Inventory and order management.

Introduction

Project Idea Definition

Project Topic: Inventory and Order Management System for AKIL Investment Company

Problem Description:

- AKIL Investment Company faces challenges in efficiently managing its corporate merchandise operations.

- The absence of a centralized database system leads to difficulties in accurately tracking inventory levels, resulting in potential stockouts of popular items like "Mens All Star T-Shirts" or overstocking of less popular items.
- Manual order processing increases the risk of errors, delays in fulfilling orders for customers like "Nairobi Hospital" or "Safaricom PLC," and negatively impacts customer satisfaction.
- Lack of a robust system hinders AKIL's ability to analyze sales trends, identify profitable products (e.g., "Executive Metal Pen") and optimize procurement from suppliers like "Amrod Corporate Solutions (Pty) Ltd."
- Inefficient communication between AKIL's sales, logistics, and procurement departments causes delays in fulfilling orders and increases operational costs.

Alignment with Sustainable Development Goal (SDG):

- This project aligns with **SDG Goal 12: Responsible Consumption and Production**.
- By optimizing inventory management, the system helps AKIL Investment Company minimize waste and improve resource utilization.
- Efficient order processing reduces unnecessary transportation, contributing to a lower carbon footprint for AKIL.

- Effective supplier management and lead time tracking enable AKIL to adopt more sustainable procurement practices.

Relevance in the Kenyan Context:

- AKIL Investment Company operates within the Kenyan corporate merchandise sector, which is essential for branding and marketing in Kenya.
- Efficient merchandise supply chains are crucial for Kenyan businesses like AKIL to maintain a competitive edge.
- Many Kenyan SMEs face challenges in adopting technology to improve their operations, making this project relevant by providing a tailored database solution for AKIL.
- This system will streamline AKIL's operations and contribute to the growth and efficiency of a Kenyan business.

Scope

- The database system will manage AKIL Investment Company's core business processes:

- Detailed product inventory management (e.g., "Mens Tournament Golf Shirt," "Corporate Jacket") with attributes like `ProductID`, `ProductName`, `Description`, `CategoryID`, `Quantity`, `SupplierID`, `ReorderLevel`, `UnitPrice`, `SellingPrice`, and `LastRestockDate`.
- End-to-end order processing, from customer order placement (e.g., orders from "Nairobi Hospital") to delivery.
- Comprehensive customer data management, including customer details (e.g., "CustomerID," "Name," "Contact," "Email," "Address," "DateRegistered") and order history.
- Supplier information management, including supplier details (e.g., "SupplierID," "Name," "Contact," "ContactPerson," "Email," "Address," "LeadTime") and performance tracking.
- Transaction recording for all sales and order-related payments.
- Product categorization (e.g., "T-Shirts," "Golf Shirts," "Jackets").
- Employee/user management with roles and permissions (e.g., "Store Manager," "Finance Officer"

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Vision & objectives

Vision

To be the driving force behind AKIL Investment Company's evolution into Kenya's leading corporate merchandise provider, recognized for its seamless operations, exceptional customer experiences, and sustainable practices, all powered by a cutting-edge database system that delivers unparalleled efficiency and insight.

Key Elements of the Vision Statement:

- **Driving Force:** Emphasizes the database system's central role in enabling AKIL's success.
- **Leading Provider:** Sets a high aspiration for AKIL's position in the market.

- **Seamless Operations:** Highlights the goal of smooth and efficient processes across the entire supply chain.
- **Exceptional Customer Experiences:** Focuses on the importance of customer satisfaction and loyalty.
- **Sustainable Practices:** Reinforces the commitment to responsible resource management and ethical operations.
- **Cutting-Edge Database System:** Positions the technology as a key differentiator and enabler of the vision.
- **Unparalleled Efficiency and Insight:** Captures the core benefits of the system in terms of productivity and data-driven decision-making.

Objectives

Objectives:

- To design and implement a relational database for AKIL Investment Company to store and organize data across its operations.
- To create efficient data retrieval and update mechanisms to support AKIL's daily activities.

- To automate order processing, inventory control, and reporting for AKIL, reducing manual effort and errors.
- To provide AKIL with real-time insights into stock levels, order statuses, sales trends, and customer information.
- To improve communication and collaboration among AKIL's employees and departments.
- To enhance AKIL's customer service and satisfaction through accurate and timely order fulfillment

Key Functionalities and Features:

Product Catalog Management:

- Adding new products with specifications.
- Updating product details and pricing.
- Categorizing products (e.g., "T-Shirts," "Golf Shirts").

Inventory Management:

- Real-time tracking of stock levels across different locations (if applicable).
- Automated reorder triggers to prevent stockouts.
- Inventory reporting and valuation.
- Managing supplier information and lead times to optimize procurement.

Order Management:

- ❖ Customer order placement and tracking.
- ❖ Order status updates and notifications.
- ❖ Delivery scheduling.
- ❖ Invoice generation.

Customer Relationship Management (CRM):

- ❖ Customer data storage and retrieval.
- ❖ Order history tracking.
- ❖ Customer communication tools.

Supplier Management:

- ❖ Supplier contact and performance tracking.
- ❖ Purchase order management.

Transaction Processing:

- ❖ Payment recording and processing.
- ❖ Sales transaction tracking.
- ❖ Financial reporting.

User Management:

- ❖ User roles and permissions.
- ❖ Access control.
- ❖ Activity logging.

Reporting and Analytics:

- ❖ Sales reports (e.g., best-selling products).
- ❖ Inventory reports (e.g., stock turnover).
- ❖ Order fulfillment reports.
- ❖ Customer behavior analysis.

Stakeholders

Main Stakeholders:

- ❖ **AKIL Investment Company Management:** Needs the system for better control, efficiency, cost reduction, and informed decision-making.
- ❖ **AKIL Employees:**
  - ➢ **Sales Team:** Needs it for order management, sales tracking, and product information.
  - ➢ **Logistics Team:** Needs it for delivery management and shipment tracking.

- ➢ **Procurement Team:** Needs it for supplier management and lead time optimization.
- ➢ **Finance Team:** Needs it for transaction processing and financial reporting.

- ❖ **AKIL Customers:** Need easy ordering, order tracking, and timely deliveries.
- ❖ **AKIL Suppliers:** Need clear communication and efficient order processing.

How the Project Addresses Stakeholder Needs:

- ❖ **AKIL Management:** Provides data-driven insights and tools to optimize operations and achieve business objectives.
- ❖ **AKIL Employees:** Streamlines workflows, automates tasks, reduces errors, and improves collaboration.
- ❖ **AKIL Customers:** Ensures accurate and timely order fulfillment and enhances the overall customer experience.
- ❖ **AKIL Suppliers:** Facilitates clear communication, efficient order management, and timely payments.

Akil Database

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Strategy

Focus areas

Here are three strategic focus areas, ordered by importance, that will guide the roadmap's initiatives for the AKIL Investment Company database project:

1. **Enhancing Operational Efficiency**
2. **Improving Customer Experience**
3. **Data-Driven Decision Making**

1. **Enhancing Operational Efficiency:**

   This focus area centers on streamlining AKIL's internal processes through automation and improved data management. It involves optimizing inventory control, order processing, and communication between departments to reduce errors, minimize delays, and lower operational costs.

2. **Improving Customer Experience:** This focus area prioritizes providing AKIL's customers with a seamless and satisfying experience. It involves enabling easy

order placement, providing timely order updates, ensuring accurate deliveries, and offering personalized service to build customer loyalty.

3. **Data-Driven Decision Making:** This focus area emphasizes leveraging the database system to provide AKIL's management with actionable insights into their business. It involves generating reports and analytics on sales trends, inventory performance, customer behavior, and supplier performance to support informed strategic decisions.

How the focus areas support objectives

How the Focus Areas Support Objectives

Here's how each focus area supports AKIL's long-term goals and the overall vision of becoming Kenya's leading corporate merchandise provider:

1. **Enhancing Operational Efficiency**

❖ **Explanation:**

➢ This focus directly supports the vision's emphasis on "seamless operations" and "unparalleled efficiency."

- ➢ By streamlining inventory management (e.g., through automated reorder points and accurate stock tracking), the database minimizes stockouts and overstocking, reducing costs and improving order fulfillment.
- ➢ Automating order processing reduces manual errors and speeds up delivery times, leading to cost savings and increased customer satisfaction.
- ➢ Improved communication between departments (e.g., sales, logistics, procurement) ensures smoother coordination and reduces delays, further enhancing efficiency.
- ➢ Ultimately, enhancing operational efficiency allows AKIL to handle a higher volume of orders with the same resources, supporting growth and profitability.

2. Improving Customer Experience

❖ **Explanation:**

- ➢ This focus directly aligns with the vision's goal of "exceptional customer experiences."
- ➢ By providing customers with easy online ordering, real-time order tracking, and proactive communication, the database system enhances customer convenience and satisfaction.
- ➢ Accurate order fulfillment and timely deliveries, enabled by efficient inventory and order management, build customer trust and loyalty.

- ➢ Personalized service, supported by customer data analysis, allows AKIL to tailor its offerings and communication to individual customer needs, further strengthening customer relationships.
- ➢ A positive customer experience differentiates AKIL from competitors and drives customer retention and referrals, contributing to long-term market leadership.

3. Data-Driven Decision Making

❖ **Explanation:**

- ➢ This focus supports the vision's aim of AKIL becoming a "data-driven organization" that makes informed decisions.
- ➢ The database provides valuable insights into sales trends (e.g., best-selling products, sales by customer segment), enabling AKIL to optimize its product offerings and marketing strategies.
- ➢ Inventory data (e.g., stock turnover, carrying costs) helps AKIL make informed decisions about procurement and pricing, maximizing profitability.
- ➢ Customer behavior analysis (e.g., purchase patterns, preferences) allows AKIL to personalize marketing campaigns and improve customer retention efforts.
- ➢ Supplier performance data (e.g., lead times, reliability) supports effective supplier relationship management and procurement decisions.

➢ By leveraging data to make strategic decisions, AKIL can adapt quickly to market changes, identify new opportunities, and maintain a competitive edge, ultimately achieving its vision of market leadership.

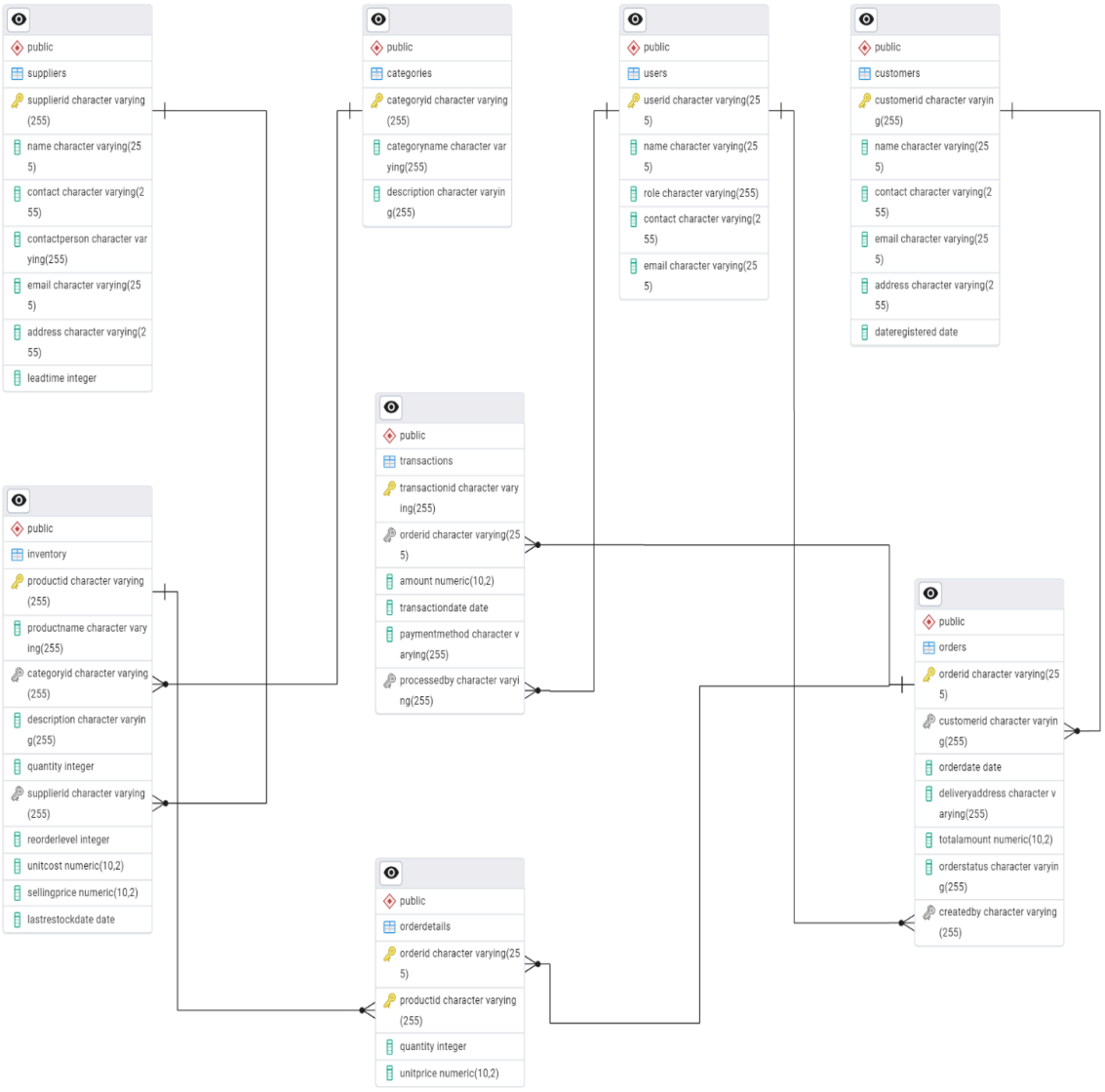
Entity-Relationship Diagram.

Relationships in the ERD:

The ERD shows relationships using lines connecting the tables,

ERD represent the following relationships:

1. **Users and Orders:** 1:M (Users table connected to Orders table)
2. **Customers and Orders:** 1:M (Customers table connected to Orders table)
3. **Orders and Transactions:** 1:M (Orders table connected to Transactions table)
4. **Suppliers and Inventory (product):** 1:M (Suppliers table connected to product table)
5. **Categories and Inventory (product):** 1:M (Categories table connected to product table)
6. **Orders and OrderDetails:** 1:M (Orders table connected to order_details table)
7. **Inventory (product) and OrderDetails:** 1:M (product table connected to order_details table)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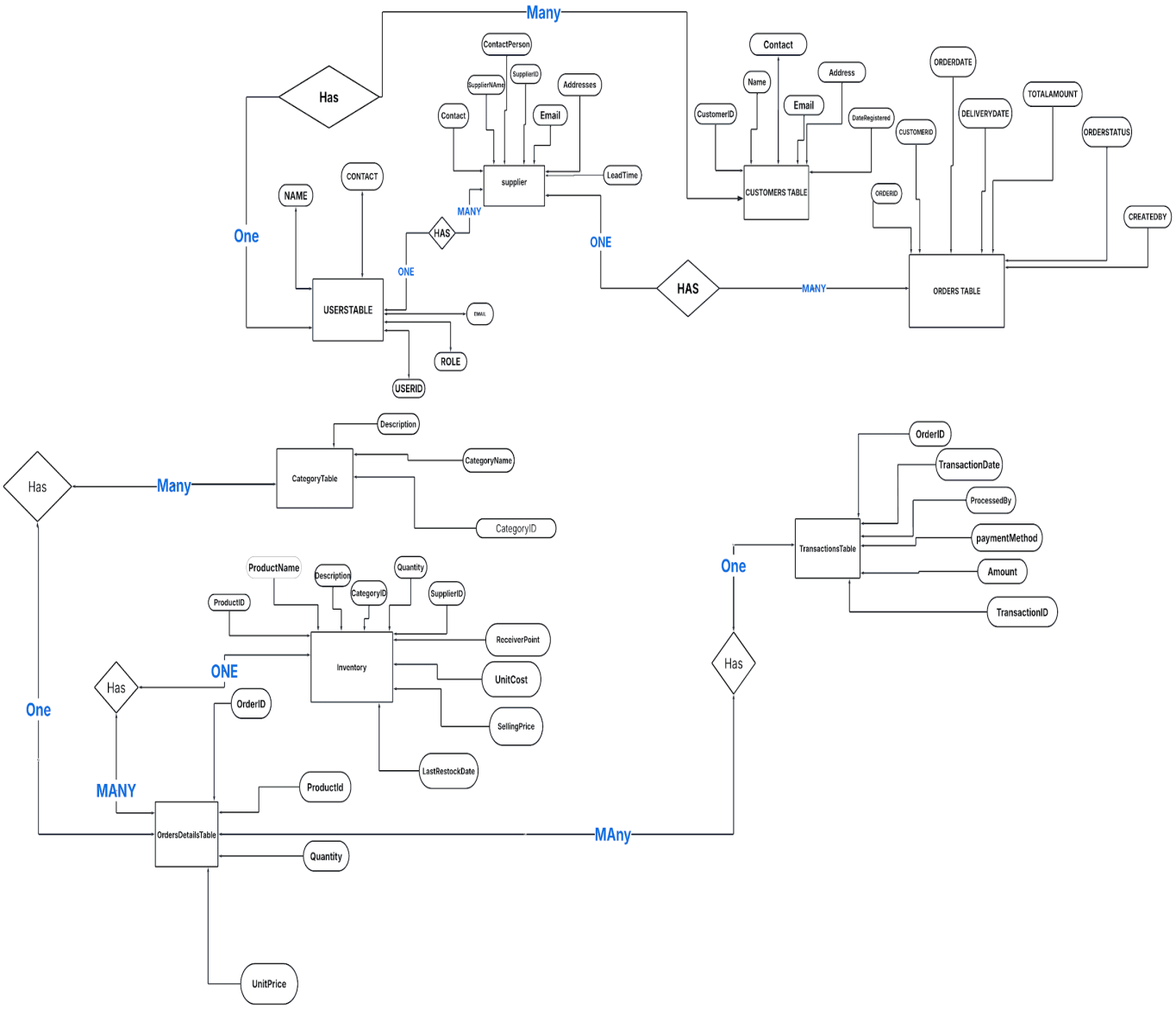
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LeadTime
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ProductName
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CategoryID
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ProductID
Inventory
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SellingPrice
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MANY
ProductId
OrdersDetailsTable
Quantity
UnitPrice
MAny
OrderID
TransactionDate
ProcessedBy
paymentMethod
Amount
TransactionID
TransactionsTable
One
Has

OrderDetailsTable

OrderID - Primary key

ProductID - Primary key

Quantity

Unit price

InventoryTable

ProductID -Primary key

ProductName

Description

CategoryID - primary Key

Quantity

SupplierID

ReceiverPoint

UnitCost

SellingPrice

LastRestockationDate

TransactionsTable

OrderID - Primary

TransactionDate

ProcessedBy

PaymentMethod

Amount

TransactionID -primary Key

OrdersTable

Order_ID - Primary Key

CustomerID

OrderDate

DeliveryDate

TotalAmount

OrderStatus

CreatedBy

CustomersTable

CustomerId - Primary Key

CustomerName

Contact

Email

Address

DateRegistered

SupplierTable

Contact

SupplierName

ContactPerson

SupplierID - Primary Key

Address

LeadTime

UserTable

UserID - Primary Key

Name

Contact

Email

Role

CategoryTable

CategoryID

CategoryName

Description

Database schema

Normalization

To normalize our database, we broke down the data into smaller relatable tables. So as to eliminate redundancy, improve data integrity and ensure that it's easier to maintain.

The unnormalized data or table can be found on our GitHub repository.

Here’s how we did following the 3NF normalization:

Step-by-Step Normalization Process

1. First Normal Form (1NF):

Already mostly done in the current denormalized table, but the OrderID with multiple products (e.g., ORD00003) must be split into OrderDetails.

2. Second Normal Form (2NF):

We split the data into multiple related tables:

- **Customers Table** (based on Customer info)
- **Employees Table** (for order handlers)
- **Suppliers Table** (who supplied each product)

- **Orders Table** (one per order)
- **OrderDetails Table** (one per product per order)
- **Products Table** (product details + category)
- **Categories Table** (category descriptions)
- **Transactions Table** (payment details)

3. Third Normal Form (3NF):

Remove transitive dependencies (non-key attributes depending on other non-key attributes).

We moved category description into a **Category** table instead of repeating it in each product row.

Normalized Tables Overview

Customers

CustomerID	Name	Contact	Email	Address	DateRegistered
CN00001	Nairobi Hospital	0711233344	procurement@nairobihospital.org	Argwings Kodhek Rd, Nairobi	2024-08-15

Users

UserID	Name	Role	Contact	Email
EMP0001	Beatrice M	Director	0712345678	beatrice.m@akil.co.ke

Suppliers

upplierID	Name	Contact	ContactPerson	Email	Address	LeadTime
SUP10001	Amrod Corporate Solutions (Pty) Ltd	27118865000	Mrs. Somaya Adams	somaya@amrod.co.za	Johannesburg, South Africa	14

Orders

OrderID	CustomerID	OrderDate	DeliveryAddress	TotalAmount	OrderStatus	CreatedBy
ORD00001	CN00001	2025-03-15	Nairobi Hospital, Arguings Kodhek Rd	15000.00	Processing	EMP0003

OrderDetails

OrderID	ProductID	Quantity	UnitPrice
ORD00001	ALTASMS-S	10	1500.00

Inventory

ProductName	Description	CategoryID	Quantity	SupplierID	ReorderPoint	UnitCost	SellingPrice	LastRes
ns All Star T-Shirt - Small	Premium cotton t-shirt with company logo, size S	CAT001	20	SUP10001	15	850.00	1500.00	2025

Categories

CategoryID	CategoryName	Description
CAT001	T-Shirts	Various styles of t-shirts

Transactions

TransactionID	OrderID	Amount	TransactionDate	PaymentMethod	ProcessedBy
INV000099	ORD00001	15000	2025-03-19	Bank Transfer	EMP0002

Indexes:

Apply indexes to specific columns within the following tables:

- Users Table: UserID
- Customers Table: CustomerID, Email
- Orders Table: OrderID, CustomerID, CreatedBy, OrderDate, OrderStatus
- OrderDetails Table: (OrderID, ProductID) - we considered a composite index on these two columns as they were often used together.
- Inventory Table: ProductID, CategoryID, SupplierID, ProductName
- Transactions Table: TransactionID, OrderID, ProcessedBy, TransactionDate
- Categories Table: CategoryID, CategoryName
- Suppliers Table: SupplierID, Name
- Speeding Up Lookups:
    - Index UserID, CustomerID, TransactionID, CategoryID, and SupplierID for fast retrieval of specific records based on their unique identifiers.
    - Index Email in Users and Customers for efficient searches based on email addresses.
    - Index ProductName in Inventory and CategoryName in Categories for quick searches.
- Optimizing Joins:
    - Index the foreign key columns used to link tables:
        - CustomerID in Orders (joins with Customers)
        - CreatedBy in Orders (joins with Users)
        - OrderID in OrderDetails and Transactions (joins with Orders)

        - ProductID in OrderDetails and Inventory (joins with Inventory)
        - CategoryID and SupplierID in Inventory (joins with Categories and Suppliers respectively)
        - ProcessedBy in Transactions (joins with Users)
    - The composite index on (OrderID, ProductID) in OrderDetails will significantly improve the performance of queries retrieving items for a specific order.
- Improving Filtering and Sorting:
    - Index Role in Users and OrderStatus in Orders if you frequently filter data based on these statuses.
    - Index OrderDate in Orders and TransactionDate in Transactions if you often filter or sort data by date.
    - Index Name in Customers and Suppliers if you frequently search or sort by name.

Key Considerations for This Data:

- Primary Keys: The primary key columns (UserID, CustomerID, OrderID, TransactionID, ProductID, CategoryID, SupplierID) are crucial for unique identification and relationships and were indexed.
- Foreign Keys: The foreign key columns are vital for efficient joins between tables and should be indexed to avoid full table scans during these operations.
- Composite Index on OrderDetails: Since we'll likely often query all items for a specific OrderID, a composite index on (OrderID, ProductID) is highly effective. The order of columns in the composite index can matter depending on the most frequent query patterns.