TED UNIVERSITY
FACULTY OF ENGINEERING
DEPARTMENT OF COMPUTER ENGINEERING

CMPE 232
2024 Fall

Info

Group Name: TED CowCode Innovators

Project Subject: Tracking and optimizing milk production and distribution

Group Members (Name Surname - ID):

İrem Özbağcı 22219520070

Ece Sezginer 10201193074

Mert Efe Şensoy 1165018015

Tardu Yüce Yavaş 10759069142

Abstract

Milk production is a large industry, evident from the fact that in 2022 alone, 21 million tons of milk was produced in Turkey (Ataseven, 2023). The goal for this project is to track the production of milk from the moment it gets milked from the cow to the point where it gets distributed to large grocery markets. By clearly mapping this process, we will be able to identify opportunities to optimize it, reduce economic losses and prevent wrong contaminant practices in the industry that affect human health just like in 2008 China (Xiu & Klein, 2010).

This project is important because most households consume milk regularly, so it is relevant to a large portion of society. This project will be valuable for major milk production companies and the stores purchasing the milk from them.

Introduction

The goal of this project is to create a tracking system for milk production that ensures freshness and quality across the whole supply chain. It keeps track of important points between milk being collected at the farms and when it is distributed to be sold in retail stores. This system involves both collection and processing, quality assurance, transportation or distribution of bio-waste treatment products to the retail industry.

Milk is transported from the farm to processing facilities in cool, temperature-controlled vehicles that guarantee freshness. The milk is then pasteurized and packed. The milk must adhere to safety standards and is subject to quality assurance testing. These particles are then transferred to the laboratory for further analysis, transportation and distribution systems of this stuff needs to be inspected on the temperature monitoring tags time.

To this end, the project seeks to enable real-time tracking and monitoring of such things as temperature and humidity in order that milk remains fresh. During its transportation it is safe for users. The latter can benefit milk producers, distributors and retailers because it increases efficiencies between them while cutting waste in the system resulting in all these sectors. Therefore as a result this database system will improve the production and distribution line in the beverage industry overall.

Requirements

Revised Entities and Attributes

1. **Products**:
    - ProductID (auto-increment)
    - Name
    - Brand
    - Flavor
    - PackSize
    - Price
    - LastModified (auto-set date)
2. **Inventory**:
    - InventoryID (auto-increment)
    - ProductID (FK)
    - QuantityAvailable
    - WarehouseLocation
    - LastModified (auto-set date)
3. **Suppliers**:
    - SupplierID (auto-increment)

    - Name
    - ContactInfo
    - Address
    - LastModified (auto-set date)
4. **Orders**:
    - OrderID (auto-increment)
    - CustomerID (FK)
    - OrderDate
    - TotalAmount
    - LastModified (auto-set date)
5. **Customers**:
    - CustomerID (auto-increment)
    - Name
    - ContactInfo
    - Address
    - LoyaltyPoints
    - LastModified (auto-set date)
6. **Shipments**:
    - ShipmentID (auto-increment)
    - OrderID (FK)
    - ShipmentDate
    - EstimatedDeliveryDate
    - LastModified (auto-set date)
7. **Employees**:
    - EmployeeID (auto-increment)
    - Name
    - Role
    - ContactInfo
    - LastModified (auto-set date)

Complex Structures

1. **Weak Entity**:
    - **Promotional Offers** (weak entity dependent on Products)
        - OfferID (auto-increment)
        - ProductID (FK, identifying relationship)
        - DiscountRate
        - StartDate
        - EndDate
        - LastModified (auto-set date)
2. **Aggregation**:
    - **OrderDetails** (aggregation of Orders and Products)
        - OrderDetailID (auto-increment)
        - OrderID (FK)
        - ProductID (FK)
        - Quantity
        - UnitPrice
        - LastModified (auto-set date)
3. **Concept Hierarchy**:
    - **Staff** is a hierarchy under Employees
        - All attributes of Employees
        - Additional attributes like Department, SupervisorID

Relationships

1. **Products to Inventory**: One-to-One
2. **Products to Suppliers**: Many-to-Many
3. **Orders to Customers**: Many-to-One
4. **Orders to Products (through OrderDetails)**: Many-to-Many
5. **Shipments to Orders**: One-to-One
6. **Employees to Orders**: One-to-Many (each employee processes many orders)

Functionality

This project will integrate the solution to ensure efficiency in the process of milk production and distribution. Its functionalities include real-time monitoring, quality control, route optimization, and an alert system.

Real-time monitoring is involved in the tracking of vital metrics, which include temperature and humidity during transportation for fresh maintenance of milk.

Quality control systems will be automated and verify the application of standards related to safety in the supply chain.

Route optimization in transport will ease the process, reduce delays, and therefore, costs.

An alert system will rapidly notify stakeholders in cases where something is wrong from expectations to enable quick responses and corrective actions. All these functions put together will enhance operational efficiency, lessen wastage, and ensure quality milk right from the farm to the retail stage.

Workload Division

İrem Özbağcı	Research about the topic, articulating and writing out the details of the project in an academic format, taking part in creation of the database
Ece Sezginer	Design and implement quality control procedures, assist with the database setup.
Mert Efe Şensoy	Develop tracking software, integrate IoT devices for real-time monitoring.
Tardu Yüce Yavaş	Optimize the transportation process, work on data analysis for route optimization.

References

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