Santa Clara University

Walmart Report

Group Walmart

MS Information Systems 2613-1:

Database Management Systems - Design, Development & Administration

12 March 2024

Introduction

Walmart, founded in 1962 by Sam Walton in Rogers, Arkansas, has grown from a single discount store to the world's largest retailer, operating thousands of stores worldwide and serving millions of customers daily. The company's growth is attributed to its commitment to low prices, vast product selection, and an efficient supply chain that leverages advanced technology and logistics to reduce costs. Walmart's operations span across multiple segments, encompassing retail stores, online marketplaces, and wholesale clubs.

This paper delves into Walmart's database management model and its integral role in daily operations. It explores Walmart's overarching business objectives, examines essential EER and Relational models, and assesses the implications for Walmart's database infrastructure. The envisioned database must effectively capture diverse datasets such as inventory, sales, customer profiles, employee records, supply chain logistics, and financial transactions. This framework serves as the cornerstone for Walmart's inventory management, customer service improvements, and key operational decisions.

During the creation of the database, emphasis will be placed on data modeling and analytics to provide insight into Walmart's database. Data privacy and security will also be discussed, as it is important to protect private customer and employee information. The project aims to enhance operational efficiency, improve customer experiences, and support Walmart's continued innovation and growth in the retail sector.

Walmart's Business Objectives

Walmart's core business objectives revolve around providing customers with exceptional value through competitive pricing, extensive product choices, and operational efficiency. Leveraging its vast scale and logistical capabilities, Walmart strives to optimize its supply chain to ensure the availability of a diverse range of products across its global network. With a commitment to seamless customer experiences both offline and online, Walmart continually invests in innovative technologies and personalized services. As it expands its presence worldwide, Walmart remains dedicated to driving operational excellence and fostering customer loyalty while sustaining long-term growth in the dynamic retail landscape.

Entities and Attributes

1. **Order** (OrderID, Date, Status, TotalAmount, PaymentMethod, DeliveryAddress, DeliveryDate, TrackingNumber, OrderType, PromoCodeApplied, CustomerID, EmployeeID) **represents a completed transaction.**
2. **OrderItem** (ItemID, Quantity, UnitPrice, DiscountRate, FinalPrice, ReturnStatus, Review, ProductID, OrderID) **represents each product within an order**.
3. **Promotion** (PromotionID, Description, StartDate, EndDate, PromoCode, MinimumPurchaseAmount, ApplicableCategories, DiscountRate) **represents sales promotions.**
4. **Shelf** (ShelfID, Location, Capacity, CategoryName, Accessibility, TemperatureControlled, RestockFrequency, LastRestockDate) **represents a physical location in the store for products.**
5. **Warehouse** (WarehouseID, Location, Capacity, ManagerID, TemperatureControlled, SecurityLevel, OperatingHours, LastMaintenanceDate) **represents storage for inventory not on store shelves**.
6. **Transport** (TransportID, Type, Schedule, Capacity, Destination, Origin, DriverID, EstimatedArrivalDate) **represents logistics for product shipment**.
7. **Membership** (MembershipID, CustomerID, MembershipLevel, Benefits, SignUpDate, ExpiryDate, RenewalRate, PointsAccumulated) **represents customer loyalty programs.**
8. **Return** (ReturnID, OrderID, ProductID, Reason, Status, ReturnDate, ProcessedBy, RefundAmount) **represents customer returns**.
9. **EmployeeSchedule** (EmployeeID, Date, ShiftStart, ShiftEnd, Location, Role, OvertimeHours) **represents work schedules for employees**.
10. **Maintenance** (MaintenanceID, EquipmentID, Date, Type, ScheduledNext, CompletedDate, PerformedBy, Cost) **represents upkeep of store equipment**.
11. **Customer** (CustomerID, FirstName, LastName, Email, PhoneNumber, Address, SignUpDate, MembershipLevel, PointsAccumulated, LastOrderDate, TotalSpent, PreferredPaymentMethod) **represents individuals who make purchases from Walmart.**
12. **Employee** (EmployeeID, Name, Role, Email, DepartmentName, HireDate, Status, Address, PhoneNumber, ManagerID, EmployeeType) **represents individuals employed by Walmart.**
    a. **Full-time Employee** (Salary) **represents employees that hold full-time positions at Walmart, such as managers, department heads, directors, etc.**
    b. **Part-time Employee** (HourlyWage, ShiftPreference) **represents employees that hold part-time positions at Walmart, such as in the warehouses or in the physical stores.**
13. **Product** (ProductID, Name, Description, CategoryName, Price, StockQuantity, PromotionID, Returnable) **represents all items and merchandise sold by Walmart.**

    a. **Returnable Product** (ReturnCondition, ReturnInstructions, ReturnPeriod) **represents products that can be returned to Walmart**
    b. **NonReturnableProduct** (NonReturnableCause) **represents products that cannot be returned to Walmart.**
14. **Inventory** (InventoryID, ProductID, WarehouseID, Quantity, RestockLevel, RestockQuantity, LastRestockDate, ExpectedDeliveryDate, Status, ShelfID) **represents the stock of products in Walmart's inventory.**
15. **Shipment** (ShipmentID, OrderID, TransportID, WarehouseID, ShipmentDate, EstimatedArrivalDate, Status, Destination, Origin, DriverID, TrackingNumber, ActualArrivalDate, ShipmentType) **represents the transportation of products from warehouses to stores and customers.**
    a. **StandardShipment** (ShipmentCarrier, ShippingInsurance) **represents items that are shipped in a standard amount of time, so it will reach the customer within 3-5 business days.**
    b. **ExpressShipment** (ExpeditedFee, SignatureRequirement) **represents items that are shipped with expedited service so that it will reach customers faster.**
16. **Equipment** (EquipmentID, Name, Type, PurchaseDate, Location, Status, MaintenanceSchedule, LastMaintenanceDate, ModelNumber, SerialNumber, Manufacturer, Cost) **represents the physical machinery and tools used in stores and warehouses.**
17. **Feedback** (FeedbackID, CustomerID, OrderID, ProductID, Rating, Comments, FeedbackDate, ResponseStatus, ResponseText, Visibility, CategoryID, ResolutionStatus) **represents customer feedback on products, services, or experiences at Walmart.**

Relationships

1. **Order is related to Customer (customer places an order) and Employee (employee processes the order).** A customer can place 0 or many orders, but each order is connected to one specific customer (one-to-many). An employee can process 0 to many orders, and each order can be processed by 1 or more employees (many-to-many).
    a. The order-customer relationship is important because it helps Walmart track customer purchases.
    b. The order-employee relationship is important for managing order processing and tracking employee productivity.

2. **OrderItem is associated with Order (each order contains order items) and Product (each order item is a specific product)**. Each order can have 1-to-many Order Items within the Order, but each OrderItem is part of only one order (one-to-many). Each Product can have 0 or many Order Items associated with it, but each OrderItem is connected to one and only one Product (many-to-one).
    a. The OrderItem-order relationship helps Walmart organize order details.
    b. The OrderItem-product relationship is important for Walmart because it helps with inventory management and tracking sales.
3. **Product participates in Promotion (products can be on promotion)**. Each Product can be part of 0 or many Promotions, and each Promotion can have 1 or many Products associated with it (many-to-many).
    a. This relationship helps Walmart analyze the effectiveness of its promotions and marketing campaigns.
4. **Shelf holds Inventories (inventories are stored on shelves)**. Inventories can be on one or many shelves, and a shelf can have one or many inventories on it (many-to-many). This relationship assumes that Walmart will never run out of a specific Product entirely, and will not have any empty shelves.
    a. This relationship helps inventory management and ensures that products are readily available for customers.
5. **Warehouse stores Inventory (inventory is kept in warehouses)**. A warehouse can store multiple inventory items, while each inventory item can be stored in multiple warehouses (many-to-many).
    a. This relationship ensures that each inventory item is attributed to a specific warehouse, meaning that Walmart can efficiently manage its inventory across different warehouse locations.
6. **Transport is assigned to Shipment (shipments are carried out by transport)**. Each shipment is assigned to only one transport for delivery; however, each transport can be assigned to multiple shipments (one-to-many). Walmart can optimize its logistics by utilizing the same transport for delivering multiple shipments.
    a. This relationship ensures effective inventory management and shipment tracking across different warehouse locations.
7. **Customer has Membership (customers can have memberships)**. A customer can have a single membership or not have a membership, and an individual membership is tied to one and only one customer (one-to-one).

    a. This relationship is important because it provides customized services to the customers, allowing Walmart to adjust the memberships based on customer needs.

8. **Return is related to Order (returns are part of orders) and Returnable Product (returns involve specific products)**. Each return is associated with one specific order (one-to-one). Meanwhile, one returnable product can be returned multiple times, but each specific return is associated with one product (one-to-many).
    a. The return-order relationship is crucial for tracking returns and managing customer refunds.
    b. The return-product relationship is important for analyzing product return trends and managing product quality.
9. **Employees are assigned to an Employee Schedule.**
    a. One employee follows one Employee Schedule, and one Employee Schedule is assigned to one employee (one-to-one).
        i. This relationship is important because it helps management keep track of how many employees there are, what tasks to assign to these employees, and what hours these employees work.
10. **Maintenance is related to Employee (employee performs the maintenance) and Equipment (equipment needs maintenance)**. An employee can perform zero or multiple maintenance activities over time, but each maintenance activity is performed by only one employee (one-to-many). One equipment item can undergo maintenance multiple times (or undergo no maintenance at all), but each maintenance activity is performed on only one piece of equipment (one-to-many).
    a. The maintenance-employee relationship is important because the employees are directly involved in maintaining equipment functionality.
    b. The maintenance-equipment relationship ensures that all the equipment in the warehouses and stores are functioning properly, increasing operational efficiency and overall safety for the workers.
11. **Customer to Feedback (customers provide feedback on products)**. Walmart customers provide feedback on products, services, and experiences. One customer can provide multiple feedback entries (or none), but each feedback entry is associated to only one customer (one-to-many).
    a. This relationship is key to gathering customer insights so that products and services can be improved.

12. **Employee manages Warehouse (a manager or employee is responsible for a warehouse)**. Only specific employees are managers. Those that are managers oversee at least one warehouse, but managers can also oversee multiple warehouses. However, each warehouse has only one manager (one-to-many).
    a. This relationship is important because the managers can oversee employee productivity, while making sure that the work environment in the warehouse is safe.
13. **Product to Inventory (linking specific products to their inventory records)**. Each product is associated with one inventory record (one-to-one).
    a. This relationship ensures accurate inventory tracking and management.
14. **Employee to Transport (employees, specifically drivers, are assigned to transport entities)**. One employee can be assigned to multiple transport jobs, and one transport can have multiple employees assigned to it (many-to-many).
    a. This relationship is crucial because once the driver is assigned to a specific transport task, the company can manage the delivery process and optimize logistics.
15. **Return to Employee (returns processed by specific employees)**. An employee can process many returns; on the other hand, a return must be associated with one employee (many-to-one).
    a. This relationship helps in tracking returns and associating them with the employees responsible for processing them. This ensures accountability and improves customer service management.
16. **Shipment to Order (associating orders to their shipments for delivery tracking)**. Each shipment is associated with one order (one-to-one).
    a. StandardShipment is related to Order. One standard shipment is associated with exactly one order, and each order corresponds to only one standard shipment (one-to-one). This relationship helps Walmart manage its orders and track the status of each shipment accurately.
    b. ExpressShipment is related to Order. Similarly, one express shipment is associated with exactly one order, and each order corresponds to only one express shipment (one-to-one). This relationship facilitates expedited delivery services for customers who opt for express shipping methods.
17. **Feedback to Order and Product (feedback is specific to a specific product in a specific order)**. Each order can receive many pieces of feedback, or receive no feedback at all (one-to-many), but each feedback item is associated with only one order (one-to-one). Similarly, one Product can have multiple pieces of feedback, or none at all; but, each piece of feedback is associated with one Product.

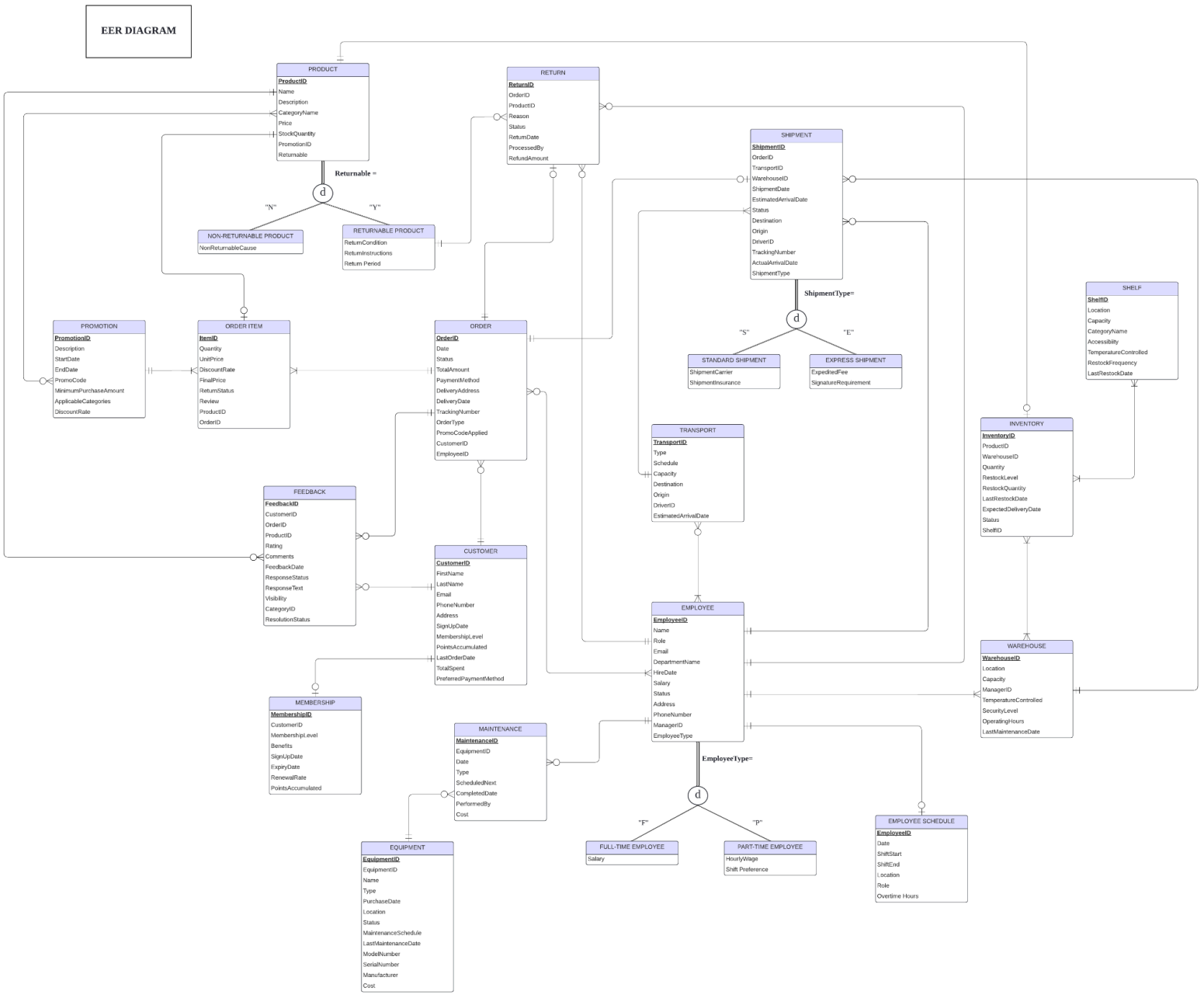
    a. This relationship is useful for understanding customer satisfaction on a per-order basis.

18. **Orderitem to Product (each orderitem is selected from products)**. Each orderitem (a specific instance of a product within an order) is linked to one product (one-to-one).
    a. This relationship is fundamental in order processing and inventory management.
19. **Shipment to Warehouse and Employee (shipment should be determined by someone and somewhere)**. One warehouse can manage many shipments at once (many-to-one), and one employee can oversee multiple shipments (many-to-one).
    a. This relationship can be used in logistics to track which warehouse an item is shipped from, ensuring accountability during shipping.
20. **Maintenance to Equipment (the equipment needs to be maintained regularly or confirmed to be offline)**. Each piece of equipment can be associated with more than one maintenance activity or record of maintenance, unless it doesn't need maintenance at all (many-to-one).
    a. This relationship is critical for tracking equipment maintenance, ensuring operational efficiency, and maintaining safety in the workplace.

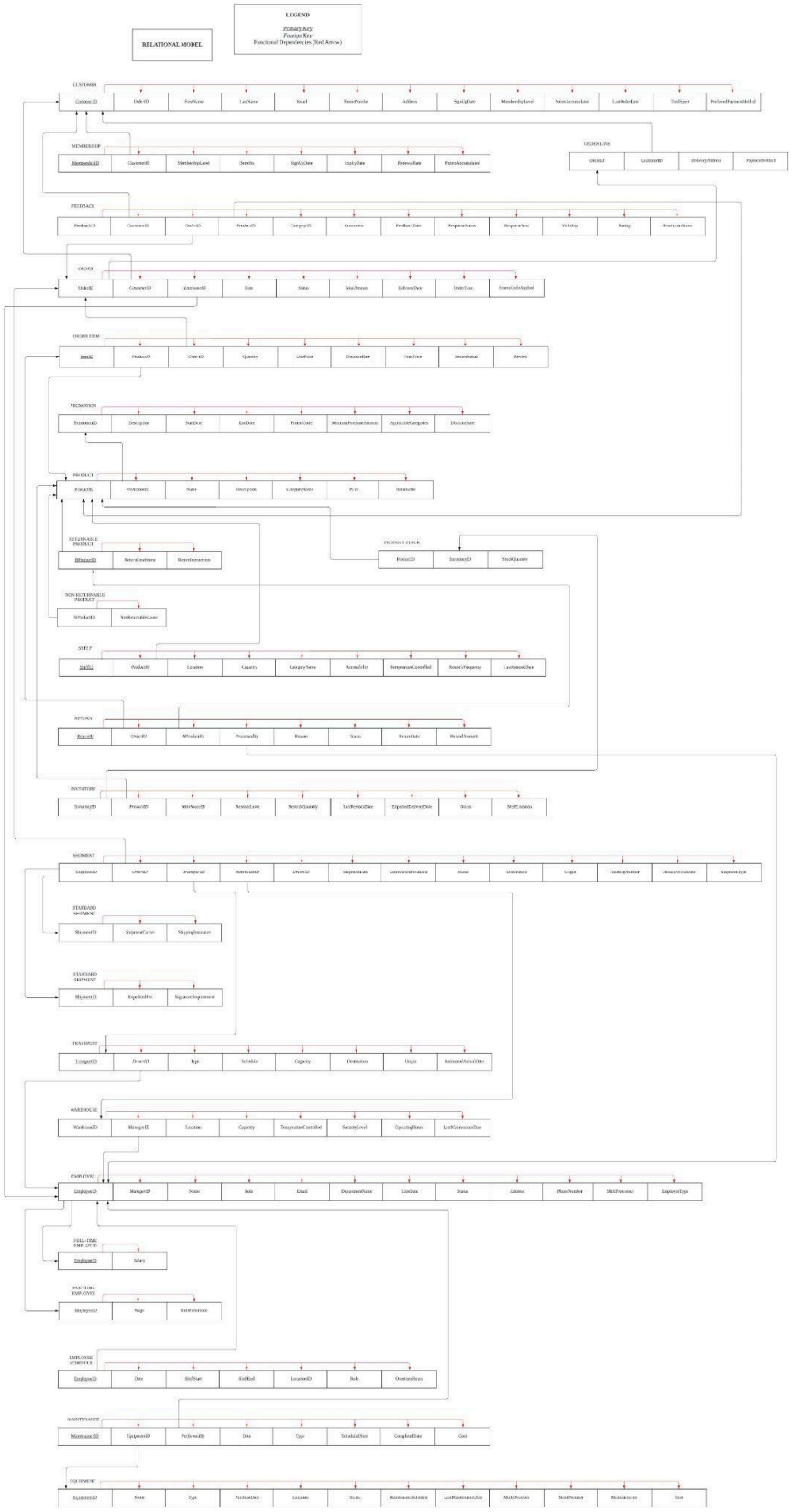
Supertypes and subtypes

1. **Employee supertype has subtypes Part-Time Employee and Full-Time Employee.** An employee has to be either a part-time employee or a full-time employee, they cannot be both.
    a. This supertype/subtype relationship helps Walmart keep track of different types of employees and the attributes that differ among them.
2. **Product supertype has subtypes Returnable Product and Non-Returnable Product.** A product has to be either a returnable product or a non-returnable product, they cannot be both.
    a. This supertype/subtype relationship helps Walmart differentiate between different types of products and the different attributes between them.
3. **Shipment supertype has subtypes StandardShipment and ExpressShipment.** Customers can choose the shipment method according to their needs. An order can either be delivered with standard shipment or express shipment; they cannot be delivered with both at the same time.
    a. This relationship helps Walmart efficiently manage its shipping logistics and fulfill customer orders effectively.

EER Model


EER DIAGRAM
PRODUCT
ProductID
Name
Description
CategoryName
Price
StockQuantity
PromotionID
Returnable
Returnable =
d
"N"
"Y"
NON-RETURNABLE PRODUCT
NonReturnableCause
RETURNABLE PRODUCT
ReturnCondition
ReturnInstructions
Return Period
RETURN
ReturnID
OrderID
ProductID
Reason
Status
ReturnDate
ProcessedBy
RefundAmount
SHIPMENT
ShipmentID
OrderID
TransportID
WarehouseID
ShipmentDate
EstimatedArrivalDate
Status
Destination
Origin
DriverID
TrackingNumber
ActualArrivalDate
ShipmentType
ShipmentType=
d
"S"
"E"
STANDARD SHIPMENT
ShipmentCarrier
ShipmentInsurance
EXPRESS SHIPMENT
ExpediteFee
SignatureRequirement
SHELF
ShelfID
Location
Capacity
CategoryName
Accessibility
TemperatureControlled
RestockFrequency
LastRestockDate
PROMOTION
PromotionID
Description
StartDate
EndDate
PromoCode
MinimumPurchaseAmount
ApplicableCategories
DiscountRate
ORDER ITEM
ItemID
Quantity
UnitPrice
DiscountRate
FinalPrice
ReturnStatus
Review
ProductID
OrderID
ORDER
OrderID
Date
Status
TotalAmount
PaymentMethod
DeliveryAddress
DeliveryDate
TrackingNumber
OrderType
PromoCodeApplied
CustomerID
EmployeeID
TRANSPORT
TransportID
Type
Schedule
Capacity
Destination
Origin
DriverID
EstimatedArrivalDate
INVENTORY
InventoryID
ProductID
WarehouseID
Quantity
RestockLevel
RestockQuantity
LastRestockDate
ExpectedDeliveryDate
Status
ShelfID
FEEDBACK
FeedbackID
CustomerID
OrderID
ProductID
Rating
Comments
FeedbackDate
ResponseStatus
ResponseText
Visibility
CategoryID
ResolutionStatus
CUSTOMER
CustomerID
FirstName
LastName
Email
PhoneNumber
Address
SignUpDate
MembershipLevel
PointsAccumulated
LastOrderDate
TotalSpent
PreferredPaymentMethod
EMPLOYEE
EmployeeID
Name
Role
Email
DepartmentName
HireDate
Salary
Status
Address
PhoneNumber
ManagerID
EmployeeType
WAREHOUSE
WarehouseID
Location
Capacity
ManagerID
TemperatureControlled
SecurityLevel
OperatingHours
LastMaintenanceDate
MEMBERSHIP
MembershipID
CustomerID
MembershipLevel
Benefits
SignUpDate
ExpiryDate
RenewalRate
PointsAccumulated
MAINTENANCE
MaintenanceID
EquipmentID
Date
Type
ScheduledNext
CompletedDate
PerformedBy
Cost
EmployeeType=
d
"F"
"P"
EQUIPMENT
EquipmentID
EquipmentID
Name
Type
PurchaseDate
Location
Status
MaintenanceSchedule
LastMaintenanceDate
ModelNumber
SerialNumber
Manufacturer
Cost
FULL-TIME EMPLOYEE
Salary
PART-TIME EMPLOYEE
HourlyWage
Shift Preference
EMPLOYEE SCHEDULE
EmployeeID
Date
ShiftStart
ShiftEnd
Location
Role
Overtime Hours

Relational Model



Sample Data

Here are some sample data from coding the database. For this project, we used MySQL to create the database.

1. Customer Table

CustomerID	FirstName	LastName	Email	PhoneNumber	Address	SignUpDate	MembershipLevel	PointsAccumulated	LastOrderDate	TotalSpent	PreferredPaymentMethod
1	John	Doe	johndoe@example.com	1234567890	123 Main St, City	2023-05-15	Gold	500	2024-02-28	1000.00	Credit Card
2	Jane	Smith	janesmith@example.com	9876543210	456 Elm St, Town	2023-07-20	Silver	300	2024-02-25	750.00	PayPal
3	Michael	Johnson	michaeljohnson@example.com	4561237890	789 Oak St, Village	2023-09-10	Bronze	100	2024-03-01	500.00	Debit Card
4	Sarah	Brown	sarahbrown@example.com	7894561230	369 Pine St, County	2023-11-05	Gold	800	2024-02-20	1500.00	Credit Card
5	Emma	Wilson	emmawilson@example.com	3216549870	159 Willow St, Suburb	2023-01-15	Platinum	1000	2024-03-02	2000.00	E-Wallet
6	Oliver	Jones	oliverjones@example.com	1237894560	753 Maple St, City	2023-04-20	Silver	200	2024-02-22	800.00	Credit Card
7	Ava	Davis	avadavis@example.com	9873216540	951 Cedar St, Town	2023-03-30	Bronze	150	2024-02-27	650.00	Direct Debit
8	William	Miller	williammiller@example.com	6549873210	357 Birch St, Village	2023-06-25	Gold	700	2024-02-24	1250.00	Bank Transfer
9	Sophia	Taylor	sophiataylor@example.com	4567891230	168 Spruce St, County	2023-08-30	Platinum	1200	2024-02-26	2200.00	E-Wallet
10	James	Anderson	jamesanderson@example.com	3219876540	264 Redwood St, Suburb	2023-10-10	Silver	250	2024-02-23	900.00	Credit Card

2. Order Table

OrderID	Date	Status	TotalAmount	PaymentMethod	DeliveryAddress	DeliveryDate	PromoCodeAppli...	TrackingNumb...	OrderType	CustomerID	EmployeeID
1	2023-01-24	Processing	97.47	Credit Card	123 Main St, City	2023-11-05	No	TN9674	Express	1	11
2	2023-05-25	Shipped	63.56	Credit Card	789 Oak St, Village	2023-07-06	No	TN2173	Express	3	11
3	2023-07-23	Shipped	321.79	Bank Transfer	159 Willow St, Suburb	2023-11-22	Yes	TN6109	Express	5	13
4	2023-02-06	Processing	161.32	Bank Transfer	168 Spruce St, County	2023-12-21	No	TN6919	Express	9	10
5	2023-07-14	Processing	439.99	Bank Transfer	951 Cedar St, Town	2023-07-31	Yes	TN7691	Express	7	13
6	2023-11-21	Cancelled	175.20	Paypal	168 Spruce St, County	2023-12-08	No	TN7624	Express	9	11
7	2023-09-13	Shipped	218.37	Paypal	168 Spruce St, County	2023-09-30	No	TN4161	Standard	9	13
8	2023-01-13	Delivered	140.90	Credit Card	753 Maple St, City	2023-07-28	Yes	TN7671	Standard	6	10
9	2023-03-16	Processing	434.35	Paypal	456 Elm St, Town	2023-05-15	No	TN8523	Express	2	13
10	2023-05-08	Delivered	185.39	Bank Transfer	168 Spruce St, County	2023-11-05	No	TN2166	Standard	9	11

3. Employee Table

EmployeeID	Name	Role	Email	DepartmentName	HireDate	Status	Address	PhoneNumber	ManagerID	EmployeeType	Salary	HourlyWage	ShiftPreference
10	Alice Johnson	Manager	alicejohnson@example.com	Sales	2022-03-15	Active	123 Main St, City	1234567890	NULL	Full-time	60000.00	NULL	NULL
11	Bob Smith	Salesperson	bobsmith@example.com	Sales	2023-01-10	Active	456 Elm St, Town	9876543210	10	Full-time	45000.00	NULL	NULL
12	Diana Lee	Driver	dianalee@example.com	Administration	2023-09-01	Active	369 Pine St, County	7894561230	10	Full-time	40000.00	NULL	NULL
13	Eva Garcia	Manager	evagarcia@example.com	Marketing	2023-06-20	Active	789 Oak St, Village	4567890123	NULL	Full-time	55000.00	NULL	NULL
14	Frank Williams	Technician	frankwilliams@example.com	Maintenance	2023-07-15	Active	987 Elm St, Town	3456789012	10	Part-time	NULL	25.00	Day Shift
15	Grace Martinez	Sales Associate	gracemartinez@example.com	Sales	2023-08-10	Active	654 Oak St, Village	2345678901	11	Part-time	NULL	18.00	Evening Shift
16	Henry Clark	Warehouse Manager	henryclark@example.com	Administration	2023-09-15	Active	321 Pine St, County	1234567890	12	Part-time	NULL	20.00	Evening Shift
17	Isabel Scott	Technician	isabelscott@example.com	Maintenance	2023-10-20	Active	123 Oak St, City	7890123456	13	Part-time	NULL	22.00	Flexible
18	James Dean	Developer	jamesdean@example.com	IT	2023-02-01	Active	159 River Rd, Town	6789012345	10	Full-time	80000.00	NULL	NULL
19	Olivia Mark	HR Coordinator	oliviamark@example.com	Human Resources	2023-05-01	Active	753 Hill St, City	8901234567	13	Full-time	45000.00	NULL	NULL
20	Peter Grant	Security Guard	petergrant@example.com	Security	2023-04-15	Active	357 Lake Ave, City	5678901234	17	Full-time	35000.00	NULL	NULL

4. EmployeeSchedule Table

EmployeeID	Date	ShiftStart	ShiftEnd	Location	Role	OvertimeHours
10	2024-11-04	09:00:00	17:00:00	Warehouse	Manager	0.00
11	2024-02-29	09:00:00	18:00:00	Store	Salesperson	1.00
12	2024-12-01	09:00:00	17:00:00	Warehouse	Driver	0.00
13	2024-03-11	09:00:00	19:00:00	Store	Manager	2.00
14	2024-02-28	10:00:00	16:00:00	Back Office	Technician	0.00
15	2024-03-17	16:00:00	22:00:00	Store	Sales Associate	0.00
16	2024-11-27	16:00:00	22:00:00	Warehouse	Warehouse Manager	0.00
17	2024-12-13	09:00:00	15:00:00	Back Office	Technician	0.00
18	2024-10-29	09:00:00	18:00:00	Back Office	Developer	1.00
19	2024-01-28	09:00:00	19:00:00	HR Office	HR Coordinator	2.00
20	2024-01-27	09:00:00	20:00:00	Security	Security Guard	3.00

5. Shipment Table

ShipmentID	OrderID	TransportID	WarehouseID	ShipmentDate	EstimatedArrivalDate	Status	Destination	Origin	DriverID	TrackingNumber	ActualArrivalDate	ShipmentType	ShipmentCarrier	ShippingInsurance	ExpeditedFee	SignatureRequirement
1	1	1	1	2023-12-22	2023-12-25	Delivered	Destination-55	Origin-53	12	SHP-41997213	2023-12-25	Standard	FedEx	0.00	NULL	NULL
2	2	2	5	2023-12-08	2023-12-09	In Transit	Destination-36	Origin-63	12	TRK-78044751	2023-12-09	Express	NULL	NULL	7.99	1
3	3	3	9	2023-11-22	2023-11-24	In Transit	Destination-35	Origin-62	12	TRK-78044752	2023-11-25	Standard	DHL	6.99	NULL	NULL
4	4	4	10	2023-11-06	2023-11-07	Shipped	Destination-77	Origin-60	12	PKG-65855885	2023-11-07	Express	NULL	NULL	7.99	1
5	5	5	6	2023-11-05	2023-11-09	In Transit	Destination-86	Origin-96	12	PKG-54973079	2023-11-09	Standard	UPS	2.99	NULL	NULL
6	6	6	2	2023-09-30	2023-10-02	In Transit	Destination-84	Origin-16	12	TRK-38276490	2023-10-03	Standard	FedEx	0.00	NULL	NULL
7	7	7	4	2023-08-01	2023-08-03	Delivered	Destination-74	Origin-22	12	PKG-07555490	2023-08-05	Standard	FedEx	0.00	NULL	NULL
8	8	8	3	2023-07-29	2023-08-03	In Transit	Destination-57	Origin-61	12	TRK-89485075	2023-08-03	Standard	UPS	0.00	NULL	NULL
9	9	9	8	2023-07-07	2023-07-11	Shipped	Destination-90	Origin-48	12	PKG-38554379	2023-07-11	Standard	UPS	0.00	NULL	NULL
10	10	10	7	2023-05-16	2023-05-21	Delivered	Destination-21	Origin-58	12	SHP-98474062	2023-05-21	Standard	FedEx	0.00	NULL	NULL

6. Equipment Table

EquipmentID	Name	Type	PurchaseDate	Location	Status	MaintenanceSchedule	LastMaintenanceDate	ModelNumber	SerialNumber	Manufacturer	Cost
1	Motor	Mechanical	2022-09-18	Site A	Out of Service	Annually	2022-07-05	SAOCEVGQ	6RV8M8Q15MZE	MfgB	9203.88
2	Pump	Mechanical	2021-12-18	Site B	Maintenance Required	Annually	2023-08-19	S7BAHG2K	LU7Y3Z7RBQZB	MfgA	18370.55
3	Generator	Mechanical	2017-12-03	Warehouse 2	Out of Service	Annually	2022-10-19	ZMXFWTJ8	ZQGZ2MYUR9YH	MfgB	7599.21
4	Valve	Electrical	2021-03-09	Site B	Operational	Bi-Annually	2023-09-10	UOQYMR0L	H1DX5XRG1X98	MfgC	7061.68
5	Generator	Mechanical	2023-08-22	Warehouse 2	Operational	Annually	2023-09-02	06ADC5GR	UU8NOE8QUDQE	MfgD	6368.04
6	Pump	Hydraulic	2017-09-10	Site A	Operational	Bi-Annually	2022-05-29	62J9WLGK	IOKSNC4QCERC	MfgB	7382.88
7	Compressor	Mechanical	2015-05-16	Site B	Out of Service	Annually	2023-03-11	G2WPOTX7	L7C06F2VO2PE	MfgB	12429.29
8	Valve	Mechanical	2018-08-31	Warehouse 1	Operational	Bi-Annually	2023-11-21	UMKYC4CB	87D70YS5HTU6	MfgC	11160.19
9	Pump	Hydraulic	2019-08-01	Warehouse 1	Operational	Annually	2022-08-27	GPN6P5RJ	1RIWDRCX9VRJ	MfgC	8346.79
10	Compressor	Electrical	2022-10-21	Warehouse 2	Out of Service	Annually	2023-11-08	7PO4MXYZ	7YH9ES8KVJKK	MfgB	14508.71

7. Return Table

ReturnID	OrderID	ProductID	Reason	Status	ReturnDate	ProcessedBy	RefundAmount
1	2	4	Changed mind	Pending	2023-12-26	13	25.99
2	9	4	Changed mind	Approved	2024-01-11	15	25.99
3	1	3	Incorrect item sent	Approved	2023-12-27	13	75.99
4	6	5	Changed mind	Approved	2023-10-09	10	49.99
5	3	4	Damaged on arrival	Pending	2023-11-22	10	25.99
6	7	5	Damaged on arrival	Processing	2023-08-14	13	75.99
7	8	3	Product malfunction	Processing	2023-08-26	10	99.99
8	5	4	Changed mind	Approved	2024-01-18	13	49.99
9	8	2	Damaged on arrival	Rejected	2023-08-27	10	25.99
10	6	1	Damaged on arrival	Processing	2023-11-26	13	75.99

Queries

Here are some sample queries from coding the database.

1. Query: Create Employee table.

```
CREATE TABLE Employee_T (
    EmployeeID INT PRIMARY KEY,
    Name VARCHAR(255),
    Role VARCHAR(50),
    Email VARCHAR(255),
    DepartmentName VARCHAR(50),
    HireDate DATE,
    Status VARCHAR(50),
    Address VARCHAR(255),
    PhoneNumber VARCHAR(20),
    ManagerID INT, -- This will reference EmployeeID within the same table
    EmployeeType VARCHAR(50),
    Salary DECIMAL(10, 2),
    HourlyWage DECIMAL(10, 2),
    ShiftPreference VARCHAR(50),
    FOREIGN KEY (ManagerID) REFERENCES Employee_T(EmployeeID) -- This establishes
the hierarchical relationship
);
```

2. Query: Create Product table.

```
CREATE TABLE Product_T (
        ProductID INT PRIMARY KEY,
    Name VARCHAR(255),
```

```
    Description TEXT,
    CategoryName VARCHAR(50),
    Price DECIMAL(10, 2),
    StockQuantity INT,
    PromotionID INT,
    Returnable BOOLEAN,
    ReturnCondition VARCHAR(255) NULL,
    ReturnInstructions TEXT NULL,
    NonReturnableCause VARCHAR(255) NULL,
    ReturnPeriod INT NULL,
    FOREIGN KEY (PromotionID) REFERENCES Promotion_T(PromotionID),
    CHECK (
        (Returnable = TRUE AND NonReturnableCause IS NULL) OR
        (Returnable = FALSE AND ReturnCondition IS NULL AND ReturnInstructions IS NULL
AND ReturnPeriod IS NULL)
    )
);
```

3. **Query: Create Shipment table.**

```
CREATE TABLE Shipment_T (
    ShipmentID INT PRIMARY KEY,
    OrderID INT,
    TransportID INT,
    WarehouseID INT,
    ShipmentDate DATE,
    EstimatedArrivalDate DATE,
    Status VARCHAR(50),
    Destination VARCHAR(255),
    Origin VARCHAR(255),
    DriverID INT,
    TrackingNumber VARCHAR(50),
    ActualArrivalDate DATE,
    ShipmentType VARCHAR(20),
    ShipmentCarrier VARCHAR(255) NULL,
    ShippingInsurance DECIMAL(10, 2) NULL,
    ExpeditedFee DECIMAL(10, 2) NULL,
    SignatureRequirement BOOLEAN NULL,
    FOREIGN KEY (OrderID) REFERENCES Order_T(OrderID),
    FOREIGN KEY (TransportID) REFERENCES Transport_T(TransportID),
    FOREIGN KEY (WarehouseID) REFERENCES Warehouse_T(WarehouseID),
    FOREIGN KEY (DriverID) REFERENCES Employee_T(EmployeeID),
    CHECK (
        (ShipmentType = 'Standard' AND ExpeditedFee IS NULL AND SignatureRequirement IS
NULL) OR
        (ShipmentType = 'Express' AND ShipmentCarrier IS NULL AND ShippingInsurance IS
NULL)
    )
);
```

4. **Query: Rank customers by spending in descending order.**

```
SELECT CustomerID, FirstName, LastName, TotalSpent,
    RANK() OVER (ORDER BY TotalSpent DESC) AS SpendingRank
FROM Customer_T;
```

5. **Query: Retrieve customers with at least 500 points but no orders in the last 3 months.**

```
SELECT DISTINCT c.CustomerID, c.FirstName, c.LastName, c.PointsAccumulated
FROM Customer_T c
LEFT JOIN Order_T o ON c.CustomerID = o.CustomerID
WHERE c.PointsAccumulated >= 500
AND (o.Date < DATE_SUB(CURDATE(), INTERVAL 3 MONTH) OR o.Date IS NULL)
GROUP BY c.CustomerID, c.FirstName, c.LastName, c.PointsAccumulated;
```

6. **Query: Sort by top five employees' total sales.**

```
SELECT e.EmployeeID, e.Name, IFNULL(SUM(o.TotalAmount), 0) AS TotalSales
FROM Employee_T e
LEFT JOIN Order_T o ON e.EmployeeID = o.EmployeeID
GROUP BY e.EmployeeID, e.Name
ORDER BY TotalSales DESC
LIMIT 5;
```

Discussion

Using the entities and relationships provided, this database serves as a foundational pillar for Walmart's efficient operations and strategic decision-making. The diverse range of entities, from Orders and Products to Employees and Feedback, reflects the multifaceted nature of Walmart's business operations and underscores the need for a robust database infrastructure.

At the heart of Walmart's database lies the ability to track and manage vast quantities of data relating to customer transactions, inventory levels, and employee scheduling. With millions of customers visiting Walmart's stores and using their online platforms, the Order and Customer entities play a pivotal role in analyzing purchasing behaviors, enabling Walmart to tailor its product offerings and marketing strategies to meet their customers' demands.

Furthermore, the relationships between entities such as OrderItem and Product help Walmart with inventory management and supply chain optimization. By monitoring product sales, promotions, and return rates, Walmart can make data-driven decisions regarding stock levels, pricing strategies, and promotional campaigns, ultimately maximizing profitability and customer satisfaction. Additionally, the Employee and Maintenance entities ensure the seamless operation of Walmart's physical infrastructure, ensuring that all employees and workers are safe while on the job.

Importance of Data

It is also important to insert sample data and queries, such as the ones written above, to test out the proposed database. Sample queries serve as a vital tool for testing the functionality and reliability of the database, allowing Walmart's data analysts and development teams to assess the accuracy and efficiency of data retrieval. By executing sample queries on the database, Walmart can simulate real-world scenarios, identify potential bottlenecks or inconsistencies in data management, and fine-tune database configurations for optimal performance. It is also crucial that Walmart protects its databases so that the proper data is available for operational purposes. Because Walmart handles so much sensitive customer information and business records, it must carefully safeguard its database systems against possible data breaches and leaks. Implementing encryption protocols, access controls, and authentication mechanisms can help mitigate these security risks, along with regular security audits, vulnerability assessments, and intrusion detection systems. Additionally, ensuring compliance with industry regulations such as GDPR (General Data Protection Regulation) and CCPA (California Consumer Privacy Act) is crucial to safeguarding the privacy of Walmart's customers. Data plays a pivotal role in Walmart's operations, driving strategic decision-making, enhancing customer experiences, and optimizing business processes. As such, it is important to make sure that Walmart's databases are well protected. Maintaining operational integrity and securing sensitive information is crucial to Walmart's success, ensuring that they can continue to drive innovation and deliver exceptional value to customers worldwide.

Conclusion

The development of a comprehensive database system is pivotal for enhancing Walmart's operational efficiency, optimizing its supply chain management, and improving its customer service. By implementing a robust database infrastructure, Walmart can effectively manage its vast inventory, streamline transactional processes, and derive valuable insights from customer data to drive informed decision-making. In addition, robust encryption protocols and compliance measures help reinforce Walmart's commitment to protecting customer information and maintaining trust. Moving forward, Walmart will continue to invest in the ongoing maintenance of its database system to ensure scalability and reliability within the growing retail space.