Product Management System

eStoreDB

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Checkpoint #	Date Submitted
Checkpoint III	07/14/2023
Checkpoint II	06/29/2023
Checkpoint I	06/19/2023

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Project Description

Motivation:
The reason behind creating this database system is to address the challenges faced by online businesses in managing their data both efficiently and effectively. Platforms focused on e-commerce generate large amounts of data given the amount of products available, customers, product orders, and inventory of said items. However, a daunting task involved with this is both the organization and utilization of the data. So the aim of this project, given these issues, is to create a user-friendly database that simplifies the data management aspect, enhances decision-making for customers, and improves the performance of said e-commerce platforms.

Description:
The database is designed to be used by platforms that focus on e-commerce. It will be a user-friendly experience and will provide an efficient backend infrastructure that supports the management, storage, and retrieval of all data. The database will give a smooth integration with the front-end application/s and use the most recent database technologies to ensure data integrity, optimal performance, and security. It will open the way for clear organization and in depth analysis of many different data types. These include, but not limited to, product information, customer details, order details, and records of inventory. The focus of this project is to create an easy to use database that meets the requirements of most e-commerce businesses.

Unique Features:

1. Product Categorization: The database system will provide tools that are easy to use for tagging and categorizing products. This feature will allow sellers to organize their product inventory enabling customers to find relevant products quicker.
2. Market Segmentation: The system will include functionality for segmenting customers based on various criteria. This feature will give sellers the ability to target specific customers with personalized marketing and promotions.
3. Inventory Tracking: The database system will offer inventory tracking and alerts for low stock levels. This feature will help sellers to manage their inventory, prevent stockouts, and ensure timely restocking.
4. Order Analytics: The system will provide analytical tools to create insights from order data, such as order frequency, average order value, and popular product

combinations. This feature helps sellers understand customer behavior, optimize pricing strategies, and identify up selling opportunities.

Existing Software Tools or Products:

1. Shopify: As a widely recognized e-commerce platform, Shopify offers a user-friendly interface and robust features for online businesses. By integrating the proposed database with Shopify, businesses can efficiently manage data, personalize marketing, track inventory, and gain valuable insights from order data.

2. Magento: Known for its flexibility and scalability, Magento is a popular e-commerce platform. Integrating the proposed database with Magento enhances data management, customer targeting, inventory tracking, and decision-making processes for businesses operating on this platform.

Functional Requirements

1. User:
    - 1.1. Many users shall be able to register with unique accounts.
    - 1.2. A user shall be able to log in using their credentials.
    - 1.3. A user shall be able to track the status of their orders.
    - 1.4. A user shall be able to subscribe or unsubscribe from newsletters or promotional emails.
    - 1.5. A user shall have a tracking id.
    - 1.6. ISA User:
        - 1.6.1. Seller (ISA User):
            - 1.6.1.1. A seller shall be able to edit additional information such as store name, contact details, and business information.
            - 1.6.1.2. A seller shall be able to manage their product inventory.
            - 1.6.1.3. A seller shall be able to create and manage product listings.
            - 1.6.1.4. A seller shall be able to view and manage orders specific to their store.
            - 1.6.1.5. A seller shall be able to track their sales and revenue.
        - 1.6.2. Registered User (ISA User):
            - 1.6.2.1. A registered user shall be able to update their personal info.
            - 1.6.2.2. A registered user shall be able to manage saved payment methods belonging to them.
            - 1.6.2.3. A registered user shall be able to view personalized product recommendations.
            - 1.6.2.4. A registered user shall be able to provide feedback or ratings for products.
            - 1.6.2.5. A registered user shall be able to manage their shipping addresses.
            - 1.6.2.6. A registered user shall be able to manage their payment methods.
2. Product:
    - 2.1. A product shall have a unique identifier.
    - 2.2. A product shall have a name, description, and price.
    - 2.3. A product shall be assigned to one or multiple categories.
    - 2.4. A product shall have one or multiple images associated with it.
    - 2.5. A product shall have stock availability information.

2.6. A product shall have specifications or attributes.
2.7. A product shall be able to be added to a user's cart.
2.8. A product shall have related products or recommendations.
2.9. A product shall be able to be searched or filtered by various criteria.
2.10. A product can be associated with multiple tags or keywords.
2.11. A product shall have only one main image.
2.12. A product will have at least one description.

3. Cart:
   3.1. A cart shall be associated with a user.
   3.2. A cart shall contain multiple products with quantities.
   3.3. A cart shall calculate the total price of all products.
   3.4. A cart shall be able to be saved for later by A registered user.
   3.5. A cart shall be able to be converted into an order by a user.
   3.6. A product can be added to multiple carts.
4. Order:
   4.1. An order shall be associated with at most onen registered user.
   4.2. An order shall have a unique order number.
   4.3. An order shall contain multiple products with quantities.
   4.4. An order shall include shipping and billing information.
   4.5. An order shall have a total price and payment status.
   4.6. An order shall have a status indicating if it is processing, shipped, or delivered.
   4.7. An order shall be able to be canceled or returned.
   4.8. An order shall include shipment tracking details.
   4.9. A registered user shall have the option to provide feedback or ratings for products in an order.
   4.10. A product can be part of multiple orders.
   4.11. An order will only have one shipping address.
   4.12. An order shall only have one billing address.
5. Category:
   5.1. A category shall have a unique identifier.
   5.2. A category shall have a name and description.
   5.3. A category shall be able to have parent or child categories.
   5.4. A category can have multiple parent categories.
   5.5. A category can have multiple child categories.
   5.6. A category shall be able to be assigned to multiple products.
   5.7. A category shall have a hierarchical structure.

5.8. A category may have a parent category.
5.9. A category may have one or multiple child categories.
5.10. A category shall be able to display its parent and child categories.
5.11. A category shall support multiple levels of nesting in the category hierarchy.
5.12. A category shall allow navigation through the hierarchical structure, enabling users to browse and filter products within specific categories and their subcategories.

6. Payment:
   6.1. A payment shall be associated with an order.
   6.2. A payment shall have a unique identifier or transaction ID.
   6.3. A payment shall have an amount and currency.
   6.4. A payment shall have a payment method (credit card, PayPal, etc.).
   6.5. A payment shall have a status indicating if it is authorized, captured, or refunded.
   6.6. A payment method shall be associated with one or many registered users.
   6.7. A registered user shall have at most one default payment method.
   6.8. An order can have multiple payments (e.g., split payment).
7. Review:
   7.1. A review shall be associated with only one product.
   7.2. A review shall be associated with only one registered user.
   7.3. A review shall have a rating (star rating, thumbs up/down, …).
   7.4. A review shall have a title and written feedback.
   7.5. A review shall have a timestamp indicating when it was submitted.
   7.6. A product can have multiple reviews.

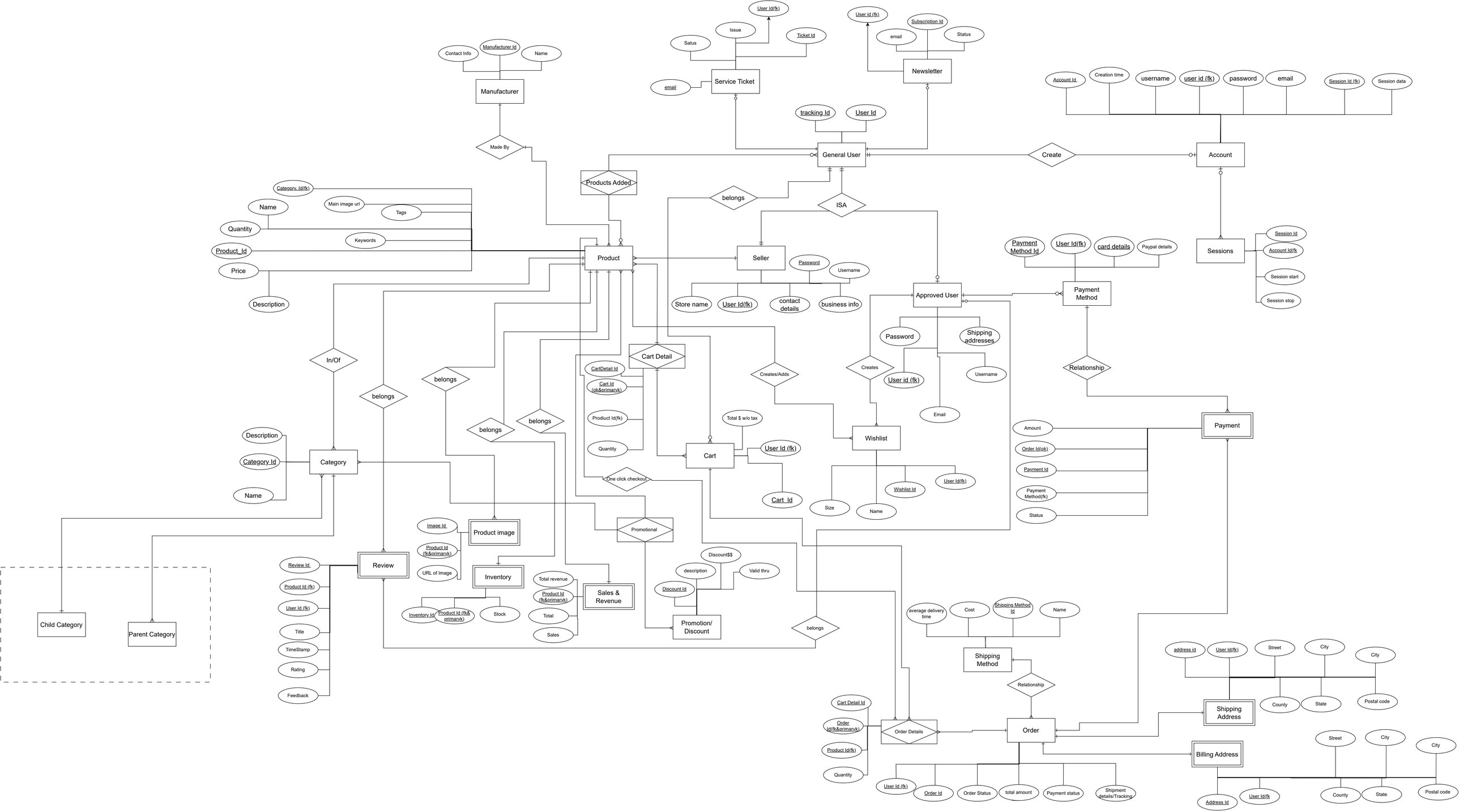
Non-Functional Requirements

1. Performance:
    1.1. The system shall respond to user interactions within an acceptable time frame.
    1.2. The system shall handle a large number of users at once without significant lag.
    1.3. The system shall ensure quick and efficient loading of product media.
2. Reliability:
    2.1. The system shall be available and accessible to users with minimal downtime.
    2.2. The system shall be resilient to failures and errors and provide appropriate error handling and recovery tools.
    2.3. The system shall backup and securely store user data to prevent data loss.
3. Security:
    3.1. The system shall protect user data from unauthorized access.
    3.2. The system shall encrypt sensitive user data, ie. passwords/payment information.
    3.3. The system shall implement HTTPS to protect data during exchange between users and the system.
    3.4. The system shall adhere to industry standards and best practices for security, including updates.
4. Scalability:
    4.1. The system shall be designed to accommodate future growth and increasing user demand.
    4.2. The system shall scale horizontally or vertically to handle increased load and traffic.
    4.3. The system shall be able to handle a growing product catalog and increasing database size without performance decline.
5. Storage:
    5.1. The database shall assign 10 MB of memory per table.
    5.2. The database system should support persistent storage.
6. Usability:
    6.1. The user interface shall be user-friendly and easy to navigate.
    6.2. The system shall give clear error messages to resolve any issues promptly

7. Maintainability:
    7.1. The system shall be modular and maintainable, allowing for easy updates and enhancements.
    7.2. The system shall have proper documentation to facilitate maintenance and troubleshooting.
    7.3. The system shall provide an efficient and reliable mechanism for system administrators to apply updates and patches.
8. Compatibility:
    8.1. The system shall be compatible with popular web browsers and mobile devices.
    8.2. The system shall integrate with external services, such as payment gateways and shipping providers, following their specified integration guidelines and APIs.
9. Data Integrity:
    9.1. The system shall ensure the accuracy and consistency of data stored in the database.
    9.2. The system shall implement proper data validation and sanitization.
10. Localization:
    10.1. The system shall support multiple languages and handle localized date and time formats, currency, and other locale-specific conventions.
11. Sessions:
    11.1. The system shall manage user sessions securely and efficiently.
    11.2. The system shall generate a unique session identifier upon user login and associate it with the user's session.
    11.3. The system shall provide a mechanism to invalidate sessions upon user logout.
    11.4. The system shall enforce session timeouts to automatically log out inactive users and ensure session security.

Entity Relationship Diagram

(NEXT PAGE)


User Id(fk)
Issue
Satus
Ticket Id
email
Service Ticket
User id (fk)
Subscription Id
email
Status
Newsletter
Contact Info
Manufacturer Id
Name
Manufacturer
Made By
tracking Id
User Id
General User
Account Id
Creation time
username
user id (fk)
password
email
Session Id (fk)
Session data
Create
Account
Products Added
belongs
ISA
Category_Id(fk)
Name
Main image url
Tags
Quantity
Keywords
Product_Id
Price
Description
Product
Seller
Password
Username
Store name
User Id(fk)
contact details
business info
Approved User
Payment Method Id
User Id(fk)
card details
Paypal details
Payment Method
Sessions
Session Id
Account Id(fk
Session start
Session stop
Password
Shipping addresses
Username
Email
In/Of
belongs
belongs
belongs
belongs
Cart Detail
CartDetail Id
Cart Id (pk&primaryk)
Prodiuct Id(fk)
Quantity
Creates/Adds
Creates
User id (fk)
Relationship
Total $ w/o tax
Wishlist
User Id (fk)
Cart
Cart_Id
One click checkout
Wishlist Id
User Id(fk)
Size
Name
Description
Category Id
Name
Category
Amount
Order Id(pk)
Payment Id
Payment Method(fk)
Status
Payment
Image Id
Product Id (fk&primaryk)
URL of Image
Product image
Promotional
Review
Review Id
Product Id (fk)
User Id (fk)
Title
TimeStamp
Rating
Feedback
Inventory
Inventory Id
Product Id (fk& primaryk)
Stock
Total revenue
Product Id (fk&primaryk)
Total
Sales
Sales & Revenue
Discount$$
description
Discount Id
Valid thru
Promotion/ Discount
Child Category
Parent Category
belongs
average delivery time
Cost
Shipping Method Id
Name
Shipping Method
Relationship
Cart Detail Id
Order Id(fk&primaryk)
Product Id(fk)
Quantity
Order Details
Order
User Id (fk)
Order Id
Order Status
total amount
Payment status
Shipment details/Tracking
address id
User Id(fk)
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City
City
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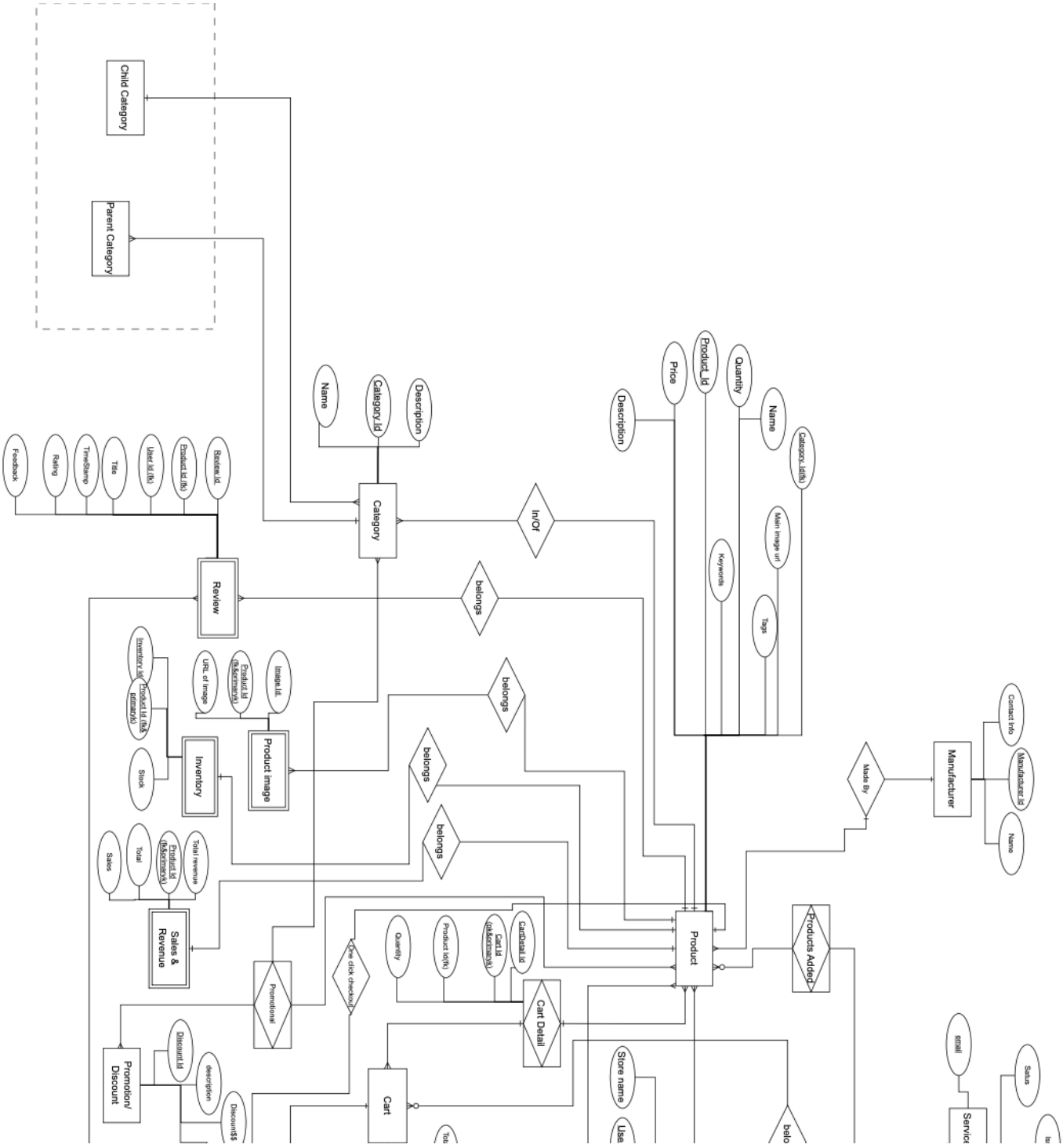
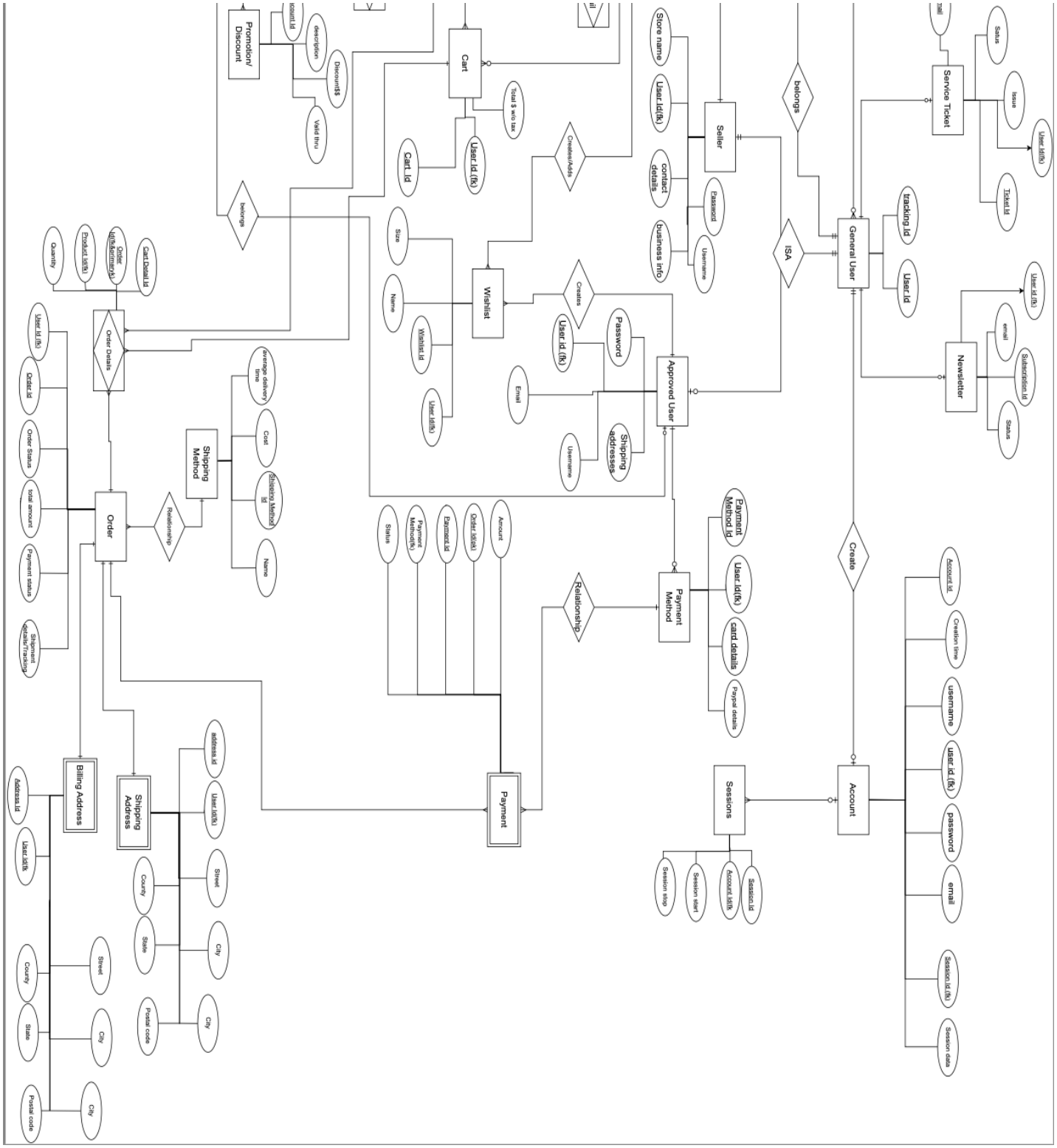
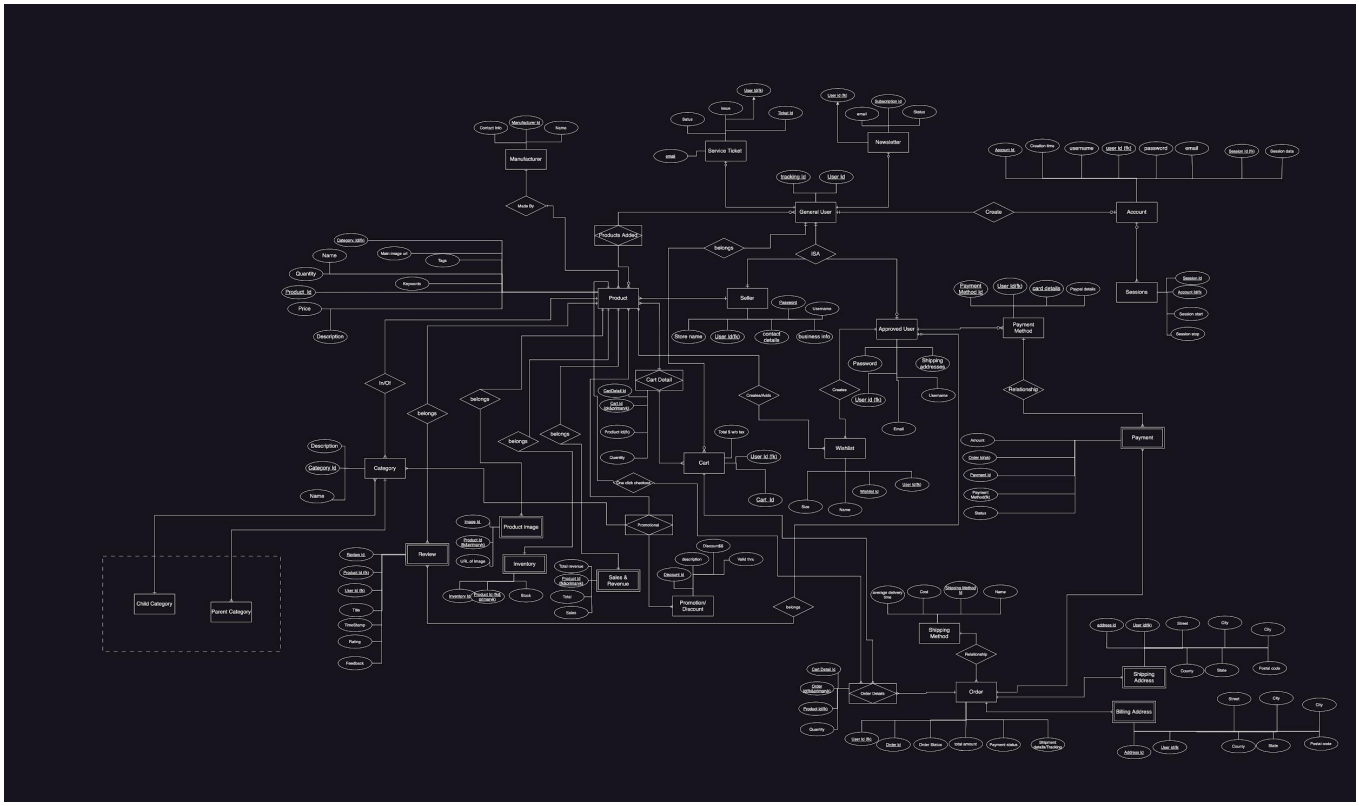
County
State
Postal code
Billing Address
Street
City
City
Address Id
User Id(fk
County
State
Postal code


Child Category
Parent Category
Name
Category_id
Description
Feedback
Rating
TimeStamp
Title
User_id (fk)
Product_id (fk)
Review_id
Category
In/Of
Review
belongs
Price
Product_Id
Quantity
Name
Description
Category_id(fk)
Main image url
Keywords
Tags
Product
Made By
Manufacturer
Contact Info
Manufacturer_id
Name
Inventory_id
Product_id (fk&comp pk)
URL of image
Product_id (fk&comp pk)
Image_id
Product image
belongs
belongs
belongs
Inventory
Stock
Sales
Total
Product_id (fk&comp pk)
Total revenue
Sales & Revenue
Products Added
CartDetail_id
Cart_id (pk&comp pk)
Product_id(fk)
Quantity
Cart Detail
One click checkout
Promotionel
Promotion/ Discount
Discount_id
description
Discount$
Cart
Store name
email
Service


Service Ticket
Status
Issue
User.Id(fk)
Ticket.Id
General User
tracking.Id
User.Id
belongs
ISA
Seller
Store name
User.Id(fk)
contact details
business info
Password
Username
Newsletter
User.Id(fk)
email
Subscription.Id
Status
Create
Account
Account.Id
Creation time
username
user.id.(fk)
password
email
Session.id.(fk)
Session data
Sessions
Session.Id
Account.Id(fk)
Session start
Session stop
Cart
Total $ w/o tax
Cart_Id
User.Id. (fk)
Promotion/ Discount
description
Discount$
Valid thru
Creates/Adds
belongs
Wishlist
Size
Name
WishlistId
User.Id(fk)
Creates
User.id.(fk)
Password
Email
Username
Approved User
Shipping addresses
Payment Method Id
User.Id(fk)
card details
Paypal details
Payment Method
Relationship
Payment
Amount
Order.Id(pk)
Payment.Id
Payment Method(fk)
Status
Order Details
Quantity
Product.Id(fk)
Order Id(Autoincrement)
Cart Detail.Id
User.Id. (fk)
Order.Id
Order Status
total amount
Payment status
Shipment details/Tracking
Order
Relationship
Shipping Method
average delivery time
Cost
Shipping Method Id
Name
Billing Address
Address.Id
User.Id(fk)
Country
State
Street
City
Postal code
Shipping Address
address.Id
User.Id(fk)
Street
City
Country
State
Postal code


Manufacturer
Service Ticket
Newsletter
General User
Account
Product
Seller
Approved User
Payment Method
Sessions
Cart Detail
Cart
Wishlist
Payment
Category
Child Category
Parent Category
Product Image
Review
Inventory
Sales & Revenue
Promotions/ Discount
Shipping Method
Order
Order Details
Shipping Address
Billing Address

Entity Relationships

Strong Entities

1. Account (Strong)
    a. account_id: key, numeric
    b. user_id: foreign key, numeric
    c. last_login_timestamp: timestamp
    d.
2. Cart (Strong)
    a. cart_id: key, numeric
    b. user_id: foreign key, numeric
    c. total_price: numeric
    d.
3. Category (Strong)
    a. category_id: key, numeric
    b. name: composite, alphanumeric
    c. description: composite, alphanumeric

4. Session (Strong)
    a. session_id: key, numeric
    b. account_id: foreign key, numeric
    c. login_timestamp: timestamp

5. Discount (AKA PROMOTION) (Strong)
    a. discount_id: key, numeric
    b. discount_code: composite, alphanumeric
    c. discount_value: numeric

6. Payment Method (Strong)
    a. payment_method_id: key, numeric
    b. user_id: foreign key, numeric
    c. method_detail: composite, alphanumeric
    d.
7. Shipping Method (Strong)
    a. shipping_method_id: key, numeric
    b. method_detail: composite, alphanumeric
    c. cost
8. Order (Strong)

   a. order_id: key, numeric
   b. user_id: foreign key, numeric
   c. total_price: numeric
9. Approved User (Strong, ISA General User)
   a. user_id: key, numeric (inherited)
   b. username: composite, alphanumeric
   c. email: composite, alphanumeric

10. Manufacturer (Strong)
   a. manufacturer_id: key, numeric
   b. name: composite, alphanumeric
   c. contact_detail: composite, alphanumeric

11. Newsletter (Strong)
   a. newsletter_id: key, numeric
   b. newsletter_type: composite, alphanumeric
   c. subscription_status: boolean

12. General User (Strong)
   a. user_id: key, numeric
   b. tracking_id: composite, alphanumeric
   c. user_type: multivalue, alphanumeric

13. Service Ticket (Strong)
   a. ticket_id: key, numeric
   b. user_id: foreign key, numeric
   c. issue_description: composite, alphanumeric

14. Wishlist (Strong)
   a. wishlist_id: key, numeric
   b. user_id: foreign key, numeric
   c. product_ids: multivalue, numeric

15. Seller (Strong, ISA General User)
   a. user_id: key, numeric (inherited)
   b. store_name: composite, alphanumeric
   c. contact_details: composite, alphanumeric

16. Product (Strong)
   a. product_id: key, numeric

b. name: composite, alphanumeric
c. price: numeric

Weak Entities:

1. Payment (Weak)
    a. payment_id: key, numeric
    b. order_id: foreign key, numeric
    c. amount: numeric
2. Shipping Address (Weak)
    a. shipping_id: key, numeric
    b. user_id: foreign key, numeric
    c. address_detail: composite, alphanumeric

3. Billing Address (Weak)
    a. billing_id: key, numeric
    b. user_id: foreign key, numeric
    c. address_detail: composite, alphanumeric

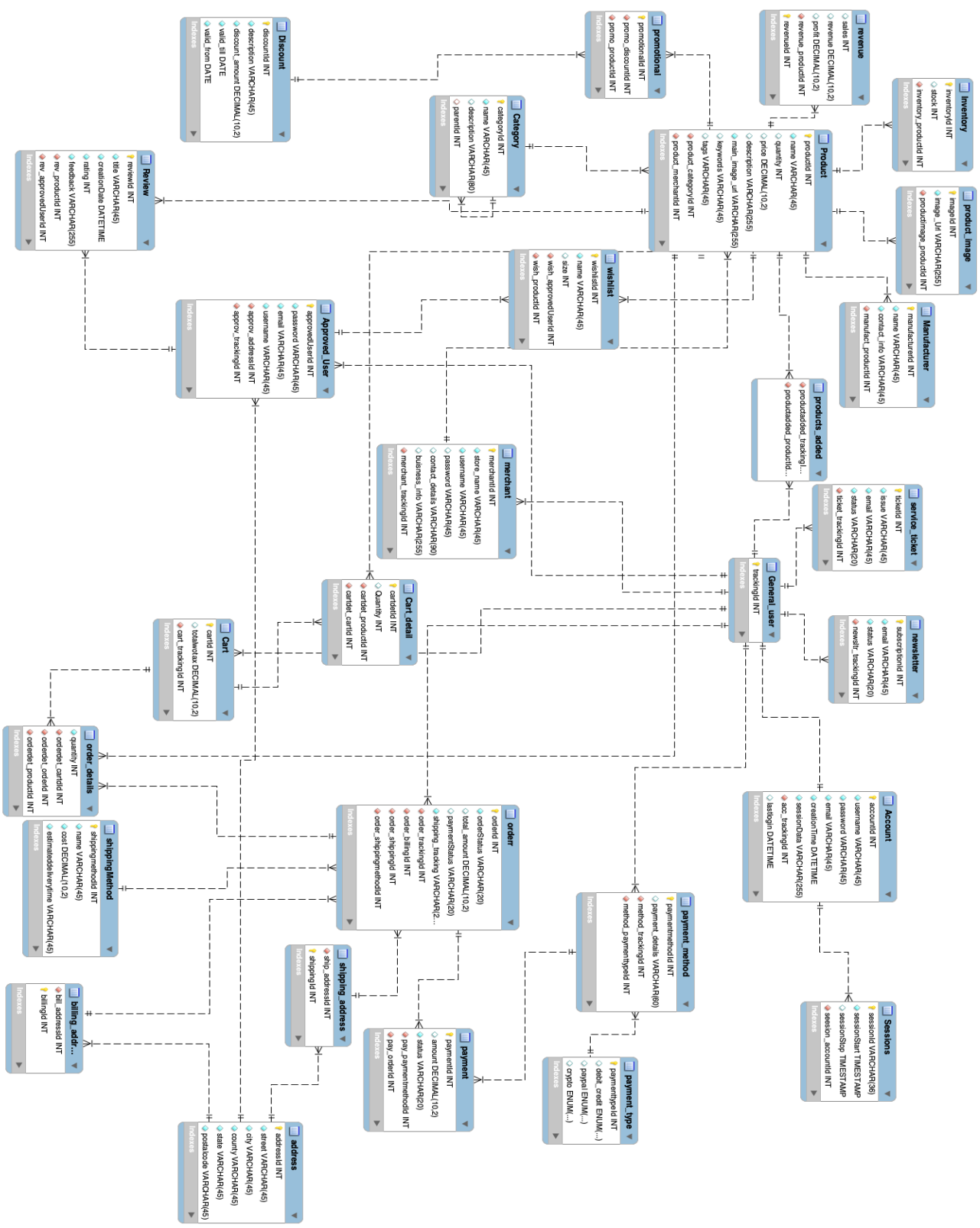
4. Sales and Revenue (Weak)
    a. revenue_id: key, numeric
    b. seller_id: foreign key, numeric
    c. sales: numeric
    d. revenue: numeric

5. Inventory (Weak)
    a. inventory_id: key, numeric
    b. product_id: foreign key, numeric
    c. stock_availability: numeric

6. Product Image (Weak)
    a. image_id: key, numeric
    b. product_id: foreign key, numeric
    c. image_location: alphanumeric

7. Review (Weak)
    a. review_id: key, numeric
    b. user_id: foreign key, numeric
    c. product_id: foreign key, numeric
    d. rating: numeric
    e. feedback: composite, alphanumeric

EER DIAGRAM


Inventory
inventoryId INT
stock INT
inventory_productId INT
revenue
sales INT
revenue DECIMAL(10,2)
profit DECIMAL(10,2)
revenue_productId INT
revenueId INT
product_image
imageId INT
image_Url VARCHAR(255)
productImage_productId INT
promotional
promotionalId INT
promo_discountId INT
promo_productId INT
Discount
discountId INT
description VARCHAR(45)
discount_amount DECIMAL(10,2)
valid_till DATE
valid_from DATE
Category
categoryId INT
name VARCHAR(45)
description VARCHAR(80)
parentId INT
Product
productId INT
name VARCHAR(45)
quantity INT
price DECIMAL(10,2)
description VARCHAR(255)
main_image_url VARCHAR(255)
keywords VARCHAR(45)
tags VARCHAR(45)
product_categoryId INT
product_merchantId INT
Manufacturer
manufacturerId INT
name VARCHAR(45)
contact_info VARCHAR(45)
manufact_productId INT
Review
reviewId INT
title VARCHAR(45)
creationDate DATETIME
rating INT
feedback VARCHAR(255)
rev_productId INT
rev_approvedUserId INT
wishlist
wishlistId INT
name VARCHAR(45)
size INT
wish_approvedUserId INT
wish_productId INT
products_added
productadded_productId...
productadded_trackingI...
Approved_User
approvedUserId INT
password VARCHAR(45)
email VARCHAR(45)
username VARCHAR(45)
approv_addressId INT
approv_trackingId INT
merchant
merchantId INT
store_name VARCHAR(45)
username VARCHAR(45)
password VARCHAR(45)
contact_details VARCHAR(90)
business_info VARCHAR(255)
merchant_trackingId INT
service_ticket
ticketId INT
issue VARCHAR(45)
email VARCHAR(45)
status VARCHAR(20)
ticket_trackingId INT
General_user
trackingId INT
newsletter
subscriptionId INT
email VARCHAR(45)
status VARCHAR(20)
newsltr_trackingId INT
Cart_detail
cartdetId INT
Quantity INT
cartdet_cartId INT
cartdet_productId INT
Cart
cartId INT
totaltaxtax DECIMAL(10,2)
cart_trackingId INT
Account
accountId INT
username VARCHAR(45)
password VARCHAR(45)
email VARCHAR(45)
creationTime DATETIME
sessionData VARCHAR(255)
acc_trackingId INT
lastlogin DATETIME
Sessions
sessionId VARCHAR(36)
sessionStart TIMESTAMP
sessionStop TIMESTAMP
session_accountId INT
order_details
quantity INT
orderdet_cartdid INT
orderdet_orderId INT
orderdet_productId INT
order
orderId INT
orderStatus VARCHAR(20)
total_amount DECIMAL(10,2)
paymentStatus VARCHAR(20)
shipping_tracking VARCHAR(2...
order_trackingId INT
order_billingId INT
order_shippingId INT
order_shippingmethodId INT
payment_method
paymentmethodId INT
payment_details VARCHAR(80)
method_trackingId INT
method_paymentypeId INT
payment_type
paymentypeId INT
debit_credt ENUM(...)
paypal ENUM(...)
crypto ENUM(...)
shippingMethod
shippingmethodId INT
name VARCHAR(45)
cost DECIMAL(10,2)
estimatedeliverytime VARCHAR(45)
shipping_address
ship_addressId INT
shippingId INT
payment
paymentId INT
amount DECIMAL(10,2)
status VARCHAR(20)
pay_paymentmethodId INT
pay_orderId INT
billing_addr...
bill_addressId INT
billingId INT
address
addressId INT
street VARCHAR(45)
city VARCHAR(45)
county VARCHAR(45)
state VARCHAR(45)
postalcode VARCHAR(45)

Constraints Description

Table	FK	On Delete	On Update	Comment
Account	acc_trackingId	Cascade	Cascade	When a General_user is deleted or its trackingId is updated, it should also delete/update corresponding records in the Account table.
Sessions	seesion_accountId	Cascade	Cascade	When an Account is deleted or its accountId is updated, it should also delete/update corresponding records in the Sessions table.
newsletter	newsltr_trackingId	-	Cascade	When a General_user is updated, the corresponding records in the newsletter table should reflect the new trackingId.
service_ticket	ticket_trackingId	-	Cascade	When a General_user is updated, the corresponding records in the service_ticket table should reflect the new trackingId.
product_image	productimage_productId	-	Cascade	When a product ID is updated, the corresponding records in the product_image table should also be updated
Inventory	inventory_productId	-	Cascade	When a product ID is updated, the corresponding records in the Inventory table should also be updated.

Cart	cart_trackingId	-	Cascade	When a General_user trackingId is updated, the corresponding records in the Cart table should also be updated.
Cart_detail	cartdet_productId	-	Cascade	When a General_user trackingId is updated, the corresponding records in the Cart table should also be updated.
Cart_detail	cartdet_cartId	-	Cascade	When a Cart is updated, the corresponding records in the Cart_detail table should reflect the new cart ID.
orderr	order_trackingId	-	Cascade	When a General_user is updated, the corresponding records in the orderr table should reflect the new trackingId.
orderr	order_shippingId	Cascade	-	The shipping_address table defines the shipping addresses associated with orders. Deleting a shipping address should delete the associated orders. However, updating the shipping address ID should not affect the association between orders and shipping addresses.
wishlist	wish_approvedUserId	-	Cascade	When an Approved_User approved user ID is updated, the corresponding records in the wishlist table should remain intact. However, if an Approved_User is updated, the corresponding records in

				the wishlist table should reflect the new approved user ID.
revenue	revenue_productId	Cascade	Cascade	When a product is deleted or its product ID is updated, the corresponding records in the revenue table should also be deleted/updated.
payment_method	paymethod_userId	-	Cascade	When a General_user trackingId is updated, the corresponding records in the payment_method table should remain intact. However, if a General_user is updated, the corresponding records in the payment_method table should reflect the new trackingId.
products_added	prdadd_trackingId	Cascade	Cascade	When a General_user is deleted or its trackingId is updated, the corresponding records in the products_added table should also be deleted/updated.
promotional	promo_productId	-	Cascade	When a product is deleted or its product ID is updated, the corresponding records in the promotional table should remain intact. However, if a product is updated, the corresponding records in the promotional table should reflect the new product ID.
promotional	promo_discountId	Cascade		The Discount table defines the available discounts.

				Deleting a discount should delete the associated promotions. However, updating the discount ID should not affect the association between promotions and discounts.
shipping_address	ship_addressId	Cascade		When a shipping address is deleted, the associated orders should also be deleted. However, updating a shipping address should not affect the association between orders and shipping addresses.