the capacity of forensic and law enforcement institutions in the Philippines to deliver justice more efficiently and ensure public safety.

1.1. Study Objectives

The following are the objectives of this study: (i) Identify the main obstacles faced by the PNP in using national fingerprint records for automated systems, (ii) Determine how do the PNP address challenges in utilizing national fingerprints records for automated systems, and (iii) Determine why it is important for the PNP to overcome challenges in utilizing national fingerprint records for automated system.

2. Methods

This study utilized a case study research design. This research design explored complex issues in their real-life settings. This implied that qualitative researchers studied phenomena in their natural settings while striving to understand or interpret phenomena in terms of the meanings that people attributed to them (Miller et al., 2023). Case study research design was appropriate to the study since it focused on exploring the forensic examiners' and SOCO investigators' experiences in the problems that they encountered in utilizing the Automated Fingerprint Identification System (AFIS); this included their own ways of coping with such problems.

3. Results and Discussions

3.1. Print Quality and Processing Challenges

This theme captures the recurring technical and environmental issues encountered by fingerprint examiners and scene investigators, directly affecting the accuracy, usability, and success rate of fingerprint identification systems like AFIS (Automated Fingerprint Identification System). Through qualitative insights from participants, three key subthemes emerged under this major category: Partial or Smudged Prints, Poor Surface and Environmental Conditions Issues with Manual and Digital Record Quality.

3.1.1. Partial or Smudged Prints are fingerprints that are incomplete or blurred, often due to improper recovery methods or suspect movement during deposition. FEP3 shared the difficulty of manually tracing ridges when AFIS fails to recognize unclear patterns, underscoring the limitations of the system when dealing with poor ridge detail. SIP1 supported this concern, noting that most recovered prints tend to be unclear or smudged, making them harder to process. SIP6 and SIP10 further emphasized that even when suspects are already in the database, low-quality prints often result in no match, reducing the accuracy and reliability of fingerprint identification. These accounts affirm that partial or smudged prints significantly hinder forensic matching, aligning with the broader concern over low-quality fingerprint evidence. These are the answers of the participants:

"AFIS struggles with recognizing partial or smudged prints. Sometimes, you have to manually trace ridges, which is challenging with unclear patterns." (FEP3)

"Most of the prints we find are unclear or smudged. Often, the ridge detail is incomplete, which complicates processing." (SIP1)

"Smudged or partial prints lower the chances of a successful match even if the person is already in the system." (SIP6)

"Smudged or partial prints significantly reduce accuracy. Even if the person is in the database, we might not get a match if the print isn't clear enough. That's a common issue we face." (SIP10)

The persistent issue of partial or smudged fingerprints continues to undermine the reliability of fingerprint identification systems. Participants in the study emphasized that incomplete ridge formations significantly compromise the effectiveness of both Automated Fingerprint Identification Systems (AFIS) and manual comparison methods. This concern aligns with the findings of Hussain et al. (2024), who noted that degraded fingerprint images—whether blurred or smeared—substantially reduce matching accuracy and may even result in erroneous identifications.

3.1.2. Poor Surface and Environmental Conditions—such as moisture, rain, and rough or absorbent surfaces—can significantly degrade fingerprint quality, making recovery and identification difficult. SIP4 noted that prints are often damaged by weather, while SIP2 highlighted that improper dusting on such surfaces further reduces clarity. SIP3 added that some prints are so poor they can't even be submitted to AFIS. Overall, these observations stress the major impact of environmental and surface factors on the effectiveness of fingerprint evidence. These are the answers of the Participants:

"We deal with damaged prints, bad surfaces, and environmental factors like rain." (SIP4)

"If the dusting is poorly done, the fingerprint becomes unclear and won't match any suspect in AFIS." (SIP2)

"Sometimes the recovered print is too low in quality for the examiner to even recommend submission to AFIS." (SIP3)

Environmental conditions and surface quality significantly affect the clarity and recoverability of fingerprints (Czech et al., 2020). Participants noted how elements like rain and inappropriate dusting techniques often damage prints beyond usability, leading to wasted efforts and missed identification opportunities.

3.1.3. Issues With Manual And Digital Record Quality relate to problems like poor scanning, bad ink application, or substandard documentation that hinder AFIS matching. FEP3 noted that AFIS struggles when fingerprint images are of low quality, while FEP1 pointed out that using bond paper for manual records prevents proper scanning, highlighting flaws in current procedures. These are the answers of the Participants:

"Although the system automatically classifies fingerprint patterns (whorl, loop, arch, etc.), poor image quality complicates matching." (FEP3)

"Some used bond paper, which isn't scannable… poor record keeping." (FEP1)

The findings of the study highlight a persistent and critical issue in both manual and digital fingerprint recording—namely, the poor quality of captured prints due to substandard practices and outdated procedures. Errors in minutiae extraction—often resulting from improper scanning techniques and the use of unsuitable materials—can significantly degrade the performance of fingerprint identification systems (Loyola-González, 2021). As noted by participants, problems such as improper scanning techniques, poor ink application, and the use of unsuitable materials (e.g., bond paper) significantly affect the integrity of fingerprint records.

3.2. Interoperability and Standardization Issues in Fingerprint Systems

This theme sheds light on the fragmented infrastructure that governs fingerprint data across different law enforcement and forensic agencies. Despite advances in biometric technologies, organizational silos and technical disparities hinder the seamless sharing and matching of fingerprint records. From the qualitative responses of fingerprint examiners and investigators, the following three subthemes emerged as the most pressing interoperability challenges: lack of unified databases, inconsistent formats across agencies, and integration and compatibility barriers.

3.2.1. Lack of Unified Databases refers to the fragmented storage of fingerprint records across different, non-interoperable systems, which leads to missed matches and inefficiencies. FEP6 and SIP10 highlighted the difficulty of conducting thorough searches due to inaccessible or agency-specific databases. SIP7 noted that many prints go unmatched because the databases are incomplete, while FEP2 emphasized the absence of a mandate for database consolidation. Together, these points illustrate how the lack of a centralized fingerprint system hampers effective identification and coordination. These are the answers of the Participants:

"A major issue is the lack of interoperability between existing databases." (FEP6)

"Many prints can't be matched because the database is incomplete." (SIP7)

"The frustration comes when a known suspect's fingerprint is stored in another agency's system, but we can't access it." (SIP10)

"No existing directive requires agencies to consolidate their fingerprint databases." (FEP2)

Participants reported that fragmented and inaccessible records, along with the absence of integration policies, lead to missed matches and delays. This aligns with international research highlighting similar issues in non-integrated systems (Mohamed et al., 2023). Respondents stressed that disconnected databases hinder efficiency and called for a centralized, policy-driven approach to improve identification and support timely justice.

3.2.2. Inconsistent Formats across Agencies refer to the lack of standardized methods for collecting and storing fingerprint data, leading to compatibility issues and disrupted data exchange. FEP3 and FEP4 noted that varied formats hinder system integration and can cause mismatches, even when data is available. FEP1 emphasized the need for uniform training to address format discrepancies. The lack of standardization undermines interoperability and complicates efforts to build a cohesive fingerprint system. These are the answers of the Participants:

"The main issue is the lack of standardization between agencies… varied formats and integration difficulties." (FEP3)

"Creating a unified format requires personnel to undergo regular training… Without standardized image formats, integration suffers." (FEP1)

"Compatibility issues between agencies also result in mismatches." (FEP4)

Participants stressed that without unified collection protocols and ongoing training, integration efforts remain flawed. FEP3, FEP1, and FEP4 noted how varied formats complicate consolidation and cause system compatibility issues, even when data is available. This mirrors global findings—Bhatt et al. (2020), Patil & Kulkarni (2022), and Li & Jain (2023) all point to inconsistent biometric standards as major barriers to efficient inter-agency collaboration and real-time identification.

3.2.3. Integration and Compatibility Barriers refer to the technical and systemic challenges that hinder the seamless connection of fingerprint databases across agencies. Issues like software mismatches, system outages, and inconsistent data quality lead to false negatives and delays, as noted by FEP5 and FEP2. These challenges underscore the broader problems with achieving effective cross-agency access and system interoperability. These are the answers of the Participants:

"False negatives often result from a fragmented database and inconsistent fingerprint quality." (FEP5)

"During my assignment in Davao, one common issue was system shutdowns." (FEP2)

Participants like FEP5 and FEP2 stressed that without reliable cross-platform systems, forensic operations—especially in the field—remain inefficient and error-prone.

3.3. Bridging Practice, System, and Coordination Gaps

This theme highlights the disconnection between field-level fingerprint collection and centralized database processing, worsened by weak inter-agency coordination. Despite diligent fieldwork, its impact is limited by outdated infrastructure, poor communication, and lack of standard protocols. The study calls for a national strategy to enhance AFIS through technology upgrades, institutionalized training, and quality control. Without uniform standards, regional efforts remain fragmented, leading to inefficiencies, inconsistencies, and increased risk of system failures.

3.3.1. Disparity in Standards across Regions refers to the inconsistent application of fingerprint digitization, scanning, and quality assurance practices nationwide. FEP4, FEP9, and FEP5 noted that while some areas follow standardized procedures, others lag behind, creating fragmentation and limiting inter-agency coordination. This inconsistency hinders the development of a cohesive national fingerprint system despite ongoing efforts toward standardization. These are the answers of the Participants:

"Different regions have varying standards for digitizing and applying quality checks to fingerprint records. These efforts are being expanded to apply nationwide. A unified system would represent major progress." (FEP4)

"We've adopted standardized scanning procedures and centralized record updates, but these efforts must be expanded across the country." (FEP9)

"Fingerprint records are regularly updated at the PNP level, but there is currently no national standard that ensures synchronization across all government agencies." (FEP5)

The study revealed significant regional disparities in fingerprint quality, handling, and digitization practices across the Philippines, with participants like FEP4, FEP9, and FEP5 noting the lack of a national mandate as a key barrier to system cohesion. While some regions have piloted best practices, the absence of standardized protocols undermines efforts to build a centralized, interoperable database.

3.3.2. Limited Communication with Database Administrators refers to the poor coordination between field investigators and those managing fingerprint databases, which disrupts feedback, guidance, and data processing. SIP5 and SIP8 highlighted that while field teams consult examiners, there is minimal interaction with database administrators, hindering the overall fingerprint verification process. These are the answers of the Participants:

"After collection, the team leader requests an examination from the fingerprint examiners. We also consult them on how to lift better prints. Coordination with database admins is still limited though." (SIP5)

"We coordinate with examiners for post-collection verification and clarification. But interaction with database administrators is still limited." (SIP8)

While consultations with fingerprint examiners are common, participants like SIP5 and SIP8 noted minimal real-time interaction with system managers, hindering feedback, data corrections, and process efficiency. Sanchez et al. (2020) stressed that effective biometric systems require strong collaboration between frontline operatives and backend custodians; without it, input errors and delays increase.

3.3.3. Need for Centralized Record Management emphasizes the importance of a national fingerprint database to consolidate records from various agencies, ensuring cross-agency access and maximizing the utility of collected prints. SIP4, SIP8, and SIP10 pointed out that despite strict protocols and careful preservation, the lack of a comprehensive system hinders effective analysis and matching of fingerprints. These insights highlight the critical need for stronger system integration to enhance the value of fingerprint evidence. These are the answers of the Participants:

"In crime scene processing, especially as SOCO members, we follow strict evidence-handling procedures. But even with proper collection, if there's no comprehensive system to receive and analyze the prints, our effort is wasted." (SIP4)

"We preserve prints by working on dry surfaces, labeling correctly, photographing before collection, etc. But without a robust database, even well-collected prints may not lead to matches." (SIP8)

"We're trained to collect and label evidence correctly, then submit it quickly. Still, we need stronger system integration to make the whole process more effective." (SIP10)

Participants highlighted the need for a centralized fingerprint database to enhance field practices. Without a national system for processing and analyzing prints, evidence collection becomes ineffective, leaving valuable data underutilized. The study points out a key operational issue: the lack of a unified database for cross-agency synchronization (Santos, 2024). Despite thorough evidence collection, as seen in SIP4, SIP8, and SIP10, high-quality fingerprint data is rendered useless without proper infrastructure.

3.4. Strengthening AFIS through Upgrading Systems, Enhancing Training, and Standardizing Processes

This theme highlights the urgent need to overhaul the operational backbone of the Automated Fingerprint Identification System (AFIS) in the Philippines. Participant narratives emphasized that while AFIS holds vast potential, its performance is significantly constrained by financial, human, and procedural limitations. Three interrelated subthemes emerged from the interviews, each pointing to a crucial area requiring systemic reform: high maintenance and operational costs, inadequate training and capacity-building, regional quality control measures.

3.4.1. High Maintenance and Operational Costs refer to the significant financial burden of maintaining AFIS infrastructure, including hardware protection, software licensing, personnel, and environmental controls. FEP1 highlighted costly measures like a generator and standby personnel after a hacking incident, while FEP2 noted a monthly maintenance budget of ₱1.5 million. FEP6 pointed out that inconsistent updates and monitoring undermine system reliability. These insights emphasize the ongoing financial strain of securing and maintaining AFIS systems. These are the answers of the participants:

"Previously, the AFIS system briefly shut down after being hacked… a generator is installed for AFIS to prevent overheating… an IT personnel and a police officer are on standby in the machine room… maintenance is very costly." (FEP1)

"Maintenance is expensive — our monthly budget for maintaining the system reaches around ₱1.5 million." (FEP2)

"Currently, fingerprint records are stored securely, but updates and system monitoring are inconsistent. This affects reliability." (FEP6)

Santos (2024) discusses how, despite measures like climate control and IT staffing, financial constraints limit the long-term scalability and efficiency of AFIS. It emphasizes that sustaining AFIS requires substantial resources for maintenance, security, personnel, and environmental control, noting ongoing costs—₱1.5 million monthly—for operational continuity, including post-hack system hardening and around-the-clock staffing.

3.4.2. Inadequate Training And Capacity-Building highlight the lack of consistent, comprehensive training for AFIS operators and related personnel, as well as the need for inter-agency collaboration on unified training standards. FEP1 noted that their training was limited to basic skills, leaving gaps in advanced system functions. FEP3 emphasized the fragmentation of training across systems, while FEP6 stressed the need for more specialized capacity-building to keep pace with technological advancements. These insights emphasize the need for improved

and coordinated training efforts to enhance system management and collaboration. These are the answers of the participants:

"In my case, I only received one week of training on AFIS… focused on photography and image enlargement." (FEP1)

"The current separation between systems makes training inconsistent. There should be inter-agency collaboration for unified development." (FEP3)

"There are ongoing trainings, but with the rapid advancement of technology, we need more focused capacity-building programs aligned with the vision of a future unified system." (FEP6)

Rapid tech advancements require ongoing, inter-agency training, rather than one-time courses. It discusses the challenges faced by police officers with AFIS, including inconsistent and insufficient training that impacts effective use of advanced system features (Alagos et al., 2024). Participants cited limited exposure to advanced system features (FEP1), inconsistent training (FEP3), and a lag in adapting to new technologies (FEP6), highlighting the need for a more cohesive, future-proof training approach.

3.4.3. Regional Quality Control Measures refer to efforts at local levels to enforce fingerprint validation, image checks, and database calibration, but these practices are not consistent across the country. FEP2 described strict quality checks at regional offices before submission to the main office. FEP7 highlighted measures like regular system calibrations and updates to maintain high standards, while FEP8 emphasized the benefits of expanding digital record standards nationwide. These insights show that while regional efforts are in place, the lack of uniformity in quality control remains a significant challenge. These are the answers of the participants:

"Measures start at the regional and provincial offices… fingerprint cards undergo strict quality checks before they reach the main office." (FEP2)

"Some measures include strict quality control in fingerprint collection, regular system calibrations, and updates to the AFIS database…" (FEP7)

"Some regions have already implemented digital record standards and quality checks. Expanding these protocols nationwide through a unified system would be a significant improvement." (FEP8)

While some regions have implemented strong quality control processes, the lack of a national standard results in inconsistent implementation. Regional best practices need to evolve into national norms, with centralized oversight to ensure uniform quality. AFIS success depends not only on technology but also on skilled operators.

3.5. Enhancing Investigative Efficiency and Judicial Outcomes

This theme focuses on how automation and modernization of fingerprint identification systems—particularly through AFIS—redefine the speed, accuracy, and legal value of forensic processes. Participant insights revealed two interrelated subthemes central to this transformation: faster case resolution through automation and improved evidence integrity in court.

3.5.1. Faster Case Resolution through Automation highlights how AFIS improves fingerprint processing speed, enabling quicker suspect identification and reducing delays in manual verification. SIP6 noted that automation speeds up arrests and enhances case files, while FEP3 emphasized the significant time savings, with their system generating 10,000 match candidates per second. FEP1 reinforced that automation accelerates the matching of crime scene prints with database records. These insights stress that automation is key to more efficient case resolution. These are the answers of the Participants:

"Automation reduces manual checking. It speeds up arrests and leads to better-prepared case files." (SIP6)

"Automation drastically reduces the time needed for fingerprint matching… our system can generate 10,000 match candidates per second…" (FEP3)

"Improving fingerprint automation, especially through AFIS, significantly speeds up the process of matching fingerprints from crime scenes against database records." (FEP1)

The integration of automated fingerprint systems like AFIS marks a major shift from manual to rapid, machine-driven identification, cutting processing time from days to seconds. Participants (SIP6, FEP3, FEP1) noted that automation reduces manual labor, speeds up suspect ID, and strengthens case files—leading to faster arrests and more efficient investigations.

3.5.2. Improved Evidence Integrity in Court highlights how advancements in fingerprint systems enhance the reliability and scientific robustness of evidence, strengthening cases and boosting confidence in forensic testimony. SIP7 and SIP8 noted that better systems ensure stronger, more defensible evidence in court. SIP4 added that addressing system challenges directly improves the credibility of forensic evidence. These insights emphasize that technological improvements in fingerprint systems are vital for ensuring reliable evidence and supporting successful prosecutions. These are the answers of the participants:

"A better system gives us confidence in the evidence and builds stronger court cases." (SIP7)

"Better fingerprint systems help build stronger cases with solid evidence that holds up in court." (SIP8)

"Addressing challenges improves the strength of our forensic evidence in court…" (SIP4)

Participants emphasized that advanced, well-maintained fingerprint systems strengthen the legal integrity of forensic evidence.

3.6. Promoting Interagency Integration and Public Trust

This theme underscores how enhancing fingerprint identification systems transcends technical efficiency—it's about institutional harmony and the public's faith in justice. The participants clearly articulated that the integration of databases, the avoidance of errors, and the prevention of fragmentation are not mere operational issues; they are deeply societal concerns. In other words, we're not just coding systems—we're coding confidence into the justice system. This theme revealed three interrelated subthemes which includes the Importance of Unified Databases, Impact of Errors on Public Confidence and Consequences of Fragmented Systems.

3.6.1. Importance of Unified Databases highlights the need for consolidated, interoperable fingerprint databases across law enforcement agencies to improve accuracy, efficiency, and collaboration. SIP5 noted that unifying databases ensures consistency and accuracy, while FEP9 emphasized that it accelerates case resolution and enhances cooperation. FEP3 added that a standardized AFIS system would streamline data sharing, facilitating faster investigations and stronger inter-agency support. These insights reinforce the necessity of a unified database for efficient, coordinated law enforcement. These are the answers of the Participants:

"Unifying databases will allow agencies to work from a common fingerprint source." (SIP5)

"A unified fingerprint system allows better data sharing between agencies, boosting cooperation and quickening case resolution." (FEP9)

"By adopting a unified and standardized AFIS, data sharing will be easier and restricted to authorized personnel. This promotes faster investigation and inter-agency support." (FEP3)

A unified and secure fingerprint database serves as a cornerstone for a collaborative and efficient justice system. Hall (2023) underscores the importance of achieving interoperability among latent fingerprint identification systems in the United States.

3.6.2. Impact of Errors on Public Confidence highlights how mistakes in fingerprint matching—due to technical issues, system fragmentation, or human error—can erode trust in the justice system. SIP4 noted that mismatches or delays may allow suspects to remain free or re-offend, while FEP2 emphasized that unresolved automation issues lead to wrongful convictions, loss of public trust, and security risks. These insights underscore that errors in fingerprint matching not only affect individual cases but also damage the credibility of forensic evidence and the justice system as a whole. These are the answers of the Participants:

"Delays or mismatches in fingerprint identification could let suspects remain free or re-offend. We might miss habitual offenders." (SIP4)

"Failure to address issues in fingerprint automation reduces investigative accuracy, leading to wrongful convictions, loss of public trust, ineffective interagency collaboration, and potential security breaches due to system vulnerabilities." (FEP2)

Accuracy in fingerprint identification transcends internal procedural concerns; it is pivotal to maintaining public confidence in the justice system. In the Philippines, Santos (2024) highlights the necessity of modernizing fingerprint identification systems to enhance their accuracy and reliability, thereby bolstering public safety measures and trust in forensic processes.

3.6.3. Consequences of Fragmented Systems highlight the risks of disconnected or outdated fingerprint databases across government and law enforcement agencies, leading to data gaps, inefficiencies, and delays in justice. SIP9 emphasized that these gaps allow criminals to evade detection, while FEP2 noted that automation issues hinder interagency collaboration. These insights stress the importance of integrated systems for ensuring timely, accurate justice delivery. These are the answers of the Participants:

"If we don't fix these gaps, criminals slip through. Justice delayed is justice denied—for everyone." (SIP9)

"Failure to address issues in fingerprint automation… leads to ineffective interagency collaboration..." (FEP2)

Fragmentation in criminal justice systems weakens investigations, increases re-offending, and creates security gaps. Disjointed agency operations lead to missed patterns and inefficiencies. While fingerprint evidence has endured and remains admissible (Bolinder & Larkin, 2025), misconceptions within law enforcement and courts hinder its full potential (Mansour, 2021).

4. Conclusions

The effective utilization of national fingerprint records by the PNP is crucial for enhancing criminal investigation and justice delivery in the Philippines. While significant challenges persist—particularly in fingerprint quality, data standardization, and system interoperability—the PNP's ongoing reforms through system enhancement, capacity-building, and process standardization reflect a strong commitment to overcoming these barriers. Ultimately, building a unified and reliable fingerprint identification system is essential not only for operational efficiency but also for strengthening interagency collaboration and restoring public trust in the justice system. Thus, improving AFIS requires a coordinated national strategy integrating technical upgrades, capacity building, and procedural standardization. In line with this, the following could be suggested:

1. Develop a Centralized Biometric Database. Establish a unified, interoperable fingerprint and biometric system that is accessible across all relevant law enforcement and justice agencies to enhance interagency coordination.

2. Implement Nationwide Standard Operating Procedures (SOPs). Create and enforce standardized protocols for fingerprint collection, processing, and data sharing to ensure consistency, accuracy, and efficiency across all units.

3. Invest in Advanced Fingerprint Technology. Allocate resources for the acquisition and maintenance of state-of-the-art Automated Fingerprint Identification Systems (AFIS) and biometric tools to improve identification accuracy and reduce processing delays.

4. Strengthen Training and Capacity-Building Programs. Provide continuous education and specialized training for PNP personnel on the latest biometric techniques, data handling standards, and forensic best practices.

5. Establish Independent Audit and Quality Control Measures. Introduce regular evaluations and third-party audits to monitor fingerprint system performance, ensure data integrity, and reinforce transparency and public confidence.

5. Recommendations

It may be recommended that policymakers may develop and implement an interagency framework to support forensic modernization and foster greater public trust in justice systems. The PNP may continue prioritizing the development of a unified and interoperable fingerprint identification system by investing in advanced technology, standardizing procedures across agencies, and institutionalizing regular training. Strengthening interagency collaboration and policy integration will be essential to ensure consistent, accurate, and trustworthy fingerprint-based investigations nationwide.

Declarations

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Competing Interests Statement

The authors have not declared any conflict of interest.

Consent for publication

The authors declare that they consented to the publication of this study.

Consent to participate

All participants in this study voluntarily gave their informed consent prior to their involvement in the research.

Authors' contributions

Both the authors took part in literature review, analysis, and manuscript writing equally.

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