

Foundations of Databases A.Y. 2021-2022

Homework 1 – Requirements Analysis

Master Degree in Computer Engineering

Master Degree in Cybersecurity

Master Degree in ICT for Internet and Multimedia

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Objectives of the System

Inventory Management plays a vital role in a company. Companies need to have an Inventory Management System (IMS) in order to accurately identify which and how much stock to order at what time. In other words, each factory should manage its production in an efficient way in order not to waste resources and to avoid overstocking, as well as outages. To do so, an IMS shall be implemented. An IMS should assist all the different phases involving production, that are: orders issued by customers, manufacturing of the final good, and shipment. In particular, the company that makes use of such system can always keep track of item quantities – in order to hold in stock only the minimum amount, hence optimizing investments –, invoices, and deliveries. Putting all these benefits together, the production is optimized, thus increasing the company revenues. With this system, both the customers will be able to get the product easily and the risk of the seller will be reduced.

Interviews

Natural Language Sentences

A major international food and beverage company is investing in a new set of technologies to increase profits. The company produces and distributes an average of X products every year, including drinks, juices, beers and snacks of various kinds.

The company's goal is to develop a new information management system that will help reduce excess and shortages of inventory. Furthermore, it is required to keep in memory as much information as possible about the commercial activity so that it is also possible to make analytics to monitor sales and expenses. In this system:

- technical employees manage products in the inventory, invoices, and employees;
- sellers, on the other hand, have to deal with customers, orders, shipments, and payments;
- managers are in charge of managing suppliers and contracts;
- data analysts have access to the acquired data for inventory, cost and profit analysis;
- a system administrator will be responsible for managing the access privileges for each user on the system.

The figure of the Manager is important for the management of relationships (and therefore of contracts) with suppliers. The latter are intended to supply raw materials to the company. For example, if the company produces sugary drinks, suppliers will provide ingredients such as sugars, additives, artificial colors, water and natural flavors. In addition to these elements, there will be suppliers who will provide different types of packaging, such as glass, aluminum latins, or double corrugated cardboard boxes. Suppliers must be registered in the system, along with their name and contact details. Managers stipulate and maintain contracts with suppliers. These contracts are characterized by the following parameters: type of contract, duration of the contract, monetary agreement, quantity requested, and an identification for both the supplier and the raw material the first provides. It will therefore be possible for managers to inspect, for example through a list, all the contracts stipulated with the different suppliers. Furthermore, through the identification of the raw materials, managers have the possibility to filter contracts based on the type of product. Therefore, it is possible that the company can purchase the same type of product from different suppliers. Contracts stipulated between managers and suppliers are of different types:

- Joint venture;
- Partnership;
- Collaboration-type network agreement;
- Network contract for joint operation.

Managers therefore work closely with suppliers and also with sellers. In fact, these 2 relationships allow the data analyst to optimize profits and limit losses. The data analyst has the task of carrying out some analyzes on the internal data of the company to allow the latter to reduce the products that will be in excess (for example because they have expired) and keep under control the minimum quantities for each single product in the warehouse. By periodically carrying out checks on the expiration date of the products in the database, the data analyst is able to find how many expired products are left in stock. The frequency on which this type of control is carried out will be in line with company policies. It is therefore possible that the company decides to carry out this check every quarter. In this case, at the end of the 3 months, the data analyst will carry out his analyzes, communicating the results to the managers through reports. In this way, in the event that the number of products discarded because expired is high, it will be the responsibility of the manager to reduce the quantities of raw materials purchased from the different suppliers. Furthermore, each product is characterized by a minimum quantity of stock in the warehouse. In the event that the number of products discarded is high, the manager will proceed with the decrease of this minimum quantity in stock, in such a way as to minimize losses. In the opposite case in which the number of orders is very high, it is possible that the quantities of some products are zeroed. In this scenario, the figure of the seller will be responsible for communicating this deficiency through a report to the managers. The latter will modify the contract with the suppliers linked to the production of these products, increasing the quantity to be purchased. Furthermore, the seller will be responsible for managing the relationship with the customer, proposing either to wait for new products to be made and then make a single order or to buy what remains in the warehouse and later make a second order. However, it is important to underline that the stock inside the warehouse will be periodically checked by the data analyst, in order to make up for any quantity shortages of some products. In both cases, therefore, the figure of the manager is of primary importance. In fact, it is he who, by decreasing or increasing (according to company policies) the quantities of raw materials purchased by suppliers, positively affects the total profit of the company. Furthermore, the data analyst, by inspecting the database, is able to provide order trends based, for example, on the type of payment used by the customer or the type of shipment selected. He will then be able to provide managers with sales trends within a certain period of interest, so that they can carry out market analyzes.

A customer should be able to register to a website in order to search for products to buy, view and manage its orders, and to write reviews – made of a rating and some comments – about products. Upon registering, it must specify its name, contact details, and delivery address. The customer receives an invoice with all the details when it places an order and can track it with a dedicated tracking number provided when the shipment is assigned to the courier. The factory shall keep track of all the payments made by customers, along with information about what payment method has been used. To ensure small orders to be evaded in an efficient manner, some products can be produced in advance, which means that the inventory should have a little stock of them, acting as a “buffer”. If instead an order requires more products than how many are already in stock, the first is held pending until the requested goods are manufactured and packaged for the shipping.

In the inventory, items are stored with name, relative quantity, and expiration date. In particular, when there is a shortage of one or more items, the supplier providing it will be immediately notified with an automatic e-mail.

Also, when a product is manufactured but has not been purchased yet, it should be stored in the inventory as well, with name, quantity, and expiration date. When a shipment that contains a specific product leaves the factory, the latter must be deleted from the inventory. Of course, products – as well as items – that are expired, must be removed from the inventory as soon as possible and disposed of, as they cannot be sold anymore.

Filtered Sentences

Term Glossary

Term	Description	Synonyms	Connection
Inventory	A tidy collection of items with relative quantities	Catalogue, Register, List	Parts, Orders, Product
Item	The ingredients needed for the manufacturing of final products	Object, Ingredient	Inventory, Product
Orders	Requests of specific products by customers		Invoice, Inventory
Product	The final good	Merchandise, food	Parts, Inventory
Invoice	Bill issued to customers	Bill, payment proof	Orders, Customer
Customer	The company requesting for products	Company, Client, Buyer	Invoice, Employee
Employee	Whoever is working for the factory	Worker, Staff member, Operator	Customer, Roles, Departments
Roles	The several roles each employee plays as, that are: manager, seller, worker, data analyst, and system administrator		Employee
Departments	The several divisions in which each employee works	Divisions, Branches, Units, Sectors	Employee
Supplier	The company which restocks items		Product, Manager, Contract
Contract	Agreement made between the factory and a supplier	Deal, Arrangement, Agreement	Manager, Item

Table 2: Describe in this table the terms of your system

Functional Requirements

Non Functional Requirements

Constraints

The Database Management System application should satisfy the following additional constraints:

- Be implemented to run on Windows operating system;
- Be implemented with PostgreSQL;
- Client side implemented as a Web application, to guarantee easy management through different devices (Html, css and javascript will be used);
- Server side implemented using Tomcat, java servlet, and REST web service.