# Database Foundations for Business Analytics

E-commerce Product Recommendation System

# Group 14

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**Abstract**

This project report delineates the design and modelling phases of the E-Commerce Product Recommendation System, with the aim of enhancing user engagement and boosting sales on an e-commerce platform. The document commences with an executive summary, providing a comprehensive overview of the logic design and modelling processes. Section 1 introduces the project, while Section 2 presents the Entity-Relationship (ER/EER) diagram and underlying assumptions. Section 3 expounds on the relational schema derived from the ER/EER diagram, outlining relationships, and accompanied by tabular data format specifications. Functional dependencies and normalization to the third normal form (3NF) are meticulously documented in Section 4. The report concludes with a concise summary, paving the way for the implementation phase and potential future refinements to address practical challenges and evolving requirements in the E-Commerce Product Recommendation System.

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1. **INTRODUCTION:**

This project seeks to create an E-Commerce Product Recommendation System designed to enrich the shopping experience for users on an e-commerce platform. Our primary objective is to address the challenge of enhancing user engagement, boosting sales, and elevating the shopping experience through personalized product recommendations. This approach aims to stimulate revenue growth, reinforce user loyalty, and establish a competitive edge for the e-commerce platform. We also aim to manage the inventory, by keeping track of the product availability

1. **CONCEPTUAL DESIGN:**
   1. ENTITY RELATIONSHIP DIAGRAM:

A diagram of a company

Description automatically generated

Fig 2.1 – Entity relationship diagram

2.2 CARDINALITY AND RELATIONSHIP EXPLANATION:

|  |  |
| --- | --- |
| **Expression** | **Discussion** |
| Customer(0,N)------------->Orders(N,N) | One customer can place 0 to many orders(0,N). However, each order can be placed only by one customer(N,N) |
| Orders(N,N)------------------>Products(0,N) | Each order can contain one or more products(N,N), and each product may or may not be part of an order.(0,N) |
| Customer(1,N)--------------->Interactions(N,N) | Each user must have at least one interaction.(1,N) Each interaction must be associated with one user(N,N) |
| Products(1,1)------------------------>Brands(1,N) | Each product must belong to exactly one brand (1, 1). Each brand must be associated with at least one product (1, N). |
| Products(1,1)----------------------->Categories(1,N) | Each product must belong to exactly one brand (1, 1). Each category must be associated with at least one product (1, N). |
| Interactions(1,1)----------------->Interaction\_Type | Each interaction must have exactly one interaction type (1, 1), and each interaction type must be associated with at least one interaction (1, N). |

1. **RELATIONAL SCHEMA:**
   1. RELATIONAL SCHEMA DIAGRAM:

3.2 DATA FORMAT FOR EVERY RELATION:

|  |  |  |
| --- | --- | --- |
| **Relation Name** | **Attributes** | **Date Type** |
| Orders | Order\_ID | Integer |
| User\_ID | Integer |
| Product\_ID | Integer |
| Quantity | Integer |
| Total\_Price | Decimal |
| Order\_Date | MM/DD/YYYY, string = 10 chars |

|  |  |  |
| --- | --- | --- |
| **Relation Name** | **Attributes** | **Date Type** |
| Products | Product Id | Integer |
| ProductName | String <= 30 |
| Category\_ID | Integer |
| Brand\_ID | Integer |
| Price | Decimal |

|  |  |  |
| --- | --- | --- |
| **Relation Name** | **Attributes** | **Date Type** |
| Brand | BrandName | String <= 30 |
| Brand\_ID | Integer |

|  |  |  |
| --- | --- | --- |
| **Relation Name** | **Attributes** | **Date Type** |
| Category | Category\_ID | Integer |
| Category\_Name | String <= 30 |

|  |  |  |
| --- | --- | --- |
| **Relation Name** | **Attributes** | **Date Type** |
| Interaction\_Type | InteractionName | String <= 30 |
| InteractionID | Integer |

|  |  |  |
| --- | --- | --- |
| **Relation Name** | **Attributes** | **Date Type** |
| Interaction | Interaction\_ID | Integer |
| User\_ID | Integer |
| Product\_ID | integer |
| Interaction\_Type\_ID | Integer |
| Timestamp | MM/DD/YYYY, string = 10 chars |
|  |  |

|  |  |  |
| --- | --- | --- |
| **Relation Names** | **Attributes** | **Date Type** |
| Recommendation Table | Interaction\_ID | Integer |
| User\_ID | Integer |
| Product\_ID | Integer |
| Recommendation Score | Decimal |

1. **NORMALIZATION:**

The defined schema and relational DB structure is already in normalized form. The below are the functional dependencies –

Customers:  
CustomerID -> {Name, Email, Age, Gender, Address}  
Email -> {CustomerID}

Orders:  
Order\_ID -> {CustomerID, Product\_ID, Quantity, Total\_Price, Order\_Date}

Products:  
Product\_ID -> {ProductName, Category\_ID, Brand\_ID, Price}

Brands:  
Brand\_ID -> {BrandName}

Categories:  
Category\_ID -> {CategoryName}

Interaction\_types:  
Interaction\_Type\_ID -> {InteractionName}

Interactions:  
Interaction\_ID -> {CustomerID, Product\_ID, Interaction\_Type\_ID, TimeStamp}

Recommendations:  
Interaction\_ID, CustomerID, Product\_ID -> {RecommendationScore}

**5. Conclusion**

In this report, we discuss and design the relational schema of the XXX Database. Our EER diagram and its associated relational schema show the conceptual and logical designs of the system. We also define data types and formats for each attribute in the relation. The next step is to implement this database. In the future, we may change some designs due to practical difficulties and other requirements.