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**ARCHIVAL AND RETRIEVAL OF MISSING OBJECTS USING IMAGE MATCHING ALGORITHMS AND ADVANCED MACHINE VISION TECHNIQUES**

**PHASE 2: REQUIREMENT ANALYSIS**

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**TABLE OF CONTENTS**

[LIST OF PARTICIPANTS 2](#_Toc166471508)

[1. INTRODUCTION 4](#_Toc166471509)

[2. Overview of Archiving and Retrieving Systems 4](#_Toc166471510)

[2.1 What is Requirement Analysis 4](#_Toc166471511)

[2.2 Importance of Requirements Analysis in Archiving and Retrieving of Missing Object 4](#_Toc166471512)

[2.3 Role of Requirements Analysis 4](#_Toc166471513)

[2.4 Benefits of Thorough Requirements Analysis 4](#_Toc166471514)

[3. REQUIREMENT OVERVIEW 5](#_Toc166471515)

[3.1 Identifying Key Stakeholders And Their Roles. 5](#_Toc166471516)

[**4. PRIORITIZING REQUIREMENTS** 5](#_Toc166471517)

[4.1 REQUIREMENT DOCUMENTATION 6](#_Toc166471518)

[4.1.2 USER REQUIREMENT DOCUMENTATION 6](#_Toc166471519)

[4.1.3 Functional Requirements 6](#_Toc166471520)

[4.1.4 Non-Functional Requirement 7](#_Toc166471521)

[4.2 SYSTEM REQUIREMENTS 8](#_Toc166471522)

[4.2.1 Scalable Database Management System (Dbms) 8](#_Toc166471523)

[**4.2.2 Cloud Infrastructure Or Hosting** 8](#_Toc166471524)

[**4.2.3 Geospatial Data Integration** 8](#_Toc166471525)

[4.2.4 Robust Search And Indexing Mechanism 9](#_Toc166471526)

[4.2.5 Secure Authentication And Authorization 9](#_Toc166471527)

[**4.2.6 Real-Time Data Processing And Notifications** 9](#_Toc166471528)

[4.2.7 Cross-Platform Compatibility 9](#_Toc166471529)

[4.2.8 Data Backup And Disaster Recovery 9](#_Toc166471530)

[4.2.9 Compliance With Data Privacy Regulations 10](#_Toc166471531)

[5. FEASIBILITY ANALYSIS 10](#_Toc166471532)

[5.1 Technical Feasibility 10](#_Toc166471533)

[5.2 Economic Feasibility 10](#_Toc166471534)

[5.3 Legal And Regulatory Feasibility 11](#_Toc166471535)

[5.4 Resource Feasibility 11](#_Toc166471536)

[5.5 Schedule Feasibility 11](#_Toc166471537)

[**6. CURRENT CHALLENGES IN ARCHIVING AND RETRIEVING MISSING OBJECTS** 12](#_Toc166471538)

[6.1 Data Integrity And Preservation Challenges 12](#_Toc166471539)

[6.2 Technological Limitations and Scalability Issues 12](#_Toc166471540)

[7. CONCLUSION 13](#_Toc166471541)

# **1.** INTRODUCTION

In the world of data management, the archiving and retrieving of missing objects play a crucial role in ensuring information is preserved and accessible. This process involves storing, organizing, and retrieving data that may have been misplaced or lost.

# 2. Overview of Archiving and Retrieving Systems

Archiving and retrieving systems are designed to securely store and retrieve data, ensuring that information remains intact and accessible when needed. These systems utilize various technologies and strategies to efficiently manage and retrieve missing objects.

## 2.1 What is Requirement Analysis

The requirements analysis is the process of discovering stakeholder needs and requirements for a system or software application being developed.

It confirms accurate capture, interpretation, and representation of the customers’, users’, and other stakeholders’ needs and transforms those needs into a set of requirements for a product. For optimal results, the set of product requirements must be verified to have the characteristics of well-formed requirements (e.g. needed, unambiguous, complete, consistent, correct, feasible, verifiable) and validated that they represent the intent of the needs from which they were transformed.

At this requirement analysis stage, we need to understand the following basic questions.

* What is the problem?
* Why is it important to solve the problem?
* What are the possible solutions to the problem?
* What exactly are the data input to the system and what exactly are the data output by the system?
* If there are external software or hardware with which the developed software has to interface, then what exactly would the data interchange formats with the external system be?

## 2.2 Importance of Requirements Analysis in Archiving and Retrieving of Missing Object

Requirements analysis is like a blueprint for a successful data management, without it, you might end up with a disorganized outcome rather than an organized one. By understanding the needs and expectations of stakeholders and defining system functionalities, requirements analysis sets the stage for a smooth and effective system development process.

## 2.3 Role of Requirements Analysis

Requirements analysis serves as a roadmap for system development, guiding the design and implementation process to ensure that the final product meets stakeholder expectations. It helps in defining the scope, functionality, and constraints of the system, laying the groundwork for a successful project.

## 2.4 Benefits of Thorough Requirements Analysis

A thorough requirements analysis not only helps in developing a system that meets stakeholder needs but also reduces the risk of project failure, cost overruns, and delays. By clarifying expectations and defining project scope upfront, requirements analysis sets the project up for success and minimizes misunderstandings along the way.

# 3. REQUIREMENT OVERVIEW

Here, we are going to dive into the gathered requirement for the Archival and Retrieval of missing objects.

## 3.1 Identifying Key Stakeholders And Their Roles.

Here, we determine who will be involved in the development, implementation, and use of the app. These include end-users (people searching for missing objects), administrators, technical team, Project Sponsors and Supervisor.

* **End-users:** End users are individuals who will interact directly with the mobile application. Their responsibilities include using the application to upload images of missing objects and search for potential matches.
* **Administrators:** Administrators manage the backend system, including maintaining the database of archived objects, managing user accounts, and ensuring the overall functionality of the application.
* **Technical Team:** The technical team is responsible for developing and maintaining the mobile application, implementing image matching algorithms, and ensuring the overall technical feasibility and performance of the solution.
* **Project sponsor and supervisor:** The project sponsor provides funding, resources, and strategic guidance for the project. They oversee the project's progress and ensure alignment with organizational goals.

# 4. PRIORITIZING REQUIREMENTS

Prioritizing requirements is an essential aspect of software development that involves the order in which features and functionalities will be implemented based on their importance, feasibility, and impact on project success.

**Criteria Used for Prioritization:**

* + **Importance:** The significance of the requirement to the overall project goals and objectives.
  + **Feasibility:** The ease of implementation and resource availability required for fulfilling the requirement.
  + **Impact on Project Success:** The potential impact of the requirement on user satisfaction, system performance, and overall project success.

## 4.1 REQUIREMENT DOCUMENTATION

### 4.1.2 USER REQUIREMENT DOCUMENTATION

User requirements for an archival and retrieval system for missing objects represent the specific needs, preferences, and expectations of individuals who will interact with the application.

### 4.1.3 Functional Requirements

* **User Registration and Authentication**: Users should be able to create accounts and log in securely to access the application's features.

User authentication should be implemented to ensure secure access (priority high)

* **Upload Images of Lost Items:** Users should be able to upload images of lost items through the mobile application interface. (priority high)

Require information includes:

* Object description (e.g names, category, description, photos)
* Last Known location.
* Date and Time of disappearance.
* Contact Information of the reporting individual or organization
* **Search for Potential Matches:** The application should allow users to search for potential matches of lost items within the database using uploaded images. (priority high)
* **Utilize Image Matching Algorithms:** The application must incorporate state-of-the-art image matching algorithms to compare uploaded images with archived objects. (priority high)
* **Implement Computer Vision Techniques:** Advanced computer vision techniques, such as feature extraction and similarity scoring, should be employed to identify potential matches with high accuracy and efficiency. (Priority: High)
* **Provide Notification System:** Users should receive notifications when potential matches for their lost items are found. Notification preferences, such as push notifications or email notifications, should be customizable. (Priority: Medium)
* **Location Tracking:** The app should have the functionality to track the last known location of the lost item, providing users with helpful information for retrieval. (priority medium)
* **System Configuration:** Settings for configuring system preferences, such as notification preferences, search parameters, and default display options. (priority medium)

Customization options for tailoring the system interface to meet specific user preferences and workflow requirements.

* **User Support:** Resources for providing user support and assistance, including documentation, help desk services, and training materials should be included (priority medium)

### 4.1.4 Non-Functional Requirement

**1. Data Security and Privacy:**

* + Implementation of encryption mechanisms to secure sensitive data, such as user information and uploaded images.
  + Implementation of access control measures to restrict unauthorized access to system resources and data. (priority high)

1. **Scalability and Performance**
   * Design for scalability to accommodate a growing user base and increasing volumes of archived objects.
   * Optimization of algorithms and data processing pipelines for improved performance and response times. (priority medium)

**3. User-Friendly Interface:** The application should feature an intuitive user interface and seamless navigation to enhance user experience (priority medium)

**4. Efficiency and Performance:** The system must be efficient and capable of processing image comparisons and search queries quickly to provide timely results. (priority high)

**5. Reliability and Accuracy:** The application should demonstrate high reliability and accuracy in identifying potential matches for lost items, minimizing false positives and negatives. (priority high)

## 4.2 SYSTEM REQUIREMENTS

System requirements for an archival and retrieval system for missing objects outline the technical specifications and capabilities needed to develop, deploy, and maintain the application.

### 4.2.1 Scalable Database Management System (Dbms)

The system should be built on a scalable DBMS capable of handling a large volume of data efficiently.

A scalable DBMS ensures that the system can accommodate the growing number of missing object records and user interactions without sacrificing performance or reliability (priority high)

### **4.2.2 Cloud Infrastructure Or Hosting**

The system should be hosted on a cloud infrastructure or platform-as-a-service (PaaS) to provide scalability, flexibility, and accessibility.

Cloud hosting allows the system to scale resources dynamically based on demand, ensures high availability and reliability, and enables users to access the application from anywhere with an internet connection. (priority medium)

### **4.2.3 Geospatial Data Integration**

The system should support the integration of geospatial data for mapping and visualization of missing object locations.

Geospatial data integration enhances the search and retrieval process by providing users with visual representations of missing object locations, facilitating navigation and coordination efforts. (priority high)

### 4.2.4 Robust Search And Indexing Mechanism

The system should employ a robust search and indexing mechanism to enable fast and accurate retrieval of missing object records.

A robust search and indexing mechanism ensures that users can quickly locate relevant missing object records based on various search criteria, such as keywords, categories, or locations. (priority high)

### 4.2.5 Secure Authentication And Authorization

The system should implement secure authentication and authorization mechanisms to control access to sensitive data and features. Secure authentication and authorization mechanisms prevent unauthorized access to confidential information about missing objects, ensuring data privacy and integrity. (priority high)

### 4.2.6 Real-Time Data Processing And Notifications

The system should support real-time data processing and notifications to keep users informed about new missing object reports and relevant updates.

Real-time data processing and notifications enable users to stay up to date on the latest information, facilitating timely responses and actions to assist in the search and recovery efforts. (priority medium)

### 4.2.7 Cross-Platform Compatibility

The system should be compatible with various web browsers and mobile devices to ensure accessibility across different platforms.

Cross-platform compatibility enhances the system's reach and usability, allowing users to access its features from a wide range of devices and operating systems. (priority medium)

### 4.2.8 Data Backup And Disaster Recovery

The system should implement regular data backups and disaster recovery procedures to protect against data loss and ensure business continuity.

Data backup and disaster recovery measures safeguard critical information about missing objects, mitigating the risk of data loss due to unforeseen events or system failures. (priority medium)

### 4.2.9 Compliance With Data Privacy Regulations

The system should comply with relevant data privacy regulations and standards to protect user privacy and ensure legal compliance.

Compliance with data privacy regulations demonstrates the system's commitment to protecting user data and mitigates the risk of regulatory penalties or legal issues. (priority medium)

# 5. FEASIBILITY ANALYSIS

Feasibility analysis is a method to examine whether the project or idea is practical and achievable. It involves looking at factors like technology, finances, operations, and legal considerations to determine if the project is likely to succeed.

Feasibility analysis for an archival and retrieval system for missing objects is crucial to ensure that the proposed system is technically, economically, and operationally viable.

## 5.1 Technical Feasibility

This aspect evaluates whether the proposed system can be developed using available technology and within technical constraints.

**Considerations:** Assess the compatibility of the system with existing hardware, software, and network infrastructure. Evaluate the feasibility of implementing required features and functionalities within the technical capabilities of the development team. Determine if integration with external systems or databases is feasible and if the system can scale to handle increasing data volumes and user traffic.

## 5.2 Economic Feasibility

Economic feasibility assesses whether the benefits of developing and implementing the system outweigh the costs.

**Considerations:** Conduct a cost-benefit analysis to compare the expected benefits of the system, such as increased efficiency in object retrieval and reduced losses, against the development, deployment, and maintenance costs. Consider factors like initial investment, ongoing operational expenses, potential revenue generation (if applicable), and the projected return on investment (ROI). Determine if the financial resources required for the project are available or can be secured within the budget constraints.

## 5.3 Legal And Regulatory Feasibility

Legal and regulatory feasibility ensures that the proposed system complies with applicable laws, regulations, and industry standards.

**Considerations**: Identify relevant legal and regulatory requirements governing data privacy, security, and intellectual property rights. Assess the system's compliance with standards such as GDPR, HIPAA, or industry-specific regulations. Determine if the system adheres to best practices for handling sensitive information about missing objects and individuals, including consent management, data encryption, and secure data storage.

## 5.4 Resource Feasibility

Resource feasibility assesses whether the necessary human, financial, and technological resources are available to develop and implement the system.

**Considerations:** Evaluate the availability of skilled personnel with expertise in software development, database management, and system administration. Assess the financial resources required for the project, including budget allocation for development, infrastructure, and ongoing maintenance. Determine if the necessary hardware, software, and network resources are accessible or if additional investments are needed. Identify potential risks and dependencies related to resource constraints and develop contingency plans to mitigate them.

## 5.5 Schedule Feasibility

Schedule feasibility evaluates whether the project can be completed within the desired timeframe and if the proposed timeline is realistic.

**Considerations:** Define development milestones and deliverables, including requirements gathering, design, development, testing, and deployment phases. Identify critical path activities and potential bottlenecks that could impact the project timeline. Assess the availability of resources and the capacity of the development team to meet project deadlines. Develop a project schedule with clear timelines, milestones, and dependencies, and regularly monitor progress to ensure adherence to the planned schedule.

# **6. CURRENT CHALLENGES IN ARCHIVING AND RETRIEVING MISSING OBJECTS**

Navigating the world of archiving and retrieving missing objects comes with its fair share of challenges. From data integrity issues to technological limitations, these challenges can impact the effectiveness of archiving and retrieving systems.

## 6.1 Data Integrity And Preservation Challenges

Maintaining data integrity and preserving information accurately over time can be a difficult task. With data being constantly updated and modified, ensuring that archived information remains valid and reliable poses a significant challenge for archiving and retrieving systems.

## 6.2 Technological Limitations and Scalability Issues

As technology continues to evolve, archiving and retrieving systems must keep up with the pace. Technological limitations and scalability issues can hinder the performance and efficiency of these systems, impacting their ability to store and retrieve missing objects effectively.

# 7. CONCLUSION

In summary, archiving and retrieval systems should be efficient, secure, and user-friendly. It's all about striking a balance between functionality and ease of use.

To implement effective archiving and retrieval systems, prioritize user feedback, regularly update security measures, and always stay ahead of the game in terms of technological advancements.

In conclusion, the thorough requirements analysis outlined in this report serves as a foundational step towards enhancing the efficiency and effectiveness of archiving and retrieving systems. By addressing the identified challenges, understanding stakeholder needs, and implementing both functional and non-functional requirements, organizations can streamline their data management processes and ensure the seamless retrieval of missing objects. With a user-centric approach to interface design and adherence to best practices, the recommendations provided offer a roadmap for successful implementation and utilization of archiving and retrieving systems.