

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

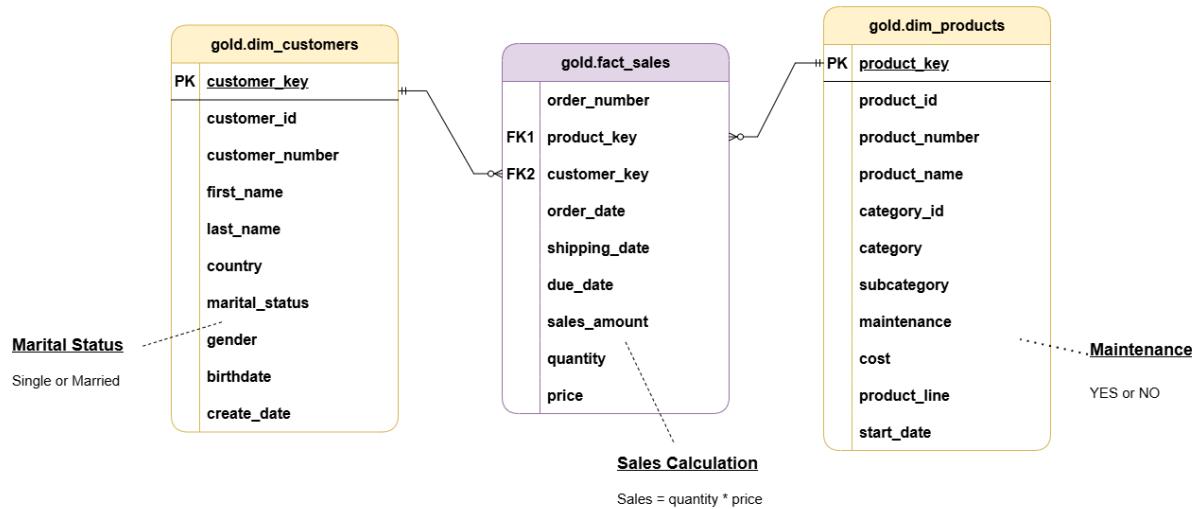
A dedicated schema (sales) is used to:

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

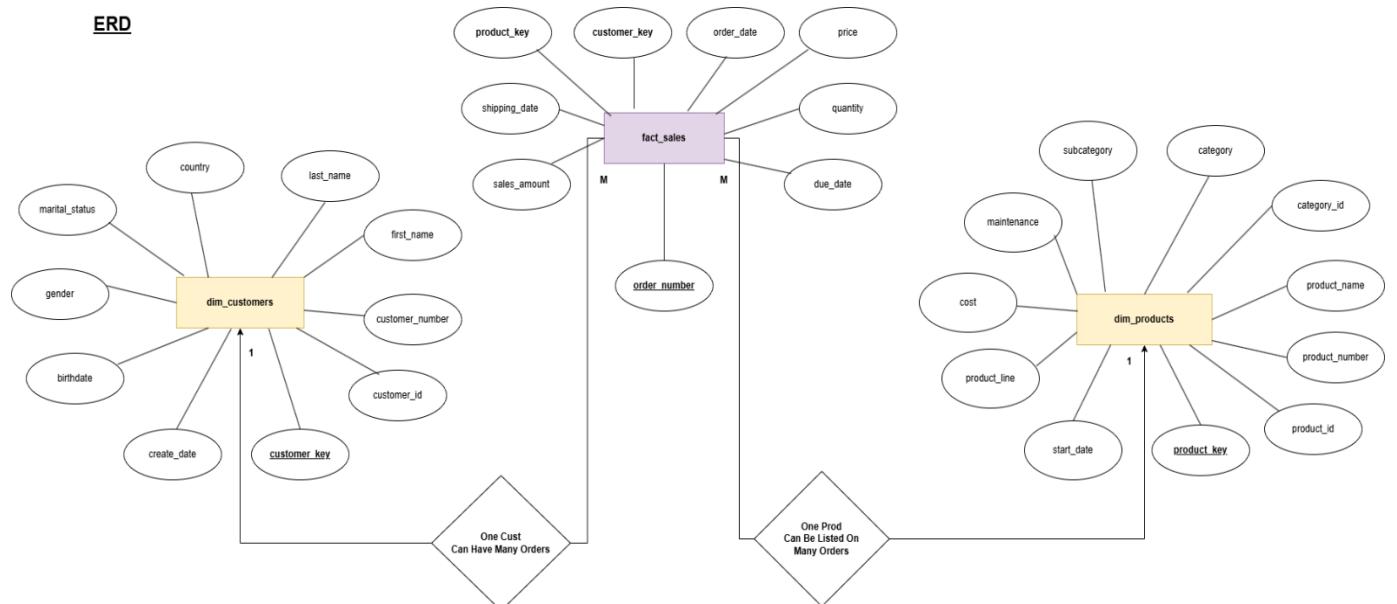
3. Database Schema Description

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:** isAuthorized
- **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:

	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:

	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

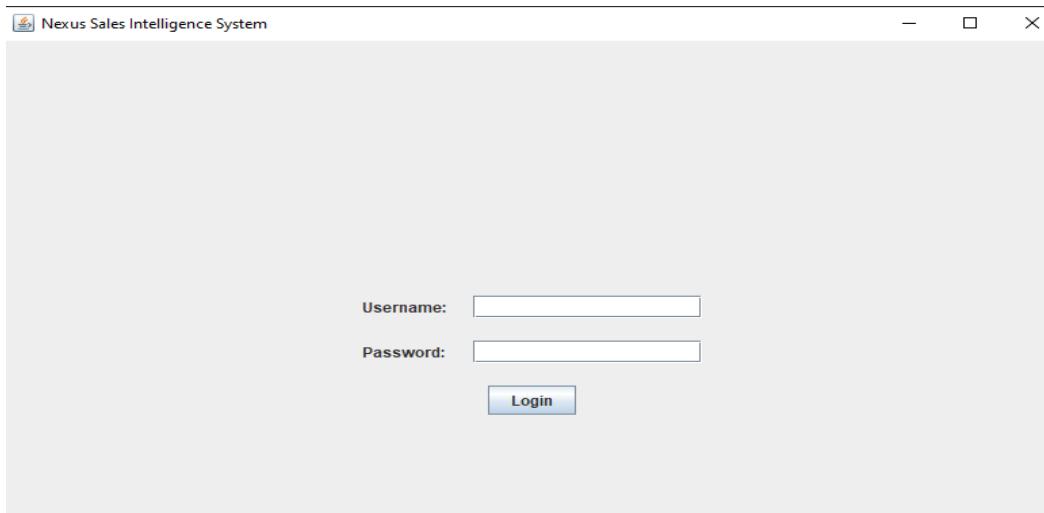
3) Sales:

	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

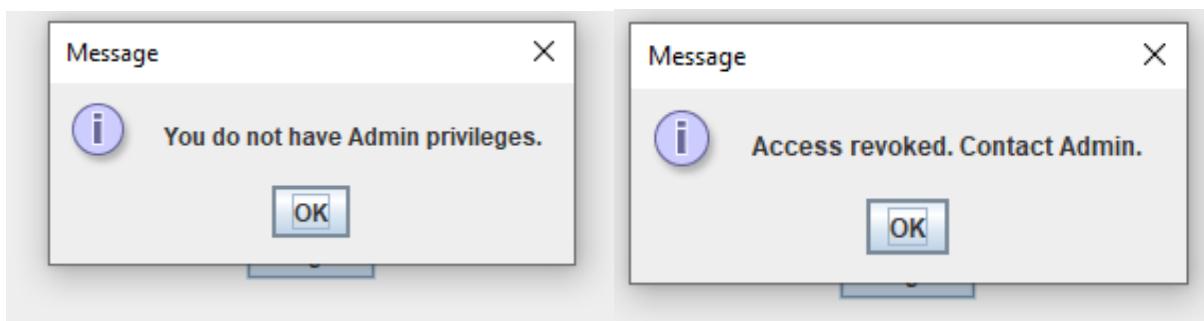
GUI Test:

Users:

	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



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.

	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.

	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.

	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.

	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:

