

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

Deadline: October 22, 2021

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Objectives of the System

Our client's business assets are cars (both new and used) and replacement pieces. The customers usually buy cars but it's offered to them the possibility of renting. The people involved are clients, suppliers and workers. Our project is a database management system which keeps track of all the data related to the sales, rentals and repairs of vehicles, as well as records of payments and current rents.

We want to automate the management of the activities of a chain of car dealerships for which we want to collect data relating to the sale and repair of motor vehicles. The reality of interest keeps track of customers and suppliers of the dealerships who will provide the spare parts used in maintenance.

Interviews

We have done different interviews to different workers on the car dealer market to better comprehend the requirements for the database.

- **Company managers:** the main stakeholders, they described how the database should be like. With general guidelines, like the need of tracking sales, rents and repairs of the different car dealers.
- **Finance Team:** their request was to keep track of the money made in the sales (if discount were applied), the monthly rental price agreed with the buyer and the price for the repairs. Another important aspect is to keep track of the cost per unit of the replacement parts.
- **Mechanic:** they described us how a repair works, how they find the replacement parts from different suppliers.
- **Sellers:** they told us the different possibilities of contracts: Sell or Rent and how they keep notes on every buyer to later call them for new businesses.

Users and Stakeholders of the System

The users and stakeholders of the system are:

- **Car dealers:** car dealers are able to sale different type of cars or lend them to customers. Moreover, car dealers must be able to send cars to mechanic to repair and/or buy new parts of car from the store.
- **Suppliers:** suppliers are able to provide the list of car parts and each related price. They can offer different products and supply specific part of cars. They must see all sold parts and print the reports of their own income.
- **Customers:** the customers of the business, who can either buy or rent the vehicles. They can access the system to find the currently available cars in the shop.

Natural Language Sentences

A car dealer enterprise that is made up of multiple branches across the country requested from us a centralized management system to track the company's evolution and developmental process to improve performance during a specific time period. The main purpose of this management system is to establish a database that keeps track of the related parameters corresponding to both the company and the customers. According to the interview with the enterprise, it is decided that the profitable processes are sales and rentals. Therefore they need the most attention in the system. As mentioned above, the car dealer enterprise has multiple branches, and each branch works independently. Each branch is responsible for its own sale and rental processes. The main database management system is cumulated by the data which comes from different branches. Each car rental branch has descriptive features such as name, city, address, phone and fax.

A car dealer offers car sales and rental services for customers. There are two types of cars: used and new. The sales process includes new and used cars. However, the rental process only includes used cars. The rental process should include certain time periods depending on the wishes of the customers. At the same time, customer requests are taken into account for both services.

Rental or sale car services are provided in line with the wishes of the customers. Customers can choose the cars they want to buy or rent, depending on factors such as year, model, and price etc. If customers want to rent a car, the rental period must be specified. Customers are registered in the system with identifying features such as name, surname, phone, address, and tax code.

The sale process is valid for two different types of vehicles: used and new cars. The registration of sales transactions in the database management system is done with the sales ID and the date of the sale. New cars are registered in the database management system with features such as the year, model, price, license plate and used cars with features such as the year, license plate, sale price, status, km, model, rental price. The database should keep track of which car is under repair or whether is ready to be rent.

Classification can be made according to the above-mentioned features in new car sales transactions. However, in used vehicle sales transactions, classification can be made according to features such as year. The rental price feature is not included in this process as it will only be used in rental transactions. When the customer wants to buy a new or used car, the car dealer can offer the appropriate car model by filtering according to these features, taking into account the wishes of the customer. One of the services offered by the company is car rental service. Rental are registered to the system with features such as id and can be done only with used cars for a certain period of time. In the car rental service, an offer can be made by filtering the relevant features in line with the customer's wishes.

Each car branch has its own repair service. Repairs of rented cars are carried out in the repair service. Every repair operation is recorded in the system with id and date properties. The problems that may occur in cars can be divided into two:

- Problems that do not require part replacement, such as scratches, and can be resolved in the repair service,
- Problems that cannot be repaired, such as engine breakdown, that require part replacement.

Transactions that require part replacement are recorded in the system with features such as ID, name, price per unit. Since the car branch does not manufacture car parts, it works with the supplier in transactions that

require car part replacement. Each supplier is registered in the system with name, phone and its inventory. In transactions that require more than one part replacement, parts can be obtained from different suppliers for the same car.

In conclusion, the purpose of the management system should be to have a clear view of the business model regarding sales, rentals and repairs in an interactive way. This means that it is important to provide tools for extracting relevant data and statistics as well as being able to enter new data, modify and delete them if necessary. In particular, the administrators are able to analyze revenues and better plan future objectives, while the technical supervisor can independently control the repairs and suppliers section. The future objectives are to develop a website where customers can have a general catalog of services and cars for sale or rent.

Filtered Sentences

Car Dealer

The car dealer has the ability to sell or rent cars that may be new or used. As for used cars, he can make repairs if necessary:

- Each car dealer is defined by his name, address, city, phone and fax.
- Each car dealer has its own selection of new and used cars.

Sale

Contract or invoice between the car dealer and the customer by which a car, new or used, is sold:

- Each sale is defined by an identifier and a date.
- Each sale is associated with the buyer and the car concerned.

Rental

Agreement between the car dealer and the customer by which a car is temporarily given to the latest. It is also agreed the price of the rental of a particular car:

- Each rental is defined by an identifier, a rental start date and a rental finish date.
- Each rental is associated with the car dealer and the car concerned.

Customer

Customer within the car dealer chain, can buy or rent one or more cars:

- The customer is the other party in the sale or rental agreement.
- Each customer is tracked through the tax code, followed by name, surname, telephone and address.

New Car

Sold by a car dealer:

- Each new car is defined by a unique license plate, price, year and model.

Used Car

Sold or rented by a car dealer, they differ from NewCar because they may be currently rented or not, or they may be under repair and therefore not available. They can also be rented or sold directly:

- Each used car is defined by a unique license plate, sale price, year, status, numbers of km and model.
- They are the only cars that are repaired by the internal repair service.

Repair

Process associated only with used car, so only used cars are repaired, with the possibility of replacing parts for damaged ones. Additionally, each repair is owned by a single car dealer, so two or more repairs are not shared between different car dealer:

- Each repair is defined by an identifier and a date.
- If there is the need to use any replacement, their quantity is also recorded.

Replacement

Which can be used during the repair:

- Each replacement is defined by an identifier, name and the price per unit.
- Each replacement can be provided by multiple suppliers.

Supplier

Which has in its catalogue one or more replacement intended for repair:

- Each supplier is defined by a name and a phone.
- We also keep track of suppliers who have not supplied any replacement.

Term Glossary

TERM	DESCRIPTION	SYNONYMS	CONNECTION
Car Dealer	Who has the concession for the sale and / or rental of one or more products of a company	Car Dealership	Repair, Sale, Rental
Sale	Contract by which ownership of a new or used car is transferred to a customer		Car Dealer, Customer, New Car, Used Car
Rental	Agreement relating to the temporary use of a used car by a customer		Car Dealer, Customer, Used Car
Customer	Who buys or rents cars	Buyer, Renter	Sale, Rental

New Car	New motor vehicle		Sale
Used Car	Used motor vehicle		Sale, Rental, Repair
Repair	Service for damage or failure suffered by a used car		Car Dealer, Used Car, Replacement
Replacement	Part used in a repair of a damaged car		Repair, Supplier
Supplier	Who sells the replacements for the used cars	Manufacturer, Vendor	Replacement

Table 2: Term glossary

Functional Requirements

The DBMS has the following functional requirements:

- Since it is a chain of car dealers, not a single car dealer, manage the different dealers located in different places.
- For each car dealer store their sale information.
- For each car dealer store their rental information.
- Each car dealer have the access to the progress of the activity, in particular can view sales, rentals and repairs regarding cars.
- Manage customer information such as name, surname, address, phone, through their purchases or rental in the car dealer.
- Allow the workers to check how many repairs an used car received.
- For each repair, keep track of the replacements used in quantity and their price.
- Store information of all the suppliers, even if they have never sold a part yet.
- Find the supplier that provides a given replacement at the lowest cost.
- For each car dealer to have a catalog that provides the list of used cars and new cars.
- Check that there is one car dealer associated to each sale / rental.
- Check that there is one customer associated to each sale / rental.
- Check that there is one new car / used car associated to each sale.
- Check that there is one used car associated to each rental.
- Check that there is one car dealer associated to each repair.
- Check that there is one supplier associated to each replacement.

Non Functional Requirements

The system must:

- Display responsive web page that it makes web pages render well on a variety of devices (Mobile and Tablet) and window or screen sizes from minimum to maximum display size.
- Guarantee a short response time for query commands.
- Implement a scheduled backup to avoid data losses in case of failures.
- Allow external connections (to supplier's websites) to periodically refresh the prices of the replacement parts.
- Users must have set at least 8 characters for the password which should be contain of capital letters, numbers, symbols.
- Passwords should be hidden and stored in an encrypted way.
- Sensitive data also must be encrypted.
- Secure connection should be used in order to transfer sensitive information.
- Two backups needed, backups must be saved in different places, the backups will be done weekly.
- Show the overall statistic through user-friendly graphs.
- Short response time when computing the overall statistics.
- Guarantee an asynchronous interaction between client and server.

Constraints

The DBMS should satisfy the following constraints:

- The database should be implemented in PostgreSQL.
- Required operating systems: Windows and Linux.
- Client side should be implemented in HTML5, CSS, JavaScript.
- Frameworks: Bootstrap.
- Libraries: JQuery.
- Server side should be implemented in PHP.

Contributions

Name	Surname	Contribution
Anahita	Abbaspour	
Mustafa	Algun	First half of Natural Language Sentences Small contribution on Constraints Grammar and typo check in Natural Language Sentences Final check of the whole report
Selen	Arslan	Second half of Natural Language Sentences Constraints Review of Natural Language Sentences for last version. Final check of the sections
Alex	Baron	Objectives Part of Natural Language Sentences Part of Filtered Sentences Constraints Layout adjustments Final review
Christian	Cattai	Interviewed car dealer's workers Small contr. to NonFuncReqs General readability and typos Final review
Fatjon	Freskina	Objectives Small contr. to Interviews General readability and typos
Enrico	Leka	Filtered Sentences Term Glossary Functional Requirements Final review
Marco	Milanese	Small contr. to Interviews Non-functional requirements Assorted small tweaks Final review
Giulio	Scattolin	Initial NLSentences draft Small contr. to readability and typos