

Foundations of Databases A.Y. 2023-2024

Homework 1 – Requirements Analysis

Master Degree in Computer Engineering

Master Degree in Cybersecurity

Master Degree in ICT for Internet and Multimedia

Deadline: October 27, 2023

Team acronym	ECOMMESTA	
Last Name	First Name	Student Number
CAKMAKCI	UMUT BERK	2071408
YANOGLU	MELTEM	2071545
TORRES-PARDO LÓPEZ	ISABEL	2099920
OZGEN	ALARA SELEN	2071410
VARELA MARTÍN	ALEJANDRO	2100062
MALOCHE	DESALEGN MATHEWOS	2090063

Objectives of the System

The company requests for the development of a database system designed to collect, classify, store and manage comprehensive datasets from several supermarkets within. The specified system is intended to have strong data storage security while allowing users to query and edit customers order's information efficiently.

Especially, the system is required to include fields for recording essential details, encompassing product names, descriptions, categories, customer information, stock quantities, supplier data, and employee records. Managers have the capability to efficiently perform tasks, such as accessing, deleting, and modifying information related to supermarket staff members.

Interviews

Several interviews were conducted to gather system requirements.

- Employees: administerial stakeholder interviews aid in understanding the company's strategic goals and requirements, guiding the structuring of the database system to meet articulated demands.
- IT technicians: to clarify the current technical infrastructure to enable the integration of the planned database system, define the constraints of the prevailing systems, and articulate the prerequisites for compatibility.
- Final users: in order to be informed about final users' expectations from the system to provide efficient service and support to customers. In addition, information about the daily tasks that need to be completed and the difficulties encountered during this process is provided.
- Inventory specialist and the store clerks: It is intended that the records be updated regularly. Support is received for reporting and resolving inconsistencies between physical counts and computer records, such as adding, deleting, and requesting more products.

Users and Stakeholders of the System

From the database point of view users and stakeholders of the system can be listed as below:

- Store Managers and supervisors: A database system has been used by managers and supervisors to manage and monitor sales, manage stuffs, employee performance, and profitability.
- Store Employees (Clerks, Cashiers, Stockers): all the sales process and customer requirements carried out by the employees
- Inventory Control Specialists: the individuals who are supposed to manage the items by using the barcodes to know whether it is expired or not, what is already sold out, and what needs to be revised based on customer interest
- IT Specialists and Database Administrators: They are very important for the database system since they are the ones who store, maintain, and secure all of the information. Also, they manage all the database environment

- Customers: a good system can have a significant impact on bringing the new customers and keeping the existing ones. As an end user, customers can define the whole system and the progress of the store

Natural Language Sentences

The company, owner of the expansive supermarket chain MERCADONE, with more than 800 locations throughout the country, finds itself in need of a new database system. The primary objective of the company is to establish a dependable system for the storage and manipulation of essential data, which is characterized by its reliability, fast performance, and its intuitive interface.

The system is required to meticulously record information concerning each supermarket; shop code, location, employees, inventory, sales records, etc. Additionally, it must have information about each product, fostering uniformity across all supermarkets; product code, name, category, price, etc. The purpose for maintaining consistent product data between stores is to ensure that if a change is made in a specific item, for example base price, all the establishments will have identical information.

During opening hours, data is collected and stored in each supermarket. This ensures that the database is always updated and its accuracy is on point. When cargo trucks arrive at the supermarket, inventory control specialists must add each batch of products to the database, so it is clear that new items have arrived. They are also intended to get in contact with the suppliers in order to keep the stock on level. Products will be identified by the product code. This and more information will be obtained from the barcode printed in the item.

Continuing the process, when an item is scanned and purchased through the cashier, the system will know exactly what product is selected from the barcode and its quantity will be decreased in the database. The receipt will also have information such as the name of the product and the price, obtained from the database. In addition to that, stock clerks will be in charge of counting the stocks every day after the supermarket is closed; making sure the number of products in store is the same as the one in the database, or in case of disarrangement, they must update the table. They are also responsible for removing the expired items from the shelves and from the database, as well as keeping the products with close expiration dates in the front, so the customers will pick them first. Overseeing these operations is the key role of store manager, who makes sure the supermarket operates smoothly. They also have a crucial role when it comes to customer services, since they are the representative of each supermarket.

Regarding the human resources; when a new employee is hired, this department is in charge of adding it to the database, with the information needed. Besides, promotions are also reflected in the database and when an employee is fired, it is mandatory to delete it from the system.

In the case of any system issues, IT specialists are the ones in charge. They hold an administrative role and are responsible for keeping the database well-maintained. They are also the ones that manage access privileges of each user and keep the hierarchy in order. Moreover, data analysis also plays a crucial role in the company. They can only view the data, but they are in charge of making statistics and keeping track of the best-seller products/stores.

One of the new additions that the company aspires to incorporate a loyalty program, where customers can subscribe in order to access a variety of benefits such as discounts and information about the products in the different establishments, as well as earning points while shopping. It will be accessible via the web page or mobile application. Consequently, the database is mandated to encompass customer information.

Each individual account, specifically associated with a particular user, will be uniquely identified by an email address, which will be necessary to register on the program. Customers will be required to establish a password when creating the account, which will serve as the authentication method for accessing their respective account. The system will also have to store personal information, including full name, surname, date of birth, and preferred store location. This program will be granted access to the database, from which it will retrieve the necessary data for informing the users. Cashiers are also required to scan the user card, or the QR available in the app, so customers can use their discounts and earned points when shopping.

Filtered Sentences

A company that owns a chain of supermarkets wants to acquire a new database system in order to store data about their supermarkets, products, and customers.

Each supermarket will store the next information:

- **Store ID:** to identify it from other establishments
- **Location:** which will include region, city and address
- **Employees:** a list with every current employee as well as personal data about each one
- **Sales record:** with recent information about sales

The users that will have access to the database are:

- **Stock clerks:** updating the database by removing expired products and taking stock every day
- **Store Manager:** editing the database as needed, can see all of the employee and the products in his/her shop
- **Inventory Control Specialists:** in charge of adding the new products when the merchandise arrives and keeping the stock level in order by placing orders of products in need
- **Data Analysts:** view the database in order to make statistics and to study the performance of the supermarkets
- **Human Resources Personnel:** adding new employees when they are hired, promoting them and removing them from the database when they are fired
- **IT Specialists:** administrate the database, keeping it in order and functional

Each role contributes to the seamless operation of the supermarket chain, from customer's transactions to product management and data analysis.

Products are characterized by:

- **Product ID:** to identify the product and distinguish it from others
- **UPC:** (Universal Product Code) is a series of black lines that help identify a product. This symbol is encoded with a series of numbers, which makes up a complete barcode
- **Name:** a brief description of the product. It can be printed in the receipt
- **Price:** shared across all the supermarkets
- **VAT:** percentage of tax (Standard rate: 22%, Reduced rates: 10% and 5%, Super-reduced rate: 4%)
- **Category:** to identify the type of product (frozen, cosmetic, alcohol, etc.)

Furthermore, each supermarket location will store the next information related to products:

- **Stock level:** quantity of an specific product in the store
- **Re-Order level:** minimum quantity that must be available in a supermarket
- **Order Quantity:** quantity that is ordered from the supplier when stock level is low

Receipts will also be stored during one month, including:

- **List of products:** with the quantity of each one
- **Date:** year, month, day and hour
- **Payment method:** cash or card (with the needed information about each one)
- **Final Price:** amount of money that is needed to be paid for the total purchase
- **Supermarket location**

Each product will be related to a specific supplier, containing the following information:

- **Supplier ID:** to identify the supplier
- **Address:** the physical address of the supplier's location
- **Contact information:** a telephone number for immediate communication and an email address for electronic communication

- **Contract:** includes payment terms, delivery terms and confidentiality

The data stored about customers registered in the loyalty program is:

- **Email:** to identify each user
- **Password:** used by the user to access its account
- **Name and surname**
- **Date of birth**
- **Points:** earned by shopping. Can be exchanged for discounts
- **Preferred supermarket location:** to inform the user about that supermarket's discounts
- **Receipts:** made using loyalty program

Term Glossary

Term	Description	Synonyms	Connection
Product	An item or service that is created, manufactured, or provided for the usage of customers	Item	Categories, Store, Price, Quantity, ID, UPC
Customer	An entity that purchases commodities or services from a seller or provider.	Client	Product, Store, Receipt, Price, Manager, Employee
Store	Physical or online location where products, goods, or items are kept, displayed, and made available for purchase by customers.	Shop	Product, Categories, Quantity, Employee, Data Analyst, Customers
Supplier	A company or entity that provides products and goods to the supermarket for resale to customers.	Dealer, Distributor	Product, Store, Price, Category
Categories	Classifications used to organize and group similar items or entities based on shared characteristics or attributes.	Section	Product
Price	A certain amount of money or services that must be exchanged to acquire a particular product or service.	Cost, Fee	Product, Store, Receipt
Quantity in Stock	It represents the total number of a specific product or item that is currently available for sale or use within a particular business or organization.	Stock level	Product, Store, Employee Manager, ID, UPC

Manager	An individual within an organization who holds a position of authority and responsibility for overseeing and coordinating the activities of a team, department, or specific area of a company.	Head of Store	Customer, Store, Employee
Employee	An individual who works for an organization or employer in exchange for compensation, which may include wages, salaries, benefits, and other forms of remuneration.	Workers, Staff	Store, Quantity, Manager
Product ID	a unique and alphanumeric or numeric code or identifier assigned to a specific product to distinguish it from other items within a database.	Product Code	Product, UPC
UPC	stands for Universal Product Code, is a standardized and widely recognized barcode system used for product identification in the retail and manufacturing industries. It consists of a unique 12-digit numerical code that represents a specific product.	Barcode, Product Identification	Product, ID
Receipts	A commercial document issued by a seller or service provider to a customer, detailing the products provided, their quantity, prices and other relevant transaction information.	Product Invoice	Product, Customer, Price, Store
Data Analyst	A professional who specializes in collecting, interpreting, and transforming data into meaningful insights.	Data Manager	Product, Store, Customers, Price, Supplier, Quantity

Functional Requirements

The database system must store:

- **Stakeholders**, including: Data analysts, HR Personnel, IT specialists,
- **Employees**, including: Stock clerks, Store manager, Inventory control specialist, Cashier
- **Record the details related to each task**; as for example adding/deleting a new item or update an item's quantity at a specific shop, data validation and verification to ensure data accuracy
- **Stakeholders data**, including: name and surname, job description,
- **Stores data**, including: store code, name, address, location, stock level, employee list;
- **Products data**, including: product code, name, price, VAT, category, supplier code;
- **Users data**, including: name, surname, e-mail addresses and preferred store
- **Receipts data**, including: List of products, date, Payment method, store location;

The system must allow;

- **Employees and stakeholders** to login and reach their personalized page;
- **Customers** to login and sign up;
- **Customers** to change/update their information;
- **HR personnel** to add/delete a new manager/employee to a store;
- **HR personnel** to promote/demote an employee;
- **Stock clerks** to add/delete a new product in their store;
- **Stock clerks** to update a quantity of a specific product in their store;
- **Managers** to update the database of products, add/delete a product if deemed necessary;
- **Data analysts** to check stores and sales/orders;
- **Inventory control specialist** to order new products to the store;
- **Data analysts** to conduct statistical exploration from sales/orders of products;
- **IT specialists** to maintain the database and interfere if necessary;
- **Transfer** of goods or employees from one store to another;
- **Manage multiple arrangements** by each team/shop;

Non Functional Requirements

The system should;

- Respond in acceptable time for user queries or transactions,
- Store all the data and metadata related to each login session of each person and all the connected information,
- Work with other software systems and databases through standardized interfaces and protocols,
- Internationalization to allow customers speaking various languages to utilize the system,
- Have different user permissions for different roles; for example the employees of a store see other stores' stocks but cannot make any change of it,
- Documented periodically and clearly and be up-to-date,
- Periodic backup of contents to avoid loss of data in case of malfunction and loss of database contents,

Constraints

The DBMS application should satisfy the following constraints:

- The employees of a store can see the products' quantities of another store but cannot change them.
- For transferring goods, both store managers have to approve the transfer.
- Be implemented with PostgreSQL;
- Client side implemented using html, css, javascript and jquery;
- Server side implemented using Tomcat, java servlet, JSP, MVC and REST web services;
- Operating system: Linux.

Group Members Contribution

- **Umut Berk CAKMAKCI:** Contributed to the development of **Functional Requirements, Term Glossary** and **Constraints** sections;
- **Alara Selen OZGEN:** Responsible for the development of **Objectives of the System, Interviews** and **Users and Stakeholders** sections;
- **Meltem YANOGLU:** Contributed to the development of **Non Functional Requirements** and **Term Glossary** sections;
- **Isabel TORRES-PARDO LÓPEZ:** Responsible for developing the sections of the project pertaining to **Natural Language Sentences** and **Filtered Sentences**;
- **Alejandro VARELA MARTÍN:** Responsible for developing the sections of the project pertaining to **Natural Language Sentences** and **Filtered Sentences**;
- **Desalegn MATHEWOS MALOCHE:** Responsible for Users and Stakeholders of the System.
- **Milad Faghih Loo:** We could not make contact with him. He did not participate any work.

Each member of the group (except Milad) has diligently reviewed the text, offering insightful comments and implementing necessary corrections to enhance its quality and accuracy.