Securetrack: An Evidence Chain Of Custody Management Application

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Abstract: *The effective management of evidence is a cornerstone of the legal system, underscored by its impact on the outcome of court cases. Proper evidence management ensures evidence's integrity, credibility, and admissibility in legal proceedings. However, challenges persist, as shown by the high dismissal rates of cases due to insufficient evidence or technicalities related to evidence handling, For instance, the Department of Justice found that up to 90% of cases were dismissed by courts, often due to issues with the evidence chain of custody. The Philippine National Police still currently relies on a paper-based system for managing the chain of custody, which presents numerous challenges. This study seeks to address the challenges encountered by the Philippine National Police in evidence chain of custody management using a paper-based system. This study also aims to propose a SecureTrack App design to revolutionize the evidence management process by introducing a digital solution. SecureTrack App is a web-based computerized data collection and management platform, designed to overcome the limitations of the current paper-based system within the Philippine National Police (PNP). To address the challenges encountered, the researcher distributed a survey questionnaire and conducted an informal interview. In the development of the SecureTrack App, the researcher also adopted the Agile Software Development method. The features of the systems help the PNP, particularly the investigators handling the cases to lessen the time of processing the evidence, and from time to time they can monitor their work, which can help in quickly solving the cases they handle.*

Keywords: *Chain of Custody, Evidence Management System, Paper-based System, SecureTrack Application*

INTRODUCTION

Effective evidence management is crucial in legal proceedings, as any lapses in documentation can compromise the legitimacy, integrity, and credibility of forensic examinations (Badiye et al., 2023). Legal systems worldwide, such as in Australia, emphasize the accurate recording of evidence movement to uphold fairness and integrity in trials, a lesson reinforced by the 1998 Wood Royal Commission, which exposed police evidence tampering and led to system improvements in New South Wales (Bohnen, 2022). Chain of custody issues arise when law enforcement fails to follow proper protocols in handling evidence, potentially weakening the prosecution's case (Pumphrey, 2022). Defense strategies often challenge gaps in the chain, exposing discrepancies in labeling, testing, or preservation (Bergman, 2023). Even a single procedural error such as mislabeling, delays in transfer, or unauthorized handling can render evidence inadmissible in court (Townsend, 2022). Given these challenges, maintaining a clear and verifiable chain of custody is essential, reinforcing the need for SecureTrack, a digital solution designed to streamline evidence management and enhance the reliability of forensic investigations.

Under Republic Act No. 6975, Section 24, the Philippine National Police (PNP) is responsible for upholding the law, maintaining peace and order, and ensuring public safety. A crucial aspect of these duties is the proper handling, storage, and monitoring of evidence, as law enforcement agencies serve as the primary custodians of assets and evidence (Ropero-Miller & Shute, 2021). The chain of custody plays a vital role in legal proceedings, providing a chronological record of the collection, management, examination, and control of evidence to ensure its integrity and admissibility in court (Pumphrey, 2022). Maintaining an unbroken and well-documented chain of custody is essential to prevent gaps or inconsistencies that could compromise legal standards. Proper evidence-handling protocols must be followed from the moment of collection at a crime

scene until its presentation in court, ensuring its legitimacy and reliability. Investigators must remain vigilant about how, where, and by whom the evidence is handled at every stage of the process to prevent any form of contamination or tampering (Banwani & Kalra, 2021).

A significant number of court cases are dismissed due to unreasonable doubt, with the Department of Justice (DOJ) reporting that up to 90% of cases are dismissed, primarily due to insufficient evidence or technicalities related to evidence handling (PhilStar, 2023). In response, the Office of the Court Administrator issued Circular No. 251-2018, and the Supreme Court, in *People of the Philippines v. Romy Lim y Miranda (G.R. No. 2311989)*, clarified the policies governing the chain of custody for confiscated illicit substances to ensure their evidentiary integrity. Similarly, in *People of the Philippines vs. Raul Del Rosario y Niebes* (June 22, 2020), the Supreme Court overturned a conviction due to breakdowns in the chain of custody and non-compliance with Section 21 of Republic Act 9165, leading to the accused's acquittal and release. However, in *Romeo Tumabini vs. People of the Philippines*, the Court of Appeals upheld the RTC's ruling with modifications. According to the 2021 PNP Forensic Group Annual Accomplishment Report, 894,740 forensic assistance requests were received, resulting in 1,268,843 laboratory exams, with 1,236,954 successfully completed marking a 7.30% increase from the previous year. Additionally, 352,697 requests were made for further investigation, reflecting a 16,631% rise from the prior year, with most cases involving drug-related offenses, shootings, and unidentified bodies. Field laboratory work (FLW) operations also saw 2,212 instances of specimen collection from locations beyond traditional crime scenes (PNP Forensic Group Annual Accomplishment Report, 2021).

The increasing number and complexity of cases handled by the PNP Forensic Group highlight challenges in maintaining the chain of custody, emphasizing the need for proper evidence management, protection, and preservation. The PNP Forensic Group's extensive forensic examinations demonstrate its critical role in criminal investigations, underscoring the importance of strict adherence to the chain of custody to uphold justice. To address these challenges, SecureTrack, a digital solution, aims to streamline the chain of custody process by replacing manual, paper-based methods with an automated system that enhances efficiency, accountability, and transparency. By ensuring accurate and reliable evidence handling, SecureTrack increases the likelihood of evidence being admitted in court while reducing administrative costs and improving workflow. Features such as real-time updates, user-friendly interfaces, and monitoring capabilities help prevent unauthorized access, tampering, or mishandling. By overcoming the limitations of paper-based evidence management, SecureTrack enhances evidence integrity, optimizes workflow, promotes accountability, and enables system integration. As a transformative tool for law enforcement, it has the potential to significantly improve the reliability and efficiency of the criminal justice system.

Conceptual Framework

The research paradigm illustrates the flow of the investigation as well as the direction it is going in. The first step in the study process involves the researcher conducting informal interviews and discussions with industry professionals to understand the difficulties encountered by the PNP-DIDM Crime Laboratory in the administration of the Evidence Chain of Custody. Following that, the development of the SecureTrack Application was led by information technology professionals, utilizing the Agile Development Method. Consultations were sought out on a continuous basis from people from the PNP-DIDM, detectives, and evidence custodians from the Municipal Police Station and Crime Laboratory in order to identify essential features and functions.
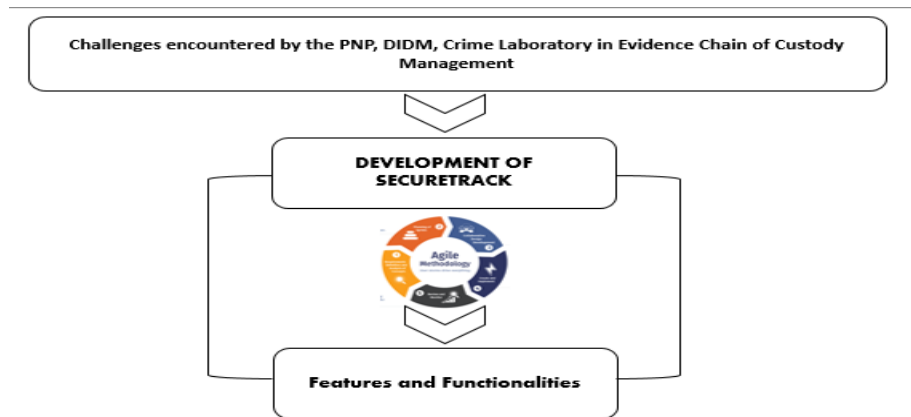
Figure 1. Conceptual Paradigm

MATERIALS AND METHODS

Research Design

The researcher employed a descriptive research method to gather, analyze, and interpret data, alongside the Agile Software Development approach, which emphasizes systematic design, development, and assessment of solutions to specific challenges. Additionally, the study utilized the Developmental Research approach, which involves the structured examination of designing and evaluating instructional programs, processes, and products to ensure coherence and efficacy (Seels & Richey, 1994, cited in Klein, Nelson, & Richey, 2004). Agile Software Development, known for its iterative and adaptive nature, was implemented in the development of the SecureTrack Application, with each cycle producing a functional version that was tested and refined based on stakeholder feedback (Brush & Silverthorne, 2022). Continuous discussions with future users and domain experts ensured the application met its intended objectives, while regular evaluations after each iteration integrated principles of both developmental research and Agile methodology to optimize technical efficiency, relevance, and user experience.

Population and Locale of the Study

The research was carried out in the Bicol Region, especially at the PNP Police Regional Office 5 (PRO-V). It is located in Legazpi City, which is situated in the Province of Albay. PRO-V's many offices are located within Camp General Simeon A. Ola. The PNP-PRO-V oversees six police districts and has authority over six provinces, namely: Camarines Norte, Camarines Sur, Albay, Catanduanes, Sorsogon, and Masbate.Under this, there are a total of 97 Police stations throughout the Region(Fandom.com/PNP RO5).
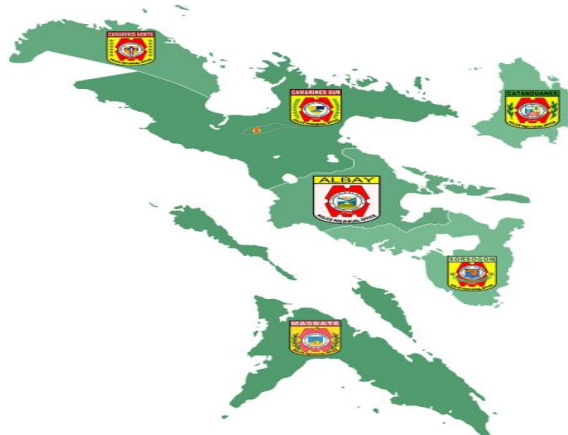

Figure 2. Map of Bicol Region showing the jurisdiction of the PNP RO-V

The research study focused on the DIDM division, Crime Laboratory. Additionally, the study will extend its scope to selected Municipal Police Stations in the region.

The breakdown of the respondents is taken as follows: Chiefs of Police (8), Chief Investigators (8), Crime Scene Investigators (15), PNP Evidence Custodians (5) coming from every municipality, Forensic Experts (1) Forensic Technicians (2), and Forensic Custodian (1, with a total of (40) respondents.

Data Gathering Tools

The development of the SecureTrack application followed software engineering methodologies, specifically iterative and agile approaches, to ensure a secure and thorough chain of custody procedure. With the assistance of an IT specialist and a developer, the researcher carefully designed and enhanced the application's features and functionality through prototyping methodologies, allowing for feedback collection and refinement. The researcher also addressed key technical challenges such as data structure, user interface design, and system integration with law enforcement databases. To gather requirements and ensure compliance with security standards, informal interviews and consultations were conducted with the Philippine National Police (PNP) and the Criminal Investigation Division. Key informants, including Chief Investigators and Evidence Custodians from a municipal police station in Sorsogon Province, were engaged due to their accessibility and expertise. Further insights were obtained from additional relevant units and agencies.

To evaluate the system's acceptability, the researcher adopted the ISO 25010 Systems and Software Quality Requirements and Evaluation framework, focusing on functionality, usability, efficiency, reliability, and maintainability. A questionnaire, validated by authorities and study respondents, was used to assess the software's acceptability. Its reliability was tested using Cronbach's Alpha, achieving a score of 0.962, confirming its reliability. Another questionnaire was developed based on informal interviews with target respondents regarding challenges in the paper-based evidence chain of custody system. After validation and approval, the survey was distributed to selected municipal police stations in Sorsogon. This structured evaluation process ensured that SecureTrack met the necessary quality standards and effectively addressed the needs of law enforcement agencies.

Data Gathering Procedure

The researcher formally requested authorization from Westrimundo D. Obinque, the Regional Director of PNP Regional Office V, through a letter endorsed by Dr. Robino D. Cawi, Dean of the Graduate School of Criminal Justice Education. The request aimed to conduct an Industry Consultation, interviews, and a survey to assess any existing technical innovations related to the PNP chain of custody and identify challenges faced with the traditional paper-based system. Alongside an IT expert, the researcher engaged in informal discussions to refine the procedures for evidence handling and determine the necessary system features. Continuous communication with chief investigators provided valuable feedback, shaping the system's development, which lasted five months from December 2023 to April 2024. Due to time constraints, the testing phase was limited to just one month.

Following system completion, the researcher and IT developer revisited the Chief Investigator to showcase the SecureTrack app and gather further recommendations for improvement. The researcher then personally visited eight municipal police stations and the PNP Crime Laboratory in Sorsogon to present the system, demonstrate its functionalities, and distribute instructional manuals. Each station received a full-day demonstration, ensuring that officers could familiarize themselves with the system. Additionally, survey questionnaires were distributed to assess the acceptability of the application, with both presentations and survey retrieval completed within one month due to time limitations.

RESULT AND DISCUSSION

This part presents the data presentation, analysis, and interpretation as answers to the problems discussed in this study.

LEVEL OF AGREEMENT ON THE CHALLENGES ENCOUNTERED IN EVIDENCE CHAIN OF CUSTODY MANAGEMENT USING A PAPER-BASED SYSTEM

The table presented the level of agreement on the challenges encountered by the PNP, DIDM, and Crime Laboratory in the Evidence Chain of Custody Management using a paper-based system. Data shows that the overall weighted mean of 3.21 indicates agreement among participants in this study regarding the difficulties encountered. The table shows that the most concerning challenges of the PNP in terms of chain of custody management using a paper system presented from the highest weighted means (WM) are retrieving and viewing specific pieces of evidence takes time (3.43), Challenges in coming up with statistical and inventory reports in real-time (3.45) and Storing and keeping safe the evidence collected at the crime scene and Lack of designated evidence rooms which had the same (3.38) weighted mean and were all are verbally interpreted by the respondent as Strongly Agree.

The result of this data is related to the findings of the study of Perkins et al. (2012) who emphasized the limitations of paper-based systems in timely data retrieval and being vulnerable to damage or loss.

Table 1 Level of Agreement on the Challenges Encountered in Evidence Chain of Custody Management Using a Paper-based System.

Challenges	WM	VI
1. There is no assigned PNP Personnel as Evidence Custodian in each Municipal Police Station.	3.0	Agree
2. Each assigned PNP Investigator has a problem in storing and keeping safe the evidence collected at the crime scene.	3.38	Strongly Agree
3. Encounter difficulty in tracking the movement of evidence?	2.93	Agree
4. Risk of loss or misplaced of evidence.	3.38	Strongly Agree
5. Lack of real-time updates on the status of evidence.	3.28	Strongly Agree
6. Potential for tampering with or unauthorized access to evidence.	3.15	Agree
7. Time–consuming paperwork and documentation.	3.28	Strongly Agree
8. Incomplete or inaccurate record-keeping	2.53	Agree
9. The integrity of evidence in some instances can be compromised.	3.0	Agree
10. Difficulty accessing and retrieving information related to the chain of custody	3.33	Strongly Agree
11. There is no designated evidence room in the municipal police station for physical evidence collected at the crime scene for proper management of evidence.	3.35	Strongly Agree
12. It takes time to monitor the status and location of evidence.	3.35	Strongly Agree
13. Encountered challenges with physical storage of paper documents related to evidence, such as limited space, and environmental factors (e.g. humidity or pests).	3.35	Strongly Agree
14. Retrieving and viewing the information of specific pieces of evidence takes time.	3.43	Strongly Agree
15. Possible breakage of a chain of custody since there are other agencies involved in the custody of the evidence.	3.03	Agree

16.	Challenges in coming up with statistical and inventory reports in real-time.	3.45	Strongly Agree
Total Weighted Mean		**3.21**	**Agree**

Also, based on the statements of the respondents from Bulan Municipal Police Station, the municipal police station has no designated evidence custodian rooms for keeping the pieces of evidence they collected from the crime scene because the supposed evidence rooms are used as offices of the PNP personnel so that people can come in and go inside the office. Due to this, there is a possible loss and tampering of the evidence. The police investigators who collected the evidence are the ones who are in charge of keeping the evidence they collected, so they usually keep it in their office for safekeeping, and the respondent mentioned that when the investigators are transferred to the other Municipal Police stations, they then encounter challenges in locating and retrieving the evidence because sometimes they have not formally turned over the data/information under their custody. So when they are asked to submit a report, just the same as what happened recently, and when they are asked to submit the inventory of the evidence collected, it takes time for them to come up with details for the data needed.

The data also revealed that lack of real-time updates (3.28) interpreted as strongly agree, potential for tampering with or unauthorized access to evidence (3.15) interpreted as agree, can lead to compromised evidence integrity (3.00), coincides with the study of Saferstein, (2007) where it is reported that loss of the integrity of evidence can lead to weakening the value of evidence in court. Paper-based system poses several problems including human errors in recordkeeping, the risk of document loss or destruction, difficulty in tracking evidence transfer, and conflicts due to lack of real-time updates, also tangible documents are more susceptible to fraud or alteration (Labtestguide). These findings are supported by the study conducted by Prayudi et al. (2014) that the correct management and storage of evidence is a crucial step in the investigative process, particularly in the context of legal proceedings. Mishandling can render the evidence ineffectual as legal evidence in court (Ramadhani & Sidiq, 2022).

THE ESSENTIAL FEATURES AND FUNCTIONALITIES OF THE SECURETRACK APP

The SecureTrack App is a web-based computerized platform designed to manage the evidence chain of custody. It allows for the collection and management of data in a secure manner.

Login Page. The user can input their account credentials that are provided by the Super Admin user to access the system, ensuring only individuals with valid credentials can access the information/data stored in the system. This page prompts the user to enter their username and password. When the credentials match, access will be granted to a pre-registered user account. The system can assign different roles to users for example Investigator, an Evidence Custodian, with different access levels and permission.
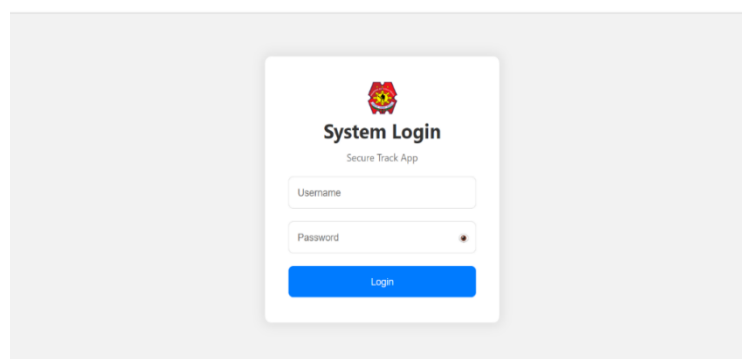

Figure 3. Login Page

The login page is a crucial feature for ensuring the security and integrity of the system. Its main purpose is to verify the identity of the users and control access to sensitive information and functionalities within the

system. Credential verification is very important for the security and safety of the data and information on the system. Users must enter their username and password to access the system, which ensures that only authorized persons with valid credentials can access the system. This feature prevents unauthorized access, reduces the risk of data breakage, and keeps confidential information secure.

The system assigns different roles to users, such as investigators, evidence custodians, and municipal administrators, with different access levels and permissions. It is important to enforce the principle of least privilege, where users can only access the data and functions necessary for their role. This limits the potential damage that could occur if an account is compromised, and it also helps in maintaining an audit trail and the accountability of the users.

The login page and other features present in this system are fundamental to the security design of the system. All features in the SecureTrack App were developed through a literature review and the suggestions of the respondents to this study during the consultation and an informal interview. Those features ensure that only authenticated and authorized users can access sensitive information, thereby protecting the data from unauthorized access, breaches, and misuse.

<u>Super Admin Dashboard</u>. This is the Super Admin Dashboard that shows the total number of users on the platform. It indicates the overall size of the user base that helps monitor the system, and ensure that only authorized individuals have access to the system. It also enables quick identification of unauthorized or excessive user accounts, facilitating a timely intervention to maintain system integrity.

The registered station on the system app shows the number of Municipal Police Stations using the system, it ensures that only verified stations are using the system, reducing the risk of unauthorized access from unregistered locations. The number of investigators who are registered reflects the registered users for case management and evidence handling, and the number of records in the system. This ensures that only authorized personnel are handling the important data/information, reducing the risk of mishandling or data breaches. A pie graph that shows the number of evidence recorded per category helps to track the volume of data being managed and stored within the system, this allows for monitoring of data growth and identifying any unusual problem in record creation, which could indicate potential security issues.
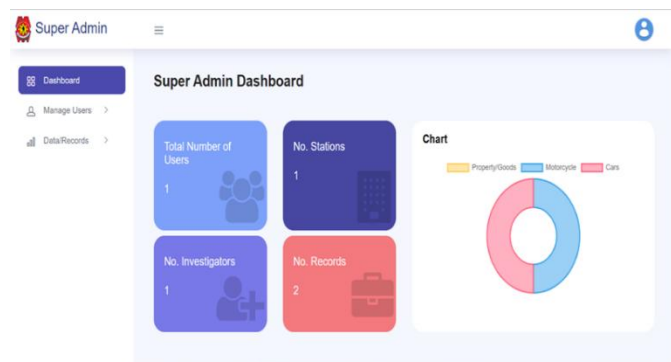

Figure 4. Super Admin Dashboard

The Super Admin Dashboard provides a centralized and comprehensive view of the system's activities, enabling continuous monitoring of user management, station registration, and record-keeping. This centralized approach is essential for maintaining control, detecting, and responding promptly to potential security issues. By enhancing visibility and accountability, the dashboard allows the super admin to trace suspicious activities to specific users or stations, ensuring data security by restricting access to authorized users only. Additionally, the dashboard aids in resource allocation by providing an overview of system usage and user distribution, ensuring users are well supported and reducing security lapses. Restricting access to super admin further minimizes the risk of data exposure to unauthorized users, protecting sensitive information from misuse.

<u>List of Municipal Police Stations registered on the System App.</u> On this page, the user can see the list of registered municipal police stations. This page serves as the directory of users within the system. The user can view the list of municipal police stations that are currently registered in SecureTrack.
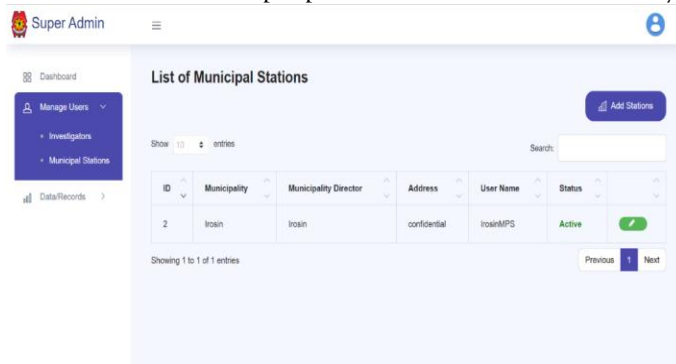

Figure 5. List of Municipal Police Station

This allows the user to easily identify and select the relevant police station when logging evidence or tracking the status and movement of the evidence. This feature is significant for efficient operations and data protection.It serves as an organized directory, enabling users to quickly find and select relevant stations where they belong, ensuring only verified and registered stations are involved, which reduces unauthorized access and maintains data integrity. This feature showcases evidence logging and tracking by associating evidence with the correct station, thus maintaining the integrity and chain of custody. By displaying only verified stations, it maintains high accountability and ensures all actions are legitimate and reliable, protecting against unusual acts.

<u>Edit Station Modal.</u> The Super Admin of the SecureTrack App can edit details of municipal police stations. (If the pencil button is clicked, the figure below will appear.) The edit station modal is exclusively accessible to the Super Admin of the SecureTrack, who then has the ability to modify the detail or information about the municipal police station within the app's database. It can update the station's name, address, and contact details to ensure that the app reflects the most current and accurate information.
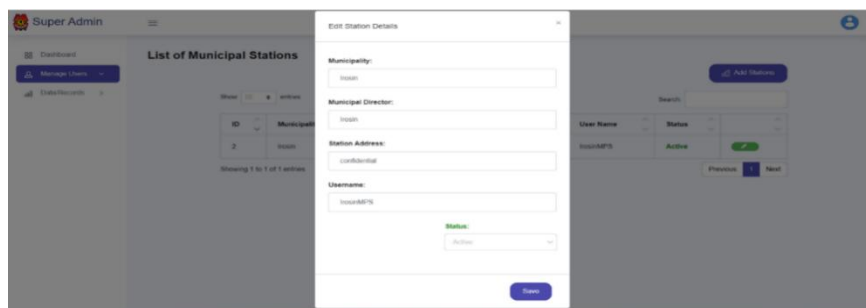

Figure 6. Edit Station Modal

The Edit Station Modal is an essential feature in the SecureTrack App, allowing the Super Admin to update and maintain accurate details of municipal police stations. With exclusive access for the Super Admin, this feature ensures that only authorized personnel can make data changes, limiting unauthorized modifications and maintaining data integrity. The ability to update station names, addresses, and contact details keeps the system's data current and accurate. Additionally, an audit trail of changes ensures accountability and transparency, allowing for the quick identification and rectification of unauthorized or incorrect changes.

<u>List of Investigators</u>. On this page, the Super Admin can view all the registered investigators on the system. The Super Admin can assign an admin to the Municipal Police Station who will be in charge of using, monitoring, and managing the system.

The Super Admin or the other user who has the role of being the Admin in the system in the Municipal Police Station can view the total number of investigator users of the system, add, edit, or deactivate investigators' accounts, and assign specific roles to the users, ensuring that the system follows the proper procedures and protocols.

The List of Investigators page in the SecureTrack App is a critical feature that enables the Super Admin to view, manage, and maintain the accounts of all registered investigators, significantly contributing to data protection. This feature provides an overview of all investigators, ensuring only authorized and verified personnel are active in the system and reducing the risk of unauthorized access. The Super Admin can assign local admins to each Municipal Police Station to delegate responsibility and ensure adherence to security protocols. The ability to add, edit, or deactivate investigator accounts keeps the system current and accurate, preventing unauthorized access by former investigators. The role assignments further define clear responsibilities and access levels; this ensures that proper procedures and protocols are followed through effective management, and the role assignments maintain the integrity and operational efficiency of the system.
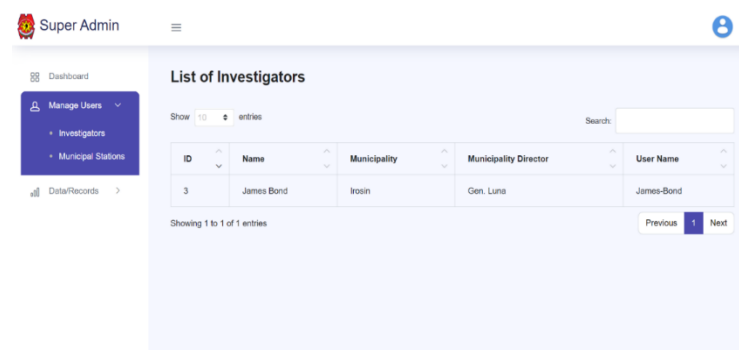

Figure 7. List of Investigators

Investigator Dashboard**.** This page shows the details of the investigators together with their records. The Investigator Dashboard serves as the center of SecureTrack for investigator users. This feature of the system provides a full view of the investigator's profiles and their associated casework. This feature is significant for providing investigators with a centralized, comprehensive view of their profiles and casework, which is needed to enhance operational efficiency and data management.
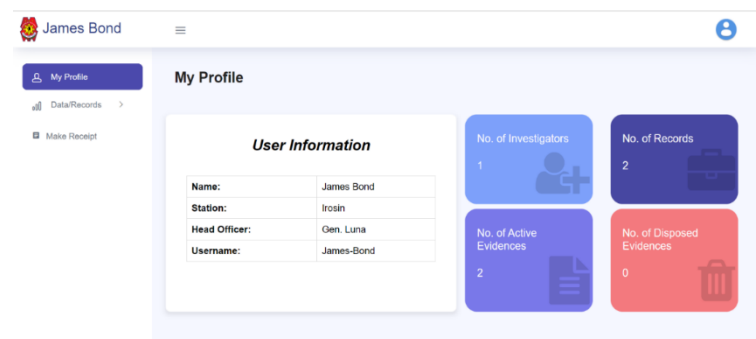
Figure 8. Investigator Dashboard

Centralizing information, implementing role-based access control, and maintaining detailed logs protect data by securing only authorized access, and enables quick identification of any security issue.

Turn-Over Receipt Page**.** On this page, the investigator must input the detail/information needed to create a turn-over request to the next agency recipient, for example, the Crime Laboratory, for examination of the collected evidence.

These features show the process of transferring evidence between investigators and the concerned agencies, such as the Crime Lab, for examination. The Municipal Police Investigator can initiate a digital handover

request within the SecureTrack system. The information or description of the evidence forwarded or transferred can be input into the system. The investigator can download the received copy of the transferred information from the document that is signed by the receiving officer of the concerned agency for maintaining and securing the flow of the evidence chain of custody process, downloadable receipt forms can be time-saving and can reduce the risk of loss.

Figure 9. Turn-over Receipt Page

It enables investigators to generate detailed turn-over requests, facilitating the transfer of evidence to subsequent agencies like Crime Laboratories for examination. This feature offers a structured method for evidence transfer, ensuring accurate documentation and maintaining traceability of evidence throughout its cycle. This feature enhances accountability and transparency by mandating detailed data input and providing a clear audit trail to prevent unauthorized access or manipulation. Securely recording and storing all transfer details safeguards the data, limits access to authorized personnel, and protects against possible alterations.

Evidence Page**.** The image below shows the list of evidence input by the investigator. The Police Investigators can directly upload photos and scans of evidence items. The system has a barcode scanning for faster and more accurate evidence logging.

This feature enables police investigators to secure documents and track evidence through direct upload capabilities and barcode scanning functionality. This feature enhances efficiency, accuracy, and data protection in evidence management, ultimately ensuring the security and integrity of the evidence record throughout the investigation process.

Figure 10. Evidence Page

Add Evidence Modal**.** On this page, the investigator can add/input evidence into the system. The format of the added evidence information may vary depending on the type of evidence to be added (If the add record button is pressed, the figure below will pop up).

Figure 11. Add Evidence Modal

The Add Evidence Modal is a key feature for adding evidence details to the system. The specific details required by the modal depend on the type of evidence being added. A detailed description or information of the evidence items can be input on this page, including the details such as the date, time, and location where the evidence was collected and can upload/attach a photo of the evidence being collected. It ensures proper documentation, reducing possible errors, and the flexibility allows for a detailed data input format, enabling investigators to capture all relevant information accurately.

Edit Evidence Modal**.** The investigators can edit the details of the information of the evidence if there is an error in inputting the details. (If the pencil icon is clicked, this will show.)

Figure 12. Edit Evidence Modal

This feature allows the investigator user to edit the errors made while inputting evidence details, but when it is already submitted, it cannot be edited. This feature is an essential tool for maintaining data accuracy. Allowing the investigator to correct errors in evidence details through the modal interface prevents inaccuracies from propagating within the system. This feature is particularly valuable during the data input phase, allowing the investigator to change any mistakes promptly before final submission. The restriction on editing after submission adds an additional layer of data protection that prevents unauthorized modification or tampering once the evidence is officially recorded.

Transfer Evidence Modal. This page shows that the investigator can transfer the evidence. They need to upload the image of the Turn-over Receipt and input the receiver of the evidence.

Figure 13. Transfer Evidence Modal

This page will show if the user clicks the transfer button icon. This feature showcases the process of transferring evidence between authorized PNP investigators. The investigator user can initiate the evidence transfer process, just by filling up the turn-over forms. This digital form serves as the record of the transfer, specifying the items being transferred, their description, and other relevant details or information. The investigator can select the authorized recipient of the evidence forwarded from the designated agencies or users registered on the system to ensure accountability of the transfer process. This feature requires the upload of a turn-over receipt image and inputting of the receiver of the evidence to ensure proper documentation of each transfer process. This digital record serves as a detailed documentation of the evidence chain process, containing the items being transferred along with their descriptions and other relevant information.

Download Modal. Upon clicking the download button, it will redirect you to the page where you can download the details of the evidence.

Figure 14. Download Modal

This feature allows authorized users to download detailed information about evidence directly from the system. It enhances the accessibility of evidence management by quickly retrieving the information of evidence which is vital for case management and reporting purposes. In protecting the data, download functionality can be restricted to authorized users only, ensuring that sensitive information is not accessed or disseminated without proper clearance.

Municipal Admin Dashboard. This page shows details about the Municipal Station record, which is exclusive only to the municipality. This serves as the centralized hub within the SecureTrack App, designed for municipal police station user administrators. It provides an overview of municipal station records, restricted to information related to that particular municipality. This restricted access ensures data privacy and security for ongoing cases and chain of custody management within the municipality's jurisdiction.
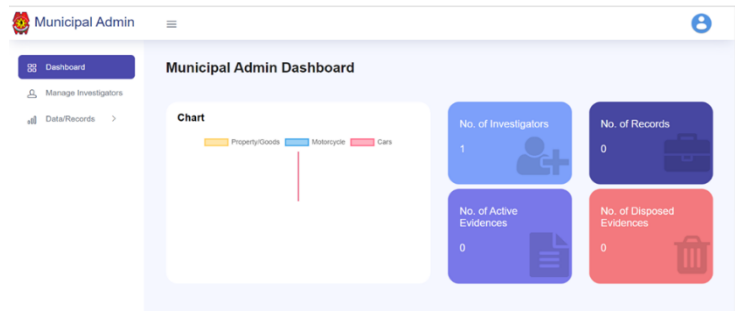
Figure 15. Municipal Admin Dashboard

This feature is vital in the SecureTrack App; it serves as the centralized hub for the municipal police station user administrators. It provides an overview of all municipal station records but restricts access to information solely related to that particular municipality. This restriction is essential for maintaining data privacy and security, ensuring that sensitive information about ongoing cases and chain of custody management remains within the municipality's jurisdiction.

List of Investigator Page. This page displays the list of all the investigators at the said Municipal Police Station.
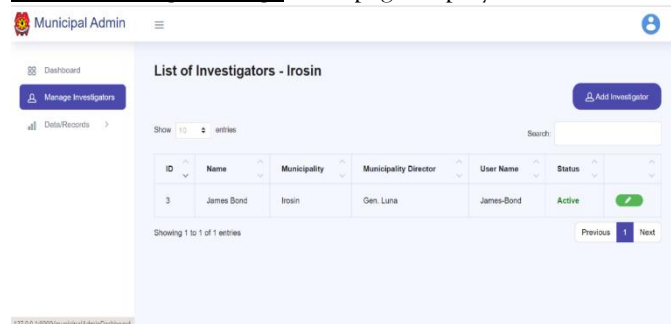
Figure 16. List of Investigator Page

This page provides a clear overview of all personnel involved in investigations, facilitating effective management and coordination within the station. Through centralizing this information, the Super Admin and designated station admins can efficiently monitor investigators' activities and ensure that only authorized individuals have access to sensitive data.

This feature enhances data protection by verifying and updating regularly the list of active investigators' accounts. Furthermore, it allows for the assignment of specific roles and responsibilities to each investigator, ensuring that access to data and functionalities is appropriately restricted based on their role.

Add Investigator Modal. The Municipal Police Station Admin user can add and provide a user account to the investigators in their station. This functionality is important for ensuring that all investigators have the necessary access to the system to perform their duties effectively, enabling local admins to manage user accounts, the system ensures that account creation is streamlined and responsive to the stations' immediate needs.

This feature also enhances data protection by ensuring that only authorized personnel, verified by local admin are granted access to the system. It allows for accurate tracking and management of user activities, as each investigator's actions can be monitored and traced back to their accounts.
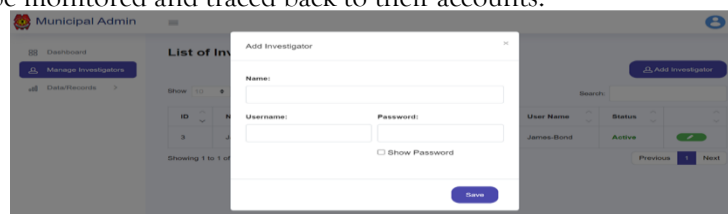

Figure 17. Add Investigator Modal

<u>Edit Investigator Modal.</u> The Municipal Police Station Admin user can edit the details of their registered investigator in the system, as well as change or suspend their status by changing their status to blocked. This feature allows admins to update an investigator's information, ensuring that the system's data remains accurate and current. By allowing admins to change the investigator's status to blocked or suspended, the feature ensures that only active and authorized personnel have access to the system.
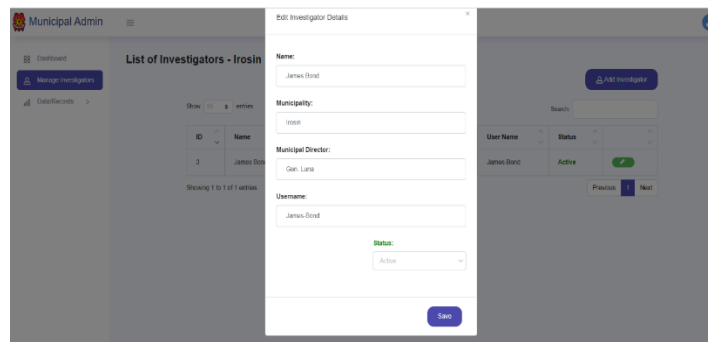
Figure 18. Edit Investigator Modal

This prevents unauthorized access by the investigators, who may no longer be in a position to handle sensitive information or when the investigator has already been transferred to other stations or units.

<u>Municipal Police Station Evidence Page</u>. This page displays the record of evidence at the Municipal Police Station. The displayed information/details were different per evidence category. The available action on this page is the download button where the user can download the information of the evidence.
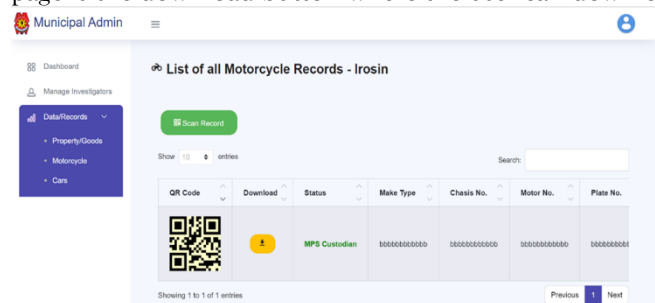

Figure 19. Municipal Police Station Evidence Page

This feature allows users to view specific details relevant to each category of evidence, ensuring precise and organized management of all entries. The ability to download evidence information directly from this page enhances efficiency by allowing users to quickly access and store data offline when needed. The download functionalities also ensure that evidence records can be securely backed up and shared with authorized personnel as needed, reducing the risk of data loss, and ensuring the continuity of information.

<u>Major Functionalities</u>. This figure shows four types of users in the system: Super Admin Account, Municipal Admin Account, Investigator Account, and Crime Laboratory Account. Each user type has a distinct function within the system.
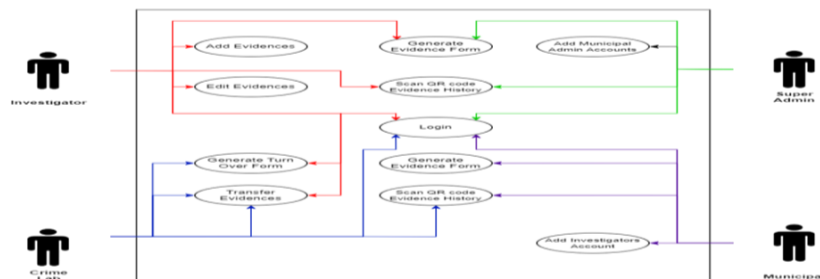

Figure 20. Major Functionalities of the SecureTrack App

The Super Admin assigns a Municipal Admin user to a Municipal Police Station. The Municipal Admin is responsible for monitoring the system and adding users, such as Investigator accounts. Once an Investigator account is created, the investigator can add or submit evidence and edit information before it is finalized or uploaded to the system. Investigators can generate the necessary forms based on the type of evidence being added. After completing and submitting the required forms, a QR code will be generated. Users can scan this QR code to check the evidence history or information.

Investigators can also forward evidence information to the Crime Laboratory for examination. The Crime Laboratory Account includes features that allow investigators to generate a turn-over form and receipt, serving as documentation that the evidence has been forwarded to the laboratory.

<u>Users Attributes</u>. The features and functionalities of the SecureTrack App, as illustrated in the figure, are designed to address key challenges encountered in the evidence chain of custody management.

One of the primary challenges in the traditional paper-based system is the lack of real-time updates and the potential for human error in recordkeeping, which can lead to compromised evidence integrity. The SecureTrack addresses this by requiring users to log in with a username and password, ensuring that only authorized personnel can access and interact with the evidence management system. This controlled access enhances security and reduces the risk of unauthorized tampering with evidence records.
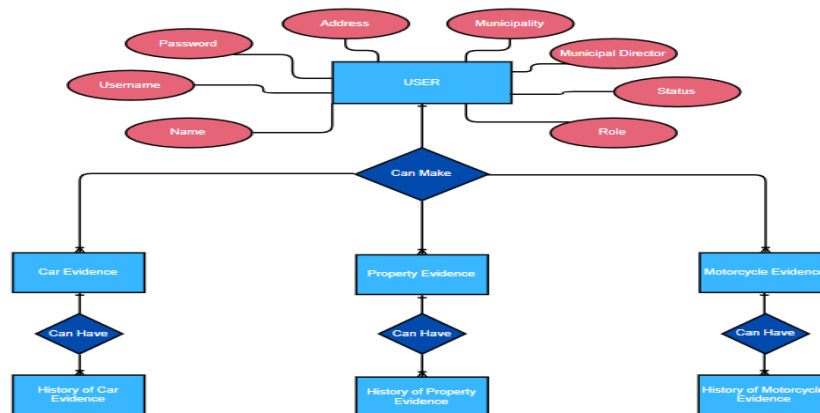

Figure 21. User's Attributes

After logging in, users are required to enter their name, the municipal police station they are assigned to, their role, and their active status. This feature ensures that all actions within the system are traceable to specific individuals, which is crucial for maintaining the chain of custody. By documenting who is responsible for each piece of evidence at any given time, the system mitigates the risk of lost or misplaced evidence, whereas, in a paper-based system, evidence can be forgotten or mishandled when personnel is transferred to other police stations or divisions.

The ability to generate multiple types of reports, for example, Car Evidence, Property Evidence, and Motorcycle Evidence, directly addresses the challenges of creating comprehensive and accurate reports in real time. In the traditional system, generating these reports is often time-consuming and prone to errors due to the manual nature of data entry and retrieval. The SecureTrack App streamlines this process by automating report generation, ensuring that all relevant data is accurately compiled and readily available for review. Furthermore, by categorizing evidence into specific types, SecureTrack allows for more organized and efficient evidence management. This helps to quickly locate and retrieve specific evidence. The functionalities and features of SecureTrack - controlled user access, detailed user profiles, automated report generation, and categorized evidence type - are all designed to overcome the limitations of traditional evidence chain of custody management.

CONCLUSION

Based on the result and analysis, the researcher concludes that it is evident that the current paper-based evidence chain of custody management system employed by the PNP, particularly in Municipal Police Stations and Crime Laboratories, shows significant challenges. The Manual nature of this system is prone to critical issues that may impact both the investigation process and case integrity, with this it shows the need for a more efficient, secure, and technologically advanced solution. The development of the SecureTrack App addresses the challenges faced by the PNP specifically, the Municipal Police Station and Crime Laboratory in evidence management under the current paper-based system, by incorporating features like Super Admin Control, Password-protected access, real-time dashboard, barcode security and transfer receipts, the app may enhance both the security and efficiency of the chain of custody process. These features will mitigate risks of unauthorized access, it can improve evidence handling, and enhance investigation procedures. The SecureTrack App shows potential for enhancing evidence chain of custody management at PNP Municipal Police Stations, as shown by strong acceptance from the respondents. However, there are still areas for improvement including operating on a local server without internet access poses data integrity risks, which must be addressed in future updates.

Ethical Consideration

The researcher developed the SecureTrack app to take into consideration the importance of the sensibility, confidentiality, and safety of the data and participants involved in this study. All personal and sensitive information of respondents will be anonymous and stored safely to prevent unauthorized access. Consent was obtained from respondents about this study's purpose, their involvement, the data collected, and their right to withdraw at any time without consequences.

Transparency throughout the research process was maintained through constant communication and consultation with respondents to keep them informed. During the testing phases, it was ensured that they do not cause any harm to respondents, avoiding any disruption to the normal operations of the PNP.

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