

Walmart Data Management

Destin Blanchard, Varsha Manju Jayakumar, Téa McCormack, Mason Shu, Felipe Zapater



**Walmart's
Data
Management
Strategy**

OLTP Systems

**Normalized
Data Model**

**Semi and Un-
Structured
Data**

**Secure the
Data and
Data
Governance**

Takeaways

ABOUT WALMART

Walmart is one of the largest global retailers in the world with over 10,000 stores and 2 million associates, selling a variety of products ranging from food to home goods, clothing, electronics, and pharmacies

The company contains superstores, and e-commerce platforms, serving a diverse array of consumers, and them to buy both in person and online worldwide

The company's philosophy of "Low prices, Always", has allowed the company to be successful due to its efficient operations in over 200 distribution centers, and innovative shopping through Walmart+ and Mobile Scan and Go

DATA MANAGEMENT STRATEGY



OFFENSIVE VS. DEFENSIVE

Since Walmart is a retailer, they are more likely to predominantly have an offensive data strategy, however, we will show are both are necessary

OFFENSIVE STRATEGY

Generate customer insights, aid data driven decision making, and to support managerial decision making in order to increase revenue and growth

DEFENSIVE STRATEGY



Since Walmart has an e-commerce platform, they have access to customer's addresses, credit card information, and other personal information that needs to be secured

OFFENSIVE DATA STRATEGY



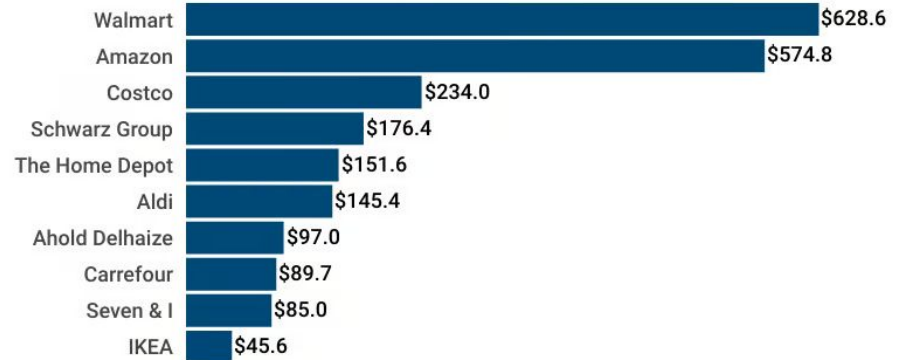
WHY AN OFFENSIVE STRATEGY

While Walmart is the largest global retailer, Amazon is quickly catching up

Having an offensive strategy is necessary in order to maintain a competitive advantage over its competitors

Top 10 Global Retailers' 2023 Corporate Revenue

(in billions)



Source: National Retail Federation, U.S. Securities and Exchange Commission

OLTP SYSTEMS

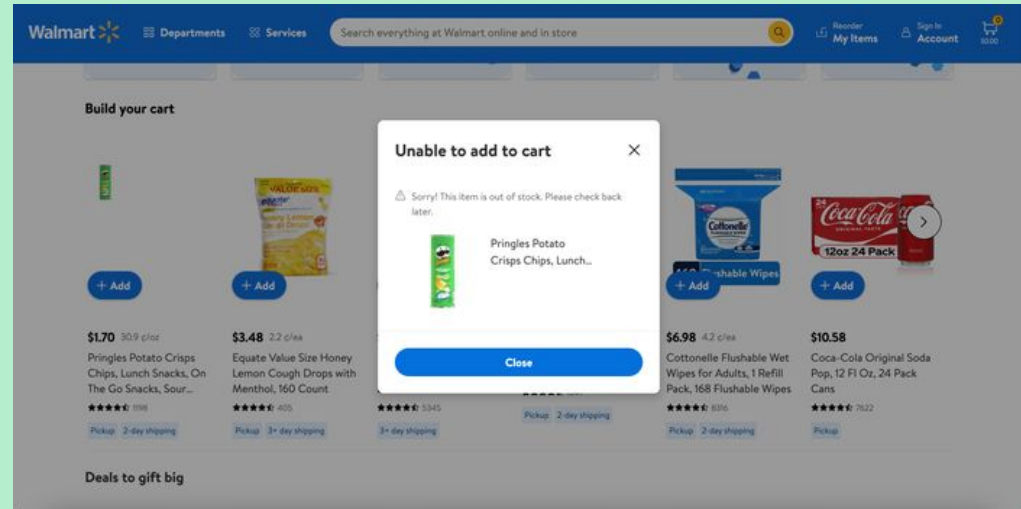
Inventory Management System

Sales and Orders Processing System

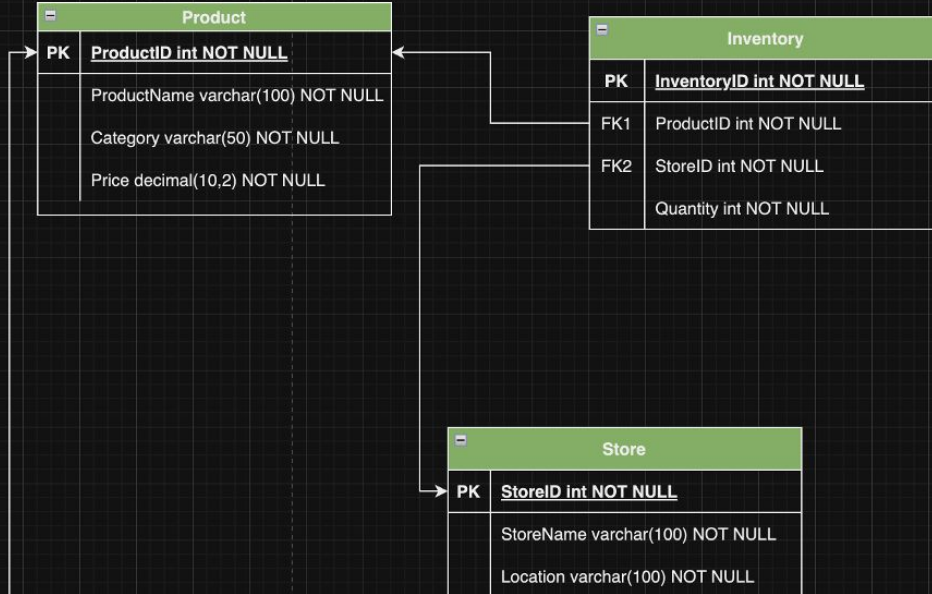
Supplier Management System

Inventory Management System

- Tracks stock levels across Walmart's 10,500+ stores and distribution centers worldwide.
- Ensures real-time visibility of inventory for popular products such as groceries, electronics, and clothing.
- Supports seamless restocking for high-demand items like groceries, which require just-in-time inventory to avoid spoilage



Inventory Management System: ERD



Product

PRODUCTID	PRODUCTNAME	CATEGORY	PRICE
1	1 Laptop	Electronics	899.99
2	2 Smartphone	Electronics	699.99
3	3 Headphones	Electronics	199.99
4	4 Jacket	Clothing	129.99
5	5 T-Shirt	Clothing	29.99

Store

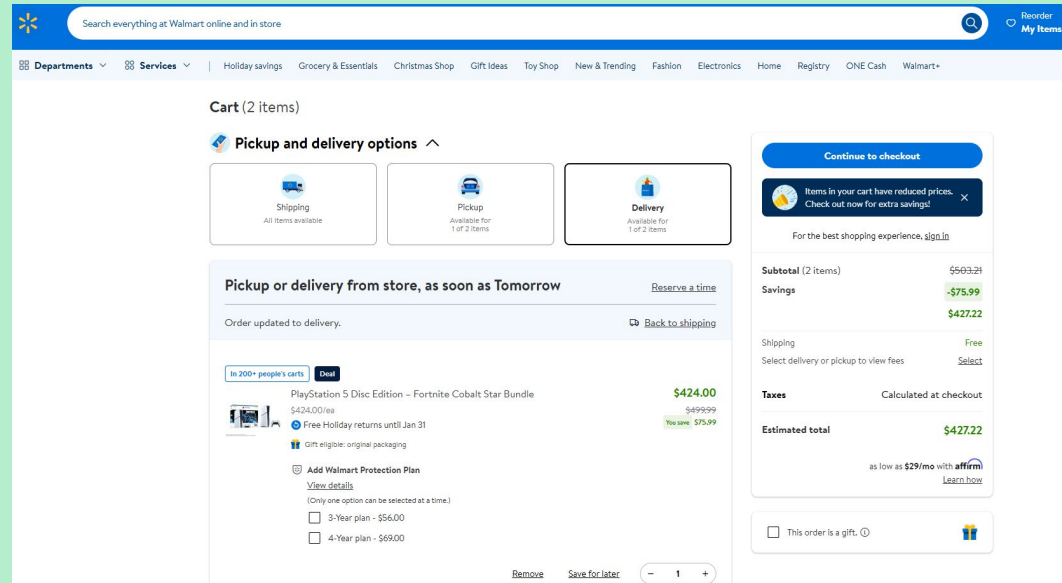
STOREID	STORENAME	LOCATION
1	1 Walmart 560	Houston
2	2 Walmart 606	Dallas
3	3 Walmart 404	Austin
4	4 Walmart 816	San Antonio
5	5 Walmart 910	Los Angeles

Inventory

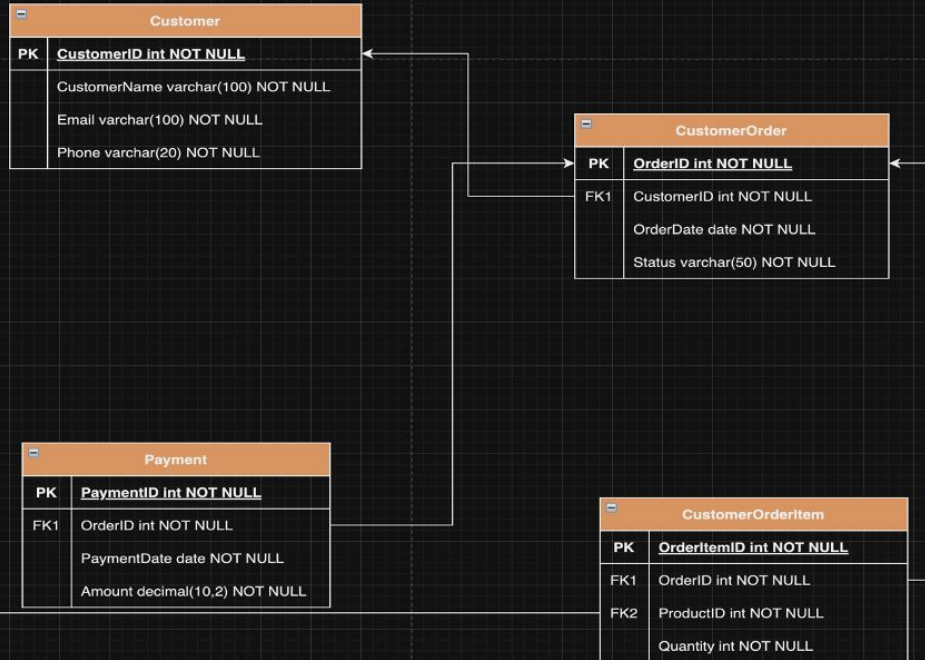
INVENTORYID	PRODUCTID	STOREID	QUANTITY
1	1	1	25
2	2	2	30
3	3	3	15
4	4	4	10
5	5	5	20

Sales and Orders Processing System

- Integrates store and online transactions to manage customer orders, payment processing, and fulfillment.
- Tracks customer preferences across platforms, enabling personalized recommendations and efficient order status tracking.
- Facilitates Walmart+ services, such as same-day delivery, by managing customer data and payment details efficiently.



Sales and Orders Processing System: ERD



Customer

	CUSTOMERID	CUSTOMERNAME	EMAIL	PHONE
1	1	John Smith	john.smith@example.com	555-123-4567
2	2	Jane Doe	jane.doe@example.com	555-234-5678
3	3	Michael Johnson	michael.j@example.com	555-345-6789
4	4	Emily Davis	emily.d@example.com	555-456-7890
5	5	Chris Brown	chris.b@example.com	555-567-8901

CustomerOrder

	ORDERID	CUSTOMERID	ORDERDATE	STATUS
1	1	1	01-OCT-24	Shipped
2	2	2	01-OCT-24	Delivered
3	3	3	01-OCT-24	Pending
4	4	4	01-OCT-24	Shipped
5	5	5	01-OCT-24	Delivered

Payment

	PAYMENTID	ORDERID	PAYMENTDATE	AMOUNT
1	1	1	01-OCT-24	1829.97
2	2	2	01-OCT-24	729.97
3	3	3	01-OCT-24	499.98
4	4	4	01-OCT-24	759.94
5	5	5	01-OCT-24	63.48

Customer OrderItem

	ORDERITEMID	ORDERID	PRODUCTID	QUANTITY
1	1	1	1	2
2	2	2	1	5
3	3	3	2	2
4	4	4	2	10
5	5	5	3	3

Supplier Management System

- Manages relationships with thousands of suppliers globally, ensuring a steady flow of products to stores and distribution centers.
- Centralizes purchase orders for seasonal items or high-demand products
- Tracks supplier performance to enforce on-time delivery and quality control



WATER CORPORATION

Supplier Management System: ERD

PurchaseOrderItem	
PK	PurchaseOrderItemID int NOT NULL
FK1	ProductID int NOT NULL
FK2	PurchaseOrderID int NOT NULL
	Quantity int NOT NULL

PurchaseOrder	
PK	PurchaseOrderID int NOT NULL
FK1	SupplierID int NOT NULL
	OrderDate date NOT NULL
	Status varchar(50) NOT NULL

Supplier	
PK	SupplierID int NOT NULL
	SupplierName varchar(100) NOT NULL
	ContactInfo varchar(255) NOT NULL

Supplier

SUPPLIERID	SUPPLIERNAME	CONTACTINFO
1	1 Tech Corp	techcorp@example.com
2	2 Apparel Inc	apparelinc@example.com
3	3 Food Co	foodco@example.com
4	4 Gadget Supply	gadgetsup@example.com
5	5 Clothing Hub	clothinghub@example.com

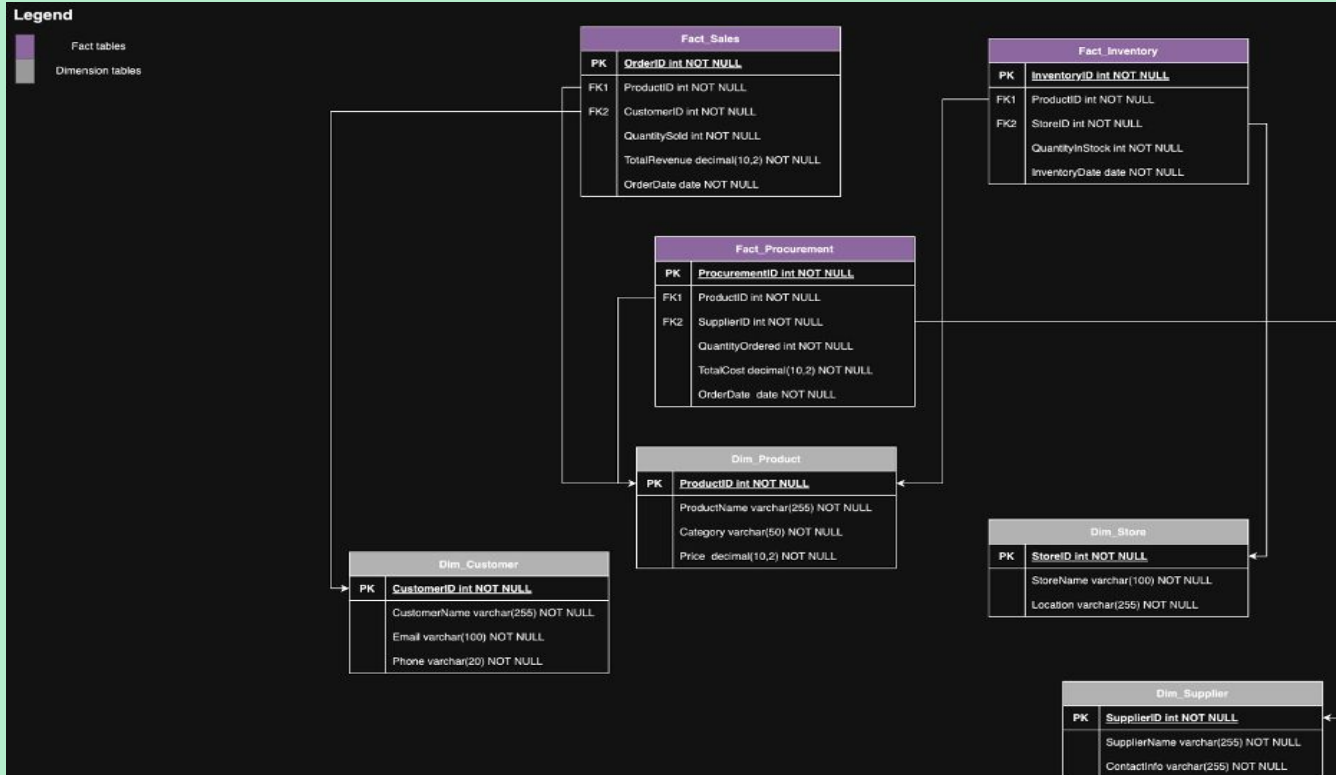
PurchaseOrder

PURCHASEOR...	SUPPLIERID	ORDERDATE	STATUS
1	1	1 01-OCT-24	Completed
2	2	2 01-OCT-24	Pending
3	3	3 01-OCT-24	Cancelled
4	4	4 01-OCT-24	Completed
5	5	5 01-OCT-24	Pending

PurchaseOrder Item

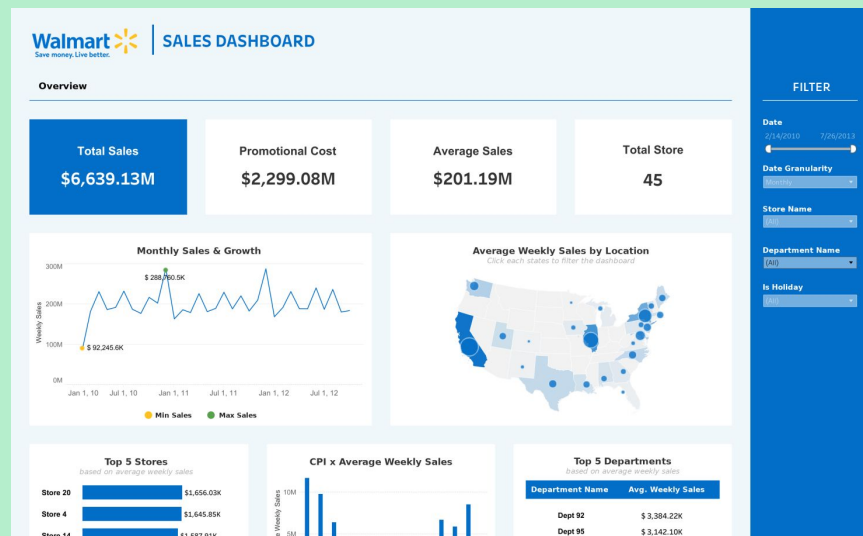
PURCHASEORDERITEMID	PURCHASEORDERID	PRODUCTID	QUANTITY
1	1	1	10
2	2	1	5
3	3	2	8
4	4	2	20
5	5	3	15

Normalized Warehouse Model



Leveraging Insights from Warehouse

- **Integrates Data Across Operations:** Combines sales, procurement, and inventory data from 10,500+ stores
- **Supports Real-Time Decision-Making:** Enables Walmart to track sales trends, optimize stock levels, and adjust pricing strategies dynamically.
- **Drives Supply Chain Efficiency:** Analyzes supplier performance to ensure on-time deliveries and cost-effective procurement.
- **Enhances Customer Insights:** Links sales data with customer behavior to improve personalization and Walmart+ services.
- **Facilitates Sustainability:** Reduces waste and optimizes distribution to minimize environmental impact.



Leveraging Insights: Sample Use Case

“Generate a report that shows summary sale statistics by product and supplier to inform supplier negotiations and product promotions.”

Sample Query

```
SELECT
    p.ProductName,
    s.SupplierName,
    SUM(f.QuantitySold) AS TotalQuantitySold,
    i.QuantityInStock AS CurrentInventory,
    ROUND((SUM(f.QuantitySold) * 100 / SUM(SUM(f.QuantitySold)) OVER ()), 2) AS SalesPercentage,
    COUNT(DISTINCT f.OrderID) AS TotalOrders
FROM
    Fact_Sales f
JOIN
    Dim_Product p ON f.ProductID = p.ProductID
JOIN
    Dim_Supplier s ON p.SupplierID = s.SupplierID
JOIN
    Fact_Inventory i ON f.ProductID = i.ProductID
GROUP BY
    p.ProductName, s.SupplierName, i.QuantityInStock
ORDER BY
    TotalQuantitySold DESC
```

ProductName	SupplierName	TotalQuantitySold	CurrentInventory	SalesPercentage	TotalOrders
Laptop A	TechSupply Co.	1500	500	20.5	300
Phone X	MobileWorld Inc.	1200	400	16.4	250

UNSTRUCTURED DATA

Social Media Posts

Social media data includes timestamps, interactions (likes and comments), text captions, and images from a variety of social media sites

Can provide insights for personalized marketing, product inventory, and product development; can manage different data types

Can use web scraping to collect necessary information from each post, followed by Natural Language Processing to extract sentiments and themes about how a user feels about the company or product

UNSTRUCTURED DATA

Customer Reviews

Customer reviews can be obtained from the company website, and include text about how a consumer feels about a product, both positive and negative

Can provide insights on customer satisfaction, preferences, and possible issues with products

Can use web scraping to get the text from the company website, and NLPs to perform sentiment analysis and extract what reviews are primarily about

ROLE / ACCESS MATRIX

Roles	Customer	CustomerOrder	CustomerOrderItem	Payment
Order Processor	R	CRUD	CRUD	
Payment Processor	R	R		CRUD
Inventory Manager		R	R	

SALES AND ORDER PROCESSING SYSTEM

DATA GOVERNANCE



DATA QUALITY

Data stewards will regularly validate data quality, resolve inconsistencies, and enforce standardized definitions in data

COMPLIANCE

Align with global privacy and security regulations (GDPR & CCPA), ensuring compliance and reducing legal risks

SECURITY

Robust security measures, including role-based access controls, encryption, and need-to-know policies



ACCOUNTABILITY

Designating data stewards and owners responsible for overseeing key data assets

LESSONS LEARNED

Data Strategy

Align the data strategy with the company's mission and business goals

System Design and Implementation

Gained experience with DDL, ERDs, modularity, and iterative problem solving

Data Security and Governance

Effective governance practices are crucial in business/IT alignment as well as maintaining quality and compliance

Future Projects

Introduce Data Visualization Component with Tableau

THANK YOU!

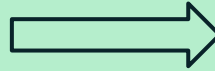


Citations

- **Source 1:** National Retail Federation, U.S. Securities and Exchange Commission. "Top 10 Global Retailers' 2023 Corporate Revenue." <https://capitaloneshopping.com/research/largest-retailers/>
- **Source 2:** Tableau Public. "Walmart Sales Dashboard by Gandes Goldestan." Available at https://public.tableau.com/app/profile/gandes.goldestan/viz/KLASADataVizWalmartSales_16779499759430/SalesDashboard

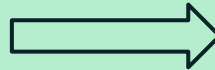
Inventory Management System- DDL

```
CREATE TABLE Product (  
    ProductID INT PRIMARY KEY,  
    ProductName VARCHAR2(100) NOT NULL,  
    Category VARCHAR2(50) NOT NULL,  
    Price DECIMAL(10, 2) NOT NULL );
```



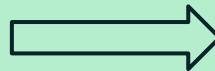
PRODUCTID	PRODUCTNAME	CATEGORY	PRICE
1	1 Laptop	Electronics	899.99
2	2 Smartphone	Electronics	699.99
3	3 Headphones	Electronics	199.99
4	4 Jacket	Clothing	129.99
5	5 T-Shirt	Clothing	29.99

```
CREATE TABLE Store (  
    StoreID INT PRIMARY KEY,  
    StoreName VARCHAR2(100) NOT NULL,  
    Location VARCHAR2(100) NOT NULL);
```



STOREID	STORENAME	LOCATION
1	1 Walmart 560	Houston
2	2 Walmart 606	Dallas
3	3 Walmart 404	Austin
4	4 Walmart 816	San Antonio
5	5 Walmart 910	Los Angeles

```
CREATE TABLE Inventory (  
    InventoryID INT PRIMARY KEY,  
    ProductID INT NOT NULL,  
    StoreID INT NOT NULL,  
    Quantity INT NOT NULL,  
    CONSTRAINT fk_inventory_product FOREIGN KEY (ProductID) REFERENCES Product(ProductID),  
    CONSTRAINT fk_inventory_store FOREIGN KEY (StoreID) REFERENCES Store(StoreID));
```



INVENTORYID	PRODUCTID	STOREID	QUANTITY
1	1	1	25
2	2	2	30
3	3	3	15
4	4	4	10
5	5	5	20

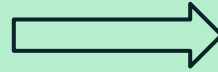
Sales Processing System- DDL

```
CREATE TABLE Customer (  
    CustomerID INT PRIMARY KEY,  
    CustomerName VARCHAR2(100) NOT NULL,  
    Email VARCHAR2(100) NOT NULL,  
    Phone VARCHAR2(30) NOT NULL);
```

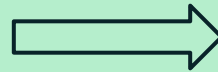
```
CREATE TABLE CustomerOrder (  
    OrderID INT PRIMARY KEY,  
    CustomerID INT NOT NULL,  
    OrderDate DATE NOT NULL,  
    Status VARCHAR2(50) NOT NULL,  
    CONSTRAINT fk_customer_order_customer FOREIGN KEY (CustomerID) REFERENCES Customer(CustomerID));
```

```
CREATE TABLE CustomerOrderItem (  
    OrderItemID INT PRIMARY KEY,  
    OrderID INT NOT NULL,  
    ProductID INT NOT NULL,  
    Quantity INT NOT NULL,  
    CONSTRAINT fk_customer_orderitem_order FOREIGN KEY (OrderID) REFERENCES CustomerOrder(OrderID),  
    CONSTRAINT fk_customer_orderitem_product FOREIGN KEY (ProductID) REFERENCES Product(ProductID));
```

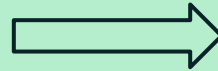
```
CREATE TABLE Payment (  
    PaymentID INT PRIMARY KEY,  
    OrderID INT NOT NULL,  
    PaymentDate DATE NOT NULL,  
    Amount DECIMAL(16, 2) NOT NULL,  
    CONSTRAINT fk_payment_order FOREIGN KEY (OrderID) REFERENCES CustomerOrder(OrderID));
```



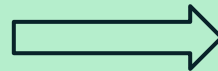
	CUSTOMERID	CUSTOMERNAME	EMAIL	PHONE
1	1	John Smith	john.smith@example.com	555-123-4567
2	2	Jane Doe	jane.doe@example.com	555-234-5678
3	3	Michael Johnson	michael.j@example.com	555-345-6789
4	4	Emily Davis	emily.d@example.com	555-456-7890
5	5	Chris Brown	chris.b@example.com	555-567-8901



	ORDERID	CUSTOMERID	ORDERDATE	STATUS
1	1	1	1 01-OCT-24	Shipped
2	2	2	2 01-OCT-24	Delivered
3	3	3	3 01-OCT-24	Pending
4	4	4	4 01-OCT-24	Shipped
5	5	5	5 01-OCT-24	Delivered



	ORDERITEMID	ORDERID	PRODUCTID	QUANTITY
1	1	1	1	2
2	2	2	1	5
3	3	2	2	1
4	4	2	10	3
5	5	3	3	1



	PAYMENTID	ORDERID	PAYMENTDATE	AMOUNT
1	1	1	1 01-OCT-24	1829.97
2	2	2	2 01-OCT-24	729.97
3	3	3	3 01-OCT-24	499.98
4	4	4	4 01-OCT-24	759.94
5	5	5	5 01-OCT-24	63.48

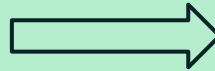
Supplier Management System- DDL

```
CREATE TABLE Supplier (  
    SupplierID INT PRIMARY KEY,  
    SupplierName VARCHAR2(100) NOT NULL,  
    ContactInfo VARCHAR2(255) NOT NULL);
```



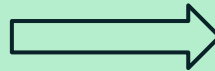
	SUPPLIERID	SUPPLIERNAME	CONTACTINFO
1	1	Tech Corp	techcorp@example.com
2	2	Apparel Inc	apparelinc@example.com
3	3	Food Co	foodco@example.com
4	4	Gadget Supply	gadgetsup@example.com
5	5	Clothing Hub	clothinghub@example.com

```
CREATE TABLE PurchaseOrder (  
    PurchaseOrderID INT PRIMARY KEY,  
    SupplierID INT NOT NULL,  
    OrderDate DATE NOT NULL,  
    Status VARCHAR2(50) NOT NULL,  
    CONSTRAINT fk_purchase_order_supplier FOREIGN KEY (SupplierID) REFERENCES Supplier(SupplierID));
```



	PURCHASEOR...	SUPPLIERID	ORDERDATE	STATUS
1	1	1	01-OCT-24	Completed
2	2	2	01-OCT-24	Pending
3	3	3	01-OCT-24	Cancelled
4	4	4	01-OCT-24	Completed
5	5	5	01-OCT-24	Pending

```
CREATE TABLE PurchaseOrderItem (  
    PurchaseOrderItemID INT PRIMARY KEY,  
    PurchaseOrderID INT NOT NULL,  
    ProductID INT NOT NULL,  
    Quantity INT NOT NULL,  
    CONSTRAINT fk_purchase_orderitem_order FOREIGN KEY (PurchaseOrderID) REFERENCES PurchaseOrder(PurchaseOrderID),  
    CONSTRAINT fk_purchase_orderitem_product FOREIGN KEY (ProductID) REFERENCES Product(ProductID));
```



	PURCHASEORDERITEMID	PURCHASEORDERID	PRODUCTID	QUANTITY
1	1	1	1	10
2	2	1	5	5
3	3	2	3	8
4	4	2	9	20
5	5	3	6	15