Database Design: eCommerce

A guide for a database design for a sample eCommerce website

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This guide is a companion to my YouTube video on designing a database for an eCommerce website.

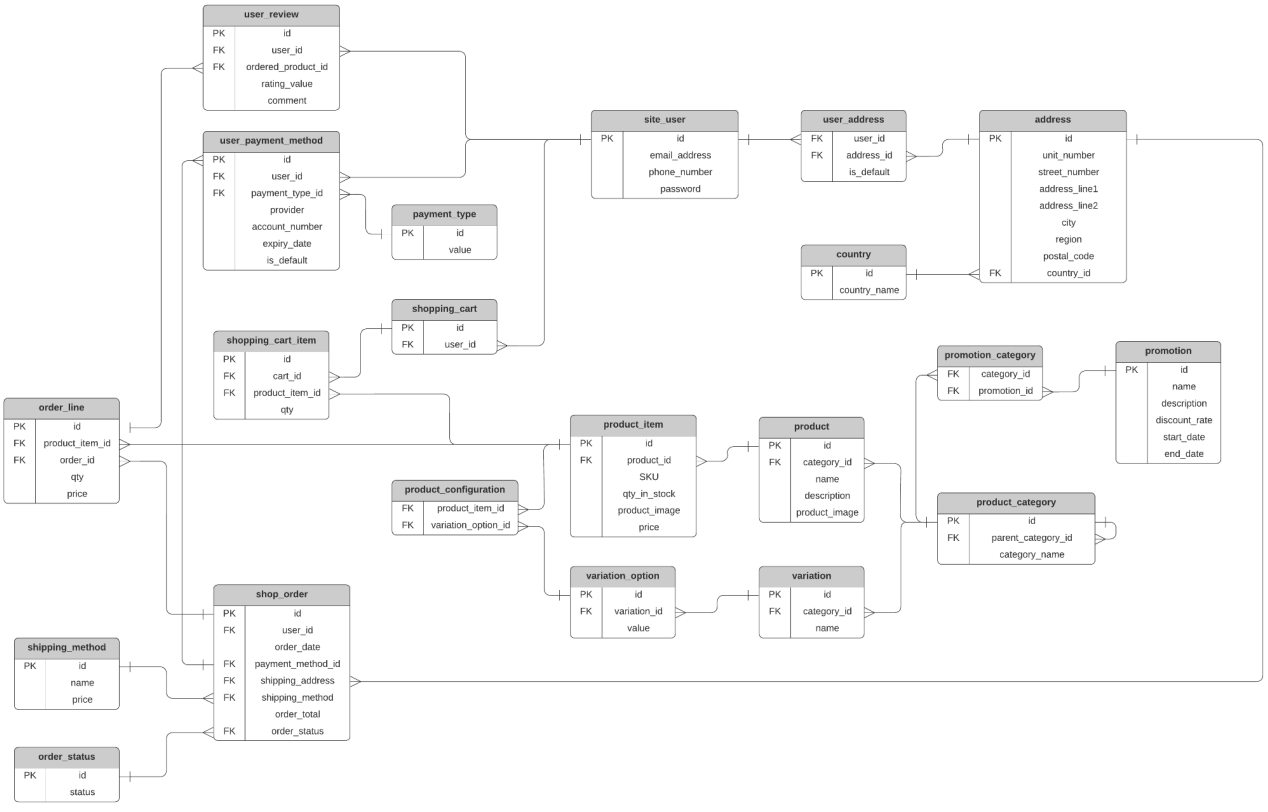
In this guide, you'll see:

- An Entity Relationship Diagram for an eCommerce website, from my YouTube video.
- An explanation of the purpose of each table and field, with sample data.
- SQL scripts to create each of these tables with some sample data.

Let's get into it.

Entity Relationship Diagram

Here's the ERD for this database:



A PNG file of this ERD is available here:

https://dbshostedfiles.s3.us-west-2.amazonaws.com/dsa/erd_ecommerce_database.png

Database Definition

This section explains each of these tables and fields.

site_user

A registered user of the website who can place orders.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
email_address	The email address for the user, which can be used to send order details to and to log in.	john@apple.com
phone_number	The phone number for the user which can be used to contact them.	0139029321
password	The password for the user's account on the website	An encrypted text value

user_address

A record of each of the addresses that a user has over their lifetime in the system.

Column	Description	Sample Data
user_id	A foreign key to the site_user table which represents the user record.	1, 2, 3
address_id	A foreign key to the address table which represents the address record.	1, 6, 20
is_default	A boolean value to indicate whether this address for this user is the user's default address when placing an order.	1, 0

address

A list of all of the addresses entered into the system, which are used to deliver orders.

Column	Description	Sample Data

id	Primary key. A unique identifier for the row.	1, 2, 3
unit_number	The unit number for this address.	55A, 8, 1
street_number	The street number for this address.	10, 45, 10015
address_line1	This will usually contain the street name and type of street	Johnston St Main Road
address_line2	This will usually contain the suburb, but could contain other information depending on the country.	South Croydon Brooklyn
city	The city that the address is in.	Portland Sydney Rome
region	The region that the address is in, which could be a state or a province.	California Queensland British Columbia
postal_code	The postal code for this address.	3000 90210 NW1
country_id	A foreign key to the country table to represent the country for this address.	2, 4, 17

country

A lookup table for countries which are used for addresses.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
country_name	The name of the country	Australia United States of America France

user_review

A record of a review left by a user for a product.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
user_id	A foreign key to relate to the user who left the review.	1, 4, 8
ordered_product_id	A foreign key to the order_line table, to relate to the product that was ordered.	4, 89, 102
rating_value	A value, such as from 1 to 5, that the user has left as part of the review for this product.	3, 5
comment	A text comment or written review for this product.	"This product met my expectations and is very sturdy."

user_payment_method

A list of payment methods that the user has set up for their account.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
user_id	A foreign key to the user table to indicate the user that this payment method is for.	1, 4, 19
payment_type_id	A foreign key to the payment_type table to indicate the type of payment.	2, 3
provider	The provider of this payment method	Mastercard Visa
account_number	The bank account number or credit card number for this payment	1234 5678 9012 3456
expiry_date	The expiry date for the payment method, if applicable.	10/25
is_default	A boolean value to indicate whether this is the default payment method for the user.	1, 0

Note: you may not want to store the full account number in this table due to payment card regulations. This design just shows where it may be stored in relation to everything else about the user.

payment_type

A lookup table of payment types for the payment methods.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
value	The payment type name or details.	Credit Card PayPal

shopping_cart

A record of the shopping carts that a user can set up for their account.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
user_id	A foreign key to the user table to indicate which user owns the shopping cart.	2, 4, 19

shopping_cart_item

The products that belong to a shopping cart for a user.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
cart_id	A foreign key to the shopping_cart table to indicate which shopping cart this record belongs to.	4, 8, 102
product_item_id	A foreign key to the product_item table to indicate which product_item is included in the shopping cart.	45, 10, 301
qty	The quantity of this item for the shopping cart.	1, 2, 10

shop_order

A record of an order that a user has placed for one or more products.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
user_id	A foreign key to the user table to indicate the user that placed the order.	34, 10, 201
order_date	The date and time that the order was placed.	2023-09-12 09:35:18
payment_method_id	A foreign key to the payment_method table to indicate the payment method used for this order.	13, 29, 40
shipping_address	A foreign key to the address table to indicate the address used for this order.	3, 10, 49
shipping_method	A foreign key to the shipping_method table to indicate the shipping_method chosen for this order.	1, 2
order_total	The total amount paid for this order, which may include product prices and the shipping method price.	210.00 1,823.95 95.50
order_status	A foreign key to the order_status table to indicate where in the lifecycle that this order is up to.	1, 3, 4

order_line

A record of a product for an order.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
product_item_id	A foreign key to the product_item table to indicate the product item added to this order.	3, 19, 209
order_id	A foreign key to the shop_order table to	20, 103, 158

	indicate which order this record is for.	
qty	The number of these product items that have been added to this order.	1, 5, 10
price	The price of this product_item for this order.	20.00 190.00 6.95

shipping_method

A lookup table of all of the shipping methods available for users.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
name	The name or description of this shipping method.	Standard Express Priority
price	The price the user pays for this shipping method	10 25 50

order_status

A lookup table of the different statuses that an order can have.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
status	The name of the order status that is readable by the user.	Ordered In Transit Delivered Cancelled

product_category

A list of categories that the products belong to. It also allows for subcategories.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
parent_category_id	A foreign key to another record in this table to indicate the parent category of this category	NULL, 2, 6, 8
category_name	The name of the category which is shown on the website	Clothing Men's Shoes Hair Products

product

A representation of a product that is shown on a list of products page.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
category_id	A foreign key to the product_category table to represent the category this product belongs to.	2, 5, 10
name	A name of the product which can be shown on the product page or list of products page.	Under Armour joggers Nike football joggers Asics Gel Kayano 34 Runners
description	A long description of the product	"A comfortable pair of jogger pants, these pants will…"
product_image	A URL for the image for this product.	yoursite.com/images/product_002.png

product_item

An instance of a product with all of its variations.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
product_id	A foreign key to the product table to indicate which product this item relates to.	4, 10, 45
SKU	A unique identifier for a product which may be shown on the website.	10970973
qty_in_stock	The number of items that the company has in stock.	0, 10, 85
product_image	A URL for the image for this product item, so that users can see different variations of the product on the page.	yoursite.com/images/product_00201.png
price	The price of this specific product item.	6.95 100.00 149.95

variation

A list of properties that can be configured for products within a category, such as Size and Colour.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
category_id	A foreign key to the product_category table to represent the category this variation belongs to.	2, 4, 7
name	The name of this variation, which could be shown on the product page or used in filters.	Size Colour Material

variation_option

A list of the possible values for each of the variations (such as S, M, L for the variation of Size).

Column	Description	Sample Data
id	Primary key. A unique identifier for the	1, 2, 3

	row.	
variation_id	A foreign key to the variation table tat represents the variation for this record.	2, 5, 9
value	The value that represents this option	S, M, L Blue, Red, Green Leather, Rubber, Suede

product_configuration

A combination of all of the variation options for a product item, such as the "Nike Basic Jogger" having a Colour of Black and a Material of Cotton.

Column	Description	Sample Data
product_item_id	A foreign key to the product_item table to indicate the product item for this record.	2, 8, 102
variation_option_id	A foreign key to the variation_option table to indicate the variation_option for this record	3, 18, 20

promotion

A list of promotions that the company may offer.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
name	The name of the promotion which could be displayed on the website.	Summer Sale Big Discount 2023
description	A description of the promotion which may also be shown on the website.	"Get great discounts on a range of products for this summer!"
discount_rate	The percentage of discount applied to the products	10% 25% 50%
start_date	The date the promotion starts	2023-08-01
end_date	The date the promotion ends	2023-08-30

promotion_category

A list of promotions and the categories they apply to.

Column	Description	Sample Data
category_id	A foreign key to the product_category table to represent the category for this record.	12, 18, 21
promotion_id	A foreign key to the promotion table to represent the promotion for this record.	15, 19, 23

SQL Scripts

Here is the SQL code to create the tables for this database.

The script is written for MySQL, but it can easily be modified to work on your preferred database vendor by changing the data types and removing the IF EXISTS (if your database doesn't support it).

```
CREATE DATABASE ecommerce;

USE ecommerce;

DROP TABLE IF EXISTS user_review;
DROP TABLE IF EXISTS order_line;
DROP TABLE IF EXISTS shop_order;
DROP TABLE IF EXISTS order_status;
DROP TABLE IF EXISTS shipping_method;
DROP TABLE IF EXISTS shopping_cart_item;
DROP TABLE IF EXISTS shopping_cart;
DROP TABLE IF EXISTS user_payment_method;
DROP TABLE IF EXISTS payment_type;
DROP TABLE IF EXISTS product_configuration;
DROP TABLE IF EXISTS variation_option;
DROP TABLE IF EXISTS variation;
DROP TABLE IF EXISTS product_item;
DROP TABLE IF EXISTS product;
DROP TABLE IF EXISTS promotion_category;
DROP TABLE IF EXISTS promotion;
DROP TABLE IF EXISTS product_category;
DROP TABLE IF EXISTS user_address;
DROP TABLE IF EXISTS site_user;
DROP TABLE IF EXISTS address;
DROP TABLE IF EXISTS country;

CREATE TABLE country (
     id INT AUTO_INCREMENT,
    country_name VARCHAR(500),
    CONSTRAINT pk_country PRIMARY KEY (id)
);

CREATE TABLE address (
     id INT AUTO_INCREMENT,
    unit_number VARCHAR(20),
    street_number VARCHAR(20),
    address_line1 VARCHAR(500),
    address_line2 VARCHAR(500),
    city VARCHAR(200),
    region VARCHAR(200),
```

```
    postal_code VARCHAR(20),
    country_id INT,
    CONSTRAINT pk_address PRIMARY KEY (id),
    CONSTRAINT fk_add_country FOREIGN KEY (country_id) REFERENCES
country (id)
);

CREATE TABLE site_user (
     id INT AUTO_INCREMENT,
    email_address VARCHAR(350),
    phone_number VARCHAR(20),
    password VARCHAR(500),
    CONSTRAINT pk_user PRIMARY KEY (id)
);

CREATE TABLE user_address (
     user_id INT,
    address_id INT,
    is_default INT,
    CONSTRAINT fk_useradd_user FOREIGN KEY (user_id) REFERENCES
site_user (id),
    CONSTRAINT fk_useradd_address FOREIGN KEY (address_id) REFERENCES
address (id)
);

CREATE TABLE product_category (
     id INT AUTO_INCREMENT,
    parent_category_id INT,
    category_name VARCHAR(200),
    CONSTRAINT pk_category PRIMARY KEY (id),
    CONSTRAINT fk_category_parent FOREIGN KEY (parent_category_id)
REFERENCES product_category (id)
);

CREATE TABLE promotion (
     id INT AUTO_INCREMENT,
    name VARCHAR(200),
    description VARCHAR(2000),
    discount_rate INT,
    start_date DATETIME,
    end_date DATETIME,
    CONSTRAINT pk_promo PRIMARY KEY (id)
);

CREATE TABLE promotion_category (
     category_id INT,
    promotion_id INT,
```

```
    CONSTRAINT fk_promocat_category FOREIGN KEY (category_id) REFERENCES
product_category (id),
    CONSTRAINT fk_promocat_promo FOREIGN KEY (promotion_id) REFERENCES
promotion (id)
);

CREATE TABLE product (
     id INT AUTO_INCREMENT,
    category_id INT,
    name VARCHAR(500),
    description VARCHAR(4000),
    product_image VARCHAR(1000),
    CONSTRAINT pk_product PRIMARY KEY (id)
);

CREATE TABLE product_item (
     id INT AUTO_INCREMENT,
    product_id INT,
    sku VARCHAR(20),
    qty_in_stock INT,
    product_image VARCHAR(1000),
    price INT,
    CONSTRAINT pk_productitem PRIMARY KEY (id),
    CONSTRAINT fk_proditem_product FOREIGN KEY (product_id) REFERENCES
product (id)
);

CREATE TABLE variation (
     id INT AUTO_INCREMENT,
    category_id INT,
    name VARCHAR(500),
    CONSTRAINT pk_variation PRIMARY KEY (id),
    CONSTRAINT fk_variation_category FOREIGN KEY (category_id)
REFERENCES product_category (id)
);

CREATE TABLE variation_option (
     id INT AUTO_INCREMENT,
    variation_id INT,
    value VARCHAR(200),
    CONSTRAINT pk_varoption PRIMARY KEY (id),
    CONSTRAINT fk_varoption_variation FOREIGN KEY (variation_id)
REFERENCES variation (id)
);

CREATE TABLE product_configuration (
     product_item_id INT,
    variation_option_id INT,
```

```
    CONSTRAINT fk_prodconf_proditem FOREIGN KEY (product_item_id)
REFERENCES product_item (id),
    CONSTRAINT fk_prodconf_varoption FOREIGN KEY (variation_option_id)
REFERENCES variation_option (id)
);

CREATE TABLE payment_type (
     id INT AUTO_INCREMENT,
    value VARCHAR(100),
    CONSTRAINT pk_paymenttype PRIMARY KEY (id)
);

CREATE TABLE user_payment_method (
     id INT AUTO_INCREMENT,
    user_id INT,
    payment_type_id INT,
    provider VARCHAR(100),
    account_number VARCHAR(50),
    expiry_date DATE,
    is_default INT,
    CONSTRAINT pk_userpm PRIMARY KEY (id),
    CONSTRAINT fk_userpm_user FOREIGN KEY (user_id) REFERENCES site_user
(id),
    CONSTRAINT fk_userpm_paytype FOREIGN KEY (payment_type_id)
REFERENCES payment_type (id)
);

CREATE TABLE shopping_cart (
     id INT AUTO_INCREMENT,
    user_id INT,
    CONSTRAINT pk_shopcart PRIMARY KEY (id),
    CONSTRAINT fk_shopcart_user FOREIGN KEY (user_id) REFERENCES
site_user (id)
);

CREATE TABLE shopping_cart_item (
     id INT AUTO_INCREMENT,
    cart_id INT,
    product_item_id INT,
    qty INT,
    CONSTRAINT pk_shopcartitem PRIMARY KEY (id),
    CONSTRAINT fk_shopcartitem_shopcart FOREIGN KEY (cart_id) REFERENCES
shopping_cart (id),
    CONSTRAINT fk_shopcartitem_proditem FOREIGN KEY (product_item_id)
REFERENCES product_item (id)
);

CREATE TABLE shipping_method (
```

```
     id INT AUTO_INCREMENT,
    name VARCHAR(100),
    price INT,
    CONSTRAINT pk_shipmethod PRIMARY KEY (id)
);

CREATE TABLE order_status (
     id INT AUTO_INCREMENT,
    status VARCHAR(100),
    CONSTRAINT pk_orderstatus PRIMARY KEY (id)
);

CREATE TABLE shop_order (
     id INT AUTO_INCREMENT,
    user_id INT,
    order_date DATETIME,
    payment_method_id INT,
    shipping_address INT,
    shipping_method INT,
    order_total INT,
    order_status INT,
    CONSTRAINT pk_shoporder PRIMARY KEY (id),
    CONSTRAINT fk_shoporder_user FOREIGN KEY (user_id) REFERENCES
site_user (id),
    CONSTRAINT fk_shoporder_paymethod FOREIGN KEY (payment_method_id)
REFERENCES user_payment_method (id),
    CONSTRAINT fk_shoporder_shipaddress FOREIGN KEY (shipping_address)
REFERENCES address (id),
    CONSTRAINT fk_shoporder_shipmethod FOREIGN KEY (shipping_method)
REFERENCES shipping_method (id),
    CONSTRAINT fk_shoporder_status FOREIGN KEY (order_status) REFERENCES
order_status (id)
);


CREATE TABLE order_line (
     id INT AUTO_INCREMENT,
    product_item_id INT,
    order_id INT,
    qty INT,
    price INT,
    CONSTRAINT pk_orderline PRIMARY KEY (id),
    CONSTRAINT fk_orderline_proditem FOREIGN KEY (product_item_id)
REFERENCES product_item (id),
    CONSTRAINT fk_orderline_order FOREIGN KEY (order_id) REFERENCES
shop_order (id)
);
```

```
CREATE TABLE user_review (
     id INT AUTO_INCREMENT,
    user_id INT,
    ordered_product_id INT,
    rating_value INT,
    comment VARCHAR(2000),
    CONSTRAINT pk_review PRIMARY KEY (id),
    CONSTRAINT fk_review_user FOREIGN KEY (user_id) REFERENCES site_user
(id),
    CONSTRAINT fk_review_product FOREIGN KEY (ordered_product_id)
REFERENCES order_line (id)
);
```

Conclusion

I hope you found this guide useful. If you have any questions or issues with it, let me know at ben@databasestar.com.

Thanks,

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