

Introduction to “Selling on Amazon”

Are there any online marketplaces more reputable than Amazon? Probably not. Why not? For one, Amazon has successfully made use of many unique innovations. For another, Amazon has significantly systematized the selling process, structuring a generalized marketplace which virtually any seller can plug into without much difficulty. Amazon has also become so large that it can negotiate discounts with international organizations, including significant shipping cost discounts. Simply speaking, other online marketplaces generally cannot compete.

One of Amazon’s innovations is Amazon fulfillment; Amazon handles the inventory, orders, shipping, returns, and customer service on behalf of the seller. To plug in to the marketplace, the seller only needs to deliver the products to one of Amazon’s warehouses and Amazon takes over from there.

Use Cases

Below are a series of use cases that help describe the operations your database supports.

Use Case 1 - New Product Created by Seller

This occurs when a seller plans to sell a product it has not sold before:

1. The seller searches Amazon’s product list to determine if another seller is already selling the product.
2. If a different seller is already selling the product, a new listing is not required; the seller re-uses the same listing.
3. If the product is not yet sold on Amazon, a new listing is created with the product’s name, description, price, and other relevant items. Every product added is linked to a product category (all categories are predefined by Amazon), for example, “Computers”, “Electronics”, “Appliances”, and similar.

Use Case 2 – Amazon Receipt of Product from Seller

This occurs when a seller sends one or more units of a product to Amazon so that they can be sold:

1. The seller ships one or more units of a product to Amazon's warehouse, along with information that indicates to Amazon what the product is, how many units there are, and the condition (new, used, etc ...).
2. After Amazon receives the product(s), it updates the seller's electronic inventory so that consumers can purchase the product.

Use Case 3 - New Consumer Account

This occurs when a consumer signs up for a new account on Amazon, so they can begin purchasing products:

1. The new consumer provides Amazon with basic information including a username, an address, phone number, and an email address.
2. Amazon creates an account for the consumer, enabling the consumer to purchase products.

Use Case 4 - Product Purchase by Consumer

This occurs when a consumer purchases a product from Amazon that was provided by a seller:

1. The consumer logs in to Amazon under their account.
2. The consumer selects one or more products on Amazon's website. When selecting a product, the consumer is actually selecting a particular seller's inventory, though they might not realize this because the process is seamless on Amazon's website.
3. The consumer selects a shipping speed (super saver shipping, standard shipping, two-day, one-day) and finalizes their choices.
4. Amazon decrements the seller's inventory for the products purchased.
5. Amazon creates an order which tracks which consumer purchased which products from which sellers.

Use Case 5 - Product Shipment by Amazon

This occurs when Amazon ships the product that consumer has purchased:

1. Amazon packages the purchased products and assigns an identifier to package so that it can be tracked.
2. Amazon links the package to the customer's order.

3. Amazon ships the package to the default address linked to the customer's account.
4. Amazon notifies the customer that it has been shipped and provides the customer with the tracking ID.

Project Breakdown

The following explains exactly what you will need to include in your project:

1: Structural Business Rules

Creating structural business rules at the outset will help guide the design throughout the rest of the sections. An example of this type of business rule not related to Amazon is “A car may be driven by many drivers; each driver drives one or more cars.” Each business rule should describe the entities involved, the relationship between the entities, and the optionality and plurality constraints for each entity. Try to make sure that you have created all the structural business rules required for each use case.

2: Entity-Relationship Diagrams

You will create a conceptual and logical Entity-Relationship diagram (ERDs) for this database. Your logical ERD will be mapped to a relational database schema through the use of SQL. The schema should contain tables, primary and foreign keys, and at least one index. The primary and foreign keys will help enforce the relationships indicated in the logical ERD and will help enforce referential integrity. Your tables should be normalized to BCNF (3.5NF) or accompanied with a justification as to why the table was not normalized.

3: Use Case Driven Aspects

The Use Cases described above are the primary driver for what tables, stored procedures, and queries are needed for your database. There are five aspects of your database you will develop based upon these use cases, with each aspect based on a single use case. Each aspect requires tables, a stored procedure, and a query for full implementation. The stored procedure for each aspect should be reusable through the use of parameters. For example, the stored procedure for Aspect 1 should use at least four parameters for the following elements: product name, product description, product price, and product category. The query for each aspect should be one single query that retrieves precisely the requested information. The completed schema design and implementation will address all five of these aspects.

***Important: Your database’s tables, stored procedures, and queries only need to address these aspects.**

It would not be feasible to attempt designing and building a full production-capable database for a large enterprise such as Amazon in the time period afforded by this course; such a database would have thousands of tables. Use the information provided in this document as a backdrop, then focus your design on these five aspects. A general guideline is that to effectively create the design for this course, you would have between 8 and 15 tables. This number is not exact and varies according to your specific implementation.

To help prove that your queries work, your tables need to be populated with sample data. In particular, all queries required by the five aspects should return results. Further, the results returned should make manifest the nuances of the query. For example, if a query selects only results matching a condition, there should be some underlying data that meets the condition, and other data that does not meet the condition. Although a production system may well have thousands or millions of rows, it is impractical for you to attempt such volume. Each table only needs a small number of rows with enough variety to help prove out the queries; you can use 10-20 rows per table as a rough guideline.

Use Case 1 - New Product Created by Seller

This occurs when a seller plans to sell a product it has not sold before:

4. The seller searches Amazon's product list to determine if another seller is already selling the product.
5. If a different seller is already selling the product, a new listing is not required; the seller re-uses the same listing.
6. If the product is not yet sold on Amazon, a new listing is created with the product's name, description, price, and other relevant items. Every product added is linked to a product category (all categories are predefined by Amazon), for example, "Computers", "Electronics", "Appliances", and similar.

Aspect 1: New Product Created by Seller

- a. Create the tables, constraints, and data needed to support new products as described in the use case.
- b. Develop a parameterized stored procedure that is used when a seller needs to add any new product.
- c. A seller adds two new products. The first is a self-driving video camera which automatically follows a subject that is being recorded. The second

is a holographic keyboard that emits a three-dimensional projection of a keyboard and recognizes virtual key presses from the typist. Invoke the stored procedure twice to add these products, keeping in mind that products have at a minimum a name, description, price, and category.

- d. 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. Develop and execute a single query that provides this information.

Aspect 2: Amazon Receipt of Product from Seller

- a. Create the tables, constraints, and data needed to support product delivery as described in the use case.
- b. Develop a parameterized stored procedure that is used when any seller delivers any product to Amazon’s warehouse.
- c. A seller delivers four each of the two new products added in Aspect 1 (the self-driving video camera and the holographic keyboard). Invoke the stored procedure twice to update the inventory of these products for a seller of your choosing.
- d. The seller from b above requests a listing of all of its products that have an inventory of 11 or less. Develop and execute a single query that provides this information (the self-driving video camera and holographic keyboard should be among those listed).

Aspect 3: New Consumer Account

- a. Create the tables, constraints, and data needed to support customer accounts as described in the use case.
- b. Develop a parameterized stored procedure that is used when any new customer signs up for a new account on Amazon.
- c. You and your facilitator sign up for new accounts on Amazon. Invoke the stored procedure twice to add you and your facilitator as customers.
- d. 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. Develop and execute a single query that provides this information.

Aspect 4: Product Purchase by Consumer

- a. Create the tables, constraints, and data needed to support product purchases as described in the use case.
- b. Develop a parameterized stored procedure that is used when any customer purchases any product.
- c. You purchase a self-driving video camera (from Aspect 1), and your facilitator purchases three holographic keyboards. Invoke the stored procedure twice, once for each purchase.
- d. 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. Develop and execute a single query that provides this information.

Aspect 5: Product Shipment by Amazon

- a. Create the tables, constraints, and data needed to support product shipments as described in the use case.
- b. Develop a parameterized stored procedure that is used when Amazon ships any order.
- c. Amazon ships the orders listed in Aspect 4, one to you and the other to your facilitator. Invoke the stored procedure twice, once for each order.
- d. Here you define your own query. Define a request for information for this aspect that is implemented with either aggregation or with a subquery. Then develop and execute a single query that provides this information.

4: Index Justification and Creation

You will justify and then create an index that is beneficial to at least one query in your implementation, including screenshots illustrating the creation of the index, along with an explanation as to why the index is beneficial (be specific).

5: Project Final Deliverables

Your final project submission will include two files, a Word document and a zip file. The contents of each are explained below.

The Word document should contain:

- Structural business rules
- Conceptual ERD or EERD
- Logical ERD or EERD
- Screenshots of the SQL addressing the five aspects (make sure to include screenshots of the query or stored procedure creation as well as the results of execution)
- A screenshot illustrating the creation of the index, along with an explanation as to why the index is beneficial (be specific).

The Word document does **not** need to include screenshots of other SQL, such as your table creation and data inserts, unless you want to clarify something. Keep in mind that part of the term project grade is exposition, so make sure to use sections and headers to keep the document organized, and to include explanations of any aspects of your project that warrant it.

The Zip file should contain SQL scripts that enable your Professor or TA to re-create your schema and execute your use case queries against the schema. A SQL script is nothing more than a text file that has a “.sql” extension in the filename. The following three scripts should be included, and you may include additional scripts if it makes sense for your implementation:

- A “create” script which contains the SQL DDL to create the tables, constraints, and stored procedures.
- An “insert” script which inserts data into the tables.
- An “aspect” script which contains the queries and stored procedure invocations for each of the 5 aspects.