Supply Chain Indicator

1. 物流与交付指标

- **订单履行周期时间 (Order Fulfillment Cycle Time)**:
  Time taken from order placement to delivery to the customer.
- **准时交货率 (On-Time Delivery Rate)**:
  Percentage of orders delivered on or before the promised date.
- **交货时间 (Lead Time)**:
  Total time taken for a product to move through the entire supply chain.
- **运输成本占比 (Transportation Cost as a Percentage of Sales)**:
  Ratio of transportation costs to total sales revenue.
- **订单行履行率 (Line Fill Rate)**
  The percentage of order lines fulfilled completely from available inventory without backorders or stockouts.
  订单行履行率衡量的是在客户订单中，完全按订单行（即订单中的每个产品项）交付的百分比。它关注的是**订单行的完整性**，而不是具体的数量。该指标更注重**客户体验**，因为它衡量的是是否能够一次性地满足客户的所有需求。

  计算公式:

  $$\text{Line Fill Rate} = \frac{\text{Number of Order Lines Fully Filled}}{\text{Total Number of Order Lines}} \times 100\%$$

  应用场景:

  - 适用于**多品种、小批量**的订单（如零售、电商）。
  - 用来评估是否能够满足客户订单中的所有产品项。

  例子:
  如果一个订单包含 5 个产品项（5 个订单行），但只有 4 个产品项完全交付，则 Line Fill Rate 为 80%。
- **数量履行率 (Volume Fill Rate)**
  The percentage of total ordered quantity (volume) fulfilled from available inventory without backorders or stockouts.
  数量履行率衡量的是在客户订单中，实际交付的产品数量占订单总需求数量的百分比。它关注的是**数量的满足程度**，而不是订单行的完整性。该指标更注重**库存管理和生产计划的有效性**，因为它衡量的是整体需求的满足程度。

  计算公式:

  $$\text{Volume Fill Rate} = \frac{\text{Total Quantity Delivered}}{\text{Total Quantity Ordered}} \times 100\%$$

  应用场景:

  - 适用于**大批量、少品种**的订单（如制造业、批发）。
  - 用来评估是否能够满足客户订单中的总需求量。

  例子:
  如果一个订单需求为 100 件产品，但实际交付了 90 件，则 Volume Fill Rate 为 90%。

- **按时完整交付率 (OTIF: On-Time and In-Full)**

  On-Time（按时）：订单是否在客户要求的交货日期或承诺的交货日期内送达。

  In-Full（完整）：订单中的产品是否按订单数量全部交付，没有缺货或短交。

综合起来，OTIF 衡量的是订单是否同时满足“按时”和“完整”两个条件。

$$\text{OTIF} = \frac{\text{Number of Orders Delivered On-Time and In-Full}}{\text{Total Number of Orders}} \times 100\%$$

On-Time（按时交付率）

$$\text{On-Time} = \frac{\text{Number of Orders Delivered On-Time}}{\text{Total Number of Orders}} \times 100\%$$

In-Full（完整交付率）

$$\text{In-Full} = \frac{\text{Number of Orders Delivered In-Full}}{\text{Total Number of Orders}} \times 100\%$$

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2. 库存管理指标

- **库存周转率 (Inventory Turnover Ratio)**:
  Number of times inventory is sold and replaced over a period.

$$\text{Inventory Turnover Ratio} = \frac{\text{Cost of Goods Sold (COGS)}}{\text{Average Inventory}}$$

- **库存持有成本 (Inventory Carrying Cost)**:
  Total cost of holding inventory, including storage, insurance, and obsolescence.

$$\text{Inventory Carrying Cost} = \text{Average Inventory} \times \text{Carrying Cost Percentage}$$

- **库存天数 (Days of Inventory / Days Sales of Inventory)**:
  Average number of days inventory is held before being sold.

$$\text{Days of Inventory} = \frac{365}{\text{Inventory Turnover Ratio}}$$

- **缺货率 (Stock-Out Rate)**:
  Percentage of times demand cannot be met due to insufficient inventory.

$$\text{Stock-Out Rate} = \frac{\text{Number of Stock-Outs}}{\text{Total Number of Orders}} \times 100\%$$

- **库存覆盖率 (Inventory Coverage Ratio)**:
  Number of days current inventory can meet future demand.

$$\text{Inventory Coverage Ratio} = \frac{\text{Current Inventory}}{\text{Average Daily Demand}}$$

- **库存过剩率 (Excess Inventory Rate)**:
  Percentage of inventory that exceeds demand and remains unsold for a certain period.

$$\text{Excess Inventory Rate} = \frac{\text{Excess Inventory}}{\text{Total Inventory}} \times 100\%$$

- **库存准确性 (Inventory Accuracy)**:
  Percentage of inventory records that match physical counts.
- **单位库存成本 (Cost per Unit of Inventory)**:
  Total cost of holding inventory divided by the number of units.

$$\text{Cost per Unit} = \frac{\text{Total Inventory Cost}}{\text{Number of Units}}$$

- **安全库存水平 (Safety Stock Level)**:
  Extra inventory held to prevent stockouts due to demand variability or supply delays.

$$\text{Safety Stock} = (\text{Maximum Lead Time} - \text{Average Lead Time}) \times \text{Average Daily Demand}$$

- **经济订货量 (Economic Order Quantity, EOQ)**:
  Optimal order quantity that minimizes total inventory costs.

$$\text{EOQ} = \sqrt{\frac{2 \times \text{Demand} \times \text{Order Cost}}{\text{Holding Cost per Unit}}}$$

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3. 采购与供应商管理指标

- **采购周期时间 (Procurement Cycle Time)**:
  Time taken from identifying a need to the receipt of goods.
- **供应商交货准时率 (Supplier On-Time Delivery Rate)**:
  Percentage of orders delivered by suppliers on or before the agreed date.
- **供应商质量指数 (Supplier Quality Index)**:
  Measure of the quality of goods or services provided by suppliers.
- **采购成本占比 (Procurement Cost as a Percentage of Sales)**:
  Ratio of procurement costs to total sales revenue.

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4. 生产与制造指标

- **产能利用率 (Capacity Utilization Rate)**:
  Percentage of production capacity being utilized.
- **生产周期时间 (Manufacturing Cycle Time)**:
  Time taken to complete the production process.
- **首次通过率 (First Pass Yield, FPY)**:
  Percentage of products that meet quality standards without rework.
- **机器停机时间 (Machine Downtime)**:
  Amount of time production is halted due to equipment failure.

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5. 客户服务与满意度指标

- **订单履行率 (Order Fill Rate)**:
  Percentage of customer orders fulfilled completely and on time.

$$OrderFillRate = \frac{\text{Number of Orders Fulfilled}}{\text{Total Number of Orders}} \times 100\%$$

- **客户订单周期时间 (Customer Order Cycle Time)**:
  Time taken from order placement to customer receipt.
- **退货率 (Return Rate)**:
  Percentage of products returned by customers due to defects or dissatisfaction.
- **客户满意度指数 (Customer Satisfaction Index, CSI)**:
  Measure of customer satisfaction with products or services.
- **服务水平 (Service Level)**:
  Percentage of demand met without stockouts or backorders.

$$\text{Service Level} = \frac{\text{Demand Met Without Stockouts}}{\text{Total Demand}} \times 100\%$$

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6. 成本与财务指标

- **总供应链成本 (Total Supply Chain Cost)**:
  Total cost of managing the supply chain, including procurement, production, and logistics.
- **单位产品成本 (Cost per Unit)**:
  Total cost divided by the number of units produced.
- **毛利率 (Gross Margin)**:
  Difference between revenue and cost of goods sold, expressed as a percentage.
- **现金到现金周期时间 (Cash-to-Cash Cycle Time)**:
  Time taken to convert investment in inventory into cash from sales.

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7. 灵活性与风险管理指标

- **供应链弹性 (Supply Chain Resilience)**:
  Ability to recover quickly from disruptions.
- **订单变更频率 (Order Change Frequency)**:
  Number of times customer orders are modified after placement.
- **供应中断率 (Supply Disruption Rate)**:
  Frequency of disruptions in the supply chain.

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8. 可持续性与环境指标

- **碳排放量 (Carbon Footprint)**:
  Total greenhouse gas emissions from supply chain activities.
- **能源消耗 (Energy Consumption)**:
  Total energy used in the supply chain.
- **废弃物率 (Waste Rate)**:
  Percentage of materials wasted during production or distribution.