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1. **Structural Business Rules**

Based on the operations that ‘Selling on Amazon’ supports, there should be 7 entities/tables:

* Category
* Product
* Seller
* Inventory
* Consumer
* Purchase
* Shipment

The business rules are based on the entities:

* A product must have an id, category, name, description, and price
* A category must have an id and name
* An inventory must have an id, seller id, product id, and inventory
* A seller must have an id and name
* An order must have an id, customer id, seller id, product id, and units purchased
* A customer must have an id, username, first name, last name, email, phone, and address
* A shipment must have a tracking id, order id, and shipping fee
* A product can only belong to one category
* A category can have one or more products
* A product can have zero or more inventory
* A seller can have zero or more inventory for each product they have
* An inventory can only belong to one product of a seller
* A seller can sell multiple products
* A product can be sold by multiple sellers
* A seller can deliver multiple products with different amounts to Amazon
* Amazon can receive multiple products with different amounts from multiple sellers
* A customer can sign up for one account on Amazon
* Amazon can create one account for a customer
* A customer can make zero or multiple orders for different products with different amounts from different sellers
* A product can have zero or multiple orders
* A seller can be involved in zero or more orders
* An order can only be linked with one customer, one seller, and one product
* Amazon can ship multiple products with different amounts to multiple customers
* A customer can receiver multiple products with different amounts from multiple sellers
* Each order must have one and only one shipment
* Each shipment must have one and only one order

1. **Conceptual ERD or EERD**

**Diagram

Description automatically generated**

1. **Logical ERD or EERD**

**Diagram

Description automatically generated**

1. **Addressing 5 aspects**

* **Aspect 1**

1. Stored procedure used when a seller needs to add any new product

Graphical user interface, text, application

Description automatically generated

1. A seller adds two new products
   * Stored Procedure Invocation

Graphical user interface, text, application, Word

Description automatically generated

* + Stored Procedure Result: 2 new rows have been added

Graphical user interface, text, application, email

Description automatically generated

1. Query requests information for

*“A seller is considering developing a new electronic product, and requests a list of existing products in the “Computers” or “Electronics” categories that cost $30 or less”*

Graphical user interface, text, application, email

Description automatically generated

* **Aspect 2: Amazon Receipt of Product from Seller**

1. Stored procedure used when any seller delivers any product to Amazon’s warehouse

When any product is delivered to Amazon’s warehouse, if the seller already has inventory of that product, the stored procedure will only update the inventory by adding more of it. Otherwise, the stored procedure will add the product with the inventory to the inventory table.

Graphical user interface, text, application

Description automatically generated

1. A seller delivers four each of the two new products added in Aspect 1 (the self‐driving video camera and the holographic keyboard)

I choose ‘Samsung’ to be the seller

* + Stored Procedure Invocation

Graphical user interface, text, application, email

Description automatically generated

* + Stored Procedure Result: 2 new rows have been added

Graphical user interface

Description automatically generated with medium confidence

1. Query requests information for

“The seller from b above requests a listing of all of its products that have an inventory of 11 or less”

Graphical user interface, text, application, email

Description automatically generated

* **Aspect 3: New Consumer Account**

1. Stored procedure used when any new customer signs up for a new account on Amazon.

**Graphical user interface, application

Description automatically generated**

1. I and my facilitator sign up for new accounts on Amazon
   * Stored Procedure Invocation:

**Graphical user interface, application, Word

Description automatically generated**

* + Stored Procedure Result: 2 new rows have been added

**Graphical user interface, application, email

Description automatically generated**

1. Query requests information for

“*For research purposes, Amazon requests the last names of consumers where there are least 4 accounts associated with the last name. Amazon would like to see the actual number of accounts associated with those last names.”*

**Graphical user interface, text, application, email

Description automatically generated**

* **Aspect 4: Product Purchase by Customer**

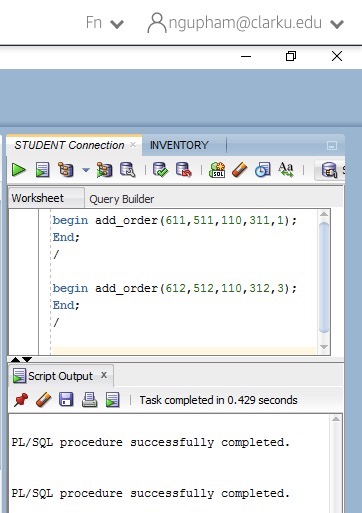
1. Stored procedure used when any customer purchases any product

When a customer purchases one or more products on Amazon, Amazon decrements the seller’s inventory for the products purchased before inserting purchase information into the Purchase table

Graphical user interface, text, application

Description automatically generated

1. I and my facilitator sign up for new accounts on Amazon
   * Stored Procedure Invocation:



* + Stored Procedure Result: 2 new rows have been added to Purchase table and the inventory in Inventory table decreases.

Table

Description automatically generated with medium confidence

A picture containing graphical user interface

Description automatically generated

1. Query requests information for

*“The marketing department at Amazon wants to reach out to consumers who buy popular products. The department requests the names and addresses of all consumers who bought any product that was purchased by at least three different people”*

Text

Description automatically generated

* **Aspect 5: Product Shipment by Amazon**

1. Stored procedure used when Amazon ships any order.

Graphical user interface, text, application

Description automatically generated

1. Amazon ships the orders listed in Aspect 4, one to me and the other to my facilitator.
   * Stored Procedure Invocation:

Graphical user interface, text, application

Description automatically generated

* + Stored Procedure Result: 2 new rows have been added

Table

Description automatically generated with medium confidence

1. My own query using a subquery provides the information for this request

*“The finance department at Amazon wants to know how the customer addresses, the specific products, or the units purchased affect the high shipping fee. The department requests the addresses of all consumers who place an order with more than $5 shipping fee, as well the products and the units purchased in the orders.”*

Graphical user interface, text

Description automatically generated

1. **Creation of the index**

Graphical user interface, text, application, chat or text message, email

Description automatically generated

|  |  |  |
| --- | --- | --- |
| **Aspect 1** | **Query** | **Indexed column(s)** |
| A seller is considering developing a new electronic product, and requests a list of existing products in the “Computers” or “Electronics” categories that cost $30 or less. | SELECT category.category\_name,product.product\_name,product.product\_price FROM category  LEFT JOIN product on category.category\_id = product.category\_id  WHERE category\_name in ('Electronics','Computers') and product\_price <=30; | *1) category.category\_name* (since it appears in WHERE clause).The index is **unique** since each category will have a unique name.  *2) product.product\_price* (since it appears in WHERE clause).The index is **non-unique** since many products can have the same price.  3) *product.category\_id* (FK, used in a JOIN condition, **non-unique** index as many products may have the same category)  (In addition, category.category\_id is automatically uniquely indexed as it is PK) |

In the above query, the WHERE clause and join conditions contain conditions that specify what rows from the tables will be present in the result set, which are the category of ‘Electronics’ and ‘Computers’ and the price of less than $30, as well as the joining of table Product and Category based on category\_id. The indexes are beneficial as the database can use category.category\_name, product.product\_price, and product.category\_id to locate the correct rows in the table in a timely fashion instead of scanning the whole table, and once the rows are located, can retrieve additional columns without searching again.