

# Nexus Sales Intelligence System

## 1. Project Overview

The Nexus Sales Intelligence System is a database-driven Sales Data Mart designed using a Star Schema architecture. The system supports sales analytics, invoicing, operational record keeping, and secure data management. This project fulfills all CCP requirements, including:

- **Authorization & Security**
- **CRUD Operations**
- **Reporting & Analytics**
- **Record Keeping**
- **Scalability**
- **Front-end Integration**

## 2. System Architecture

### Database Design Approach

- Schema Type: Star Schema
- Fact Table: sales.fact\_sales
- Dimension Tables: sales.dim\_customers, sales.dim\_products, sales.dim\_users

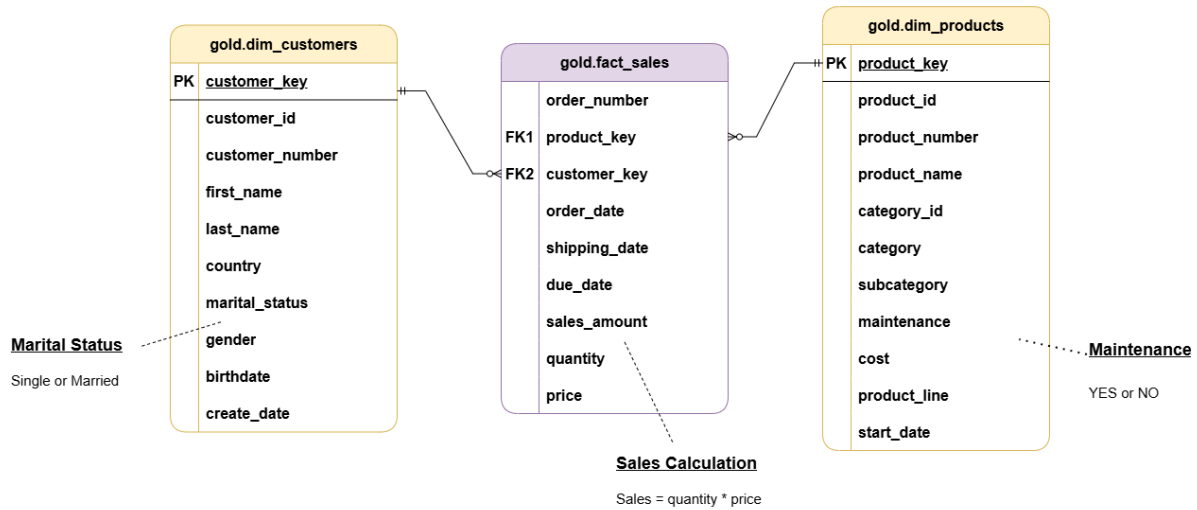
**A dedicated schema (sales) is used to:**

- Improve logical organization
- Enhance security and authorization
- Simplify permission management

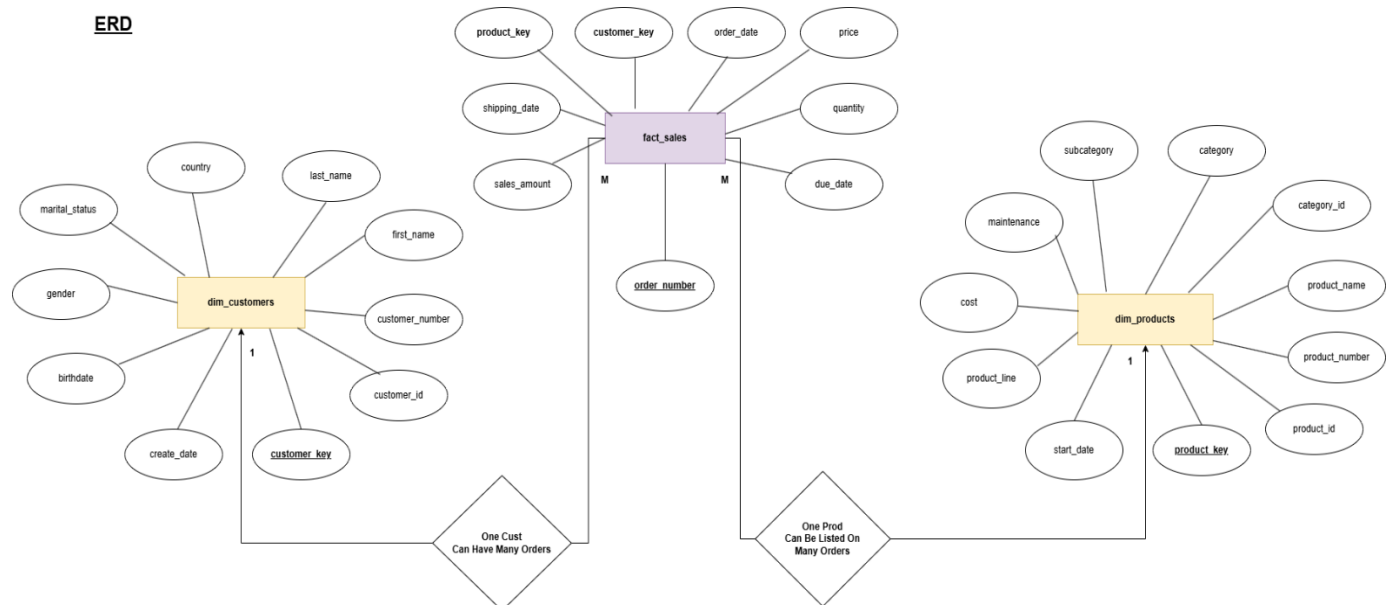
## 3. Database Schema Description

## STAR SCHEMA:

**Sales Data Mart** (Star Schema)



## ENTITY RELATIONSHIP DIAGRAM:



## Dimension Tables

Customers Dimension – sales.dim\_customers

Stores customer master data.

- **Surrogate Key:** customer\_key
- **Soft delete:** using is\_active
- **Historical preservation:** Supports historical record preservation

Products Dimension – sales.dim\_products

Stores product catalog and classification details.

- **Surrogate Key:** product\_key
- **Classification:** Category and subcategory support
- **Soft delete:** using is\_active

Users Dimension – sales.dim\_users

Manages system users and authorization.

- **Role-based access:** Admin, Sales\_Staff, Invoice\_Staff
- **Authorization kill-switch:** is\_authorized
- **Enforcement:** Used for enforcing secure operations

## Fact Table

Sales Fact – sales.fact\_sales

Stores transactional sales data.

- **Foreign keys:** linked to Products and Customers
- **Validation:** Data validation using CHECK constraints
- **Calculated Field:** Computed column sales\_amount = quantity × price
- **Integrity:** Maintains referential integrity

## 4. Security & Authorization

## Role-Based Authorization

Authorization is enforced at the application and database level:

- Users are assigned roles in sales.dim\_users.
- Only Admin users can remove (soft delete) records.

## Stored Procedures for Secure Operations

### a) sales.sp\_DeleteProduct\_Safe

- Allows only Admin users to deactivate products.
- Uses soft delete (is\_active = 0).
- Preserves historical sales data.

### b) sales.sp\_DeleteCustomer\_Safe

- Allows only Admin users to deactivate customers.
- Ensures past invoices and sales remain intact.

## 5. CRUD Operations Mapping

Operation	Implementation
Create	INSERT scripts for Users, Customers, Products, Sales
Read	SELECT queries, Views, Java GUI tables
Update	Soft delete using UPDATE statements
Delete	Restricted via Admin-only stored procedures

## 6. Reporting & Views

### Invoice Department View

sales.view\_invoice\_report

Combines sales, customer, and product data into a flat structure for invoicing.

- **Filtering:** Filters inactive products
- **Calculations:** Uses computed sales\_amount
- **Efficiency:** Simplifies departmental reporting

## 7. Advanced Analytics & KPIs

The system provides analytical queries using SQL Window Functions:

- Product performance ranking (DENSE\_RANK)
- High-value customer transactions
- Category-wise order volume
- Running total of revenue
- Total company revenue KPI
- Category revenue contribution (%)

## 8. Sample Data Population

The database is initialized with:

- 10 Users, 10 Customers, 10 Products, and 10 Sales Transactions.
- Data cleansing is handled before insertion to maintain consistency and referential integrity.

## 9. Front-End Integration (Java)

### Technology Stack

- **GUI:** Java Swing
- **Connectivity:** JDBC for database connectivity
- **Driver:** SQL Server JDBC Driver

### GUI Features

- Secure login using dim\_users
- Admin-only access to management panel

- Real-time refresh after operations

## **10. Record Keeping & Data Integrity**

- Soft deletes ensure no historical data loss.
- Foreign key constraints preserve relationships.
- Fact table remains unchanged after dimension deactivation.

## **11. Scalability & Best Practices**

- Star schema optimized for analytics.
- Surrogate keys for performance.
- Modular stored procedures and easily extendable dimensions.

## **12. Conclusion**

The Nexus Sales Intelligence System successfully fulfills all CCP requirements for DBMS. It demonstrates strong database design principles, secure authorization, and industry-standard best practices.

# 13. Appendix:

## Tables Data

### 1) Products:

Results Messages												
	product_key	product_id	product_number	product_name	category_id	category	subcategory	maintenance	cost	product_line	start_date	is_active
1	1	501	P-LAP	Pro Laptop 15	10	Electronics	Laptops	YES	1200.00	Computers	2024-01-15	1
2	2	502	P-MOU	Wireless Mouse	11	Accessories	Peripherals	NO	25.00	Computers	2024-02-10	1
3	3	503	P-KEY	Mechanical Keyboard	11	Accessories	Peripherals	NO	85.00	Computers	2024-03-05	1
4	4	504	P-MON	4K Monitor 27in	10	Electronics	Monitors	YES	350.00	Computers	2024-05-20	1
5	5	505	P-HEA	Noise Cancelling Headset	12	Audio	Headphones	NO	150.00	Peripherals	2024-06-15	1
6	6	506	P-TAB	Graphic Tablet	10	Electronics	Design Tools	YES	200.00	Design	2024-08-01	1
7	7	507	P-CAM	Webcam HD 1080p	13	Video	Cameras	NO	60.00	Peripherals	2024-09-12	1
8	8	508	P-MIC	USB Studio Mic	12	Audio	Microphones	YES	120.00	Peripherals	2024-10-10	1
9	9	509	P-CHL	Ergonomic Chair	20	Furniture	Chairs	NO	250.00	Office	2024-11-20	1
10	10	510	P-DSK	Standing Desk	20	Furniture	Desks	YES	450.00	Office	2025-01-05	0

### 2) Customers:

Results Messages												
	customer_key	customer_id	customer_number	first_name	last_name	country	marital_status	gender	birthdate	create_date	is_active	
1	1	101	C-001	John	Doe	USA	Married	M	1985-05-15	2025-12-21 04:37:26.030	1	
2	2	102	C-002	Alice	Smith	Canada	Single	F	1992-08-22	2025-12-21 04:37:26.030	1	
3	3	103	C-003	Mohammad	Ali	Pakistan	Married	M	1978-12-01	2025-12-21 04:37:26.030	1	
4	4	104	C-004	Elena	Rossi	Italy	Single	F	1995-03-10	2025-12-21 04:37:26.030	1	
5	5	105	C-005	Li	Wei	China	Married	M	1988-11-30	2025-12-21 04:37:26.030	1	
6	6	106	C-006	Sarah	Connor	USA	Single	F	1980-07-04	2025-12-21 04:37:26.030	1	
7	7	107	C-007	David	Beckham	UK	Married	M	1975-05-02	2025-12-21 04:37:26.030	1	
8	8	108	C-008	Fatima	Zahra	UAE	Married	F	1990-01-20	2025-12-21 04:37:26.030	1	
9	9	109	C-009	Hans	Muller	Germany	Single	M	1983-09-14	2025-12-21 04:37:26.030	0	
10	10	110	C-010	Sofia	Garcia	Spain	Married	F	1994-06-25	2025-12-21 04:37:26.030	1	

### 3) Sales:

Results Messages										
	order_number	product_key	customer_key	order_date	shipping_date	due_date	quantity	price	sales_amount	
1	ORD-2025-101	1	1	2025-12-01	2025-12-03	2025-12-10	1	1499.99	1499.99	
2	ORD-2025-102	2	2	2025-12-03	2025-12-05	2025-12-12	2	29.99	59.98	
3	ORD-2025-103	4	3	2025-12-05	2025-12-08	2025-12-14	1	399.00	399.00	
4	ORD-2025-104	5	4	2025-12-07	2025-12-10	2025-12-16	1	175.00	175.00	
5	ORD-2025-105	10	5	2025-12-10	2025-12-13	2025-12-19	1	499.00	499.00	
6	ORD-2025-106	3	6	2025-12-12	2025-12-14	2025-12-21	3	89.50	268.50	
7	ORD-2025-107	7	7	2025-12-14	2025-12-16	2025-12-23	1	75.00	75.00	
8	ORD-2025-108	9	8	2025-12-15	2025-12-18	2025-12-24	1	299.00	299.00	
9	ORD-2025-109	6	9	2025-12-18	2025-12-20	2025-12-27	1	250.00	250.00	
10	ORD-2025-110	8	10	2025-12-20	2025-12-22	2025-12-29	2	135.00	270.00	

## GUI Test:

### Users:

Results		Messages			
	user_id	username	password_hash	user_role	is_authorized
1	1	admin_sarah	sh@256_x1	Admin	1
2	2	sales_mike	sh@256_x2	Sales_Staff	1
3	3	sales_jane	sh@256_x3	Sales_Staff	1
4	4	inv_robert	sh@256_x4	Invoice_Staff	1
5	5	admin_khan	sh@256_x5	Admin	1
6	6	sales_ali	sh@256_x6	Sales_Staff	1
7	7	inv_sana	sh@256_x7	Invoice_Staff	1
8	8	sales_leo	sh@256_x8	Sales_Staff	1
9	9	sales_maya	sh@256_x9	Sales_Staff	0
10	10	manager_eric	sh@256_x0	Admin	1

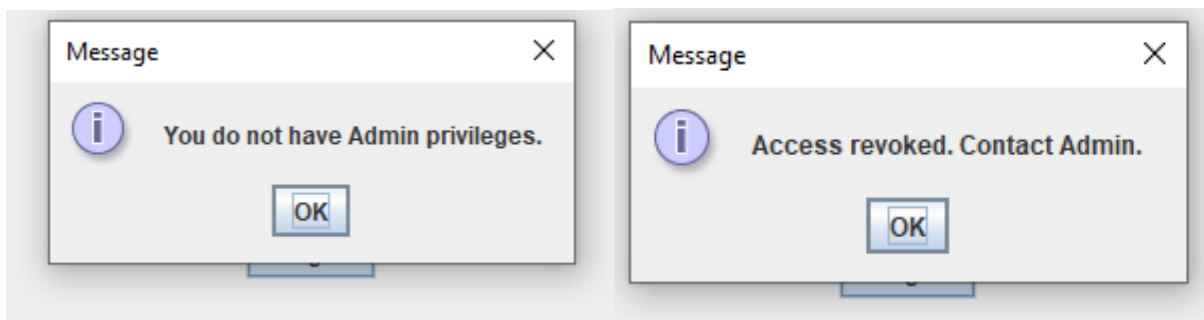
Nexus Sales Intelligence System

Username:

Password:

Login

### If User is Not Admin or If User is Not Authorized:





GUI Based Deletion (IF User is Authorized to Do):

Nexus Sales Intelligence System

Products

Product Key	Product ID	Name	Category	Cost	Active
1	501	Pro Laptop 15	Electronics	1200.0	true
2	502	Wireless Mouse	Accessories	25.0	true
3	503	Mechanical Keyboard	Accessories	85.0	true
4	504	4K Monitor 27in	Electronics	350.0	true
5	505	Noise Cancelling He...	Audio	150.0	true
6	506	Graphic Tablet	Electronics	200.0	true
7	507	Webcam HD 1080p	Video	60.0	true
8	508	USB Studio Mic	Audio	120.0	true
9	509	Ergonomic Chair	Furniture	250.0	true
10	510	Standing Desk	Furniture	450.0	false

Refresh Products

Delete Selected Product

Customers

Customer Key	Customer ID	Name	Country	Active
1	101	John Doe	USA	true
2	102	Alice Smith	Canada	true
3	103	Mohammad Ali	Pakistan	true
4	104	Elena Rossi	Italy	true
5	105	Li Wei	China	true
6	106	Sarah Connor	USA	true
7	107	David Beckham	UK	true
8	108	Fatima Zahra	UAE	true
9	109	Hans Muller	Germany	false
10	110	Sofia Garcia	Spain	true

Refresh Customers

Delete Selected Customer

Invoice Generation

Results		Messages					
	order_number	order_date	customer_name	product_name	quantity	price	sales_amount
1	ORD-2025-101	2025-12-01	John Doe	Pro Laptop 15	1	1499.99	1499.99
2	ORD-2025-102	2025-12-03	Alice Smith	Wireless Mouse	2	29.99	59.98
3	ORD-2025-103	2025-12-05	Mohammad Ali	4K Monitor 27in	1	399.00	399.00
4	ORD-2025-104	2025-12-07	Elena Rossi	Noise Cancelling Headset	1	175.00	175.00
5	ORD-2025-106	2025-12-12	Sarah Connor	Mechanical Keyboard	3	89.50	268.50
6	ORD-2025-107	2025-12-14	David Beckham	Webcam HD 1080p	1	75.00	75.00
7	ORD-2025-108	2025-12-15	Fatima Zahra	Ergonomic Chair	1	299.00	299.00
8	ORD-2025-109	2025-12-18	Hans Muller	Graphic Tablet	1	250.00	250.00
9	ORD-2025-110	2025-12-20	Sofia Garcia	USB Studio Mic	2	135.00	270.00

## Report Generation

**PRODUCT PERFORMANCE:** Rank products by the total volume sold

Identifies high-demand items using DENSE\_RANK to handle ties without skipping ranks.

Results Messages				
	customer_name	product_name	quantity	most_selling_rank
1	Sarah Connor	Mechanical Keyboard	3	1
2	Alice Smith	Wireless Mouse	2	2
3	Sofia Garcia	USB Studio Mic	2	2
4	John Doe	Pro Laptop 15	1	3
5	Mohammad Ali	4K Monitor 27in	1	3
6	Elena Rossi	Noise Cancelling Headset	1	3
7	David Beckham	Webcam HD 1080p	1	3
8	Fatima Zahra	Ergonomic Chair	1	3
9	Hans Muller	Graphic Tablet	1	3

**CUSTOMER VALUE:** Rank individual transactions based on total sales amount

Used by the Sales Dept to identify high-value orders and key contributors to revenue.

Results Messages				
	customer_name	product_name	quantity	cust_rank
1	John Doe	Pro Laptop 15	1	1
2	Mohammad Ali	4K Monitor 27in	1	2
3	Fatima Zahra	Ergonomic Chair	1	3
4	Sofia Garcia	USB Studio Mic	2	4
5	Sarah Connor	Mechanical Keyboard	3	5
6	Hans Muller	Graphic Tablet	1	6
7	Elena Rossi	Noise Cancelling Headset	1	7
8	David Beckham	Webcam HD 1080p	1	8
9	Alice Smith	Wireless Mouse	2	9

**DEPARTMENTAL ACTIVITY:** Rank categories by the total number of orders processed

Helps the Invoicing Dept understand transaction volume across different product lines.

Results			Messages		
	category	category_rank			
1	Electronics	1			
2	Accessories	2			
3	Audio	2			
4	Furniture	3			
5	Video	3			

**REVENUE TRENDS:** Calculate a cumulative running total of sales

Essential for visualizing revenue growth over time and tracking daily business progress.

Results						Messages					
	customer_name	product_name	quantity	sales_amount	running_total						
1	John Doe	Pro Laptop 15	1	1499.99	1499.99						
2	Alice Smith	Wireless Mouse	2	59.98	1559.97						
3	Mohammad Ali	4K Monitor 27in	1	399.00	1958.97						
4	Elena Rossi	Noise Cancelling Headset	1	175.00	2133.97						
5	Sarah Connor	Mechanical Keyboard	3	268.50	2402.47						
6	David Beckham	Webcam HD 1080p	1	75.00	2477.47						
7	Fatima Zahra	Ergonomic Chair	1	299.00	2776.47						
8	Hans Muller	Graphic Tablet	1	250.00	3026.47						
9	Sofia Garcia	USB Studio Mic	2	270.00	3296.47						

**FINANCIAL OVERVIEW:** Grand Total of all sales revenue

Provides a single Key Performance Indicator (KPI) for the company's total gross income.

	total_sales
1	3795.47

**EXECUTIVE SUMMARY:** Category Revenue Analysis & Market Share %

Ranks categories by revenue and calculates their percentage contribution to total sales.

	Category	Total_Revenue	Revenue_Rank	Sales_Contribution_Pct
1	Electronics	2148.99	1	65.19
2	Audio	445.00	2	13.50
3	Accessories	328.48	3	9.96
4	Furniture	299.00	4	9.07
5	Video	75.00	5	2.28

**POWERBI DASHBOARD:**

