

DBMS Project Description

INTEGRATED SUPPLY CHAIN AND FINANCIAL MANAGEMENT SYSTEM

Project Overview:

Your design and development team is charged with creating a comprehensive Enterprise Resource Planning (ERP) Database Schema to oversee the intricate operations of a manufacturing and supply chain company. This database is intended to streamline the workflow from design to production, regulate and evaluate the internal departmental structures and roles, and optimize the management of materials procured from diverse vendors. A pivotal component of this system is the adept handling of invoices, ensuring unequivocal sender details, and meticulous processing by the accounting department.

By the culmination of this project, the team should deliver a robust and efficient database schema proficient in accommodating the operational exigencies of a contemporary manufacturing entity, ensuring peak performance, precise employee management, and meticulous financial oversight.

The database will be designed to handle the following core components:

1. Management of employees across departments, warehouses, and production lines, ensuring everyone is distinctly allocated to one specific entity.
2. Overseeing the product lifecycle, from design departments conceptualizing products to the production lines manufacturing them.
3. Efficiently managing the flow of raw materials, whether they originate from warehouses or are directly supplied by vendors.
4. Tracking and processing of vendor-supplied invoices with clear sender identification, ensuring seamless financial operations within the accounting department.

Learning Value:

Through this endeavor, there will be a profound immersion into the multifaceted dynamics of production-oriented businesses, spanning from product design and raw material procurement to warehousing and production line oversight.

Business Rules and Attributes

The initial set of Business Rules:

- B1: The company has departments, warehouses, and production lines.
- B2: The company designs and produces products.
- B3: Each department, warehouse, and production line has multiple employees.
- B4: Each employee works in only one department, warehouse, or production line.
- B5: Some departments design products. Such departments design at least one product.
- B6: Different departments must not work on the same product.
- B7: Each product must be produced by one specific production line.
- B8: Each production line can produce only one product. For repair purposes, production lines may produce no products.
- B9: Raw materials are supplied by any number of warehouses, which are supplied by any number of vendors.
- B10: Raw materials may also be directly supplied by vendors.
- B11: Vendors can supply any number of materials.
- B12: Vendors submit invoices if they receive any orders.
- B13: Invoices must be processed by the accounting department.

The initial set of Entities and Attributes:

- Employee (ID, first name, last name, Salary, Position)
- Department (Name, Location, Number of employees, Phone Number)
- Product (Product number, Name, Price, Cost, Dimensions, Color, Weight, Raw Material)
- Production Line (Line Number, Line Capacity)
- Vendor (Company Name, Address, Phone Number, Specialty)
- Warehouse (Address, Phone Number)
- Invoice (Invoice Number, Total amount)

NOTE: The term "initial" in this document indicates that while a foundational structure is provided, there remains the flexibility to add or modify items based on the evolving needs of the project.

Consider the database schema initially consists of six relations, whose schemas are:

1. **Employee:** This table stores information related to the individual workers of the company.
(ID: NUM, first name: VARCHAR, last name: VARCHAR, Salary: NUM, Position: VARCHAR)
2. **Department:** This table captures details about the various departments within the company.
(Name: VARCHAR, Location: NUM, Number of employees: NUM, Phone Number: NUM)
3. **Product:** This table holds details about the products that the company designs and produces.
(Product Number: NUM, Name: VARCHAR, Price: NUM, Cost: NUM, Dimensions: NUM,
Color: VARCHAR, Weight: NUM, Raw Material: VARCHAR)
4. **Production Line:** Representing the manufacturing facet of the company, this table details the various production lines. (Line Number: NUM, Line Capacity: NUM)
5. **Vendor:** This table is dedicated to external suppliers or vendors who provide raw materials or other essential items to the company.
(Company Name: VARCHAR, Address: VARCHAR, Phone Number: NUM, Specialty: VARCHAR)
6. **Warehouse:** Highlighting the storage component of the company, this table records details about the warehouses where raw materials or products are stored.
(Address: VARCHAR, Phone NUMBER: NUM)
7. **Invoice:** This table maintains records of the financial transactions related to orders, specifically from vendors. (Invoice Number: NUM, Total Amount: NUM)

Given the initial tables and attributes provided, you might find certain relationships that need refining for optimal database efficiency. As you analyze the structure, consider if there's a need for additional tables or if normalization is warranted. Ensure the database's integrity by paying close attention to the interconnections between entities.

Database Design and Normalization Tasks

1.0 TASK 0

Develop a comprehensive repository, comprising both Metadata and Business Rules. Ensure this repository is systematically organized to facilitate ease of access, interpretation, and understanding. It's imperative to note that business rules can either be inferred by analyzing the project description or by scrutinizing the provided data. Moreover, these business rules should align seamlessly with your proposed models and designs.

1.1 TASK 1

Identify the most appropriate primary and foreign keys for all relations. In your finalized EER model, list out the Primary Keys and Foreign Keys for each relation. It's crucial to emphasize that this task should be executed step by step in tandem with tasks 2 and 4. Ensure that the reference to EER remains consistent throughout your documentation.

1.2 TASK 2

Illustrate the relationships using an EER diagram. Ensure the diagram is comprehensive and precise, devoid of any superfluous entities, relationships, or attributes. The EER model presented here can be your pre-normalization one.

1.3 TASK 3

Transform the given data into a relational schema. Please provide a concise description of 1) Unary, 2) Binary, and 3) Ternary relationships that you came up with in your model. Enumerate all the Binary relationships evident in the provided schema. Recognize any relevant integrity constraints for the database issue and establish them using specific database constraints.

1.4 TASK 4

For each relation, list out any functional dependencies, whether they're complete, partial, or transitive. Highlight and describe any anomalies. If normalization is needed, detail the normalization process. If normalization led to any data cleaning, please explain that as well. Should normalization be undertaken, showcase the final EER model or Relational Schema. Demonstrate that the schema adheres to 1NF, 2NF, and 3NF.

1.5 TASK 5: *(To do this task, you should first receive your Oracle Apex credentials from the instructors or one of the SAs. This will be provided to the whole class.)*

Task 5 is made up of five unique questions. SQL queries must be written for each inquiry to get the necessary data. Following the submission of the project proposal, these questions will be provided.