Implementation of database systems for order management for Mi Pymes

Carmen Sofia Florez Juajibioy [1]

[1]Universidad Distrital Francisco José de Caldas

INTRODUCTION

Efficient order management is crucial in modern commerce, where speed and accuracy are essential. This project, developed in the Database Fundamentals in Systems Engineering course, focuses on designing a relational database for a store order management application.

Although systems such as ERP and CRM improve order management (Smith, 2018; Johnson, 2019), their cost and complexity limit their accessibility for MSMEs. This project addresses these limitations by gathering requirements and using user stories, facilitating a clear understanding of end-user needs.

The database design uses the entity-relationship model (Chen, 1976) and is based on normalization principles and relational calculation techniques (Codd, 1970), ensuring the integrity and efficiency of the data. The implementation is carried out in MySQL, optimizing order management for stores of various types and improving inventory control and stakeholder satisfaction.

Methodology

This process is carried out through a 10-step ontology methodology, which ensures a design of the entity-relationship (ER) model

1. Identification of Entities: Identify the key entities of the store order management system.

2. Definition of Attributes: Specify the attributes associated with each entity to capture the relevant information.

3. Identification of Relationships: Analyze the interaction between entities to determine possible relationships between them.

4. Defining Constraints and Properties: Establish constraints and properties to ensure the integrity and consistency of the data stored in the database.

5. Attribute Refinement: Review the identified attributes and ensure that they are adequate to capture the necessary information.

6. Attribute Normalization: Apply normalization rules to avoid redundancy and improve data integrity.

7. Resolution of Many-to-Many Relationships:Resolve many-to-many relationships using a link or association entity.

8.Determination of Primary and Foreign Keys: Determine the primary and foreign keys to guarantee the uniqueness and referential integrity of the data.(Since many-to-many relationships were not identified in the design of the order management system database, this step was not applicable in this project.)

9. Creating the E-R Diagram: Use standard symbols to create the Entity-Relationship diagram that represents the structure of the database in a clear and understandable way (Figure. 1)

Entity relationship diagram

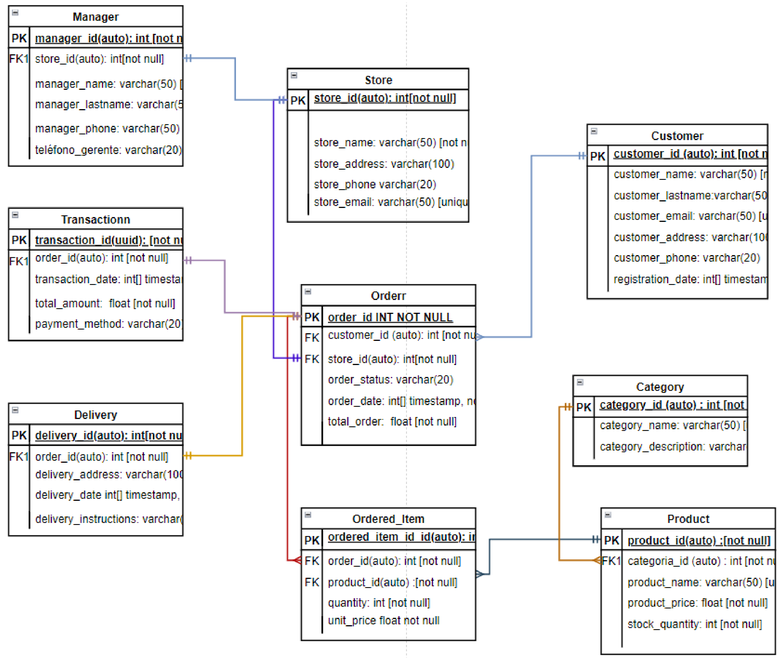

Figure 1.

Experiments

Relational algebra was used to perform queries in the database. Relational algebra offers a set of well-defined operators. Furthermore, its portability makes it easy to adapt to different database environments, making it a versatile and powerful tool for data manipulation. Below is one of the different queries performed:

- To allow customers to browse the product catalog, a projection operation is performed on the ”Product” entity, selecting the relevant attributes such as product ID, name, price and quantity in stock. This ensures that customers can see a complete list of available products along with their basic information. Query: πproductid,productname,productprice,stock-quantity,categoriaid(Product)

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A view called ”Product Catalog” was created to provide a list of products available in the store, showing details such as product name, price, and quantity in stock.

The resulting table is presented below:

	product_name	product_price	stock_quantity
	Action Figure	39.99	90
	Baby Monitor	99.99	25
	Baby Stroller	199.99	20
	Bicycle	299.99	15

Figure 2. Diagrama

Conclusions

During the development of this project, the main objective of improving order management in stores has been achieved through performing SQL queries beneficial to interested parties. The application of relational algebra has been fundamental for this achievement.

Performing SQL queries has provided us with valuable detailed information on various aspects of the business, including not only the availability of products in the store catalog and the status of completed orders, but also other relevant data. This information is crucial to both providing optimal service to customers and improving store operational efficiency. Customers benefit by being able to easily access product availability and track the status of their orders efficiently, contributing to a satisfying shopping experience. On the other hand, store managers also benefit significantly from this detailed information. They can use the data obtained through SQL queries to perform a thorough analysis of product demand, identify purchasing trends, and adjust inventory strategies accordingly. Additionally, access to real-time information on the status of completed orders allows them to monitor store operational performance and make informed decisions about resource allocation, production planning, and internal process optimization.

References

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sofiflorez2018@gmail.com