UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Development of a Database for an E-commerce System

David Santiago Buitrago C.[1] and Carlos Andres Pardo Angel[2]

[1]Universidad Distrital Francisco José de Caldas, Bogotá, Colombia

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Abstract

This project describes the development of a database for an e-commerce system, focusing on the design and implementation of a robust and scalable structure. The methodological aspects, results obtained, and conclusions derived from the development and implementation of the database are discussed.

Introduction

This project aims to develop a database for an e-commerce system, called ”MercadoFree”. The database will allow managing users, products, orders, shopping carts, purchase history, among other fundamental elements for the platform’s operation.

Methodology

Definition of Relationships

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
E1										
E2										
E3										
E4										
E5										
E6										
E7										
E8										
E9										
E10										

Figure 1: Table showing how relationships were defined

Conceptual Model

The conceptual model defines the main entities involved in the e-commerce system database. These include:

- **User**: User ID, Username, Email address, etc.
- **Product**: Product ID, Product name, Description, Price, Category, etc.
- **Order**: Order ID, User ID, List of products, Order status, etc. ...

Conceptual Diagram

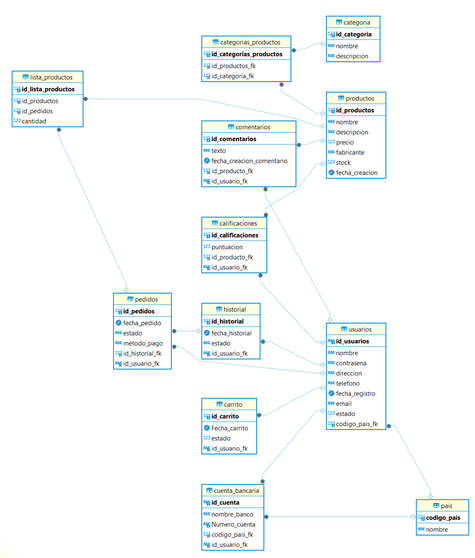

Figure 2: Conceptual diagram of the database

Relational Model

The implementation of the relational model was carried out through a series of steps that included entity normalization and the definition of one-to-many relationships. Some examples of queries in relational algebra include:

- Search for a specific user by username and email.
- Display relevant data for a product with a specific name within a price range.
- View the purchase history of a user.
- See all orders from a seller by their shipping status.

Example of Used Relational Algebra

$$\sigma_{\text{username}='username' \wedge \text{email}='email'}(\text{users})$$

Figure 3: Fragment showing a search by relational algebra

Data Generation

To test the database, fictitious data was generated using Python and libraries such as Faker. This allowed validating data consistency and maintaining relationships between entities. The generated data included realistic names, addresses, email addresses, products, and categories.

Results

The implementation of the database allowed testing performance under different load conditions. The results showed that the chosen design is capable of handling large volumes of data efficiently and effectively.

Example of Search

id_productos	nombre	precio	fabricante	promedio_puntuacion
1	Producto A	100	Fabricante A	5
6	Producto F	600	Fabricante F	5
11	Producto K	1.100	Fabricante K	5

Figure 4: Table showing a search for the top-rated products

Discussion

The discussion focused on the challenges faced during development, such as managing data consistency and optimizing queries to improve performance. Solutions and future improvements were proposed, including the integration of new functionalities and the expansion of the database.

Conclusion

The development of the database for the e-commerce system has allowed understanding the challenges associated with handling large volumes of data and the importance of a robust and scalable design. Future lines of work include expanding functionalities and optimizing performance.