# AgriMed Hub

# Project Report

**Supervisor**

Mr. Hafiz Muhammad Usman

**Submitted by**

Muhammad Kamran
Student id: AS23LHB2550
Ahsan Aqeel
Student id: AS23LHB2510

**Riphah International College**
**Harbanspura Campus Lahore**

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|---|---|
| Project ID *(for office use)* | |
| Title of Project | **LiteVault** |
| Type of project | [ ] Traditional [✓ ] Industrial [ ] Continuing |
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| Area of specialization/ Field | Web Application |

**Project Group Members**

| Sr.# | Reg. # | Student Name | CGPA | Email ID | Phone # | Signature |
|---|---|---|---|---|---|---|
| (i) | Group Leader AS23LHB2550 | Kamran | 3.27 | kamranshakh841@gmail.com | 0320-6899684 | |
| (ii) | AS23LHB2510 | Ahsan Aqeel | 3.52 | ahsanaqeel200124@gmail.com | 0305-4602816 | |

**Declaration:** Project group members have cleared all prerequisites courses For project as per their degree requirements.

**Supervisor Name and Signatures:**
HAFIZ MUHAMMAD USMAN
_____

**Principal:**
PROF. IZHAR AKRAM
_____

## Plagiarism Free Certificate

This is to certify that, I am _____ S/D/o _____, group leader of FYP under registration no RIC/_____ at Computer Science Department, Riphah International College Lahore. I declare that my FYP proposal is checked by my supervisor and the similarity index is _____% that is less than 20%, an acceptable limit by HEC. Report is attached herewith as Appendix A.

**Date:** __/__/____ **Name of Group Leader:** _____**Signature:** _____

**Name of Supervisor:** _____ **Name of Principal:** _____

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# ABSTRACT

AgriMed Hub is an innovative, offline-first platform designed to revolutionize agricultural education, smart farming, and farmer health management. Built on LiteVault's secure, backend-independent architecture, AgriMed Hub eliminates reliance on cloud-based infrastructures, offering a decentralized, privacy-first solution that ensures seamless access to learning resources, crop diagnostics, and health monitoring tools—even without an internet connection.

At the core of AgriMed Hub is its farmer-centric design, which integrates interactive educational content, AI-driven crop health analysis, and real-time farmer health tracking. The platform empowers agricultural communities by providing soil health analysis, smart farming simulations, precision irrigation techniques, and AI-powered pest and disease detection, ensuring better crop yield, sustainability, and improved farmer well-being. Additionally, wearable health monitoring solutions track pesticide exposure, hydration levels, and overall wellness, fostering a comprehensive approach to agricultural and personal health.

By leveraging LiteVault's advanced local storage and IndexedDB-based data management, AgriMed Hub ensures that users can store, retrieve, and analyze essential information with complete autonomy. Unlike traditional systems that depend on server-side databases, this innovative approach allows farmers, educators, and researchers to securely access and manage their data without concerns about connectivity issues or third-party breaches. Customizable UI themes, encrypted data handling, and regular manual backup reminders further enhance the platform's usability and security.

For developers and agricultural researchers, AgriMed Hub serves as a scalable framework for building AI-driven precision farming tools, blockchain-enabled supply chain transparency solutions, and next-generation agricultural innovations. Its modular, lightweight architecture allows rapid integration of data-driven agricultural solutions, ensuring flexibility across different farming needs. For farmers, agricultural trainers, and policymakers, the platform provides an accessible and cost-effective ecosystem for continuous learning, sustainable farming practices, and proactive health management.

AgriMed Hub's privacy-first, cost-effective, and highly scalable model redefines agri-health education and management, ensuring that farming communities worldwide benefit from secure, accessible, and innovative solutions. By bridging agriculture, health, and technology, AgriMed Hub stands as a cornerstone of modern smart farming and sustainable agricultural education, ensuring a healthier, more resilient future for both farmers and their crops.

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# 1. Introduction

The primary goal of LiteVault is to create a privacy-first, offline platform that revolutionizes secure and structured data management by completely removing reliance on backend infrastructure. This forward-thinking approach addresses the growing concerns around data privacy and security in an era dominated by cloud services and online platforms. By shifting away from cloud dependency, LiteVault empowers users to retain full control over their data, ensuring a safer, simpler, and more autonomous experience. Building on this core vision, AgriMed Hub extends LiteVault's capabilities to the agricultural sector, tailoring the platform's benefits to meet the unique challenges faced by agricultural professionals and smallholder farmers.

## i. Key objectives of LiteVault and AgriMed Hub include:

Providing Secure Offline Storage: Offering agricultural professionals and smallholders a secure, offline storage solution for critical agricultural records, such as crop yields, pest control measures, and financial transactions. This feature ensures that sensitive data is stored locally and protected from potential cyber threats and online breaches.

**a. Ensuring Robust Privacy and Data Security:**

Implementing cutting-edge encryption techniques to safeguard agricultural data from unauthorized access. By securing data locally within the user's device and utilizing strong encryption, LiteVault ensures that sensitive agricultural information remains private, even in low-connectivity or high-risk environments.

**b. Delivering an Intuitive and Customizable Interface:**

Designing an easy-to-use, highly customizable interface that caters specifically to agricultural professionals and smallholder farmers. This interface is designed to simplify data management, allowing users to easily track and organize records with minimal effort, thus improving operational efficiency and enabling better decision-making.

**c. Maximizing Cost-Effectiveness:**

Maintaining affordability by completely eliminating the need for server infrastructure and cloud-based operational costs. LiteVault's offline-first design ensures that users, especially in resource-constrained rural areas, can manage their data without incurring the high costs typically associated with traditional cloud-based platforms. This cost-

effective approach allows for a greater focus on providing value to users without compromising on functionality or security.

**d. Integrating Agricultural-Specific Features:**

Introducing powerful features like GIS tagging for farms, localized weather data storage, and inventory management to better meet the needs of agricultural professionals. These capabilities allow users to more effectively monitor farm activities, track environmental conditions, and manage resources, thus providing a comprehensive solution tailored to the agricultural sector's unique challenges.

By combining a privacy-first, offline architecture with tailored solutions for agriculture, LiteVault and AgriMed Hub aim to empower users to manage and protect their data in a way that is secure, efficient, and cost-effective. These solutions are designed not only to meet the needs of modern data management but also to provide sustainable and accessible technology for individuals and communities with limited internet access or resources. Through this innovation, LiteVault paves the way for a future where data security and autonomy are within reach of all users, particularly those in underserved or rural areas.

## 2. Methodology

AgriMed Hub builds upon LiteVault's foundational technologies, offering a tailored solution for agricultural data management:

**i. Local Storage APIs:**

LiteVault's offline-first storage mechanism ensures secure data within the browser.

AgriMed Hub categorizes agricultural data (e.g., crop records, livestock, pesticide logs) to streamline management.

**ii. Encrypted JSON/CSV Formats:**

LiteVault encrypts data during imports/exports for security.

AgriMed Hub offers predefined agricultural data templates for easy organization and sharing among stakeholders.

**iii. GIS Tagging and Mapping:**

Integrates GIS tagging for field and farm records, associating location data for better tracking and management.

**iv. Responsive Design with Agriculture Themes:**

LiteVault's responsive interface adapts to devices.

AgriMed Hub provides agricultural-specific themes for tablets and rugged mobile devices used in the field.

**v. Offline-First Data Analytics:**

While LiteVault focuses on offline storage, AgriMed Hub adds browser-based analytics for visualizing crop yields, pest data, and financial trends.

**vi. Backup Reminders and Data Hygiene:**

LiteVault's backup reminders are enhanced in AgriMed Hub with domain-specific prompts for seasonal data backups, especially post-harvest.

## 3. Project Scope

The AgriMed Hub project aims to provide a secure, offline-first platform tailored to the needs of agricultural communities, especially those with limited internet access. Built on LiteVault's decentralized, privacy-first architecture, the platform offers a comprehensive solution for agricultural management, farmer health monitoring, and education. The project scope includes the following key components:

**i. Offline-First Data Management**:

AgriMed Hub uses LiteVault's local storage APIs to securely store agricultural data such as crop yields, pest control measures, and financial records offline. This ensures full data autonomy without internet dependency.

**ii. AI-Powered Agricultural Tools**:

The platform integrates AI-driven tools for crop health analysis, pest detection, and farming simulations, helping farmers optimize practices and increase productivity.

**iii. Farmer Health Monitoring**:

Wearable health devices will track key health metrics like hydration levels and pesticide exposure, promoting farmer well-being through actionable insights.

**iv. GIS Tagging and Mapping**:

GIS integration enables mapping of fields and farms, linking location data to crop records for better resource management and environmental monitoring.

**v. Customizable User Interface**:

The platform offers an easy-to-use, customizable UI with agriculture-specific themes, optimized for mobile and rugged devices used in the field.

**vi. Data Import/Export and Backup**:

Secure, encrypted data import/export (JSON/CSV formats) will facilitate efficient data sharing. Backup reminders ensure critical data is regularly saved, reducing the risk of data loss.

**vii. Offline Data Analytics**:

Lightweight analytics tools will visualize trends in crop yields and financial summaries, aiding decision-making without needing an internet connection.

**viii. Educational Content**:

Interactive educational resources on sustainable farming, crop management, and health safety will be available to farmers and agricultural professionals, supporting continuous learning.

**ix. Cost-Effective and Scalable**:

By eliminating server-side infrastructure, AgriMed Hub offers a cost-effective, scalable solution for farmers, especially in rural or underserved areas.

**x. Integration with External Tools**:

The platform will integrate with external systems like weather data services and supply chain management, providing a holistic solution for modern farming.

AgriMed Hub's focus on offline functionality, AI-driven tools, and farmer health monitoring ensures a comprehensive and accessible platform that addresses the unique challenges of agriculture. The project aims to empower farmers and stakeholders with the tools and knowledge to improve productivity, sustainability, and health outcomes.

# 4. Fesibility Study

## i. Risks Involved:

### a. Limited Storage Capacity of Browsers:

One of the most significant risks when using LiteVault is the limited storage capacity provided by modern browsers for local storage. While browser storage APIs offer the ability to store data locally on the user's device, they come with restrictions that vary from browser to browser, typically ranging from 5MB to 10MB per domain. This means that while LiteVault can handle small to medium-sized datasets without issue, users with large amounts of data—such as extensive spreadsheets, high-resolution images, or bulky databases—may experience limitations. If the local storage reaches its cap, users may find that they can no longer save additional data, leading to performance degradation or potential data loss. To mitigate this, LiteVault can employ strategies such as compressing data before saving it or breaking up large datasets into smaller, manageable files to fit within the available storage space. Additionally, users may be encouraged to periodically export data to external storage solutions, ensuring that they don't reach the local storage limits.

### b. User Reliance on Manual Backups:

A key design principle of LiteVault is its offline-first nature, meaning that all user data is stored locally within the browser. While this provides a high level of security and privacy, it also introduces a critical dependency on the user to manually back up their data. Unlike cloud-based services that offer automatic backups, LiteVault requires users to perform regular manual backups to ensure data preservation. If users fail to back up their data, they run the risk of losing it due to accidental deletion, hardware failure, or browser issues such as data corruption. Furthermore, non-technical users may find it difficult to understand the importance of regular backups or how to perform them correctly. To address this, LiteVault can offer periodic reminders, easy-to-follow backup prompts, and even the ability to automate backups at regular intervals.

Encouraging good data management habits and offering educational resources can help ensure that users do not fall victim to data loss.

**c. Potential for Data Corruption:**

Since LiteVault operates entirely within the browser and utilizes local storage for data management, there is an inherent risk of data corruption. This could occur in several scenarios, such as when the browser crashes unexpectedly, when there are issues during data transfers (such as imports or exports), or when users lose internet connectivity during operations that require online communication. While browsers are generally reliable, no system is immune to occasional failures, and any interruption to the process could result in partial or corrupted data. To minimize the risk, LiteVault will employ error-checking mechanisms during data operations, such as verifying the integrity of data files after every import/export, and providing users with alerts if data corruption is detected. Additionally, offering users the ability to recover previous versions of data, via local or manual backups, could help safeguard against data corruption and minimize the loss of important information.

**d. Device Dependency:**

LiteVault stores data locally on the user's device, which means that the user's access to their data is limited to the specific device where the data is stored. If users want to access their data across multiple devices or from different locations, they will need to manually transfer the data, as there is no cloud-based synchronization or multi-device support built into the platform. This creates challenges for users who need to access their data from different places, whether for work, travel, or collaboration with others. Furthermore, users who change devices frequently may face difficulties in transferring their data without a straightforward synchronization process. To address this limitation, LiteVault could offer a simple export/import mechanism, enabling users to move data between devices easily via external storage or USB drives.

## 5. Solution Application Areas

LiteVault is a versatile platform designed to meet the needs of various user groups, providing a privacy-first, offline data management solution. Below are several key application areas where LiteVault can offer significant value:

### i. Individuals Managing Personal Data:

LiteVault is an excellent tool for individuals who need a simple, secure, and private way to manage personal data. Whether it's keeping track of financial records, maintaining personal notes, organizing contacts, or storing important documents, LiteVault provides an easy-to-use solution without the need for cloud storage or complex server infrastructure. By offering offline functionality and ensuring that all data remains encrypted and stored solely in the user's browser, LiteVault puts individuals in full control of their personal information. For users who are particularly concerned about privacy, the platform is an ideal choice, as it eliminates the risk of exposing sensitive data to third-party services or cloud providers. Furthermore, the ability to import and export data securely ensures that users have full ownership of their information and can back it up or move it between devices at their convenience.

### ii. Developers Requiring a Lightweight Data Storage Solution:

LiteVault serves as an efficient, lightweight data management tool for developers, especially those who need to work with small datasets or prototype data-driven applications. Developers can use LiteVault as a quick solution for storing temporary or user-specific data during the development process. Unlike traditional databases that require a server backend, LiteVault enables developers to work with structured data like JSON and CSV files directly in the browser. This feature makes it particularly useful for creating small-scale applications, testing out features, or storing configuration settings without having to set up complex server infrastructures. Developers can also take advantage of LiteVault’s encrypted storage options, ensuring that sensitive data remains secure even during the development phase. Additionally, the platform's offline capabilities allow developers to work in environments with limited internet connectivity, ensuring uninterrupted development processes.

### iii. Users in Low-Connectivity or Resource-Constrained Environments:

LiteVault is specifically designed to perform well in environments with low internet connectivity or limited resources. In regions where internet access is unreliable or unavailable, LiteVault enables users to manage their data offline without the need for cloud-based services or persistent internet connections. This makes it an ideal solution

for people in remote areas, those traveling frequently, or individuals who live in places with limited access to high-speed internet.

## 6. Requirements:

### 6.1 Hardware/ Equipments Requirements

Processor: Dual-core or higher.
Hard Disk: 1 GB free space.
RAM: 2 GB minimum.

### 6.2 Software Requirements

Operating System: Windows/Mac/Linux.
Browser: Latest versions of Chrome, Firefox, or Safari.

### 6.3 Stakeholders:

End-users seeking a secure, offline data management tool.
Developers leveraging LiteVault for prototyping or small-scale applications

## 7. Tools/Technology

LiteVault leverages a selection of modern, reliable, and efficient technologies to ensure seamless user experience, data security, and offline-first functionality. The key tools and technologies used in the development of LiteVault are as follows:

**i. Frontend:**

LiteVault's frontend is built using **HTML**, **CSS**, and **JavaScript**, which are the core technologies of modern web development. HTML provides the structural foundation for the application, while CSS ensures that the platform has a visually appealing and consistent design. JavaScript powers the dynamic elements of LiteVault, enabling interactive features, such as data import/export, theme switching, and backup reminders. The combination of these three technologies ensures that LiteVault is lightweight, fast, and works smoothly across different browsers and devices.

### ii. Data Handling:

LiteVault uses **JSON** and **CSV** formats for importing, exporting, and managing structured data. **JSON** (JavaScript Object Notation) is a lightweight, human-readable data interchange format, widely used for transmitting data between systems, making it ideal for LiteVault's offline capabilities. **CSV** (Comma Separated Values) provides a simple format for handling tabular data, such as spreadsheets or databases, enabling users to import and export lists, contact information, or other forms of structured data easily. These formats are not only lightweight but also widely supported, ensuring compatibility with various third-party systems and data processing tools.

### iii. Storage:

LiteVault makes use of the **LocalStorage API** for offline, client-side data storage. The LocalStorage API allows data to be stored directly in the user's browser, providing persistent storage across sessions without requiring an internet connection. Since all data is stored locally, there are no concerns related to server downtime or the need for expensive cloud storage, giving users full control over their data. LocalStorage is also highly secure, as data remains confined to the user's device and can be encrypted for added protection. It provides a simple and efficient way to ensure that data is available to users even when offline, while also reducing reliance on external servers or services.

### iv. UI Framework:

The user interface (UI) of LiteVault is crafted using **custom CSS** and incorporates a **responsive design**. Custom CSS ensures that LiteVault's interface is tailored to the needs of its users, allowing for a smooth and intuitive interaction with the platform. The responsive design ensures that LiteVault adapts to different screen sizes, providing an optimal experience whether on a desktop, tablet, or mobile device. With the flexibility to switch between light and dark modes, users can personalize the platform to their preferences, improving usability and accessibility. The UI framework is designed to be lightweight, minimizing the resource consumption while maximizing the functionality and aesthetics.

## 8. Expertise of the Team Members

The development of LiteVault is supported by a skilled team of professionals with expertise in various areas of frontend development, data security, and UI design. The team's collective experience ensures the platform's functionality, user experience, and security meet the highest standards. Below is an overview of the key areas of expertise possessed by the team members:

### i. Frontend Development (HTML, CSS, JavaScript):

The team has strong expertise in frontend web technologies, including **HTML**, **CSS**, and **JavaScript**. These technologies are foundational to LiteVault's design and functionality, and the team is well-versed in crafting responsive, interactive, and visually appealing user interfaces. The team's proficiency with **JavaScript** enables them to implement dynamic features, such as data manipulation, theme switching, and seamless user interactions, while **CSS** expertise ensures a consistent, polished design that works across all devices and screen sizes. Additionally, team members are proficient in modern frontend frameworks and best practices, enabling LiteVault to provide a smooth and optimized experience for users.

### ii. Data Encryption and Browser Storage APIs:

The team has deep knowledge of **data encryption** techniques and **browser storage APIs**, which are critical to LiteVault's core functionality. By using secure encryption methods, such as AES (Advanced Encryption Standard), the team ensures that all data stored in LiteVault is protected from unauthorized access. This expertise allows LiteVault to offer a privacy-first approach by keeping all sensitive data encrypted and confined to the user's browser. Furthermore, the team's experience with **LocalStorage** and other client-side storage solutions ensures that LiteVault can store data securely and persistently without relying on backend servers, maintaining both security and performance.

### iii. Responsive UI Design and Implementation:

The team excels in designing **responsive user interfaces** that are both functional and aesthetically pleasing. Their experience in creating intuitive designs ensures that LiteVault provides a user-friendly experience across all devices, from desktop

computers to mobile phones. The design team understands the importance of usability and accessibility, ensuring that the platform is easy to navigate and operate for users of all levels of technical expertise. The team's expertise in **responsive design** guarantees that LiteVault's interface adjusts seamlessly to different screen sizes, providing an optimal experience no matter the device. By using modern design principles, the team ensures that LiteVault remains simple, attractive, and efficient to use.

**iv. Cross-Disciplinary Collaboration:**

In addition to these specialized areas, the team is highly collaborative, working together to ensure that all aspects of LiteVault—ranging from frontend development to data security and design—are aligned with the platform's core mission. The team's ability to integrate different technologies and practices effectively enables LiteVault to maintain its offline-first functionality, secure data handling, and user-centered design.

## 9. Timeframe

Estimated Completion Time: 3 months.

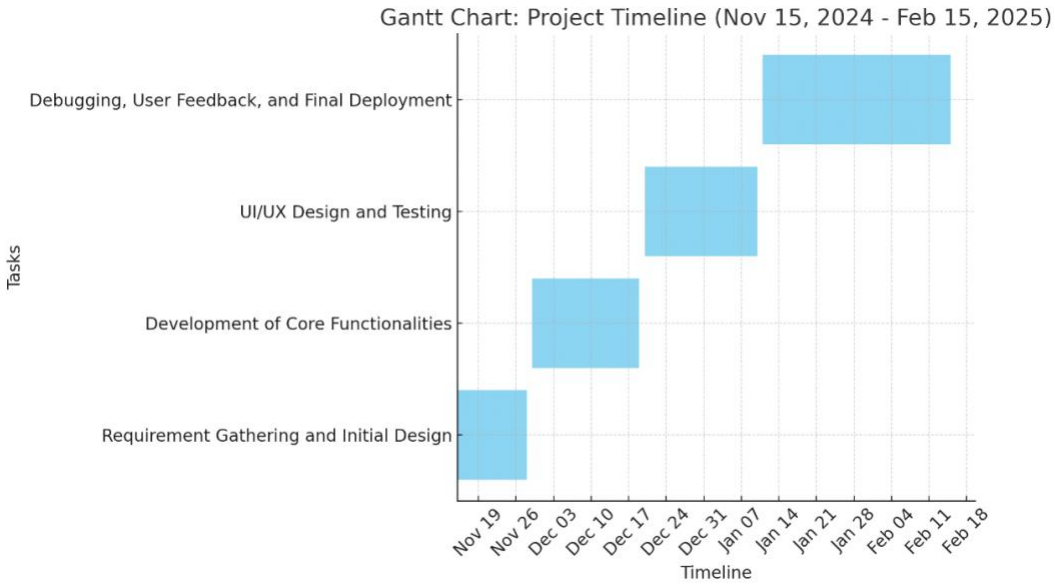
**i. Initial Plan:**

Week 1-2: Requirement gathering and initial design.

Week 3-5: Development of core functionalities.

Week 6-8: UI/UX design and testing.

Week 9-12: Debugging, user feedback, and final deployment.




## 10. Risks & Issues

### i. Risks

a. Limited browser storage capacity may restrict data volume.

b. Reliance on user compliance for regular backups.

### ii. Issues

a. Potential lack of technical knowledge among end-users.

b. Reliance on user compliance for regular backups.

## 11. Milestones

i. Completion of the core data management module.

ii. Integration of backup and encryption features.

iii. Implementation of UI/UX customization options.

iv. Final testing and deployment.

## 12. Use Case Diagram Overview

a. **User**: Central actor interacting with the system.

b. **Store Data**: Saves user data securely.

c. **View Data**: Accesses stored data.

d. **Manage Data**: Updates or deletes data.

e. **Manual Backup**: Creates backups manually.

f. **Restore Data**: Recovers backed-up data.

g. **Switch Theme**: Changes interface appearance.

h. **Offline Operation**: Supports offline functionality.

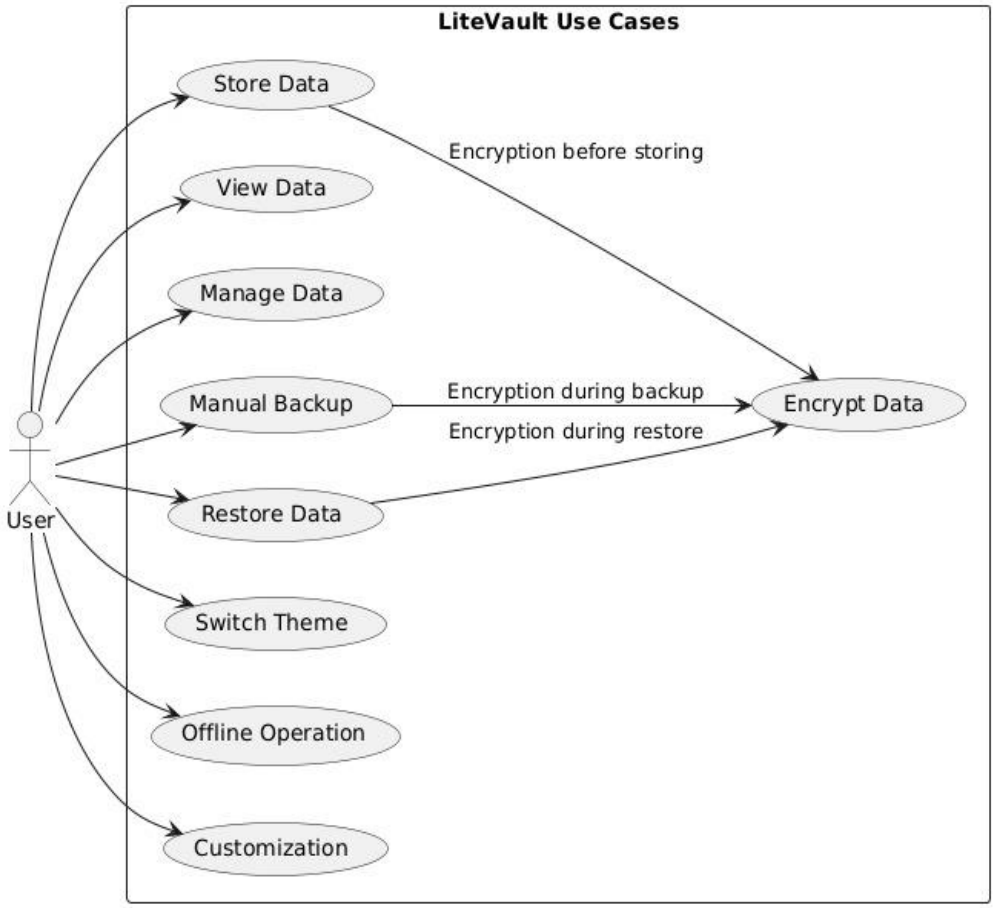
i. **Customization**: Adjusts user preferences.

j. **Encrypt Data**: Secures data during storage, backup, and restore.

### i. Relationships

**a. User ↔ Use Cases**: Directly interacts with all functions.

b. **Encrypt Data**: Linked to storage, backup, and restore processes.




## 13. Database Diagram Overview

a. **User**: Stores user info (`UserID`, `Name`, `Email`, `Password`, `PIN`).

b. **Data**: Saves user data (`DataID`, `Content`, `CreatedAt`, `Encrypted`).

c. **Backup**: Maintains data backups (`BackupID`, `BackupDate`, `FileFormat`).

d. **Customization**: Holds user preferences (`CustomizationID`, `Theme`, `Preferences`).

e. **Device**: Tracks devices (`DeviceID`, `Browser`, `LastAccessed`).

## i. Relationships

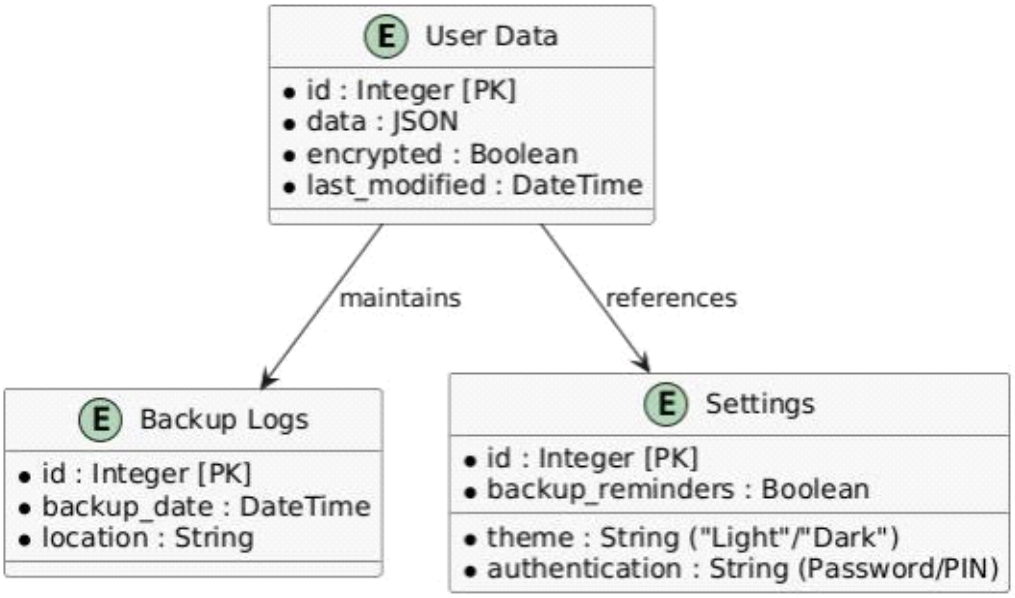
a. **User ↔ Data**: Owns data records.

b. **User ↔ Backup**: Links backups to data.

c. **User ↔ Customization**: Manages preferences.

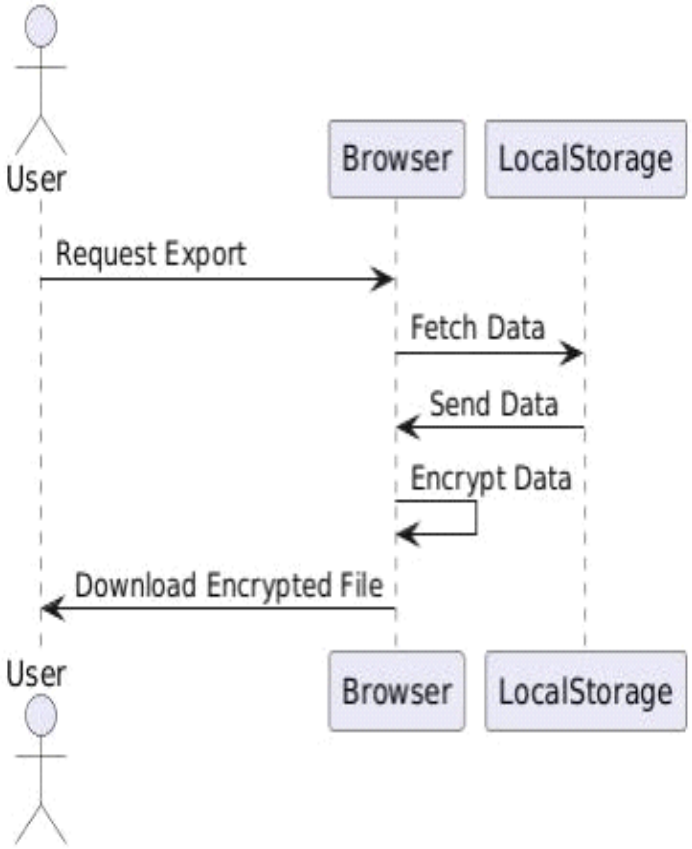
d. **User ↔ Device**: Tracks user devices.

e. **User ↔ Log**: Logs user actions.

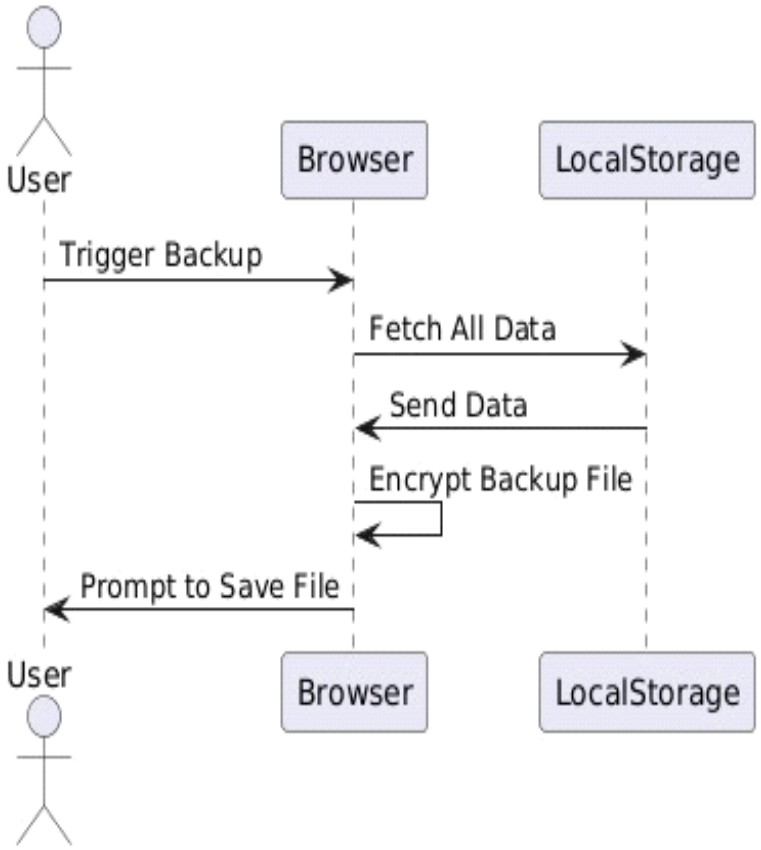


## 14. Sequence Diagram

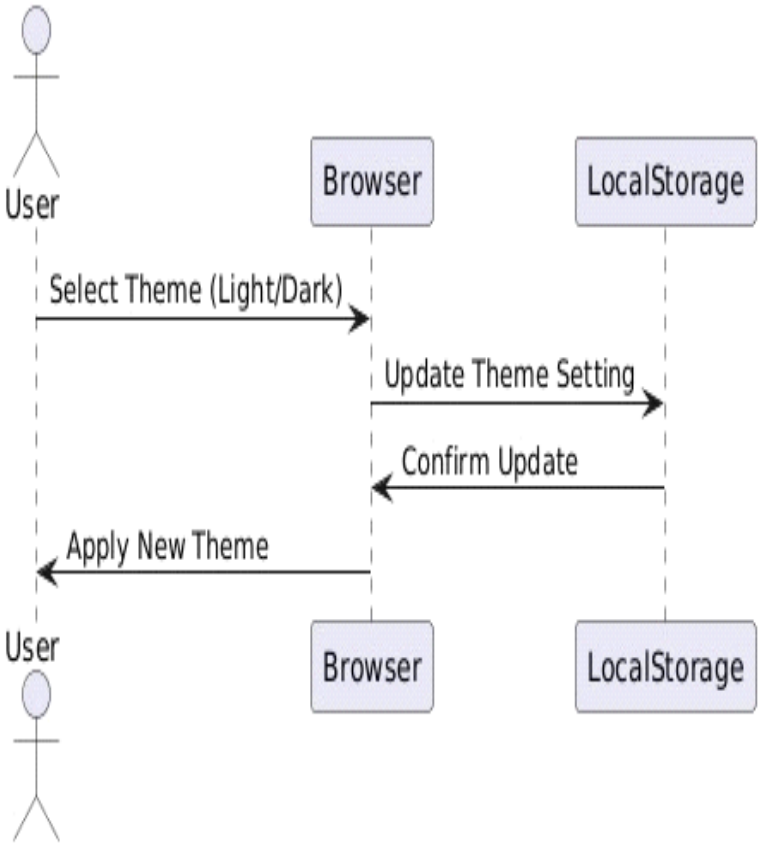
### i. Data Export Process



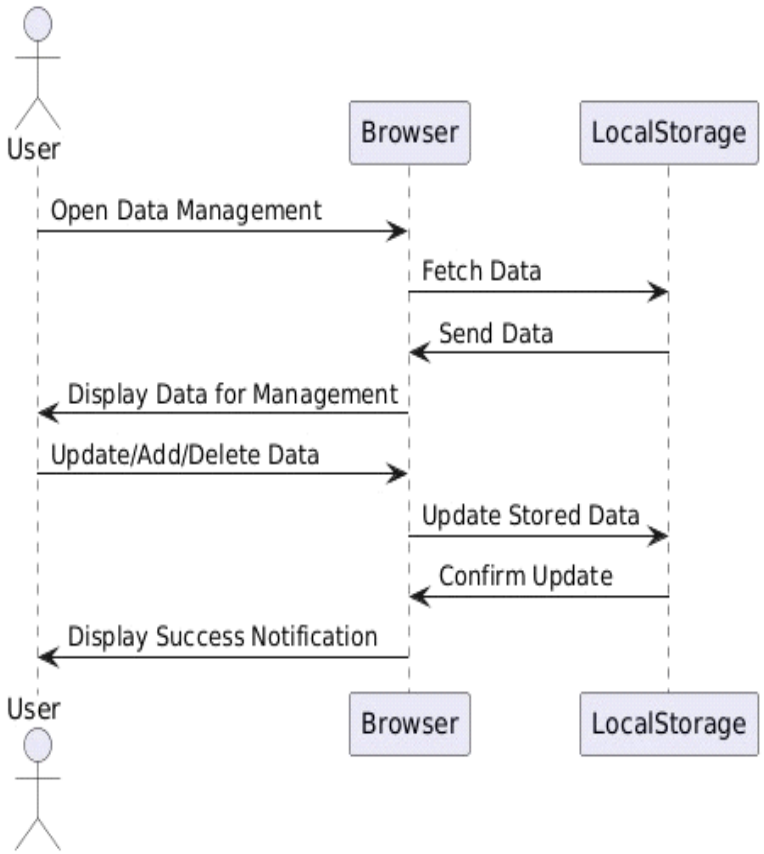
### ii. Backup Process



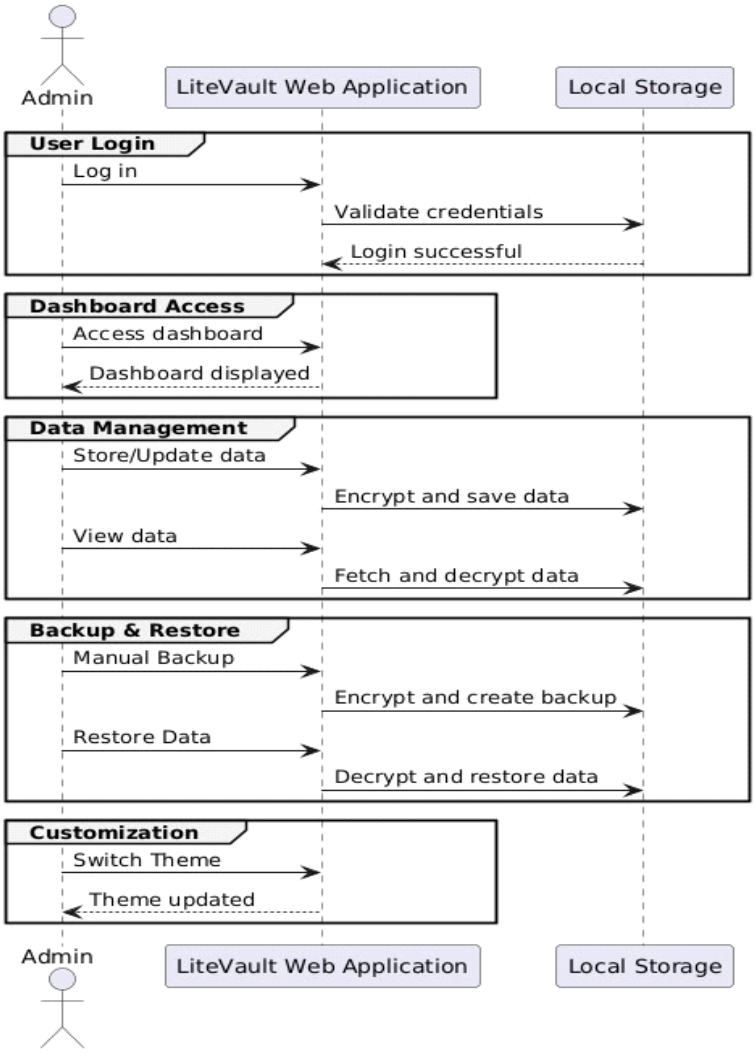
### iii. Theme Selection and Update Process



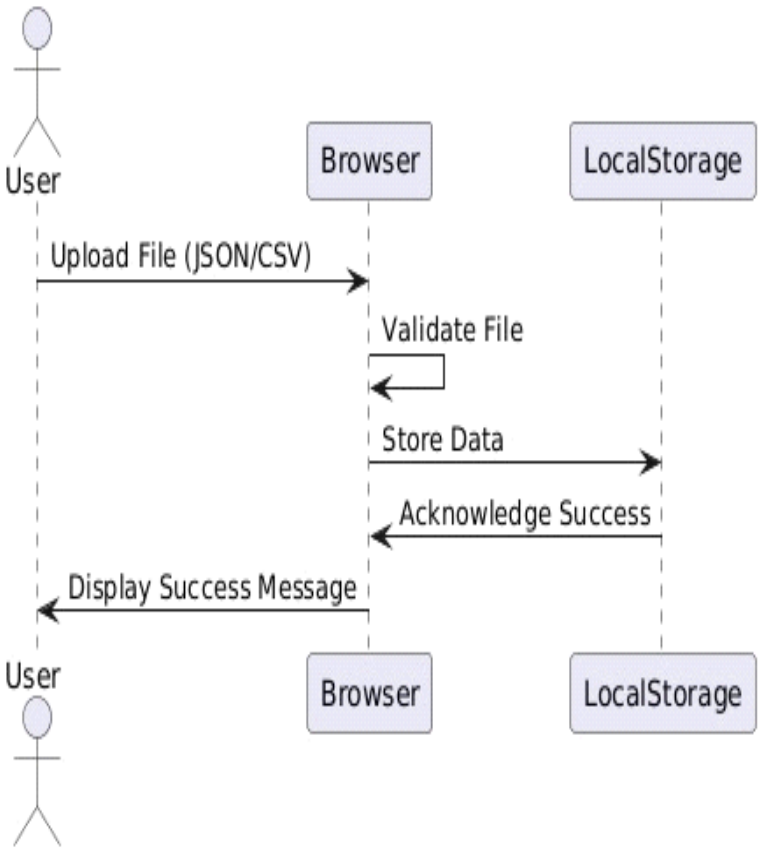
### iv. Data Management Process



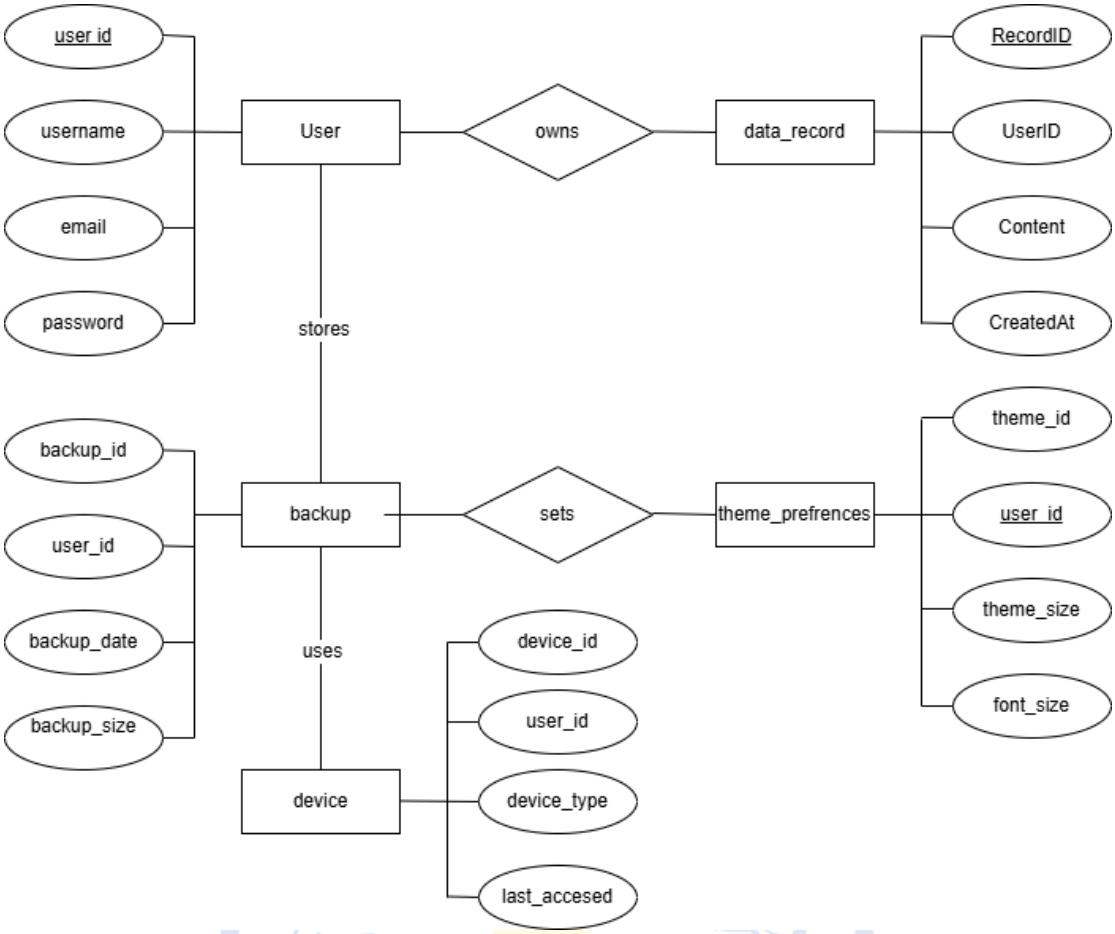
## v. LiteVault Web Application Overview



### vi. File Upload and Validation Process



## 15. ERD Diagram




### i. LiteVault ERD Overview

a. **User**: Manages system access (`UserID`, `Email`, `Password`).

b. **Data**: Stores user info (`DataID`, `Content`, `Encrypted`).

c. **Backup**: Keeps data backups (`BackupID`, `BackupDate`).

d. **Customization**: Saves user preferences (`Theme`, `Preferences`).

e. **Device**: Tracks user devices (`DeviceID`, `LastAccessed`).

f. **Log**: Records actions (`LogID`, `Action`, `Timestamp`).

### ii. Relationships

a. **User ↔ Data**: Owns data.

b. **User ↔ Backup**: Has backups.

c. **User ↔ Customization**: Personalizes settings.

d. **User ↔ Device**: Accesses from devices.

e. **User ↔ Log**: Actions logged

## 16. Functional and Non-Functional Requirements

### i. Functional Requirements

a. Data Management: The system should allow users to create, read, update, and delete (CRUD) their data.
b. Offline Capability: The system should function offline, allowing users to access and manage their data without an internet connection.
c. Local Storage: The system should use local storage APIs to store data securely within the user's browser.
d. Encryption: The system should encrypt data during imports and exports to ensure security.
e. Backup and Restore: The system should allow users to manually back up their data and restore it in case of data loss.
f. Customizable Themes: The system should offer customizable light and dark themes to enhance user experience.
g. Responsive Design: The system should have a responsive design that adapts to different screen sizes and devices.

### ii. Non-Functional Requirements

a. Security: The system should ensure the security and privacy of user data through encryption and local storage.
b. Usability: The system should be user-friendly and easy to navigate, with intuitive interfaces and minimal complexity.
c. Performance: The system should perform efficiently, with fast data processing and minimal latency.
d. Reliability: The system should be reliable, with minimal downtime and errors.
e. Scalability: The system should be scalable, able to handle increasing amounts of user data without compromising performance.
f. Compatibility: The system should be compatible with different browsers and devices, ensuring a seamless user experience across platforms.

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