Tenant Industries : Supply Chain Analytics

What is a Supply Chain?
So, what is a Supply Chain exactly? A supply chain is a network of individuals and companies who are involved in creating a product and delivering it to the consumer. The Supply Chain begins with the producers of raw material and ends with the product being delivered to the consumer.

What is Make versus Buy?

A make-versus-buy decision refers to the process of choosing between manufacturing a product in-house (make option) or purchasing it from an external supplier (buy option).

Factors in the Make versus Buy Analysis

Continuing with the **pizza analogy**, the **make-versus-buy decision** involves several important considerations:

- **Quality:** The pizza you make at home might not taste as good as one from a professional Italian restaurant.

- **Time:** Preparing a pizza yourself might take an hour, whereas ordering one takes just a few minutes.

- **Cost:** Making pizza at home may seem cheaper, but restaurants often purchase ingredients in bulk, reducing their costs.

This analogy illustrates how **complex** a make-versus-buy decision can be. Companies need reliable methods to **quantify these factors** before making a decision.

For simplicity, this case study focuses primarily on **analyzing the cost** of the Make and Buy options. However, real-world organizations must also consider **quality, time, and ethical factors** in their supply chain decisions.

The case study focuses on a **make-versus-buy decision**. You are hired as a **Supply Chain Analyst** at a fictitious company called **Tenate Industries**, which sells replacement parts for industrial pizza ovens.

Your task is to **calculate the total cost** for both the *Make* and *Buy* options. To do this, you will work with **fictitious data tables** containing supplier quotes and internal manufacturing estimates.

Page : (Supplier Selection)

- Analysing the Non- Recurring Expense and Extended Cost of the supplier offering the **lowest quoted amount** through a comparative analysis of all received quotations.
- Creation of Full Cost and Extended Cost Measure.

Formula

1. Extended Cost: Unit Cost * Volume
2. Full Cost: Non-Recurring Expense + Extended Cost
- Visualizing Unit Cost and Non - Recurring Expenses from each supplier.

Problem Statement 2: The project manager says that a recent viral internet trend has affected our projected production volumes.

Page : (Scenario Analysis)

- Creating a Parameter for Scenario Volume ranging from 1000 - 100000 Volume with step size of 500 units and setting the default value to 15000. Later using this parameter to analyse and assume the full cost of the X amount of Volume.
- Creation of a DAX Measure where we Find the Minimum total cost of X Volume of Production from all the suppliers for a specific part number selected.
- Creation of a Card which gives us the Least Non-Recurring Expense amongst all the Suppliers.
- Creation of a DAX Measure in Scenario Table(All) Where We find the Full Cost of the Minimum Scenario Volume For each supplier. Visualizing it and Analysing it using a Line Chart.
- Implementation of RLS for the different projects. Such as, "Siliode" and "Kerfuffle".

Problem Statement 3: Finding out the Internal Cost Estimates.

Page: (Make Vs Buy)

- Measures

2. <u>Additional Unit Capacity Required || Table (Internal_Mfg_Resource_Estimates)</u>: It shows the difference between the Scenario Volume case and the Existing Capacity of the least amount quoted for a part number.
3. <u>Capital Investment Required (Make) || Table (Internal_Mfg_Resource_Estimates)</u>: It shows how much capital will be required if the company decides to make a part number and compare it with the lowest quoted amount by the supplier.

   General Formula: (Unit Capacity Required / Unit capacity) * Machine Fixed Cost

4. <u>Make Scenario (Full Cost) || Table (Internal_Mfg_Resource_Estimates)</u>: It gives us the lowest full cost of making X Volume of a part number.

   General Formula: Capital Investment Required + Unit_per_cost * Scenario Volume Value.

5. <u>Cost Avoidance || Table (Internal_Mfg_Resource_Estimates)</u>: It shows us the amount difference of the Make Scenario Full Cost Vs Buy Scenario Full Cost.
6. <u>Make Vs Buy || Table (Internal_Mfg_Resource_Estimates)</u>: This tells us if the difference between the Buy and Make is Positive then we should "Make" the part as it is the cheaper option. If the difference is Negative then we should "Buy" the part and Blank() if the difference comes out as 0.
   - ○ Adjustment of Measure according to Yield Rate

Changing of Buy - Scenario Full Cost Formula according to the Yield Rate of the suppliers. (Yield Rate is for every 100 units of order the suppliers only fulfill X percentage of units only. Example: For every 100 Units of orders given to "Ucell, We make" they fulfill 98% of 100 Units).

Formula: DIVIDE(Quotes[Unit_Cost] * 'Scenario Volume'[Scenario Volume Value], [Yield Rate]) [Note: Yield Rate is in Percentage format]

Summary

Chapter 1: Focused on developing a **quote analysis tool** and learning to calculate **extended cost** and **full cost** for the supplier-provided volumes.

Chapter 2: Introduced a **dynamic scenario analysis tool** to evaluate **full costs** across a range of potential production volumes.

Chapter 3: Added the **Make option analysis**, calculating **full costs** using **internal manufacturing estimates**.

Overall Outcome: The result was a **comprehensive and useful cost analysis model** that supports **Make vs Buy decisions** effectively.

Theory

1. Introduction

- Concepts covered: **Extended Cost** and **Full Cost**

- Importance: Understanding cost drivers helps in **better decision-making and communication** in supply chain management.

- Objective: Learn how to **calculate** these costs and **interpret their impact**.

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2. Unit Cost

- **Definition:** Cost of purchasing or producing **one additional unit**.

- **Includes:**

  - Raw material costs

  - Production costs (energy, labor, etc.)

  - Manufacturer's profit margin

- **Example:**

  - For custom t-shirts:

    - Raw materials → blank t-shirts, ink

    - Production → labor, energy

  - If one t-shirt costs $15, the **unit cost = $15**

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3. Extended Cost

- **Definition:** Total cost for all purchased units, **excluding one-time (non-recurring) costs**.

- **Formula:**
  Extended Cost=Number of Units×Unit Cost$\text{Extended Cost} = \text{Number of Units} \times \text{Unit Cost}$Extended Cost=Number of Units×Unit Cost

- **Example:**
  10 t-shirts × $15 each = **$150 Extended Cost**

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4. Non-Recurring Expenses (NRE)

- **Definition:** One-time costs incurred to **enable production**.

- **Usually charged by suppliers** to the purchasing company.

- **Examples:**

  - Tooling or fixtures unique to a product

  - Engineering setup or design work

  - Minimum equipment usage fees

- **Behavior:**

  - As production volume increases, **NRE often increases** due to added equipment, setup, or labor needs.

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5. Full Cost

- **Definition: Total cost** a company pays to acquire a specific quantity of products.

- **Formula:**
  Full Cost=Extended Cost+Non-Recurring Expenses$\text{Full Cost} = \text{Extended Cost} + \text{Non-Recurring Expenses}$Full Cost=Extended Cost+Non-Recurring Expenses

- **Example (T-shirt case):**

- Extended Cost = $150 (10 shirts × $15)

  - Set-up Fee (NRE) = $65

  - **Full Cost = $150 + $65 = $215**

- **Key Point:**

  - Supply chain decisions should be based on **Full Cost**, not just unit or extended cost.

  - A low unit cost can be misleading if NRE is high.

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6. Overhead Rates (Note)

- **Definition:** Costs allocated to production but **not directly tied** to manufacturing a specific product.

  - Example: Corporate office expenses, utilities, administration.

- **Usage:**

  - Some companies include overhead in full cost calculations; others don't.

  - This course **excludes** overhead rates for simplicity.

- **Learning Goal:**

  - Understand the core cost principles to **later integrate overheads** if required.

Details of the 3rd part

1. Introduction: Assessing the Make Option

- This chapter introduces the **"Make" side** of the Make vs Buy decision.

- Focus: Evaluate whether producing internally is more cost-effective than purchasing externally.

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2. Internal Cost Estimates

- Similar to supplier quotes in the Buy option, the Make option requires **internal cost estimates**.

- These include:

  - **Expected unit costs**

  - **Upfront investment requirements**

- **Difference:**

  - Supplier quotes are **binding** offers.

  - Internal estimates are **non-binding** — if costs rise, the company bears the difference.

- Purpose: To calculate the **full cost of production** accurately.

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3. Internal Estimate Data – Cost per Unit

- Internal estimates include **unit costs**, made up of:

  - Raw material costs

  - Energy costs

  - Labor costs

- These are **variable costs** that increase with each additional unit produced.

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4. Internal Estimate Data – Equipment Information

- Includes detailed **equipment data**:

- ○ Model number

- ○ Manufacturing capacity per machine

- ○ Existing available capacity

- ○ Cost of purchasing new equipment

- **Key point:**

  - ○ If production demand **exceeds current capacity**, you must include **new equipment costs** in the Make option's full cost.

  - ○ Equipment capacity varies per part.

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5. Incremental Equipment Costs

- Only **incremental costs** (new costs caused by the make-or-buy decision) should be included.

- **Sunk costs** (already existing, like current equipment) should be **excluded**.

- Incremental costs reflect **new spending** required **because of the decision**.

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6. Pizza Example (Understanding Incremental Cost)

- Example: You already own an oven (a sunk cost).

- Making one pizza requires buying dough, cheese, and sauce — these are **incremental costs** for the pizza.

- The oven's cost isn't included, since you already have it.

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7. Pizza Party Example (Scaling Production)

- If you plan to make **10 pizzas** for a party:

    - Ingredients for 10 pizzas = incremental cost.

    - But one oven may not be enough → you may need another oven.

- The cost of an **additional oven** = **incremental equipment cost**.

- Similarly, **hiring extra help** (labor) is also incremental.

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8. Other Incremental Make Costs

- Incremental costs can include:

    - **New facilities**

    - **Hiring new salaried staff**

- If existing facilities and staff can handle the demand → no need to add these costs.

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9. Calculating Required Investment

- **Full cost (Make option)** =
  $\text{Extended Cost} + \text{Incremental Investment Cost}$
- **Investment cost** is based on:

    - Existing equipment capacity

    - Expected production volume

- If **production > capacity**, include **new equipment investment** in full cost.

10. Equipment Needed Formula

To determine how many machines to purchase:

$$\text{Machines Needed} = \frac{(\text{Production Volume} - \text{Existing Capacity})}{\text{Equipment Capacity}}$$

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11. Rounding Equipment Count

- You can't buy half a machine — always **round up** to the nearest whole number.

- Using the DAX function: ROUND()