SQL Database Management Project - Orders and Employee Database

Overview: This project is a three-part endeavour focused on SQL database management, with the final part emphasizing SQL database administration. It extended the Employee Database from the previous project by addressing real-world challenges. Through hands-on SQL tasks, the project involved optimizing database functionality, enhancing usability, and ensuring long-term stability. The scope included solving specific data issues raised by a supervisor, automating processes, and implementing advanced SQL features like user-defined functions and stored procedures.

PART 1: Orders Database and SQL Queries In this project, I worked on the design and querying of an eCommerce orders database using **MS SQL Server Management Studio**. The database consisted of multiple tables, including customer orders, product details, and shipment methods. Key objectives included:

- **Database Design:** Implemented the schema for the *Orders* and *Product* data stores, populating them with test records adhering to business specifications.
- **SQL Query Development:** Constructed 20 complex SQL queries to extract meaningful data, such as order totals, shipment methods, and customer order details. Queries ranged from equijoins to subqueries and aggregate functions.
- **Data Integrity:** Ensured referential integrity between primary and foreign keys across the schemas.
- **Result Presentation:** Captured and formatted query outputs for presentation.

Key Skills Utilized:

- SQL Querying (SELECT, JOIN, WHERE GROUP BY, and Subqueries)
- Database Design and Schema Creation
- Data Validation and Referential Integrity

PART 2: Employee Database and Management In this project, I worked with a human resources database system for a growing company, focusing on database creation, management, and testing using **Microsoft Visio** for ERD design and **SQL scripts** for database operations.

- **Data Modelling:** Designed the employee data model using crow's foot notation, ensuring entity and attribute relationships for multiple tables such as Employees, Departments, Roles, and EmployeeContacts.
- **SQL Scripting:** Created CREATE TABLE, INSERT, UPDATE, and DELETE SQL scripts to establish the database, insert and update records, and clean up test data.
- **Recursive Queries and Views:** Developed complex SQL views to display hierarchical relationships between managers and subordinates, as well as identifying employees without emergency contacts.
- **Testing and Maintenance:** Verified the functionality of the database with test data, ensuring all constraints and relationships were upheld.

Key Skills Utilized:

- SQL Table Creation and Management
- Entity-Relationship Diagram (ERD) Design
- Database Constraints (Primary Key, Foreign Key, Default Values)
- Data Integrity and Maintenance

Technologies Used:

- **SQL Server**
- **Microsoft Visio** for database modeling
- **SQL scripting** for table creation, data manipulation, and testing.

PART 3: SQL Database Administration Key tasks and solutions implemented include:

1. **Database Modifications:**
    - **Issue Resolution:** Addressed design flaws in the *EmployeePersonal* table to allow employees to record multiple allergies. Modified the table design to make the field open-ended, ensuring that HR could correctly file insurance claims.
    - **Enhancing Usability:** Added intersection tables to allow employees to input multiple addresses, ensuring accurate data without modifying the existing structure.
    - **Referential Integrity:** Adjusted the PK-PK relationship between *EmployeeAddress* and *Address* tables to a PK-FK relationship, stabilizing the database without data loss.
2. **SQL Scripting:**
    - **Custom Function Creation:** Developed a user-defined function, LastNameFirst#, to concatenate employee first and last names.
    - **Medical Concerns View:** Created a view, EmployeesMedicalConcerns, listing employees with known allergies, making it easier for HR to track medical needs.
    - **Stored Procedure for Salary Field:** Proposed and implemented a stored procedure to format salary data, converting it from INT to CHAR with appropriate currency formatting, improving data presentation.
3. **Database Performance and Maintenance:**
    - **Data Cleansing Automation:** Proposed a strategy to automate data cleansing using stored procedures, reducing manual work while maintaining data integrity.
    - **Concurrency Control:** Considered concurrency issues like dirty reads and non-repeatable reads when managing multiple stored procedures that may conflict, ensuring proper database functionality.

Key Skills Utilized:

- SQL Administration (Database Repair, Optimization, and Usability Enhancements)
- Writing and Testing SQL Queries, Views, and Stored Procedures
- Database Security and Integrity (PK-FK Relationships, Referential Integrity)
- User-defined Functions, Automated Data Cleansing
- Concurrency Control and Database Stability