

HanapBalik: A Lost and Found Location-Based Mobile Application with Smart Matching and Verified Claiming for Systems Plus College Foundation

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ABSTRACT

Nowadays, people always lose personal belongings such as mobile phones, wallets, IDs, and other items. This is a common issue due to forgetfulness; these incidents often happen to both students and school employees. This study aims to develop Hanapbalik, a lost-and-found location-based mobile application with smart matching and verified claiming for Systems Plus College Foundation. The study addresses the difficulties in searching, recovering and managing lost items within the school campus. The research design that will be employed for this study is the descriptive-developmental using a quantitative approach for gathering and analyzing data from the students and employees of the school. The proposed mobile application will have features such as location-based searching, AI-assisted item description, smart matching, and a verified claiming that will be managed by the OSA. These features will help to make the process of lost and found easier, efficient and will ensure that the items will return to its rightful owner. This application is supported by two OS, including Android and IOS that will utilize Flutter and Dart. The study intends to provide a more secure, accessible and organized way in managing lost and found in Systems Plus College Foundation. The results and findings of the study may be used as a basis in improving the efficiency of lost-and-found in the school community.

Keywords: *Location-Based Searching, Smart Matching, AI-Assisted Item Description, Verified Claiming, Android, IOS, Flutter, Dart, Systems Plus College Foundation*

SECTION I — INTRODUCTION (THE PROBLEM AND ITS SETTING)

1.1 Introduction

Losing of personal belongings is one of the common issues among employees and students in school. Mobile phones, keys, wallets, and identification cards are the items that are always easily misplaced anywhere on the campus. The traditional process of lost-and-found simply relies on manual processes like posting it to social media platforms, verbal communication, and registers, which a lack of efficiency, unorganized and there is no proper way of tracking, and it results in limited item recovery (Karn et al., 2026).

As the use of digital devices increases, digital lost-and-found can also be done through a mobile application. This can provide a more efficient and organized way to report, search, and verify the lost items if the person claiming is the rightful owner through different features like smart matching, location-based, and verification claiming that HanapBalik offers.

This paper will explore how this application can help manage the school's lost-and-found and how it can make the process of finding lost items more efficient for the school community. This study will prove that through this mobile application, HanapBalik will contribute a big help in managing lost-and-found in Systems Plus College Foundation, making it easier, time saving, and organized for all.

HanapBalik aims to provide a centralized mobile application where members of the school community can report found items and search recorded items based on keywords or specific locations around the campus while also following a verification process when claiming an item. By these features, HanapBalik seeks to provide a more organized and technology-based approach to lost-and-found management within the campus.

1.2 Background of the Study

Managing lost-and-found items pose a significant challenge to students, faculty members and staff, as misplaced objects can be anywhere in the school, from classes and labs, to the library and cafeteria, making it difficult to return a lost item directly to the owner.

Lost-and-found has evolved as people began to use apps (Rahim & Arbain, 2026). Some, such as UTHM LostHub, were designed for handling lost and found items in a university setting (Rahim & Arbain, 2026), whereas others, such as Facebook groups, were not designed for the purpose but carry it out, as people share photos and messages of lost and found items (Yubal & Bocar, 2025). LostNet was also developed around the need, with the use of image similarity to match found items to existing lost-item reports (Zhou et al., 2024).

Few underlying principles are apparent in these technologies. First, smart-matching, as manifested in LostNet, works on the principle of similarity: if you find an item, you can match against items that have been reported as lost to match, sorted by the degree of similarity, rather than an indiscriminate search. Second, location-based systems work on the principle of proximity: tagging the specific area where you found or lost an item narrows your search rather than an indiscriminate search through the campus. Third, and perhaps most critically, is verified claiming, the principle that finding or matching an item is not sufficient to claim it, and that a claimant must prove that they are entitled to the item before it is given. These three principles, smart-matching, location-based systems, and verified claiming, each align with the United Nations' Sustainable Development Goals (SDG) 9 and 11: Industry, Innovation and Infrastructure, and Sustainable Cities and Communities (United Nations, 2023). The systems that have been developed by Tan and Chong (2023), and Salman and Athab (2022) each include some, but not all, of the mechanisms, and an opportunity thus is to do further research and practice, given how closely the mechanisms align with SDG 9 and SDG 11.

As such, these principles can be applied to the Systems Plus College Foundation's (SPCF) current lost-and-found process. Currently, there is no application in the school in order to organize misplaced or found items among students and staff, and there is no way to know who reported a lost item, found an item, or claimed a found item. Given that location-based systems and smart-matching mechanisms have been used (Rahim & Arbain, 2026; Zhou et al., 2024), these concepts may be adapted to the SPCF setting while also involving the Office of Student Affairs in the claiming process, to ensure that claims for found items are legitimate and verified.

The purpose of HanapBalik is to provide a location-based mobile application that makes lost item recovery

among students and staff of Systems Plus College Foundation more organized and methodical, with the use of AI-assisted image analysis to generate descriptive item information that supports searching and smart matching and involves the Office of Student Affairs in the claiming process for found items.

1.3 Objectives of the Study

General Objective: The general objective of this study is to develop HanapBalik, a location-based lost-and-found mobile application for Systems Plus College Foundation, which makes use of an AI-assisted image analysis, smart-matching, authenticated user records, and OSA-led verified claiming to improve the current reporting, searching and recovering processes of lost items within the campus.

Specific Objectives:

1. To create a login portal by using the school-issued ID numbers to identify those who report and claim lost items.
2. To enable the finders to upload photos, location, and other details about the found items before handing them over to the Office of Student Affairs.
3. To utilize AI-assisted image analysis to extract and create descriptive information about the found items to support searching and smart matching.
4. To allow the searching of items by keywords and locations and facilitate OSA-assisted ownership verification before releasing items to their owners.
5. To store digital records of found items, finders, claimants, and item status.

1.4 Scope and Limitation of the Study

Scope: The scope of this study is to develop HanapBalik, a location-based lost-and-found mobile application with smart-matching and verified claiming feature intended for the use in the Systems Plus College Foundation. This will involve the creation of a login system that will utilize the school-issued ID numbers of the users to identify and record the entries of the finders and the claimants of the found items within the campus. It will also involve allowing the finders to post pictures, location, and other relevant information about the found items before surrendering them to the Office of Student Affairs. The application will involve the use of AI-assisted image analysis in generating an item description based on the pictures of the found items for keyword and location-based search filtering. It will also include an OSA-led verification process of ownership of the found items prior to their release to the claimant and a record-keeping of found items, their finders, and the claimants with the status of the items.

Limitation: The proposed mobile application will only be limited to facilitating lost and found items within the premises of the Systems Plus College Foundation. It does not include a feature for the direct exchange of found items between students. It will also not have a delivery feature or a reward system for the finders for returning the found items. The physical custody, verification, and release of found items will only be handled by the Office of Student Affairs. The AI-generated item description will only be used for record-keeping and search purposes and cannot be used as a basis for the ownership of the found items. Therefore, all found items must be surrendered to and claimed from the Office of Student Affairs.

1.5 Significance of the Study

The study focuses on the development of HanapBalik, a location-based lost-and-found mobile application for Systems Plus College Foundation. It aims to provide an organized way of reporting, searching, matching, and claiming lost-and-found items through AI-assisted image analysis, smart matching, authenticated user records, and OSA-led verified claiming.

For the Students. The system may help students easily report and search for lost-and-found items within the campus. It may also help them identify possible matches through keywords and locations and provide a

verification process when claiming an item.

For the Office of Student Affairs. HanapBalik may help the Office of Student Affairs in managing found items and verifying the ownership of claimants before releasing them. It may also help the OSA keep organized digital records of found items, finders, claimants, and item status.

For the Faculty and Staff. The system may provide faculty and staff with an easier way to report found items by uploading photos, location, and other details. Aside from reporting items, HanapBalik will allow them to search for reported belongings and view complete information before turning the items over to the OSA.

For the School Administration. This study may help the school administration in keeping organized digital records of lost-and-found activities. Furthermore, it will allow the administration to monitor the status of items, including those that have been found, claimed, returned, and released.

1.6 Definition of Terms

Artificial Intelligence (AI) – refers to the technology that is used in HanapBalik to analyze the uploaded photos and create the item description of the found items that will be reviewed by the authorized personnel.

Centralized Database – refers to the electronic storage system that is used in HanapBalik to store the records of the found, claimed, returned, and released items in one place.

Claimant – refers to an individual who claims a found item and goes through the ownership verification process at the Office of Student Affairs before its release.

Finder – refers to an individual who finds a lost item and reports the found item through the platform by uploading photos, location, and relevant item details before surrendering the item to the Office of Student Affairs.

Found Item – refers to a personal belonging that was found in the SPCF campus and was reported using HanapBalik before surrendering to the Office of Student Affairs.

HanapBalik – refers to the proposed location-based mobile application that will be used to report found items, search and locate possible lost belongings, smart matching, and verified claiming of items in Systems Plus College Foundation.

Item Description – refers to the information that describes the characteristics of a found item that can be generated using the AI-assisted image analysis, reviewed by the authorized personnel, and saved as the item record.

Keyword-Based Searching – refers to the searching feature of HanapBalik that can help the users locate the possible found items by searching through the item description.

Location-Based System – refers to a system that uses the recorded location information to indicate where the item was found. In HanapBalik, the found-item location is posted by using the campus map.

Lost Item – refers to a personal belonging that is misplaced by its owner that can be searched using the found items recorded information that is found in HanapBalik.

Map-Based Searching – refers to a searching feature in HanapBalik that helps the users locate reported found items by viewing the items according to their recorded discovery location on the campus map.

Mobile Application – refers to the software that is designed for mobile devices that will be used as the main platform for accessing HanapBalik's item reporting, searching, locating, and claiming functions.

Office of Student Affairs (OSA) – refers to the authorized SPCF office that will receive and hold the found items, review the item records, verify the claimant ownership, and release the items to verified claimants.

Smart Matching – refers to the use of AI-generated item descriptions to help the users search and compare the recorded found items by using keywords and location information.

User Authentication – refers to a process of verifying the user's identity upon accessing HanapBalik. The system will use the school-issued ID numbers to identify the users and record who reported or claimed the item.

Verified Claiming – refers to a process of verifying the claimant's ownership of the found item before its release by the Office of Student Affairs.

SECTION II — LITERATURE REVIEW

2.1 Introduction to the Review

This review presents the related literature and studies that will provide a foundation for the development of HanapBalik: A Location-Based Lost-and-Found Mobile Application with Smart Matching and Verified Claiming for Systems Plus College Foundation. The reviewed literature will focus on the technologies and features such as location-based, smart matching, and verification claiming. These studies are reviewed to identify existing solutions, their contributions, and the gaps that can be addressed by the proposed HanapBalik application.

2.2 Review of Related Literature and Studies

2.2.1 Challenges and Digital Transformation of Lost-and-Found Systems

Being forgetful when it comes to personal belongings is one of the common senior moments that can lead to affecting the activities and daily lives of people (Morge et al., 2023). The study of Lasagas et al. (2025), states that an application or system for lost and found is a service assigned to assist individuals to recover items they have lost, usually it involves a certain location where lost items are temporarily stored until the rightful owners claimed it.

Recovering lost items can have a significant impact on the possibility of the lost items getting back if the management is unorganized and the information about the lost belongings is scattered. Lost and found that is not well managed, will be inefficient for the owners of the lost items (Itaagi, 2023).

In terms of accountability and transparency, traditional systems are continuously insufficient. There is no proper way of monitoring the progress of the lost item or to confirm whether it is already claimed by the owner, when it is reported. Due to the fact that they don't have a centralized database to validate and verify reports, one of the common issues appears are duplicate entries and false claims (Busad et al., 2026).

According to Kanjalkar et al. (2024), the usual methods for managing lost and found such as physical notice boards or verbal communication, often prove not time saving and efficient. The development of digital technology contributes to continuing to innovate these processes, making the management easier and faster to claim lost items to the owners.

Suchana et al. (2021) have created a web-based lost-and-found system that enables users to report lost and found items, attach photos, and search the database using specific criteria and locations. The research has revealed the effectiveness of a centralized web application in storing lost-and-found data and providing convenient searching options. Similarly, Salman and Athab (2022) have designed an android application that allows users to enter lost-item claims, save their contact information, manage stored data, and receive lost-and-found notifications. The above studies have significance for HanapBalik, as it shows the potential of centralized web applications and android platforms to store lost-and-found data and increase users' accessibility to the service.

2.2.2 AI-Assisted Item Description and Searchable Information

Recent international studies present the diverse ways in which digital lost-and-found systems leverage artificial intelligence and location information. Wadbudhe et al. (2025) introduced UniFind, a system that utilizes artificial intelligence to perform image analysis and natural language processing to identify, classify, and match lost items, while AI-driven algorithms suggest potential matches through a web or mobile interface. Wilson (2023) presented AppalLOCATE, an application that uses a combination of mobile, web, and cloud components, and contextualized searching, item tagging, GPS information, and a proximity algorithm to help users search for reported found items. The aforementioned works relate to the proposed HanapBalik system as they indicate the potential of employing image-based technologies and location information to find misplaced items in a campus setting.

Mhaske et al. (2026) have created a mobile lost and found app where the users can upload the information and image of the lost item, search by keywords, and filter records according to the category and location while saving the data in a database. Similarly, Komaravolu et al. (2025) have designed a university lost and found system, where the users can enter the time, location, description, date, and category of the lost item, and the system saves the user's history of lost and found items in their profile. These two works are related to the

proposed project since they show how the information about items, keywords, location data, and user records could be organized in a digital lost-and-found system.

Zhou et al. (2024) created LostNet, a new approach to lost-and-found management that employs image comparison to identify similar lost and found items. The researchers implemented a photo-matching system based on deep learning principles to simplify the search for lost-and-found items and reduce the burden of the current lost-and-found recordkeeping system. This study is related to the proposed solution, HanapBalik, because the former also utilizes artificial intelligence to operate a lost-and-found system. However, unlike LostNet, HanapBalik will utilize AI-assisted image analysis to extract photo descriptions for item information generation and recordkeeping.

In the Philippine context, Quitlong (2026) designed See You in CEU, a mobile-based digital lost and found system for Centro Escolar University Manila. The application uses a Convolutional Neural Network implemented through TensorFlow Lite to extract descriptive keywords from uploaded images and applies keyword-based matching through a simplified algorithm. The system also employs university-based authentication, item reporting, administrative verification, and push notifications. This relates to the current research since it presents the implementation of an AI-assisted approach for analyzing the images and using keywords for the purpose of searching lost items in the university's lost and found service. Similarly, HanapBalik will implement AI-assisted description of items for keyword-based searching and utilizing smart matching, as well as implementing location-based searching and a verified claiming system.

2.2.3 Location-Based Searching and Campus Mapping

Managing lost and found items on a school campus can be hard when done manually. Mobile applications provide a more organized way to search for lost belongings by using location details and campus maps.

In lost and found system, mobile apps allow users to search and filter items based on where they were lost. Teja et al. (2024) developed FindIt+, a mobile app where users report missing items by entering their last-seen location, allowing others to search records by specific places. Similarly, Shadaksharappa et al. (2025) developed a campus lost and found app that uses location tags to sort reported items across areas such as libraries, cafeterias, and hostels. These applications show how location tags can make lost item searching easier and more organized, supporting the location-based search features of HanapBalik at Systems Plus College Foundation (SPCF).

Mobile applications in campus settings also show how GPS and indoor sensors can help users find specific areas. Dhanush et al. (2026) developed CampusNav, a mobile app that uses smartphone GPS for outdoor campus maps and Bluetooth sensors for locating specific rooms. Similarly, Tamanke et al. (2026) developed a mobile app that uses GPS coordinates to check if a user is within the school grounds and Bluetooth signals to identify indoor areas. These applications show how GPS and indoor location tools can help identify places, supporting HanapBalik in recording and displaying the discovery locations of found items across SPCF facilities.

Interactive maps on mobile phones can also help users view specific locations when searching for lost belongings. Ramadhani and Sisephaputra (2026) developed an Android app that uses Google Maps services to show live locations and directions. This provides a relevant approach for HanapBalik in displaying recorded found-item locations through an interactive campus map.

2.2.4 User Verification, Claiming, and Item Accountability

Deepthi et al. (2026) address the problem of user verification as central to their design for campus lost and found. After authenticating users via institutional email, the system records a claim request with the claimant's identifying information, a timestamp, and an optional justification message. However, rather than assessing possession claims based on first-come, first-claimed ordering or self-reporting, this solution proposes to open a WebSocket-based chat between the owner and any claimant. This channel remains exclusive to the involved parties, meaning that other claimants receive notifications about the ongoing discussion. Through it, the owner can ask clarifying questions about serial numbers, identifying marks, typical location of use, and other attributes of the listed items that static data from the lost property database may not include. Once the owner accepts one claimant's request, their chat windows close, and the system denies further claims. In the event of the owner's inaction, the claim administration is forwarded to an administrator, who reviews the requests and selects one claimant to fulfill the request. After the resolution, the chat transcripts become read-only, and all participants can review them as evidence of the selection. The authors note that the solution saw higher perceived fairness in

their campus-based trials, as users actively engaged in the selection process. However, Deepthi et al. also concede that the approach requires further development and depends on users' truthfulness; therefore, they recommend storing identifying attributes of lost items in a database or attaching physical identification means, such as serial numbers or RFID tags, to high-value property. Thus, the approach seems applicable to the HanapBalik project as a verification method that would allow owners to question claimants and involve administrators in the final decision.

Arava et al. (2026) put in place a campus wide lost and found system which is centered around owner verification which in turn puts in better chances of lost items going back to their true owners. The system uses verification questions and matching features which in turn support in the identification and claim of lost items.

Borade et al. (2025) came up with foundify which is a digital lost and found ticket system that puts reporting and recovery of lost items in an organized structure. Also, it includes details of the item, images, intelligent matching, notifications and central management which in turn makes the process more organized and efficient.

Rahim and Arbain (2026) have created UTHM LostHub, a mobile application designed to manage lost-and-found items at Universiti Tun Hussein Onn Malaysia. The product offers an integrated system for students and staff to report, find, and manage misplaced property with institutional authentication, filtering options, and inter-user communication. The research underpinning this app is pertinent to HanapBalik as both systems are focused on the tertiary education sector and utilize a centralized mobile application with authentication as the key feature.

Tan and Chong (2023) developed a web and mobile based lost and found system for a university campus. The system which is used by the users to report and search for lost or found items which include descriptions, photos and locations, also user authentication which in turn improves the system's reliability.

Sinha et al. (2024) proposed a lost and found campus system which is an integration of QR codes with personal item registration. Users are able to put in detailed information and personal images of their belongings also the QR codes which in turn help with item identification and notify owners when items go missing.

Most lost and found systems pose a limitation of ownership verification. Vasavi et al. (2022) propose a web system for VNR VJIET in which only the administrator may add found items to the database. The owners browse the published items and submit a claim with proof of ownership, which the administrator approves or disapproves. The item's rightful owner collects it in person, where the administrator double-checks the proofs before handing the item over. A reclaim function lets the owner contest an erroneously approved claim, and the details of approved claimants are saved to avoid further disputes. Emails notify the parties of every approved, disapproved, or reclaimed claim. The paper does not report quantitative findings but does not specify the proofs as valid. Nevertheless, their process of claiming with proof, administrator assessment, in-person verification, and stored record of release is a viable model for the claiming feature of HanapBalik.

2.3 Conceptual Framework

The conceptual framework of this study is based on the Input-Process-Output (IPO) Model that provides an overview of how the information of users and items will be transformed into an organized and searchable lost-and-found repository using the proposed application, HanapBalik. It highlights the key components of the system, including user authentication, AI-assisted item documentation, location-based search, and claiming verification.

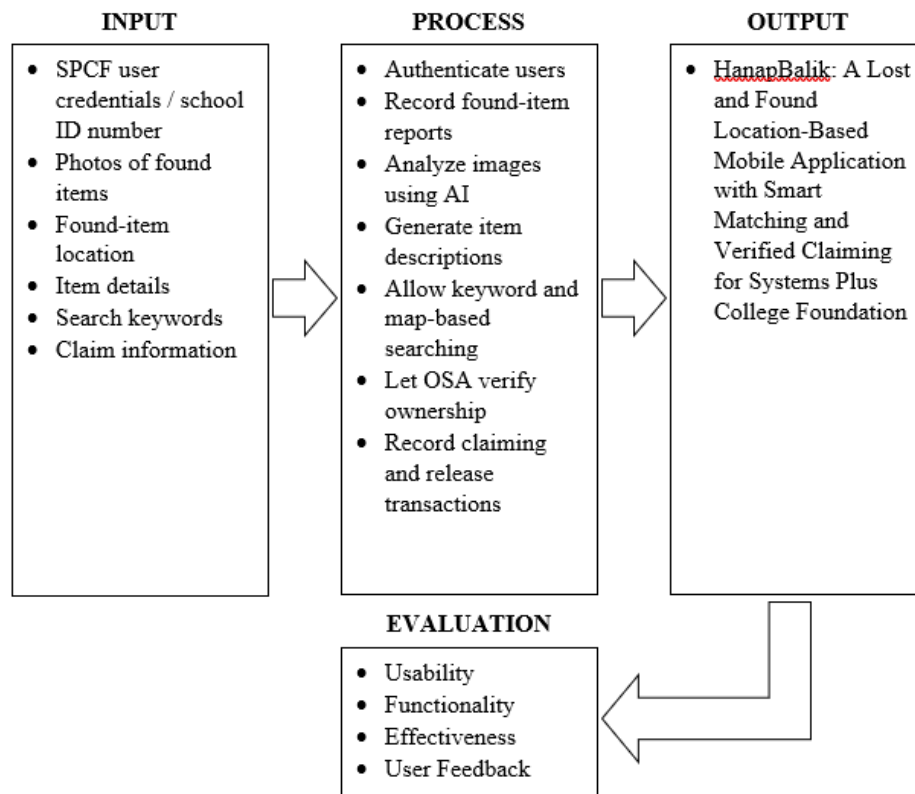


Figure 1. IPO Model

2.4 Synthesis

The reviewed literature shows that the current practice of lost-and-found items in many organizations may present information that is scattered, inefficient, unmonitored, duplicated, and even accompanied by false claims. Web-based and mobile applications were suggested as potential solutions to the disorder of lost-and-found items management through their ability to provide centralized information, photograph uploading and sharing, searchable item description, location search, and records of users (Suchana et al., 2021; Salman & Athab, 2022; Kanjalkar et al., 2024). All the three articles affirmed the significance of a centralized lost-and-found system in digital form.

Similarly, the reviewed papers demonstrated the application of artificial intelligence and image processing in finding and identifying lost-and-found items. Specific examples included using image analysis and natural language processing for similarity detection between found and lost items in UniFind and applying image comparison technologies in LostNet for finding similar belongings (Wadbudhe et al., 2025; Zhou et al., 2024). Other examples included utilizing keywords extracted from images, category description, and searchable item features as tools for finding lost items (Mhaske et al., 2026; Quitlong, 2026). In relation to HanapBalik, the three examples above justify the inclusion of AI-assisted image analysis in the application for the description of found items for search and smart match purposes. However, as mentioned in the scope, the AI description will not be used for determining ownership proof.

The location feature is another essential element of lost-and-found applications. According to the reviewed literature, FindIt+ and other campus-based applications offer the last location features, location tag, Google maps, GPS, and location-based searching for organizing found and lost items (Teja et al., 2024; Shadaksharappa et al., 2025; Dhanush et al., 2026; Tamanke et al., 2026). In addition, the interactive map service was integrated into some lost-and-found applications to visualize the location data (Ramadhani & Sisephaputra, 2026). Accordingly, HanapBalik will also integrate location and map services to enable location-based searching of found items within the Systems Plus College Foundation premises.

Most of the reviewed literature emphasized the role of authentication and ownership verification in lost-and-found systems to ensure that the person claiming the found item was the actual owner and the reported lost item was genuine. Institutional authentication and user records were considered essential elements of trust-building between finders and claimers (Rahim & Arbain, 2026; Tan & Chong, 2023). The authentication process included the verification question, proof of ownership, and administrator assessment of the lost and found items. Some applications also used an in-person verification procedure and a claiming record of found property as proof of ownership (Arava et al., 2026; Vasavi et al., 2022). Therefore, the reviewed literature demonstrated that ownership verification and authentication were necessary procedures for lost-and-found sites. As such, HanapBalik will also implement an authentication and verification procedure as a mechanism for limiting access to found items and ensuring that the claimer was the actual owner of the found item.

Although the reviewed literature covered various functions and features of lost-and-found applications, the applications presented different features useful for the management of lost-and-found items in college settings. Specifically, based on the reviewed literature, the current lost-and-found system in the Systems Plus College Foundation is scattered, unorganized, and insecure. The organization lacks a centralized lost-and-found application for storing found items and monitoring lost-and-found items reports and records. Therefore, given the identified need for a lost-and-found system in the Systems Plus College Foundation premises, HanapBalik will be developed to meet the need.

HanapBalik will be a location-based mobile lost-and-found application that will be used in the Systems Plus College Foundation. The application will use institutional authentication where users will be identified using the institutional ID card number. In addition, the application will allow finders to upload an image, location, and description of the found items. Using image analysis, the application will produce item description, keywords, and item identification for smart match and search features. Similarly, the application will have a search feature that will include searching using keywords and location-based searching. Moreover, records of found items, finders, and claimers will be saved in the system to monitor found items. The Office of the Student Affairs will have access to the records and use them to verify ownership before releasing found items to the claimer. In line with the scope of this study, the Office of the Student Affairs will also retain custody of found items, verify ownership, and release the found items to the claimer.

SECTION III — METHODOLOGY

3.1 Research Design

This study will use a descriptive-developmental research design, and it will take a quantitative approach for developing and evaluating HanapBalik: A Location-Based Lost-and-Found Mobile Application with Smart Matching and Verified Claiming for Systems Plus College Foundation. Descriptive aspects will be used to identify and describe the current experiences, needs, and struggles of students, employees, and other members of the school community in managing lost and found items that they are experiencing. The researchers will conduct surveys that will be analyzed with the use of numerical analysis to know the users' thoughts and needs regarding having a digital lost-and-found mobile application in school.

Based on the data gathered, the developmental aspect of the study will focus on the design and development of the HanapBalik mobile application. The application will have features such as location-based searching, smart matching, and verified claiming. These features will be a big help for people in school to find and recover their lost belongings easily and efficiently. After development, the researchers will conduct an application evaluation by a small group of respondents to measure its usability, if it is functioning well, and if the developed application is effective in managing lost and found. The reviews and recommendations of the respondents will be used to identify areas for improvement and determine whether the developed application fits what the users actually need.

3.2 System Development Methodology

3.2.1 Requirements Gathering and Analysis

The first phase will focus on identifying and analyzing the requirements of HanapBalik. This phase will examine the existing lost and found process at Systems Plus College Foundation and determine the difficulties encountered by students, faculty, staff, and authorized personnel in reporting, searching, verifying, and claiming lost and found items.

The needed functions of the system will be identified, including school-issued ID authentication, reporting of found items, uploading of item photographs, item descriptions, location information, keyword and location-based searching, AI-assisted item description, smart matching, ownership verification, and claiming management. These requirements will serve as the basis for designing the system and developing its major features.

3.2.2 System Design

The second phase will focus on designing the structure, interface, and workflow of HanapBalik. The system layout will be created to determine how users will navigate through the application when reporting found items, searching for items, viewing possible matches, and submitting claims.

The system design will include the user interface, database structure, authentication process, item reporting module, search and location features, smart matching process, and OSA verification and claiming workflow. The design will be based on the identified requirements and relevant findings from previous lost-and-found systems reviewed in the study.

3.2.3 Prototype Development

The third phase will focus on developing the initial prototype of HanapBalik. The major functions identified during the requirements analysis and system design phases will be implemented. The prototype will allow authenticated users to record found items, upload photographs, provide item details and location information, and search for existing item records.

AI-assisted image analysis, location-based searching, and smart matching will also be integrated into the prototype. The AI-generated descriptions will be used to support item documentation and searching and will not serve as proof of ownership.

3.2.4 Testing and Evaluation

The fourth phase will focus on testing and evaluating the developed prototype. Each major function of HanapBalik will be tested to determine whether it operates according to the identified requirements. The testing will cover authentication, item reporting, photograph uploading, location recording, searching, smart matching, ownership verification, and claiming management.

Errors, functional limitations, and usability issues encountered during testing will be identified and documented. The results will be used to determine which parts of the prototype require modification or improvement before implementation.

3.2.5 Refinement and Improvement

The fifth phase will focus on refining and improving the prototype based on the results of testing and evaluation. Identified errors will be corrected, and system functions that do not meet the requirements of the study will be modified.

The interface, search functions, location-based features, smart matching, and claiming workflow will be improved to ensure that the system operates according to its intended purpose. This phase will allow HanapBalik to be further improved before its final implementation.

3.2.6 System Implementation

The final phase will focus on implementing the complete HanapBalik system. After the prototype has undergone testing and refinement, the system will be prepared for use within Systems Plus College Foundation.

The implemented system will provide a centralized platform for recording found items, allowing users to search and compare recorded found items, and supporting ownership verification and claim management. The Office of Student Affairs will remain responsible for the physical custody, verification, and release of claimed items, consistent with the scope of the study. methods, and data collection protocols.

3.3 Requirement Specification and Analysis

This section includes functional and non-functional requirements for HanapBalik and examines how the system's users, processes, and data interact. It also identifies the key functions that should be supported by the application, including user authentication, found item reporting, item description using artificial intelligence, search with keywords, location, and ownership verification and record management. The requirements described in this section will become the basis of the system diagrams and the design of the application.

3.3.1 Data Flow Diagram

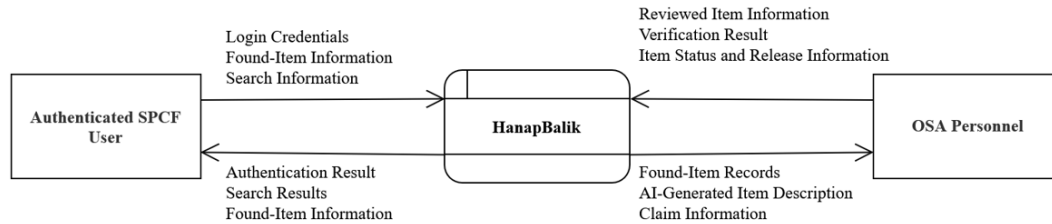


Figure 2. DFD Level 0 of HanapBalik

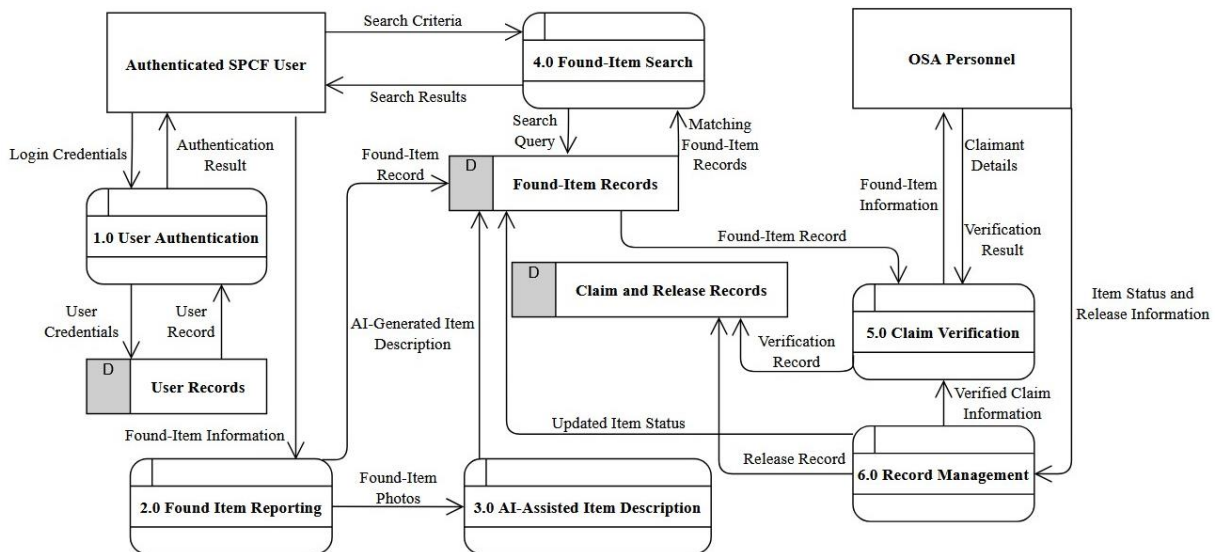


Figure 3. DFD Level 1 of HanapBalik

3.3.2 Entity-Relationship Diagram

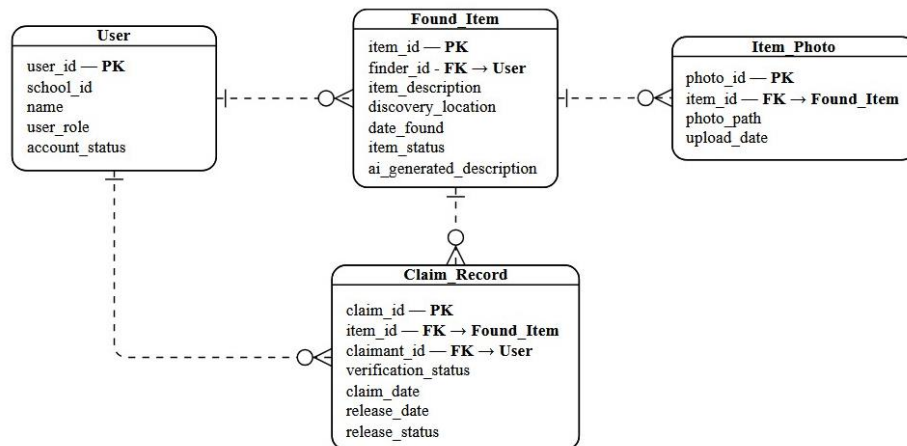


Figure 4. Entity-Relationship Diagram of HanapBalik

3.3.3 System Flowchart

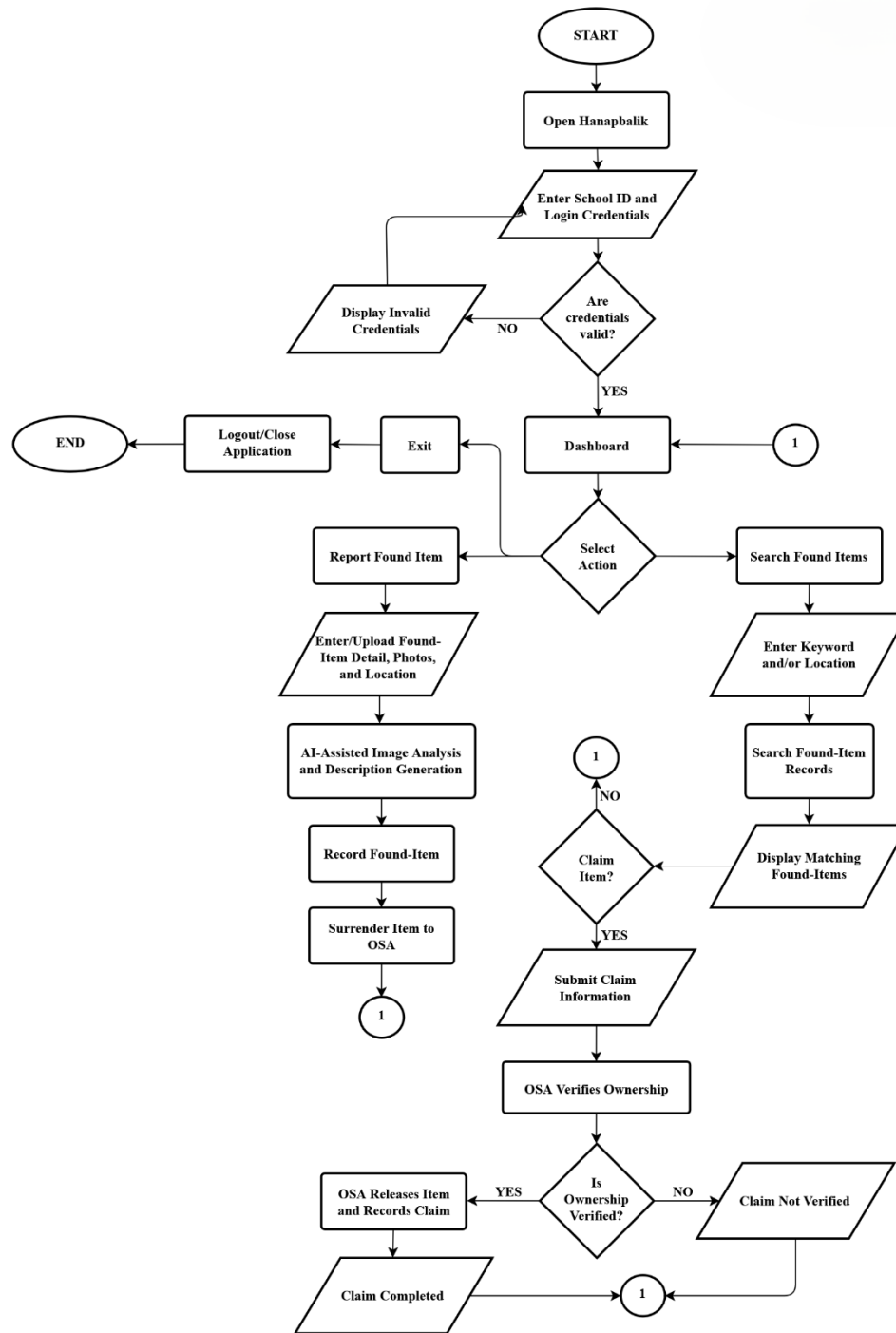


Figure 5. System Flowchart of HanapBalik

3.4 System Design Specification

The system design specification for HanapBalik is the conceptual and physical layout of the proposed mobile application according to the requirements, processes, and constraints determined in the study. The design was created as a basis for the development component of the research and will show how the application's major

components will work together to fulfill its purpose of managing lost and found items in Systems Plus College Foundation.

HanapBalik will be developed as a mobile application with features of user authentication, found item reporting, AI-assisted item description, keyword and location search, verified claiming, and record management. The said features are based on the requirements and objectives of the study, such as differentiating users via school-issued ID numbers, claiming found items with photographs and description, providing keywords and location information of found items, and OSA-assisted ownership verification before releasing found items.

3.4.1 Logical System Design

The logical design of the Hanabik application will be composed of modules related to its major processes of user authentication, found item reporting, AI-assisted item description, found item search, claim verification, and record management. The modules were determined based on the processes identified in the Level 1 Data Flow Diagram of the proposed system.

The User Authentication Module will be used to distinguish users according to their school-issued ID numbers. The reports and found items submitted through the application will be linked to the authenticated users' accounts, determining who reported or claimed a particular found item.

The Found-Item Reporting Module is where authenticated users can report found items within the SPCF campus with accompanying pictures, location, and description of the found property. Once a report is submitted, the found item will still have to be turned over to the Office of Student Affairs, as intended by the scope of this study.

The AI-Assisted Item Description Module will utilize photographs of found items to create a description of the found property. The generated description will be used to update records and perform searches; however, the AI-generated description will not be used as proof of ownership, as the ownership verification will still have to be approved by the OSA.

The Found-Item Search Module will allow users to search for found items with keywords and location information. The module will also support location-based searching on a map to determine found items in relation to the inputted location.

The Claim Verification Module will be used to verify item claims to ensure that items are only released to the rightful owners. The OSA will review submitted claimant information to approve or deny claims, despite the claim matching the found item description or AI-assisted description.

The Record Management Module will serve as a central repository for the records of the application, including users, found items, finders and claimants of found items, claim information, release records, and status of found items.

3.4.2 User Interface Design

The application's user interface will be structured around the major functions of the application as identified across the requirements, processes, and design components of the study. Specifically, the application will have interfaces related to user authentication, found item reporting and description, found item search via keywords and location, item information search, map location search, claim verification, and record management.

The authentication interface will provide fields for entering the identifying information of the user, such as school-issued ID number. The reporting interface will allow finders to upload pictures, location, and description of found items. The search interface will let users input keywords and locations to determine found items that match the inputted descriptions and locations.

The application will also have an interface for accessing item information, where users can view found items with uploaded photographs and descriptions. The interface will differ for the OSA, as it will have to view claimant information, item status, and other relevant records for verifying claims and releasing found items. The actual layout of the interface, color scheme, font, and design elements will be determined during the development component of the study.

System Architecture of HanapBalik

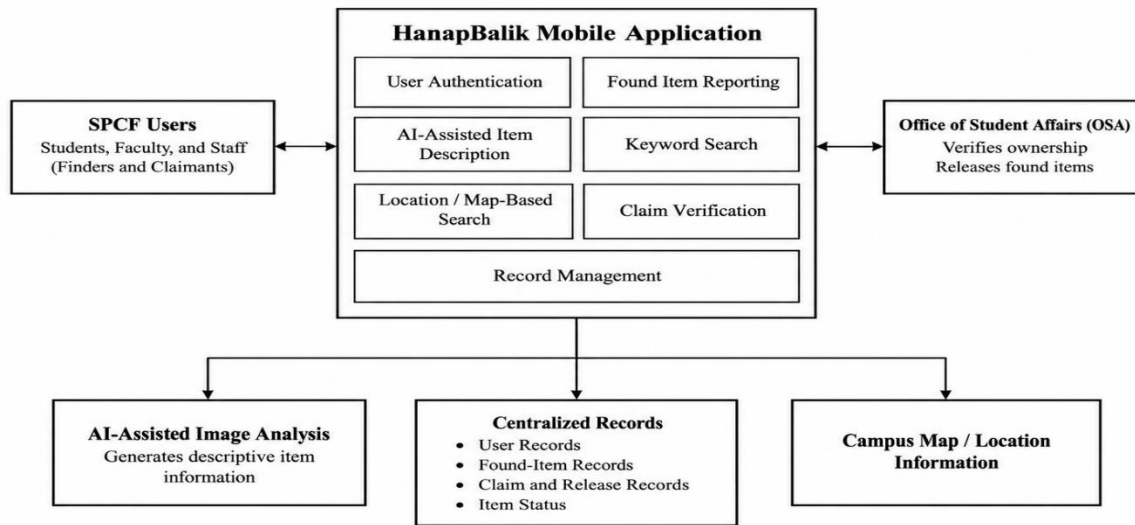


Figure 6. System Architecture of HanapBalik

The figure above shows the system's architecture, with the relationship between users, HanapBalik mobile app, Office of Student Affairs, AI-assisted image analysis, records, and locations. The mobile application is the main component of the system, where users can interact with the system to report found items. The Office of Student Affairs oversees the verification and release of found items, with the application only serving as a medium for reporting and searching found items.

3.4.3 Data and Record Design

HanapBalik will utilize centralized records to store information related to users, found items, and claimed or released found items. Based on the requirements, processes, and constraints of the system, the following records will be stored: user records, found item records, and claim/release records. The records will contain information related to users who accessed the application and found items with accompanying description, location, photographs, and other relevant information.

The use of centralized records will eliminate the need for multiple scattered documents. Using one source of information would allow easier maintenance and retrieval of information related to the status of found items across the reporting, claiming, and releasing process.

3.4.4 Physical System Design

The physical design of the system will comprise the mobile application, centralized records, AI-assisted image description, and location service. The mobile application will be the main component of the system, with functions related to reporting, searching, locating, and claiming found items. The application will require an internet connection to upload and download data, including photographs, item descriptions, location, and other relevant information. The testing procedure of the application, specifically image upload and database synchronization, will consider both wifi and cellular data connections.

The mobile application's framework, the programming language for the mobile application and database, AI image description service, map location service, server and hosting, and hardware specifications are not identified in this research paper. Physical system design will be further elaborated during the development component of the study, depending on the resources that will be utilized by the researchers.

3.5 Implementation

The mobile application is being designed to facilitate user authentication, reporting of found items, searching based on location, generating item descriptions with AI assistance, smart matching, verifying ownership, and monitoring the status of items. Development of the application for Android and iOS devices will utilize Flutter and

Dart. Firebase will be leveraged for user authentication, data and image storage, as well as backend functionalities, while Gemini API will help in image analysis and item description creation. To capture and display the locations of found items on the campus map, Google Maps SDK will be integrated. The system will undergo development and testing using approved user data and controlled sample records within the specified SPCF environment.

3.5.1 Cross-Platform System Deployment

The completed system will be deployed as a cross-platform mobile application using Flutter and Dart for Android and iOS devices. Firebase Authentication will be used to manage user access through school-issued ID records and identify users who report or claim found items. Firebase Firestore will store records of users, items, finders, claimants, locations, and item status, while Firebase Storage will be used to store uploaded images. The Gemini API will be used to create item descriptions from uploaded images, while Google Maps SDK will provide the campus map for recording and displaying the locations where items were found.

3.5.2 System Configuration and Initial Data Establishment

Prior to using the system, essential Firebase services and initial records will be configured for user authentication, data storage, image handling, and system functionalities. User authentication will be based on records provided by the school's IDs, and Firestore collections will be created for users, lost items, finders, claimants, locations, and the status of items. Firebase Storage will be organized to hold images of items, while Firebase Cloud Functions will be utilized to streamline backend processes as necessary. Furthermore, the Gemini API and Google Maps SDK will be integrated to improve AI-driven item descriptions and features related to specific locations.

3.5.3 User Orientation and System Familiarization

Students, faculty, staff, and Office of Student Affairs personnel will undergo orientation on the mobile application and its main functions. Users will be guided on school-ID authentication, found-item reporting, photo uploading, entering item details and locations, and searching through keywords and the campus map. Finders will be instructed to surrender the reported physical items to the Office of Student Affairs after submitting the required information. OSA personnel will be oriented on reviewing item records and AI-generated descriptions, verifying ownership, updating item status, and recording the claiming and release of verified items.

3.5.4 Operational Deployment and System Monitoring

Following the configuration of the system and user orientation, HanapBalik can be implemented for lost-and-found processes at Systems Plus College Foundation, pending approval from the institution. The initial monitoring phase will focus on user authentication, reporting lost items, uploading images, generating item descriptions with AI assistance, conducting keyword and map searches, synchronizing the database, and overseeing the verification and release process by the OSA. Additionally, the monitoring will evaluate the accuracy and consistency of item details, locations, and status records. If access to actual SPCF users or institutional services is limited, controlled test data will be utilized within the designated application environment.

3.6 Testing and Evaluation

To accomplish that HanapBalik serves its intended purpose as a location-based mobile application, the following testing and evaluation procedures will be taken to determine system's usability, functionality and operational reliability:

Functional and Core Feature Testing – Examines the end-to-end performance of core features such as school-issued ID authentication, AI-assisted image description extraction, found-item reporting with campus map location tagging, map searching/keyword and the system's digital record-keeping of item status.

OSA Verification and Workflow Checks – Verifies the administrative claiming workflow to ensure that item releases require manual verification by Office of Student Affairs (OSA) staff and that sensitive item details are secured against unauthorized access.

Usability and Stakeholder Evaluation – Aims to assess student satisfaction and access to information for SPCF students, staff, faculty, and OSA personnel through overall ease of navigation and search efficiency.

Performance and Data Stability Checks – Includes measuring the time it takes to upload images for the AI

to describe an image and for the data to sync to the databases using cellular data and Wi-Fi to ensure no information is lost if a student's cellular connection is lost.

REFERENCES

- Arava, R. R., Reshma, S., Neethusree, P., Akthar, S. S., & Kumar, P. M. (2026). Smart lost and found management system for campus with ownership verification. In 2026 6th International Conference on Inventive Computation and Information Technologies (ICICIT) (pp. 957–963). IEEE.
<https://doi.org/10.1109/ICICIT69063.2026.11634076>
- Borade, S., Joshi, K., Birajdar, R., Bondre, A., Budhwant, A., Burgul, V., & Chaknalwar, P. (2025). Foundify – Lost and found ticket system. *International Journal of Innovative Research in Technology*, 12(5), 113–118.
- Busad, A. A., Ravikiran, Sajjan, N. V., Priya, M. K., & Nanditha, V. (2026). Lost and Found Management System. *International Journal of Research in Engineering and Science (IJRES)*.
<https://www.ijres.org/papers/Volume-14/Issue-1/140196103.pdf>
- Deepthi, R., Pujari, P., Priyanka, J. B., Prarthana, M. O., & Prithvi, B. M. (2026). Smart lost and found system for campus: A web-based approach for item recovery and management. *International Journal of Research in Engineering & Science*, 16(1), 56–64. <https://doi.org/10.5281/zenodo.18246844>
- Dhanush, S., Bhavyalekshmi, A. S., Aswathy, A. S., Yahya, M., George, J., Reji, R., & Ravi, R. (2026). CampusNav: Campus navigation and faculty tracking enhanced by AI. *International Research Journal of Modernization in Engineering Technology and Science*, 8(2), 45–52.
<https://ijnrd.org/papers/IJNRD2607051.pdf>
- Itaagi, B. J. (2023). A mobile application for finding lost items (SearchiT). Makerere University Institutional Repository. <https://dissertations.mak.ac.ug/items/f0c491b7-d94e-4e18-b622-3ffc7ff9ad38>
- Kanjalkar, P., Pingle, J., Sagar, A., Lohe, R., Patil, S., & Kanjalkar, J. (2024). Lost and Found Web Application. *International Journal For Research In Applied Science and Engineering Technology (IJRASET)*.
<https://doi.org/10.22214/ijraset.2024.65573>
- Karn, S., Makwana, A., Singh, M.K., Suryawanshi, T., Chaudhary, M.P., & Sinha, A. (2026). Lost and Found Management System. *International Journal on Science and Technology*.
- Komaravolu, S. C. M., Krishnam, K., Madupalli, K., Repakula, R., Suganya, & Talluri, V. K. (2025). Web development VIT lost and found: Design and implementation of a VIT lost and found.
<https://doi.org/10.13140/RG.2.2.12362.27841>
- Lasagas, K. P., Daig, C. S., Pabatang, I. J. M., Sumaylo, J. M., & Caw-it, J. G. (2025). USTP-Panlaon Lost and Found Management System. *Multi Data Palembang Student Conference*. <https://doi.org/10.35957/mdp-sc.v4i1.11185>
- Mhaske, M., Pandhare, M., & Sapkal, V. (2026). Lost and found mobile application. *International Journal of Advanced Multidisciplinary Research and Educational Development*, 2(2), 1126–1136.
- Mogle, J. A., Turner, J. R., Rabin, L. A., Sliwinski, M. J., Zhaoyang, R., & Hill, N. L. (2023) Measuring Memory Lapses and Their Impact on Daily Life: Results From Two Daily Diary Studies. *PubMed. Assessment*, 30(5), 1454–1466. <https://doi.org/10.1177/10731911221077962>
- Quitlong, J. M. M. (2026). SEE YOU IN CEU: a digital lost and found system for campus using convolutional Neural network (CNN). *International Journal of Science Architecture Technology and Environment*.
<https://doi.org/10.63680/ijstate0326019.017>
- Rahim, A. R. K. A., & Arbain, S. H. (2026). UTHM LostHub – Mobile application for lost and found items in UTHM. *Applied Information Technology and Computer Science*, 7(1), 879–896.
<https://doi.org/10.30880/aitcs.2026.07.01.047>
- Ramadhani, D. R., & Sisephaputra, B. (2026). DESIGN OF LOST PILGRIM MONITORING APPLICATION WITH ANDROID LBS. *Journal of Emerging Information Systems and Business Intelligence (JEISBI)*, 7(1), 134–143. <https://doi.org/10.26740/jeisbi.v7i1.64726>
- Salman, Z. A., & Athab, O. (2022). Smartphone application for managing missed and found belongings. *MEST*

- Journal, 10(1), 66–71. <https://doi.org/10.12709/mest.10.10.01.08>
- Shadaksharappa, B., Harinee Devi, V., Anusha, S., Kaviya, M., Lakshna Priya, G., & Yamuna, V. (2025). Mobile application for efficient lost and found item management. *International Journal of Innovative Research in Information Security*, 11(9), 483–490. <https://www.ijiris.com/volumes/Vol11/iss-09/05.NVIS10084.pdf>
- Sinha, S., Kaswan, S., Kumari, K., Kumar, A., Bisht, L., Katiyar, S., & Amita. (2024). A novel approach to enhance campus lost and found services through integration of QR code with personalized item registration. In *2024 International Conference on Trends in Quantum Computing and Emerging Business Technologies* (pp. 1–7). IEEE. <https://doi.org/10.1109/TQCEBT59414.2024.10545109>
- Suchana, K., Alam, S., Meem, A., Turjo, M. and Khan, M. (2021) Development of User-Friendly Web-Based Lost and Found System. *Journal of Software Engineering and Applications*, 14, 575-590. doi: 10.4236/jsea.2021.1410034.
- Tamanke, M. S., More, K. R., Mane, S. S., & Yash. (2026). Advanced attendance system using Bluetooth Low Energy and geo-fencing: A smart campus automation solution. *International Journal Advanced Research Publications (IJARP)*, 2(2), 112–119. <https://doi.org/10.1555/ijarp.9080>
- Tan, S. Y., & Chong, C. R. (2023). An effective lost and found system in university campus. *Journal of Information System and Technology Management*, 8(32), 99–112. <https://doi.org/10.35631/JISTM.832007>
- Teja, V. K., Uhaaravindsai, P., Nishanth, M., & Salunke, H. R. (2024). FindIt+: A mobile-based lost and found management system using image and text matching. *Journal of Emerging Technologies and Innovative Research (JETIR)*, 11(5), a1–a8.a152–a155. <https://www.jetir.org/papers/JETIR2604018.pdf>
- United Nations. (2023). The sustainable development goals report 2023: Special edition. <https://unstats.un.org/sdgs/report/2023/>
- Vasavi, R., Reddy, S., Chakrapani, C., Samhitha, P., Vaishnavi, Y., & Datta, V. (2022). Lost and found system for VNR VJIEET. *International Journal of Engineering Research & Technology*, 11(6). DOI: 10.5281/zenodo.18438802
- Wadbudhe, R., Ganesh, V., Patil, A., Meshram, A., Sayyed, A., & Hedau, A. (2025). Uni Find: Lost and Found Objects Management System for Campus using AI Cloud Services. *International Journal of Latest Technology in Engineering Management & Applied Science*, 14(10), 134–139. <https://doi.org/10.51583/ijltemas.2025.1410000017>
- Wilson, D. C. (2023). AppalLOCATE: a lost and found solution. In Figshare. <https://doi.org/10.71889/5fylantbak.29868161.v1>
- Yubal, J. V., Jr., & Bocar, E. C. (2025). Freedom of speech? Viscan FB group slammed for fueling online hate. *Amaranth*. <https://amaranth.vsu.edu.ph/specials/investigative/775-freedom-of-speech-viscan-fbgroup-storya-sa-biska-slammed-for-fueling-online-hate>
- Zhou, M., Fung, I., Yang, L., Wan, N., Di, K., & Wang, T. (2024). LostNet: A smart way for lost and find. *PLOS ONE*, 19(11), Article e0310998. <https://doi.org/10.1371/journal.pone.0310998>