***Final Project Options***

**1. Global Supply Chain Management System**

* **Scope**: Design a database to manage a global supply chain network for a large company. This would include:
  + **Inventory Management**: Track and forecast stock levels across warehouses globally, including re-order levels and automated procurement based on demand.
  + **Vendor and Supplier Network**: Detailed vendor tracking by region, quality score, delivery efficiency, and terms.
  + **Logistics**: Real-time tracking of shipments, including multiple carriers and shipping modes.
  + **Warehouse Management**: Enable real-time monitoring of warehouse space, shelf life, and optimal packing.
* **Technical Complexity**:
  + **Partitioned Tables** for each region for efficient querying.
  + **Complex Views and Materialized Views** to support reporting and analytics.
  + **Temporal Tables** to manage time-based data such as inventory levels over time.
  + **Advanced Indexing** for optimal performance on large-scale, cross-region queries.
  + **Stored Procedures** for automating periodic inventory checks, audits, and vendor assessment updates.

**2. Enterprise Human Resource and Payroll System**

* **Scope**: Build a fully-featured HR and payroll database that can support a multinational workforce.
  + **Employee Management**: Store detailed employee information, including roles, promotions, benefits, and performance evaluations.
  + **Payroll Processing**: Create tables and procedures to handle multi-currency payroll, deductions, and allowances based on various regions.
  + **Attendance and Leave Management**: Track attendance, overtime, leave balances, and approvals.
  + **Training and Development**: Track training schedules, certifications, and skill growth for each employee.
* **Technical Complexity**:
  + **Advanced Role-Based Security**: Create different access levels for HR, finance, and team managers to ensure data integrity.
  + **SQL Server Agent Jobs** for automated payroll processing, reporting, and backup.
  + **Dynamic Data Masking** and **Row-Level Security** for sensitive data like salaries and personal details.
  + **Data Partitioning** by departments, regions, or even pay periods for quick payroll calculations and reporting.

**3. Financial Transactions and Fraud Detection System**

* **Scope**: A complex database for handling high-volume financial transactions, monitoring for fraud, and providing real-time analytics.
  + **Transaction Records**: Store transaction data for various account types, including deposits, withdrawals, transfers, and foreign exchange.
  + **Fraud Detection**: Implement stored procedures to detect anomalies based on patterns (e.g., unusual frequency, high-value transactions).
  + **User Profile and Risk Scoring**: Store user data along with a dynamic risk score based on transaction history and behaviors.
  + **Audit Logs and Compliance**: Log all access, modifications, and transactions to meet compliance needs.
* **Technical Complexity**:
  + **In-Memory OLTP** for high-frequency transaction tables to ensure fast processing.
  + **Full-Text Search** for pattern matching and fraud detection within transaction descriptions.
  + **Triggers and Stored Procedures** for real-time fraud checks and alert generation.
  + **Data Encryption** and **Transparent Data Encryption (TDE)** for secure data storage.