

Data warehouse: Requirements specification for Sale business process

Requirements specification for Sale business process

1. General description of business process

- a. A general description of the business process and a description of the performance metrics generated by this process, possible current analytical problems.

The material ordering process is as follows: the assigned employee uses a dedicated software system to assess the material needs for every project. This system shows current inventory stock and past order history. Once the materials required are identified, the employee places orders through the software, selecting different suppliers based on availability and price. When materials arrive at the warehouses, the software updates the inventory automatically. The employee then allocates materials to specific construction sites according to project schedules. This allocation is also managed in the software, which creates a delivery schedule to ensure timely transportation. As materials are sent from the warehouse to the construction sites, the system tracks each delivery, noting any discrepancies like missing or damaged items. Throughout the process, the software provides important data on costs, delays and supplier performance, helping the company negotiate better prices and optimize material use for future projects.

- **Reduction in material costs: The purchase of the summed price of materials is to decrease by at least 0.5% each month.**
- **Reduction in material wastage: Weighted average material wastage is to be reduced by 5% in the current six months to the previous six months.**

- b. Typical questions

- How many orders are placed per month and for which materials?
- Which suppliers have the highest on-time delivery rates?
- What are the average costs of materials from each supplier, and how can this data be used to negotiate better deals?
- What materials are ordered most often, and what are the trends over time?
- How do material costs fluctuate over time? Are there seasonal price changes?
- Give the average monthly material cost for the last year.
- How quickly are materials distributed from warehouses to construction sites after arrival?
- Compare the number of materials ordered versus the number actually used on-site.

- a. Data for the data warehouse comes from two main sources. **Both are databases.** First, the **material ordering system**, which tracks all key information such as project details, supplier data, material quantities, order and delivery dates, costs, and discrepancies between ordered and delivered items. This provides insight into procurement efficiency and supplier performance.

Second, the **inventory management system**, where stock levels in warehouses, material allocations to projects, and delivery schedules are recorded. This ensures that materials are properly tracked from warehouse to construction site, helping prevent shortages and delays. Together, these two sources provide a complete view of material flow and usage for analysis and optimization.

2. Data sources structures

Material ordering system database

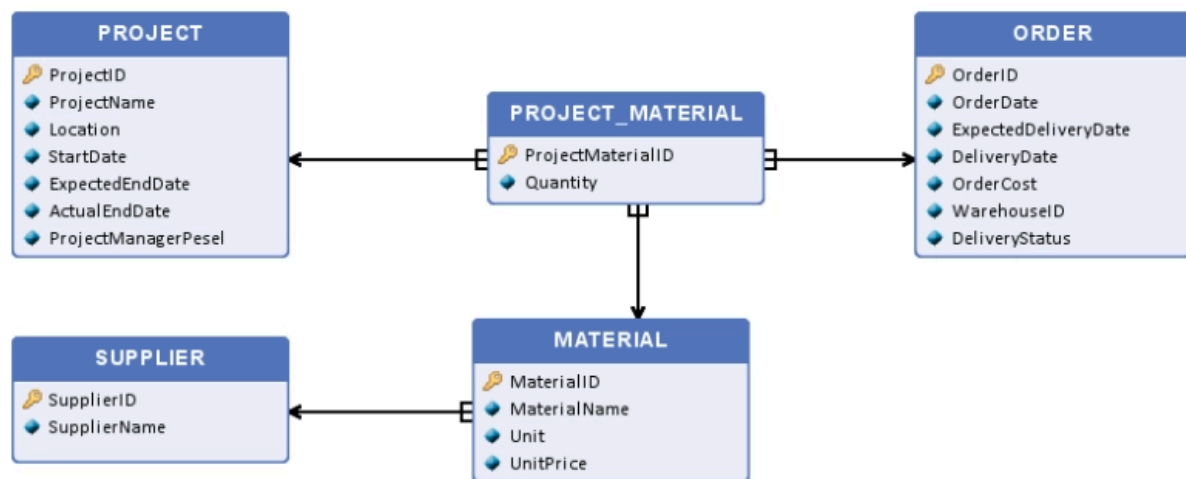


TABLE NAME	ATTRIBUTE	ATTRIBUTE TYPE	DESCRIPTION
PROJECT	Contains information about the construction projects identified by its ProjectID.		
	ProjectID	String - 10 characters	PK - project identification number
	ProjectName	String - 30 characters	Name of the construction project
	Location	String - 20 characters	Name of the construction location
	StartDate	DateTime	The day when the project began
	ExpectedEndDate	DateTime	The expected project completion date
	ActualEndDate	DateTime	The actual project completion date

	ProjectManagerPesel	String - 11 characters	The Pesel which identifies the project manager of project
SUPPLIER	The Supplier table holds information about the companies supplying materials for various projects.		
	SupplierID	String - 10 characters	PK - supplier identifier
	SupplierName	String - 30 characters	The name of the supplier providing materials
MATERIAL	Stores information about the materials used in various projects and information about the supplier of each material.		
	MaterialID	String - 10 characters	PK - material identifier
	MaterialName	String - 20 characters	The name of the material
	Unit	String - 20 characters	Unit of materials. Allowed value: [kg, m, m ² , m ³ , l]
	UnitPrice	Decimal	The price per unit of the material
	SupplierID	String characters	FK - pointing to the supplier of the material. The same material may have different entries for different suppliers
PROJECT_MATERIAL	This table will link the materials required for each project, along with the quantity needed.		
	ProjecMaterialID	String - 10 characters	PK - project material identifier
	ProjectID	String - 10 characters	FK - pointing to the project
	MaterialID	String - 10 characters	FK - pointing to the material
	Quantity	Numeric	The quantity of the material needed for this project.
	OrderID	String - 10 characters	FK - pointing to order
ORDER	This table represents the actual orders placed for the materials. It captures details of deliveries for each project.		
	OrderID	String - 10 characters	PK - order identifier
	OrderDate	DateTime	The day when the order began
	ExpectedDeliveryDate	DateTime	The expected order delivery date

	DeliveryDate	DateTime	The actual order delivery date
	OrderCost	Numeric	How much does deliver costs
	WarehouseId	String - 10 characters	Information about the warehouse where the order will be delivered.
	DeliveryStatus	String - 10 characters	Describes the quality of the delivery. Allowed values: "Excellent", "Average", "Poor")

Inventory management system database

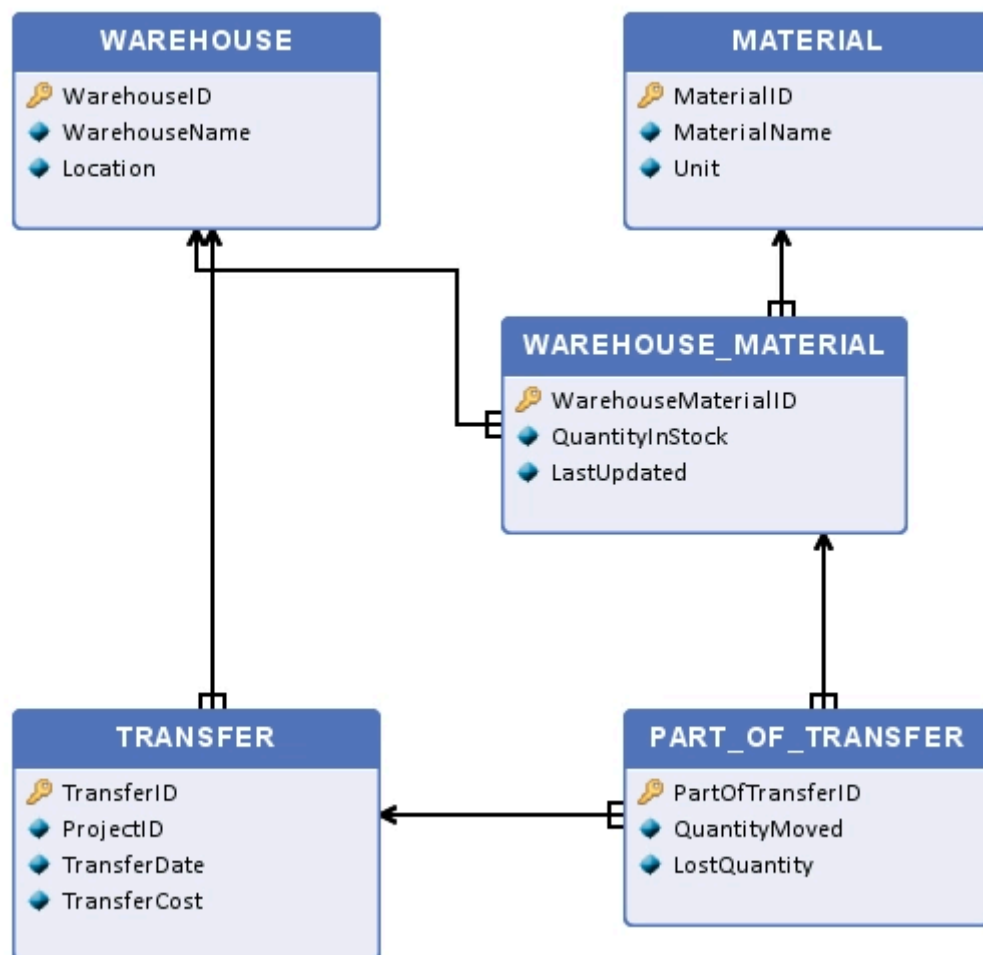


TABLE NAME	ATTRIBUTE	ATTRIBUTE TYPE	DESCRIPTION
WAREHOUSE	Stores details about each warehouse where materials are stocked.		

	WarehouseID	String - 10 characters	PK - warehouse identifier
	WarehouseName	String - 20 characters	Name of the warehouse
	Location	String - 20 characters	Location of the warehouse.
MATERIAL	Single material that can be stocked in different warehouses.		
	MaterialID	String - 10 characters	PK - material identifier
	MaterialName	String - 20 characters	The name of the material
	Unit	String - 20 characters	Unit of materials. Allowed value: [kg, m, m ² , m ³ , l]
WAREHOUSE_MATERIAL	Represents the stock level of each material in each warehouse.		
	WarehouseMaterialID	String - 20 characters	PK - warehouse material identifier
	WarehouseID	String - 20 characters	FK - pointing to the warehouse
	MaterialID	String - 20 characters	FK - pointing to the material
	QuantityInStock	Numeric	Quantity of the material currently in stock
	LastUpdated	DateTime	Date when the stock levels were last updated.
TRANSFER	Tracks the movement of materials from warehouses to projects.		
	TransferID	String - 20 characters	PK - identifier for the material transfer
	WarehouseID	String - 20 characters	FK - pointing to the warehouse
	ProjectID	String - 20 characters	Information about the project where the transfer will be made.
	TransferCost	Numeric	How much does transfer costs
	TransferDate	DateTime	Date when the materials were transferred.
PART_OF_TRANSFER	Tracks individual material being moved in transfer. It allows partial quantities of warehouse material to be moved.		
	PartOfTransferID	String - 20 characters	PK - identifier for the transfer material detail

	TransferID	String - 20 characters	FK - identifier for the transfer
	WarehouseMaterialID	String - 20 characters	FK - pointing to the warehouse material
	QuantityMoved	Numeric	The quantity of the material being transferred
	LostQuantity	Numeric	Quantity of materials lost or damaged during movement.

3. Scenarios of analytical problems

Why was there an increase/decrease in material costs this month?

1. Compare the quantity of materials ordered for each project relative to previous months.
2. What were the most expensive materials ordered this month compared to previous months?
3. Compare the material purchase price trends over the last 12 months.
4. Compare the quantity of materials ordered from each supplier.
5. How much material is wasted due to damage during transportation from each warehouse to project sites?
6. How do material costs vary based on the supplier's location?
7. What are the cost differences between bulk material purchases and smaller, frequent orders?
8. Compare material costs during peak construction periods with the off-season.
9. How did transportation costs affect the overall material cost this month?
10. Compare the total material costs across different construction sites this month.

How can we improve material flow and efficiency in the supply chain to reduce overall costs?

1. Determine which materials are ordered most frequently and which are for long time in warehouses, leading to increased storage costs.
2. What is the relationship between material wastage and total material costs?
3. Which materials are most prone to damage or loss during transportation, and how does this impact project costs?
4. Compare the time it takes from material ordering to their actual use on construction sites, and analyze how long materials stay in warehouses.
5. Analyze supplier performance in terms of delivery time and how delays contribute to increased storage or material shortages.
6. Identify which materials have the highest rate of wastage due to damage during transportation.

4. Data needed for analytical problems.

Analytical problem: "Why was there an increase/decrease in material costs this month?"

1. Compare the quantity of materials ordered for each project relative to previous months.

- **quantity of material:** Material ordering system (*Project_Material* table, *Quantity* column).
 - **time of order:** Material ordering system (*Order* table, *OrderDate* column).
2. What were the most expensive materials ordered this month compared to previous months?
 - **material cost:** Material ordering system (*Material* table, *UnitPrice* column) and Material ordering system (*ProjectMaterial* table, *Quantity* column)
 - **order date:** Material ordering system (*Order* table, *OrderDate* column).
 3. Compare the material purchase price trends over the last 12 months.
 - **material cost:** Material ordering system (*Material* table, *UnitPrice* column) and Material ordering system (*ProjectMaterial* table, *Quantity* column)
 - **order date:** Material ordering system (*Order* table, *OrderDate* column).
 4. Compare the quantity of materials ordered from each supplier.
 - **order date:** Material ordering system (*Order* table, *OrderDate* column).
 - **supplier:** Material ordering system (*Supplier* table, *SupplierID*, *SupplierID* columns)
 - **quantity of material:** Material ordering system (*Project_Material* table, *Quantity* column).
 5. How much material is wasted due to damage during transportation from each warehouse to project sites?
 - **damage reports:** Inventory management system (*Part_of_transfer* table, *LostQuantity* column)
 - **quantity:** Inventory management system (*Part_of_transfer* table, *QuantityMoved* column)
 - **warehouse:** Inventory management system (*Warehouse-material* table, *WarehouseID* column)

Analytical problem: “How can we improve material flow and efficiency in the supply chain to reduce overall costs?”

1. Determine which materials are ordered most frequently and which are for long time in warehouses, leading to increased storage costs.
 - **order data:** Material ordering system (*Order* table, *DeliveryDate*, *Quantity* columns).
 - **inventory material quantity:** Inventory management system (*Warehouse_Material* table, *MaterialID*, *QuantityInStock*, *LastUpdated* columns)
 - **material data:** Material ordering system (*Material* table, *MaterialID*, *MaterialName* columns)
2. What is the relationship between material wastage and total material costs?
 - **material wastage:** Inventory management system (*Part_of_transfer* table, *LostQuantity* column,)
 - **transfer cost:** Inventory management system (*Transfer* table, *TransferCost* column)
 - **material cost:** Material ordering system (*Material* table, *Unit*, *UnitPrice* columns)
3. Which materials are most prone to damage or loss during transportation, and how does this impact project costs?
 - **wastage quantity:** Inventory management system (*Part_Of_Transfer* table, *LostQuantity* column)
 - **material data:** Inventory management system (*Material* table, *MaterialID*, *MaterialName* columns)
4. Which projects experience the highest material transportation costs, and how can we optimize them?
 - **project data:** Project management system (*Project* table, *ProjectID*, *Location* columns)
 - **transfer cost:** Inventory management system (*Transfer* table, *TransferCost* column)

5. How frequently do materials arrive on time, and what percentage is delayed?
- **delivery status:** Material Ordering System (*Order* table, *DeliveryStatus* column)
 - **delivery records:** Material Ordering System (*Order* table, *ExpectedDeliveryDate*, *DeliveryDate* columns)
 - **number of orders:** Material Ordering System (*Order* table, *OrderID* column)

Query demanding additional data source, but does not demand changing the business process

How does the popularity of materials affect the frequency of orders and supplier performance, specifically the correlation between frequently ordered materials and on-time deliveries?

Data needed:

- **material popularity data:** This data could come from the Material Order Frequency Excel and track the frequency of orders for each material.
- **delivery info data:** Material Ordering System (*Order* table, *ExpectedDeliveryDate*, *DeliveryDate* columns)

Sample structure of Material Order Frequency Excel

Column A - MaterialID (text)

Column B - MaterialName (text)

Column C - OrderFrequency (Numeric)

Query demanding additional data source which can be gathered only by changes in the business processes

How does the handling and storage conditions in warehouses impact material wastage and loss during transfers to projects?

Currently, data on handling and storage conditions are not tracked. To answer this question, changes in the warehouse processes would need to be made, such as implementing a new system for recording storage conditions and handling practices. These changes would allow the business to analyze whether poor handling or storage conditions lead to increased material wastage during transfers.

Data and changes needed:

- **handling conditions data:** This would require warehouse staff entering information about how materials are handled and stored (e.g., temperature, humidity, packaging) before transfers. This data would need to be recorded in a new system tracking warehouse handling conditions.
- **wastage data:** Inventory Management System (*PART_OF_TRANSFER* table, *LostQuantity* column).