Project Coffee Economics FSD

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1. Introduction

1.1. Project Overview

The Coffee Economics platform is a digital system designed to provide transparent, accessible, and data-driven insights into the economics of coffee production, pricing, and supply chain activity. The platform aims to enhance decision-making, promote transparency, and improve sustainability across the value chain.

1.2. Purpose of the Document

The purpose of this Functional Specification Document (FSD) is to define the functional and non-functional requirements for the Coffee Economics platform, based on the approved Business Requirements Document (BRD). This document serves as a blueprint for the design, development, testing, and deployment of the system.

It ensures that all stakeholders, including business analysts, developers, testers, and project managers, share a common understanding of the system's behavior and expected outcomes. This FSD will also guide implementation decisions and validate whether the final deliverable meets the intended business objectives.

1.3. Scope

This FSD details the core functionalities of the Coffee Economics application, including but not limited to:
- Develop a cross-platform mobile application using Flutter.
- Enable local data storage to allow offline functionality for rural and low-connectivity areas.
- Provide data sync capabilities with an external API when an internet connection is available.
- Support user authentication and profile setup.
- Allow users to input, view, and update coffee production, pricing, and sales data.
- Display visual reports and summaries (e.g., charts, graphs) based on local or synced data.
- Ensure data integrity and prevent conflicts during sync operations.
- Include support for multiple languages (e.g., English, Amharic).
- Provide export functionality for reports (e.g., CSV, PDF generation on-device).
- Implement secure storage of sensitive data using device-level encryption.

Excluded from this FSD are technical implementation details for underlying algorithms and third-party service integrations, as well as deployment and marketing strategies.

1.4. Assumptions

The following assumptions have been established for this document: All stakeholders have agreed upon the Business Requirements Document (BRD) as the baseline for this specification.
1. **User Competency**:

      a. End-users will have access to Android/IOS based smartphones with basic storage and performance capabilities.

      b. Users are assumed to have basic technical skills, enabling them to interact with digital/mobile applications effectively and navigate through the Coffee Economics platform without extensive guidance.

      c. Users will have periodic access to the internet for data synchronization with the external API.

      d. A single user with a user-name and password is responsible for managing all the wet mill operations sites.

2. **Device Compatibility**:
      a. Local storage on the device will be sufficient to store required offline data for a practical period, this could be from month two years.

3. **Network Availability**:
      a. The application is expected to be operated offline and all the data for its operation will be stored locally. Third party API calls will be initiated when there is an active connection. The data fetched from these apis also will be recorded locally for further offline operations.

4. **Standard File Formats**:
      a. Import and export data will be in a PDF format.

5. **Security and Data Privacy Compliance**:
      a. The platform will follow industry-standard security practices, including data encryption (in transit and at rest). Compliance with data privacy regulations (e.g., GDPR, CCPA) will be maintained, ensuring users' personal information is protected and managed responsibly.

1.5. Definitions & Acronyms

- **Coffee Economics**: The digital system designed to provide transparent, accessible, and data-driven insights into the economics of coffee production, pricing, and supply chain activity.
- **FSD**: Functional Specification Document, outlining the functionalities, features, and interactions of the Coffee Economics system.
- **UI**: User Interface, the interactive layer of the application.
- **API**: Application Programming Interface, enabling system interoperability and integration with third-party tools.
- Best Practice Benchmarks: Standard or user-defined values for cost inputs, profit margins, and pricing models used to validate data.
- Wet Mill Owners: individuals managing coffee processing facilities.
- Conversion Rates: Metrics used to calculate output for different coffee processing stages.

2. System Overview

2.1. System Context

The Coffee Economics Mobile Application is a cross-platform mobile solution developed using Flutter, designed to collect, store, and synchronize economic data related to the coffee value chain. The application supports offline functionality by locally storing user inputs and enabling read/write operations without a network connection. When internet access is available, the app synchronizes with an external API to fetch updates and upload new records.

- **Core modules include:**
    - **User Profile Management**
    - **Data input forms for production, pricing, and sales**
    - **Local data persistence with offline capabilities**
    - **Sync engine for API communication**
    - **Reporting and visualization tools**
    - **Multi-language support**
    - **Device-level encryption for sensitive data**

2.2. Key Stakeholders

The success of Coffee Economics relies on the collaboration and contribution of several key stakeholders, each playing a vital role in the platform's development and operation:

- **wet mill operators**: Responsible for
    - Enter raw data related to cherry purchases, processing volumes, labor costs, and related operational expenses.
    - Responsible for **accurately recording real-time or daily data** during the processing season.
    - Use the mobile app **in offline mode**, syncing data to the central system when the internet is available.

2.3. User Persona

The Coffee Economics platform is designed to cater to a variety of user personas, each with distinct roles and objectives in the coffee production and trading ecosystem. Below are the primary user personas targeted by the platform:

- **Persona 1: Wet Mill Manager**
    - **Description**: A wet mill manager or owner responsible for overseeing coffee processing operations. This user manages multiple wet mill profiles, evaluates production efficiency, and optimizes operational planning to maximize yield and reduce costs.
    - **Goals**:
        - Accurately convert and track coffee measurements across processing stages.
        - Efficiently schedule and manage production processes including pulping, fermentation, and drying.
        - Monitor operational costs and optimize resource allocation.
- **Persona 2: Coffee Procurement Specialist**
    - **Description**: A procurement professional engaged in sourcing high-quality coffee. This user employs pricing calculators to determine competitive

purchase prices based on variable costs, conversion rates, and market conditions.
- **Goals**:
  - Calculate break-even and final selling prices using both basic and advanced price calculators.
  - Assess cost factors in real time and adjust procurement strategies accordingly.
  - Leverage detailed pricing breakdowns for strategic purchasing decisions.
- **Persona 3: Market Analyst**
  - **Description**: A data-driven market analyst or coffee economist focused on tracking global trends in the coffee market. This user reviews real-time coffee price displays and trend graphs to inform strategic decisions and forecast market movements.
  - **Goals**:
    - Access and analyze up-to-date international coffee price data.
    - Customize views based on region, currency, and date for targeted insights.
    - Utilize trend graphs for forecasting and market analysis.

3. Functional Requirements

The Coffee Economics platform is engineered to deliver a seamless and interactive user experience by integrating a robust set of functionalities that align with the business needs specified in the BRD. This section details a comprehensive list of the key functional features of the Coffee Economics platform. Designed to support the operational needs of coffee production and processing, each feature provides specialized tools—from basic profile management and wet mill site configuration to advanced calculators for conversion, operational planning, and pricing. Additionally, the platform offers real-time global coffee stock price displays to enable informed, data-driven decisions. Together, these features form an integrated system that streamlines user interactions, optimizes production workflows, and enhances market responsiveness.

3.1. Feature List

The key functional features of the Coffee Economics platform include:
- User Profile Setup
- Site Operation Management (Wet Mill Profile Management)
- Coffee Conversion Calculator
- Unit Conversion
- Coffee Operational Planning
- Basic Price Calculator
- Advanced Price Calculator
- Global coffee stock price display

3.2. Feature Descriptions
- User Profile Setup
    - **Description**: This feature allows users to set up profiles, allowing them to create and manage multiple wet mill profiles for simulating various operational scenarios. User profile data is stored locally on the device.

    - **Inputs**: User inputs include name and/or username

    - **Processing Logic**:
        - The system checks that all necessary fields are filled and validates the fields format.
        - Once the user enters the name and confirms, the system saves the profile locally.
        - If the user already has a local profile, they are redirected to the home page instead of creating a new profile.

    - **Outputs**:

- - ○ System Confirms Successful profile setup by displaying a confirmation message
      "Your account has been successfully saved!"
    - ○ If the app fails to save data locally an error message is displayed, prompting the user to take an action.

- Site Operation Management (Wet Mill Profile Management)
  - **Description**: This feature enables users to manage operations at different wet mill sites. Users can add, edit, or modify wet mill profiles, and manage the settings for each site such as location, and other configurations.

  - **Inputs**: User inputs include Site Name, Location and Business model. The Business model is a drop-down list pre-populated by Direct export, Supplier, Cooperative and other options.

  - **Processing Logic**:
    - ○ Add new wet mill site:
      - ■ The system validates all required fields.
      - ■ If valid, the system saves the new wet mill information and displays a confirmation message.
      - ■ If the limit is reached, the system notifies the user that the maximum number of wet mills has been created and prevents further account creation
    - ○ Edit wet mill site:
      - ■ The system validates the edited fields.
      - ■ System Saves Updates and Confirms Changes
    - ○ Delete wet mill site:
      - ■ The system prompts the user with a confirmation message.
      - ■ If confirmed, the system deletes the record
  - **Outputs**:
    - ○ On a success system displays a confirmation message.
    - ○ On failure system displays an error message

- Coffee Conversion Calculator
  - **Description**: The Coffee Conversion Calculator feature enables users to accurately convert coffee measurements across various processing stages. By entering values such as

cherry weight, parchment weight, green bean weight, or any other stage weight, the calculator automatically computes and displays the corresponding output for the selected coffee stage.
- **Inputs**: User inputs include input coffee type, input unit, amount of input coffee, desired output coffee type and desired output unit
- **Processing Logic**:
    - The system validates user input
    - From cherry volume to any desired stage
        - The system fetch the conversion factor provided based on user input
        - The system multiply the conversion factor with the volume user inputted
    - From any stage to any desired stage
        - The system fetches the conversion factor for both the input and output stages
        - Calculate the conversion rate by dividing the output stage conversion factor by the input stage conversion factor.
        - Multiply the input stage volume by the conversion rate.
- **Outputs**: Display the final output.

- Unit Conversion
    - **Description**: The Unit Conversion Calculator feature enables users to accurately convert unit measurements across various units. By entering values such as KG, Feresula and other units, the calculator automatically computes and displays the corresponding output for the selected unit.
    - **Inputs**: User inputs include input unit and output unit
    - **Processing Logic**:
        - The system displays a list of available units based on the selected category and the user selects input and output units from the options.
        - The system accepts and validates the numerical amount to be converted.
        - The system converts the input amount into the desired output unit.
    - **Outputs**: The system displays the original value and unit. And the converted value and unit.

- Coffee Operational Planning
    - **Description**: The Operations Planning Feature enables users to set production targets and allocate resources towards

achieving specific output goals. This feature helps wet mill owners and managers optimize workflows.

- **Inputs**: User inputs include
    - the green beans the user wants to produce this season and the conversion unit
    - pulping machine type, the disk type, number of pulper machines, the average number of hours the machine operates.
    - length, width and depth of the fermentation tank, number of fermentation tanks and the number of hours the fermentation tank operates.
    - the number of drying tables, the drying bed size and the dry parchment days
- **Processing Logic**:
    - The system accept and validate necessary fields
    - Pulping Days
        - The system converts the entered green beans to cherry.
        - The system converts the cherry volume to kg.
        - The system calculates the daily pulping capacity:
        Daily Pulping Capacity = Pulper Hourly Capacity (Mt) × Average No. of Hours × Number of Pulper Machines
        - The system calculates the number of days required for pulping:
        Pulping Days = Cherry Amount / Daily Pulping Capacity
    - Fermentation Days
        - The system converts the cherry amount to wet parchment using a predefined conversion ratio.
        - The system calculates the daily fermentation capacity:
        Daily Capacity = (Length × Width × Depth × Mt per m³ × Number of Tanks) ÷ Number of Days Fermenting (Rounded up)
        - The system calculates the number of fermentation days:
        Fermentation Days = Wet Parchment Amount / Daily Capacity
    - Drying Days
        - The system converts wet parchment to dry parchment using a predefined conversion ratio.
        - The system calculates the daily drying capacity:
        Daily Capacity = Length × Width × Dry Parchment kg/m² × Number of Drying Tables ÷ Average Drying Period × 5

- - - ■ The system calculates the number of drying days:
          Drying Days = Dry Parchment Amount / Daily Capacity
      - ○ Total Processing Days
        - ■ The system sums the pulping, fermentation, and drying days
      - ○ Required Bags and Transportation Cost
        - ■ The system calculates the number of bags needed (assuming 60kg per bag) based on the overall cherry volume
        - ■ The system calculates the total transportation cost based on cost per bag user input:
          Total Transportation Cost = Number of Bags × Cost per Bag
  - ● **Outputs**:
    - ○ On success:
      - ■ Total processing days
      - ■ Required number of bags
      - ■ Total transportation cost
    - ○ On failure:
      - ■ System prompts the user to correct missing or incorrect values.

- ● Basic Price Calculator
  - ● **Description**: The Basic Price Calculator helps users calculate the final coffee selling price by inputting key cost factors, using a model to ensure accurate pricing. It flags deviations from best practices, allows currency selection, and provides options to save, view, or download a cost breakdown in PDF format for sharing.
  - ● **Inputs**: User inputs include:
    - ○ The desired volume of coffee to procure, unit, coffee type purchase price per KG, total variable costs for the season, quality premium / second payment, other operational costs, conversion ratios, desired profit margin
  - ● **Processing Logic**:
    - ○ The system accepts and validate user input
    - ○ Break-even price
      - ■ The system adds the purchase price, other variable cost, quality premium / second payment (if available), and fixed operating cost.
      - ■ The system divides the added amount to the selected coffee type volume multiplied by the ratio input the user entered (cherry to parchment, etc).

- If the user wants to view it in kg then the system then divides the output by 17
  - ○ Profit
    - Then the system takes the break-even price then multiplies it by the profit margin from the user input
  - ○ Final selling price
    - The system takes the profit and adds it to the break-even price

- **Outputs**:
  - ○ Displays the calculated break-even price
  - ○ Displays the final price.

- Advanced Price Calculator
  - **Description**: The Advanced Price Calculator provides a detailed cost breakdown for coffee pricing, considering all processing expenses. Users input key details such as procurement volume, purchase price, processing costs, labor, fixed costs and more. The system ensures precise calculations for variable costs and break-even price while allowing unit and currency conversions after the output.
  - **Inputs**: User inputs include:
    - ○ The purchased coffee type
    - ○ The desired volume
    - ○ The coffee type purchase price per KG
    - ○ The estimated coffee type purchase price per KG
    - ○ The Estimated quality output (G1, G2, commercial and ungraded) in percentage.
    - ○ Second payment plan per KG
    - ○ Other estimated expenses.
  - **Processing Logic**:
    - ○ The system accepts and validate user input
    - ○ Procurement Cost Calculation
      - The system calculates the total procurement cost by adding the selected coffee type purchase price, quality premium/broker costs/ second payment(Optional), jute & plastic bags and transport costs.
    - ○ Processing Cost Calculation
      - The system calculates the total processing cost by adding the labor cost, utilities cost, low-grade hulling cost and drying bed equipment cost.
    - ○ Other Variable Cost

- - - ■ The system calculates the other variable cost by adding the parchment transport and other variable costs.
      - ○ Variable Cost Summary
        - ■ The system calculates the variable cost summary by adding the total procurement cost, processing cost and other variable cost.
      - ○ Variable Cost Calculation
        - ■ The system calculates the variable cost by dividing the variable cost summary to the output of the coffee stages ratio the user entered (i.e. cherry to parchment if the initial volume of the cherry is 300,000kg then according to the coffee wet mill excel the ratio of cherry to parchment is 18% which results in 54,000kg) divided by 17.
          Variable Cost = total variable cost (output of the ratio / 17)
      - ○ Pre-tax Break-even Price Calculation
        - ■ Then the system will calculate the pre-tax Break-even Price by adding the variable cost summary and the total fixed cost divided by the output of the ratio divided by 17. (you can refer to the above calculation found on the variable cost calculation to find what the output ratio means).
          Pre-tax Break-even Price = total variable cost + total fixed cost (output of the converted ratio / 17)

  - **Outputs**: The system displays calculated pricing breakdown.
    - ○ variable costs, fixed costs, break-even prices, and other calculations.

- Global coffee stock price display
  - **Description**: This feature provides users with real-time coffee price trends from different international markets, allowing them to make data-driven pricing decisions. The system will fetch and display prices from an open API and allow users to customize their view based on region, currency, unit, and date.

  - **Processing Logic**:
    - ○ The system connects to an external market API to retrieve the latest coffee prices.
    - ○ The system fetches the latest coffee price for the selected zone

- ○ The system updates the displayed price and renders a price trend graph
- **Outputs**:
  - ○ The system displays a graph of price trends for easier analysis

4.   Non-Functional Requirements
4.1.   Usability Requirements

Ensuring Coffee Economics is user-friendly, intuitive, and accessible is essential for providing a positive user experience across a diverse audience.

- **Performance**
  - The system must respond to user actions within 2 seconds under normal load. and no more than 5 seconds in a state of API update.
  - The platform should support offline activities without degradation in performance.
- **Ease of Use**:
  - The user interface should be intuitive and straightforward, with clearly labeled navigation and controls.
  - Users should be able to perform key actions (e.g., sign up, creating wet mill profiles) within no more than three clicks from the dashboard.
  - Consistent design patterns and familiar iconography should reduce the learning curve for new users.
- **Maintainability**
  - Codebase must follow modular architecture and be documented for easy maintenance.
- **User Assistance and Guidance**:
  - Tooltips, contextual help, and a dedicated help section should be available to guide users through the platform.
  - A brief onboarding tutorial should be presented to new users, highlighting key features and actions.

4.2.   Reliability & Availability Requirements

Coffee Economics needs to be a dependable, continuously available platform to ensure seamless usage of the system and its functionalities.

- **Availability & Uptime**
  - The system must be available **100% of the time**, considering the underlying infrastructures are in the normal/operational state.
- **Data Consistency and Integrity**:
  - All user data must be stored locally and updated regularly.
  - All API call must be transmitted over **HTTPS (TLS 1.2 or above)**.
- **Scalability**
  - The platform must be horizontally scalable to accommodate future increases in data volume and user base.

4.3.   Compliance Requirements

Coffee Economics must meet applicable regulatory standards and ensure compliance with privacy laws to protect user rights and data integrity.

- **Legal Compliance**:
  - The system must comply with Ethiopia's **data protection guidelines** and applicable local privacy laws for handling personal and economic data.
- **Content Regulations**:
  - Data must be retained for a minimum of **2 years**. to use the history as a reference.

4.4. Performance Requirements

To provide a smooth and responsive experience, Coffee Economics should meet defined performance metrics, ensuring efficient response times and load handling capabilities.

- **Response Times**:
  - User interactions, such as sign-up and creating wet mill profiles should have a maximum response time of 2 seconds.
  - API call and data retrieval should take no more than 3-5 seconds given a good internet speed.
- **Latency**:
  - Data retrieval latency from the local storage should be optimized to be less than 500ms for primary actions (e.g., sign-up and creating wet mill profiles).
  - Network latency for real-time interactions (e.g., API calls) should be minimized to provide near-instantaneous feedback.

4.5. Security Requirements

Coffee Economics must implement robust security measures to protect user data, ensure privacy, and comply with data protection regulations.

- **Authentication and Authorization**:
  - The admin will have a username and password once registered, and authentication will be based on these details.
  - Password will be encrypted and stored which latter will only be matched with the user login encrypted password. This matching will be the assertion that the user hase the right password (user password will not be available. visible in its original form at ay given time).
  - The authorized admin will have all the authentication in the system.
- **Data Encryption**:
  - Sensitive data, such as user credentials and business details, must be encrypted and stored locally.
  - All personal information should be stored in compliance with relevant privacy laws.
- **Data Masking and Logging**:
  - Personally identifiable information (PII) should be masked in application logs.
  - Maintain audit logs for critical activities, such as admin actions and login attempts, with regular monitoring for suspicious activities.

4.6. Support & Maintenance Requirements

Providing continuous support and maintenance is essential to ensure Coffee Economics functionality, security, and usability over time.

- **Support Availability**:
  - A dedicated support team should be accessible during issues/flaws occur, with options for voice call helpdesk, chat support, and email assistance.
  - Provide a knowledge base with FAQs, user guides, and tutorials to help users resolve common issues independently.
- **Scheduled Maintenance**:
  - Regular platform updates should be implemented on a side and scheduled during low-usage periods to minimize disruptions.

- ○ Implement a versioning system to ensure backward compatibility and smooth transitions for new feature releases.
- **Security and Software Patches**:
  - ○ Critical security patches should be deployed as soon as vulnerabilities are identified to protect the platform from emerging threats.
  - ○ Regularly update libraries, frameworks, and dependencies to the latest stable versions to ensure compatibility and address potential security risks.
- **User Feedback Loop**:
  - ○ The development team should review feedback regularly to prioritize enhancements and improvements in upcoming releases.

5. Use Cases

Use Case 1: User Profile Setup

Name: User Profile Setup

Description: Allows users to set up profile

Primary Actor: Wet Mill Manager

Preconditions:
- The user opens the mobile application for the first time
- The user views the onboarding screen

Steps:

1. User Launches the App:
   a. The user downloads and opens the app.
   b. The system displays a Welcome Screen with profile setup option
      i. The welcome screen acknowledges the app's development and key collaborators.
   c. The user will be redirected to the home page if the user has already a local profile.
2. User Selects Sign Up:
   a. The user continues with profile setup
   b. The system presents a field to put their name / username
   c. Once the user enters the name and confirms, the system saves the profile locally.
3. The system displays a Credit and Disclaimer Notice outlining the terms of use.
4. The user reads and acknowledges the notice by clicking Agree & Continue.
5. System Confirms Successful profile setup:
   a. If profile setup is successful, the system displays a confirmation message: ***"Your account has been successfully saved!"***
   b. The user is redirected to the wet mil Setup or Home Page

Postconditions:
- A new user profile is successfully stored
- The user is redirected to the wet mill setup or home page after successful profile set up.

Use Case 2: Add New Wet Mill Site

Name: Add New Wet Mill Site

Description: Enables users to add wet mill profiles.

Primary Actor: Wet Mill Manager

Preconditions:
- The user must have an active login session.
- The user must be on the wet mill site profile page.

Steps:

1. User Navigates to Wet Mill site Profile Management
2. User clicks on the "Adds New Wet Mill" button :
    a. The system displays a form with fields:
        i. Site Name
        ii. Location
        iii. Business model: A drop-down list pre-populated with options:
        iv. Direct export
        v. Supplier
        vi. Cooperative
        vii. Other (for share companies that export and supply, or farmer exporters operating at a small scale)
3. The user fills in the required fields and clicks Save.
4. The system validates all required fields.
5. If valid, the system saves the new wet mill information and displays a confirmation message.
6. If the limit is reached, the system notifies the user that the maximum number of wet mills has been created and prevents further account creation.

Postconditions:
● The system updates the profile list, reflecting newly created profiles with a confirmation message.

Use Case 3: Edit Wet Mill Site

Name: Edit Wet Mill Site

Description: Enables users to edit wet mill profiles.

Primary Actor: Wet Mill Manager

Preconditions:
● The user must have an active login session.
● The user must be on the wet mill site profile page.
● There is already created wet mile profile

Steps:
1. User selects a wet mill profile from the list and clicks on edit
2. The system displays the current profile details in editable fields.
3. The user modifies necessary information and clicks Save.
4. System Saves Updates and Confirms Changes:
    a. A confirmation message is displayed: "Your wet mill has been updated successfully."
5. User Reviews Updated Wet Mill Information:
    a. The user sees the changes reflected in their wet mill profiles.

Postconditions:
● The system updates the selected profile reflecting edited fields of the selected profile with a confirmation message

Use Case 4: Delete Wet Mill Site

Name: Delete Wet Mill Site

Description: Enables users to delete wet mill profiles.

Primary Actor: Wet Mill Manager

Preconditions:
- The user must have an active login session.
- The user must be on the wet mill site profile page.
- There is already created wet mile profile

Steps:
1. The user selects a wet mill profile and clicks "Delete".
2. System prompts the user with a confirmation message
   a. "Are you sure you want to delete this profile? This action cannot be undone."
3. User confirms deletion and proceeds with the action.
4. System validates the request and displays a success message:
   a. "Profile deleted successfully."
5. System updates the user's wet mill list, removing the deleted entry.
6. The user is redirected back to the wet mill list page.

Postconditions:
- The system deleted the selected profile and update the wet mill profile list

Use Case 5: Coffee Conversion Calculator

Name: Coffee Conversion Calculator

Description: Enables users to accurately convert coffee measurements across various processing stages

Primary Actor: Wet Mill Manager

Preconditions:
- The application is installed and running
- The user access the coffee conversion calculator menu

Steps:
1. User Navigates to the Coffee Conversion Calculator
   a. The user navigates to the Convert section.
   b. The user selects the Coffee tab.
2. The user selects the input coffee type and unit (e.g., Cherry, KG).
3. The user enters the amount of input coffee (e.g., 1000 KG of Cherry).
4. The user selects the desired output coffee type and unit (e.g., Green Coffee, KG).
5. The system uses the following coffee conversion ratios in respect of cherries.

	Ratio to 1 kg cherry	Ratio
Cherry	1:1	1
Pulped Parchment	1.8:1	0.55
Wet Parchment	2.6:1	0.39
Dry Parchment	5.0:1	0.20
Unsorted Green Coffee	6.3:1	0.16
Export Green	6.9:1	0.14

6. If the user inputs the cherry volume to convert to any desired stage, the system will multiply the cherry volume by the conversion factor (ratio) for the selected output stage.
   a. For e.g:
   If the user wants to convert 3000 kg cherry to wet parchment, then the system will fetch the conversion factor provided for wet parchment and multiply it by the cherry volume

   Conversion factor: 2.6 : 1 or (0.39)
   Cherry weight: 3000 kg
   Wet parchment weight = cherry weight x conversion factor = 3000 kg x 0.39 = 1170 kg
7. If the user wants to convert from any stage (other than the cherry stage) to another stage, the system will determine the conversion rate based on the provided data. Since the conversion factors are relative to cherry weight, the system will:
   a. Fetch the conversion factors for both the input and output stages.
   b. Calculate the conversion rate by dividing the output stage conversion factor by the input stage conversion factor.
   c. Multiply the input stage volume by the conversion rate.
   d. Display the final output.
   For e.g.
   If the user wants to convert 200 kg of pulped parchment to unsorted green coffee, then the system will fetch the conversion factor provided for both Pulped Parchment and unsorted green coffee.

   Pulped Parchment: Conversion Factor = 0.55
   Unsorted Green Coffee: Conversion Factor = 0.16
   Conversion Rate = 0.16 / 0.55 = 0.2909
   Then the system will calculate the unsorted green coffee from the 200 kg of pulped parchment
   Pulped parchment weight: 200 kg
   Unsorted green coffee weight = pulped parchment * conversion rate
                  = 200 kg x 0.2909
                  = 58.18 kg

Postconditions:
- The user sees the calculator output for the selected coffee stage

Use Case 6: Coffee unit conversion

Name: Coffee unit conversion

Description: Allows users to convert values between different Units.

Primary Actor: Wet Mill Manager

Preconditions:
- The user must have an active login session.
- The user has launched the app and navigated to the " Convert -> Unit " section.

Steps:
1. User Opens the Convert Screen
    a. The user navigates to the "Convert" section from the bottom navigation bar.
    b. The system displays two tabs: Coffee and Units.
2. User Selects a Conversion Category
    a. The user taps on the unit tab:
        i. Units: Converts between different general units of measurement.
    b. The system highlights the selected category.
3. User Selects the Source Unit
    a. The user taps the dropdown menu under the first input field.
    b. The system displays a list of available units based on the selected category.
    c. The user selects a unit (e.g., Kilograms for weight conversion).
4. User Selects the Target Unit
    a. The user taps the dropdown menu under the second input field.
    b. The system displays a list of compatible units for conversion.
    c. The user selects the desired target unit (e.g., Feresula).
5. User Inputs a Value to Convert
    a. The user types a numerical value into the input field.
    b. The system dynamically calculates and updates the converted value in real time.
6. System Displays the Converted Value
    a. The system performs the conversion based on predefined conversion rates.
    b. The converted result is displayed below the input fields.
    c. The result includes:
        i. The original value and unit.
        ii. The converted value and unit.
        iii. A "Clear All" button to reset the inputs.

Postconditions:
- The user sees the unit calculator output

Use Case 7: Coffee Operation Planning

Name: Coffee Operation Planning

Description: Enables users to set production targets and allocate resources towards achieving specific output goals.

Primary Actor: Wet mill owners, managers

Preconditions:
- The user must have an active login session.
- The system must have predefined conversion ratios and equipment specifications.
- The system must allow input of all required production components.

Steps:
1. User Opens the Plan Screen
   a. The user navigates to the "Plan" option from the menu.
   b. The system displays the coffee production planning interface.
2. User Inputs Green Coffee Bean Production Goal
   a. The system prompts the user to enter the desired production volume.
   b. The user enters the amount in the preferred unit (kg/Lbs/F).
3. User Selects Pulping Machine Details
   a. The user selects the pulping machine type (Disk pulper, Drum Pulper – horizontal/vertical, or Screen pulper).
   b. The system displays an additional option for disk type.
   c. The user selects the disk type (1 disk or 3 disk).
   d. The user enters the number of pulper machines.
   e. The user inputs the average number of hours the pulping machines operate per day.
4. System Calculates Pulping Days
   a. The system converts the entered green beans to cherry.
   b. If necessary, the system converts the cherry volume to kg.
   c. The system calculates the daily pulping capacity:
      Daily Pulping Capacity = Pulper Hourly Capacity (Mt) × Average No. of Hours × Number of Pulper Machines
   d. The system calculates the number of days required for pulping:
      Pulping Days = Cherry Amount / Daily Pulping Capacity
5. User Provides Fermentation Tank Details
   a. The user enters the length, width, and depth of the fermentation tank.
   b. The user specifies the number of fermentation tanks available.
   c. The user enters the number of hours the fermentation tank operates per day.
6. System Calculates Fermentation Days
   a. The system converts the cherry amount to wet parchment using a predefined conversion ratio.
   b. The system calculates the daily fermentation capacity:
      Daily Capacity = (Length × Width × Depth × Mt per m³ × Number of Tanks) ÷ Number of Days Fermenting (Rounded up)
   c. The system calculates the number of fermentation days:
      Fermentation Days = Wet Parchment Amount / Daily Capacity
7. User Provides Drying Space Details
   a. The user enters the number of drying tables.
   b. The user can input the drying bed size (Length × Width) or use the system default.

      c. The user can input the drying period (days) or use the system default (11 days).
8. System Calculates Drying Days
      a. The system converts wet parchment to dry parchment using a predefined conversion ratio.
      b. The system calculates the daily drying capacity:
        Daily Capacity = Length × Width × Dry Parchment kg/m² × Number of Drying Tables ÷ Average Drying Period × 5
      c. The system calculates the number of drying days:
        Drying Days = Dry Parchment Amount / Daily Capacity
9. System Calculates and Displays Total Processing Days
      a. The system sums the pulping, fermentation, and drying days and displays the total number of processing days.
10. System Calculates Required Bags and Transportation Cost
      a. The system calculates the number of bags needed (assuming 60kg per bag) based on the overall cherry volume.
      b. The system prompts the user to enter the transportation cost per bag.
      c. The system calculates the total transportation cost:
        Total Transportation Cost = Number of Bags × Cost per Bag
11. User Reviews and Adjusts Inputs
      a. The system displays the estimated results, including:
        i. Total processing days
        ii. Required number of bags
        iii. Total transportation cost
12. The user reviews the results and makes adjustments if necessary.
13. The system updates the calculations dynamically based on any changes made by the user.

Postconditions:
- The system calculates and displays required resources for the target production volume

Use Case 7: Basic Price Calculator

Name: Basic Price Calculator
Description: Helps users calculate the final coffee selling price by inputting key cost factors, using a model to ensure accurate pricing
Primary Actor: Wet Mill Managers
Preconditions:
- The user must have an active login session.
- The system must load default best practice pricing benchmarks.
- The system must allow input of all required pricing components.

Steps:
1. User Navigates to the Basic Price Calculator
      a. The user logs into the Coffee Economics App and selects the "Calculator" option. Then select the basic calculation tab.

2. User Inputs Pricing Details
    a. The system displays a pricing form where the user can enter all the input fields needed for the basic coffee calculator.
        i. The user selects the purchased coffee type from the drop down menu.
        ii. The user inputs the volume of the selected coffee type(KG).
        iii. The user inputs the purchase price.
        iv. The user enters the Quality premium / Second Payment if available.
        v. The user provides other variable costs (such as utilities, drying bed in terms of price, labor, hulling cost) for the operating season.
        vi. The user inputs the ratio for the conversion to the output coffee type. (e.g. cherry to parchment 18%)
        vii. The user then enters/inputs fixed Operating expenses(such as labor (management) and annual maintenance).
    b. The system will calculate the basic price and display the break-even price in birr.
    c. The user inputs the profit margin (%)
    d. The system then calculates the profit margin and displays the final price.
    e. The system then displays the final selling price.
    f. The user has the option to change to the preferred currency.
3. User Saves/Exports the Data
    a. Once satisfied with the adjustments, the user will select the wet mill from a drop-down and save the calculation for future reference.
    b. The user also has the option to export the price breakdown as a PDF Cost Breakdown Document (CBD) (excluding profit margin) for sharing purposes.

Postconditions:
- The system calculates and displays the final selling price in different currencies with price per KG/LB/FERESULA/KESHA (60KG bag).
- The system shows deviations from best practices
- The user can save or export the pricing details as a PDF

Use Case 8: Edit Basic Calculation Model

Name: Edit Basic Calculation Model
Description: Helps users modify the saved calculations.
Primary Actor: Wet Mill Managers
Preconditions:
- The user must have an active login session.
- The system must load default best practice pricing benchmarks.
- The system must allow input of all required pricing components.

Steps:
1. The user can navigate to the calculation menu and click on the save button
2. The user will come across lists of saved calculations.
3. The user can open one selected file
4. Adjust the input values.
5. The system recalculates the final selling price and updates the break-even price.

6. The updated cost breakdown is displayed.

Postconditions:
- The system calculates and displays the final selling price in different currencies with price per KG/LB/FERESULA/KESHA (60KG bag).
- The system shows deviations from best practices
- The user can save or export the pricing details as a PDF

Use Case 9: Upload PDF

Name: Upload PDF

Description: Helps users upload previously downloaded CBD files to access past calculation data.

Primary Actor: Wet Mill Managers

Preconditions:
- The user must have an active login session.

Steps:
1. The user can navigate to upload PDF page
2. The user choose already downloaded PDF file from their device
3. A progress indicator will show the status of the upload.
4. Upon successful upload, the file will be added to the list
5. Users can open the file and make edits as needed.

Postconditions:
- The system shows list of uploaded files
- User can open and edit the files

Use Case 10: Advanced Price Calculator

Name: Advanced Price Calculator

Description: Provides a detailed cost breakdown for coffee pricing, considering all processing expenses.

Primary Actor: Wet Mill Managers

Preconditions:
- The user must have an active login session.
- The system must allow users to input planned procurement volume, conversion ratios, and estimated costs.

Steps:
1. User Navigates to the Advanced Price Calculator
   a. The user logs into the Coffee Economics App and selects the "Calculator" option. The user then selects the Advanced calculation tab.
2. User Inputs Advanced Pricing Details
   a. The system displays a pricing form where the user can enter all the input fields needed for the advanced coffee calculator.

        b. User enters the following input values:
            i. The user selects the purchased coffee type from the drop down menu.
            ii. The user inputs the desired volume (KG).
            iii. The user selects from the drop-down the coffee type purchase price (per KG; average or season-starting)
3. System Processes the Inputs and Calculates
4. User Reviews the Advanced Pricing and Operational Breakdown

Postconditions:
- The system successfully calculates and displays the required resources and operational needs.

Use Case 11: Global coffee stock price display

Name: Global coffee stock price display
Description: provides users with real-time coffee price trends from different international markets, allowing them to make data-driven pricing decisions.
Primary Actor: Wet Mill Managers
Preconditions:
- The user must have an active login session.
- The system must be connected to an external API to fetch live coffee stock prices.
- The user must have an internet connection to fetch live data

Steps:
1. User Navigates to the Global Coffee Prices Feature
    a. The user logs into the Coffee Economics App and lands on the home page
2. System Fetches Live Coffee Price Data
    a. The system connects to an external market API to retrieve the latest coffee prices.
    b. The user selects a preferred custom zone from the drop-down menu.
    c. The system fetches and displays the latest coffee price for the selected zone
    d. The user selects a desired data from a date picker to see historical prices
    e. The user selects a preferred currency from the currency picker
    f. The user selects a preferred unit from the unit picker
3. System Displays Price Information
    a. System updates the displayed price and renders a price trend graph
4. User Views Stock Prices and Trends.
    a. The user can redirect to the ECX price website by clicking the button.

Postconditions:
- The system successfully retrieves and displays updated coffee stock prices.
- The user can switch between different regions, currencies and units
- The system displays a graph of price trends for easier analysis
- The user can visit the ECX website for more details

6.   Acceptance Criteria

1. User Profile Setup

- **Functionality:** The system shall allow users to create and manage their profiles efficiently.
- **Usability:** The profile setup form must be intuitive, offering real‑time field validation with clear, immediate feedback for any errors.
- **Performance:** Profile creation should be processed and confirmed within 1-2 seconds.
- **Validation:** The system must verify that both the username and user's name are provided and properly formatted, displaying specific error messages for any invalid entries.

2. Site Operation Management (Wet Mill Profile Management)

- **Functionality:** The platform shall enable users to add, edit, and delete wet mill profiles to manage different operational sites.
- **Usability:** The wet mill management interface must be simple to navigate, with forms that offer real-time validation and user-friendly error feedback.
- **Performance:** Operations such as add, edit, or deletion of a wet mill site should complete within 1 second.
- **Validation:** All user inputs (e.g., site name, location, and business model selection) must be validated with appropriate error prompts when data is missing or formatted incorrectly.

3. Coffee Conversion Calculator

- **Functionality:** This feature must accurately convert coffee measurements across various processing stages.
- **Usability:** The conversion interface should be straightforward, with clear instructions and instantaneous feedback for input errors.
- **Performance:** Conversion calculations are expected to complete in under 0.5 seconds.
- **Validation:** The system must validate user inputs and conversion factors, ensuring that calculated outputs are accurate and errors are clearly communicated.

4. Coffee Unit Conversion

- **Functionality:** The unit conversion tool should enable precise conversion between different units (e.g., KG, Feresula) as required.
- **Usability:** Clear instructions shall be provided, and the interface must guide the user to select valid input and output units.
- **Performance:** Conversions should be computed and displayed within 1 second.
- **Security & Validation:** Numeric inputs and selected units must be validated to ensure only supported conversions occur, with explicit error messages for unsupported values.

5. Coffee Operational Planning

- **Functionality:** This feature shall allow users to set production targets and plan resource allocation by calculating pulping, fermentation, and drying days, as well as associated costs.
- **Usability:** The planning interface must provide clear prompts and progressive stages to guide the user through the operational planning process.
- **Performance:** All calculation results and stage transitions should load within 2 seconds.
- **Security & Validation:** User inputs are to be securely processed and validated at each stage with immediate feedback for missing or incorrect data.

6. Basic Price Calculator

- **Functionality:** The calculator shall determine a break-even price and final selling price of coffee using key cost factors such as purchase price, variable costs, and desired profit margin.
- **Usability:** The layout must be clear and easy to follow, with step-by-step input guidance.
- **Performance:** Price calculations must be completed within 1 second.
- **Security & Validation:** All numeric inputs and computed pricing outputs should be validated to ensure accuracy and handled securely.

7. Advanced Price Calculator

- **Functionality:** This feature must provide a detailed cost breakdown including procurement, processing, and other variable costs, resulting in a pre-tax break-even price and final price.
- **Usability:** The advanced pricing interface must be organized, allowing users to easily comprehend and review individual cost components.
- **Performance:** The dashboard and detailed calculations should load within 1-2 seconds.
- **Security & Validation:** Access to detailed pricing data should be restricted to authorized users, with all computations and cost components validated for accuracy.

8. Global coffee stock price display

- **Functionality:** The system shall fetch and display real-time coffee prices and trend graphs from international markets via an external API.
- **Usability:** The price trend display must be clear, customizable by region, currency, and date, and include intuitive graph visualizations.
- **Performance:** API calls and graph updates should complete within 3 seconds.
- **Security & Validation:** Price data must be securely transmitted (using encryption), and the system should validate API responses and display appropriate error messages for any failures.

7. Assumptions and Constraints
8. Dependencies
8.1. Development Tools and Frameworks

These tools and frameworks support the core development and ongoing maintenance of the Coffee Economics platform.

1. **Mobile application development**
   - **Dependency**: Flutter (a modern mobile application development framework) provides the structure for building the user interface, ensuring a responsive and interactive experience.
   - **Impact**: The framework enables rapid UI development and helps maintain a consistent look and feel across IOS and Android devices. Framework issues or compatibility limitations could affect the usability and accessibility of the platform.
2. **Database Management System**
   - **Dependency**: the device local storage will be used for storing the offline data's, all data will be stored on the device running the application.
   - **Impact**: This will let the app perform its operation ofline and reduce the dependency for internet connection.
3. **Version Control System**
   - **Dependency**: Git and GitHub for code versioning, collaboration, and history tracking.
   - **Impact**: Ensures source code integrity, enables collaboration, and allows for rollback to previous versions if issues arise. Any service interruptions could disrupt the development workflow.
4. **UI Component Libraries**
   - **Dependency**: Component libraries (e.g., Material UI, Bootstrap) streamline UI development with pre-built design components.
   - **Impact**: Reduces frontend development time, maintaining consistent UI design. Any library updates or deprecations may impact the UI's consistency and functionality.

8.2. Third-Party Services and APIs

Coffee Economics relies on external services and APIs to handle specific functions such as Global coffee stock price.

1. **Global coffee stock price display**
   - **Dependency**: tradingeconomics and other API service providers will be used to collect live stock prices.
   - **Impact**: Provides insights into user engagement, enabling data-driven decisions for improvement. Lack of reliable analytics may reduce insight into platform performance and usage.

8.3. Project Management and Collaboration Tools

Effective collaboration and organization are essential for team productivity and project success.

1. **Project Management Tool**
   - **Dependency**: Tools like Jira or Trello for tracking project progress, assigning tasks, and managing deadlines.
   - **Impact**: Facilitates task management, milestone tracking, and team accountability. Unavailable project management tools could hinder coordination and visibility into project timelines.
2. **Collaboration and Documentation Tools**
   - **Dependency**: Platforms like Confluence or Notion for team documentation, knowledge sharing, and collaboration.
   - **Impact**: Allows centralized access to project documentation and guidelines, improving team collaboration. Documentation gaps may arise if these tools are inaccessible.
3. **Communication Tool**
   - **Dependency**: Real-time communication platforms like Slack or Microsoft Teams for team discussions, updates, and quick decision-making.
   - **Impact**: Enables efficient communication and swift issue resolution. Outages could impact team coordination and response time to development issues.

8.4. Testing and Deployment

Testing frameworks and deployment tools ensure Coffee Economics's reliability and readiness for use in a production environment.

1. **Automated Testing Framework**
   - **Dependency**: Testing frameworks like flutter-unit-test, flutter-integration-test, and end-to-end testing.
   - **Impact**: Ensures the platform functions as expected, detecting issues early. Delayed or inaccurate testing results could lead to undetected bugs.
2. **Continuous Integration/Continuous Deployment (CI/CD)**
   - **Dependency**: Tools like Jenkins or GitHub Actions automate testing and deployment.
   - **Impact**: CI/CD tools support streamlined testing and deployment, enabling faster iterations and updates. CI/CD tool outages may delay development cycles and reduce the frequency of updates.
3. **Staging Environment**
   - **Dependency**: A staging environment to test new features and updates in a controlled setting before releasing to production.

- ○ **Impact**: Enables testing in an environment close to production, reducing potential bugs in live releases. Lack of a staging environment could lead to more production bugs and downtime.

8.5. Legal and Compliance

Compliance tools and guidelines are critical for meeting legal standards, ensuring data protection, and managing user privacy.

1. **Data Protection Compliance**
   - ○ **Dependency**: Compliance with regulations like GDPR and CCPA for data handling and user privacy rights.
   - ○ **Impact**: Ensures that user data is managed in accordance with privacy laws, protecting the platform from legal issues. Non-compliance could result in fines or penalties.
2. **User Consent Management Tool**
   - ○ **Dependency**: Consent management for tracking user agreement to terms of service, privacy policies, and data usage.
   - ○ **Impact**: Maintains records of user consent, supporting transparency and regulatory compliance. Inadequate consent tracking could lead to privacy violations.
3. **Terms of Service and Privacy Policy Updates**
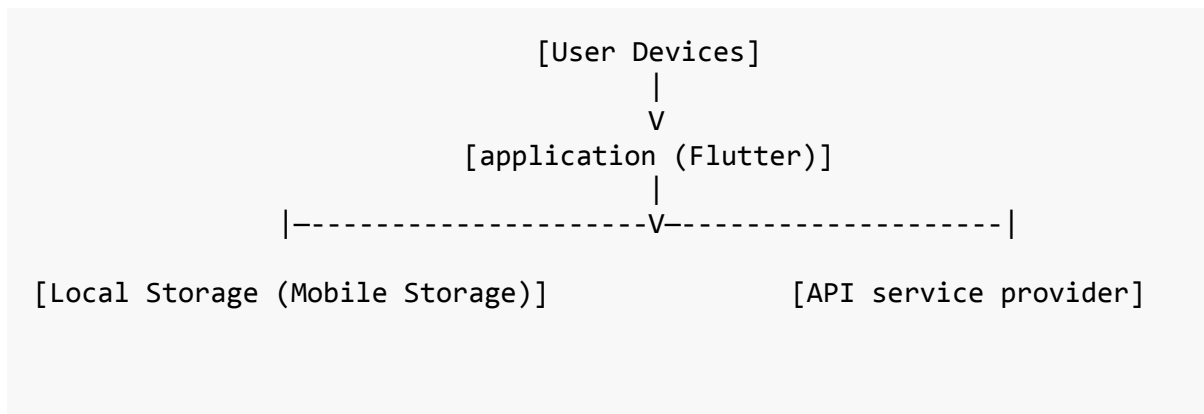   - ○ **Dependency**: Regular updates to terms and policies to reflect platform changes or legal requirements.
   - ○ **Impact**: Ensures that users are informed of their rights and any data usage changes. Lack of updated policies could result in misunderstandings or legal issues.

9. Architecture Diagrams

System Architecture Diagram

- **Objective**:
  To illustrate the overall architecture of the Coffee Economics platform, including the interaction between various components.
- **Components**:
  - **User Devices**:
    - **Mobile Devices**: Smartphones capable of running Android or IOS application.
    - **Features**: User Profile Setup, Wet Mill Site Operation Managemen, Coffee Conversion Calculator and more.
  - **Mobile application (Flutter)**:
    - **User Interface (UI)**: The primary interactive layer for users, handling navigation, content display, and responsive design.
    - **API Calls**: Executes REST API requests to interact with the Global coffee stock price api data providers, fetching and providing all the data needed for the global coffee stock price display.
  - **External Systems**:
    - **Third-Party APIs**:
      - **API service providers**: A selected API provider will be used to fetch all the data. This service is expected to be provided before the global coffee stock price sprint comence.

Diagram Layout:

```
                        [User Devices]
                             |
                             V
                   [application (Flutter)]
                             |
        |----------------------V--------------------|

 [Local Storage (Mobile Storage)]              [API service provider]
```
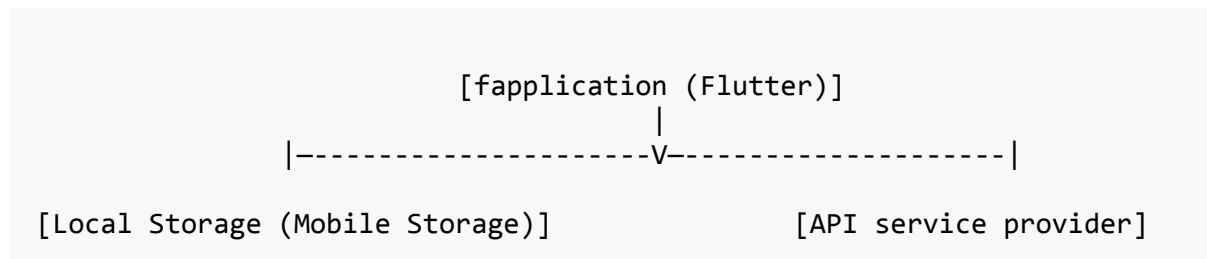
- **User Devices** interact with the **mobile application (flutter)**, enabling users to access Coffee Economics features.
- **Mobile application (Flutter)** communicates with the **Local Storage (Mobile storage)** to retrive data needed for the app to operate/function properly.
- **Mobile application (Flutter)** communicates with the **Extenral systems** via API calls, handling user interactions and data retrieval..

10. Integration Diagrams

API Integration Diagram

- **Objective**:
  To illustrate how external components of the Coffee Economics platform communicate through APIs.
- **Components**:
  - **Mobile application (Flutter)**
    - **UI Layer**: Provides user interactions, such as User Profile Setup, Wet Mill Site Operation Management, and Coffee Conversion Calculator.
    - **API Calls**: Executes REST API requests to interact with the Global coffee stock price api data providers, fetching and providing all the data needed for the global coffee stock price display.
  - **Local Storage (Mobile Storage)**:
    - **User Data Storage**: Stores user profiles and data related to user operations.
    - **Content Storage**: Holds data about Wet Mill Site data, Coffee Conversion history, and calculation formulas.
  - **Third-Party Services**:
    - **API Providers**: Provides API interface to fetch data needed for Global coffee stock price display.

Diagram Layout:

```
                    [fapplication (Flutter)]
                              |
        |---------------------V--------------------|

[Local Storage (Mobile Storage)]              [API service provider]
```

- **Mobile application (Flutter)**:
  - communicates with both the Local Storage (Mobile storage) to retrive data needed for the app to operate/function properly, and Extenral systems via API calls, handling user interactions and data retrieval..
- **Local Storage (Mobile Storage)**:
  - **User Data Storage**: Stores user profiles and data related to user operations.
  - **Content Storage**: Holds data about Wet Mill Site data, Coffee Conversion history, and calculation formulas.
- **API service provider**:
  - **API Providers**: Provides API interface to fetch data needed for Global coffee stock price display.

Revision History

Version	Date	Description	Author