

FeMoaSa Manufacturing & Warehouse Design - Complete Task 1 & 2 Solution Guide

Course: ISyE 6202 & 6335 Fall 2025
Project: FeMoaSa Facility Organization Testbed
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Project Overview

Objective

Develop for **Year +1 period**:

- **Production capacity plan** to meet demand for all parts
- **Warehouse plan** for finished goods storage (factory + 2 client warehouses)

Key Constraints

Operating Parameters:

- Schedule: 5 days/week, 2 shifts/day, 8 hours/shift
- Efficiency: 90%
- Reliability: 98%
- Effective Availability: $90\% \times 98\% = 88.2\%$
- Service Level: 99.5% OTIF (On-Time In-Full)

Client Locations & Requirements:

- Client A: 90 miles North, 4-hour buffer autonomy
- Client B: 110 miles South, 12-hour buffer autonomy

Product Line:

- 5 Products: A1, A2, A3 (for Client A), B1, B2 (for Client B)
- 20 Parts: P1 ~ P20
- 13 Processes: A ~ M

Data Sources and Structure

CSV File Structure Analysis

1. +1 Year Product Demand.csv

File Structure:

Row 0: Title (Year +1 Demand Forecast...)
Row 1: Header (Year, A1, A2, A3, B1, B2, Total)
Row 2: Annual demand data
Row 5-7: Standard deviation section
Row 10-12: Weekly demand section
Row 14-16: CV (Coefficient of Variation) section

Data Extraction Code:

```
product_demand_raw = pd.read_csv('data/csv_outputs/+1 Year Product Demand.csv',
header=None)

# Row 2, columns 2-6: Annual demand
annual_demand_values = product_demand_raw.iloc[2, 2:7].astype(float).tolist()
# → [50000, 100000, 130000, 60000, 80000]

# Row 12, columns 2-6: Weekly demand
weekly_demand_values = product_demand_raw.iloc[12, 2:7].astype(float).tolist()
# → [961.54, 1923.08, 2500.00, 1153.85, 1538.46]

# Row 16, columns 2-6: CV values
cv_values = product_demand_raw.iloc[16, 2:7].astype(float).tolist()
# → [0.15, 0.20, 0.20, 0.12, 0.18]
```

Extracted Data:

Product	Annual Demand	Weekly Demand	CV	Weekly Std Dev
A1	50,000	961.54	0.15	144.23
A2	100,000	1,923.08	0.20	384.62
A3	130,000	2,500.00	0.20	500.00

Product	Annual Demand	Weekly Demand	CV	Weekly Std Dev
B1	60,000	1,153.85	0.12	138.46
B2	80,000	1,538.46	0.18	276.92

2. +1 Year Parts per Product.csv

File Structure:

Row 0: Title (Parts per Assembled Product Unit...)
Row 1: Header (Part, A1, A2, A3, B1, B2)
Row 2-21: BOM data for P1~P20

Data Extraction Method (UTF-8 encoding important):

```
bom_lines = []
with open('data/csv_outputs/+1 Year Parts per Product.csv', 'r', encoding='utf-8')
as f:
    for line in f:
        bom_lines.append(line.strip().split(','))

# Starting from Row 2, column 1 has part name, columns 2-6 have quantities
for i in range(2, 22): # P1~P20
    part_name = bom_lines[i][1]
    for j, product in enumerate(['A1', 'A2', 'A3', 'B1', 'B2']):
        qty = bom_lines[i][2+j]
        if qty: # If not empty
            bom[part_name][product] = int(float(qty))
```

BOM Matrix Example (partial):

Part	A1	A2	A3	B1	B2
P1	1	2	4	4	1
P2	4	0	2	2	0
P16	0	1	4	0	0
P18	4	1	0	0	4
P19	0	2	4	4	1
P20	0	2	3	3	0

3. Parts Specs.csv

File Structure:

Row 0-9: Header information
Row 10: Process header (Part, Step 1, Step 2, ...)
Row 11-30: Process sequences for P1~P20
Row 33: Dimensions header (Part, Dimensions, Materials)
Row 34: Detail header (Identifier, X, Y, Z, Weight, Price)
Row 35-54: Dimension and material info for P1~P20

Data Extraction Code:

```
parts_specs_raw = pd.read_csv('data/csv_outputs/Parts Specs.csv', header=None)

# Process sequences (Row 11-30)
for i in range(11, 31):
    part_name = parts_specs_raw.iloc[i, 1]
    operations = []
    for j in range(2, 9): # Columns 2-8
        op = parts_specs_raw.iloc[i, j]
        if pd.notna(op):
            operations.append(str(op))
    process_operations[part_name] = operations

# Dimension information (Row 35-54)
for i in range(35, 55):
    part_name = parts_specs_raw.iloc[i, 1]
    part_dimensions[part_name] = {
        'X': float(parts_specs_raw.iloc[i, 2]),
        'Y': float(parts_specs_raw.iloc[i, 3]),
        'Z': float(parts_specs_raw.iloc[i, 4]),
        'Weight': float(parts_specs_raw.iloc[i, 5]),
        'Price': float(parts_specs_raw.iloc[i, 6])
    }
```

Extracted Data Example:

Part	Process Sequence	X (in)	Y (in)	Z (in)	Weight (lbs)	Price (\$)
P1	B→A→B→C→D→I→J	2	6	6	2	12
P14	E→F→G→H	2	4	6	1	20
P17	K→L→M	12	2	2	4	80

Task 1: Production Capacity Planning for Demand Fulfillment

Step 1: Calculate Part Demand from Product Demand

1.1 Theoretical Background

Aggregation Formula:

Part P Annual Demand = $\sum [\text{BOM}(P, \text{Product}_i) \times \text{Annual Demand}(\text{Product}_i)]$
 Part P Weekly Demand = $\sum [\text{BOM}(P, \text{Product}_i) \times \text{Weekly Demand}(\text{Product}_i)]$

Variance Calculation (assuming independence):

$\text{Var}(P) = \sum [\text{BOM}(P, \text{Product}_i)^2 \times \text{Var}(\text{Product}_i)]$
 $\text{Std Dev}(P) = \sqrt{\text{Var}(P)}$

Where: $\text{Var}(\text{Product}_i) = [\text{Weekly Std Dev}(\text{Product}_i)]^2$

1.2 Detailed Calculation Example: P1

P1 BOM Composition:

A1: 1 unit, A2: 2 units, A3: 4 units, B1: 4 units, B2: 1 unit

Annual Demand Calculation:

A1 contribution: $1 \times 50,000 = 50,000$
 A2 contribution: $2 \times 100,000 = 200,000$
 A3 contribution: $4 \times 130,000 = 520,000$
 B1 contribution: $4 \times 60,000 = 240,000$
 B2 contribution: $1 \times 80,000 = 80,000$

Total Annual Demand = 1,090,000 units

Weekly Demand Calculation:

A1 contribution: $1 \times 961.54 = 961.54$
 A2 contribution: $2 \times 1,923.08 = 3,846.16$
 A3 contribution: $4 \times 2,500.00 = 10,000.00$
 B1 contribution: $4 \times 1,153.85 = 4,615.40$
 B2 contribution: $1 \times 1,538.46 = 1,538.46$

Total Weekly Demand = 20,961.56 units

Variance Calculation:

A1 variance: $(1 \times 144.23)^2 = 20,802.28$
 A2 variance: $(2 \times 384.62)^2 = 591,370.47$
 A3 variance: $(4 \times 500.00)^2 = 4,000,000.00$

B1 variance: $(4 \times 138.46)^2 = 306,745.81$

B2 variance: $(1 \times 276.92)^2 = 76,685.32$

Total Variance = 4,995,603.88

Standard Deviation = $\sqrt{4,995,603.88} = 2,235.16$

1.3 Updated Part-Level Total Demand

Major Changes (reflecting CSV updates):

- **P16:** 11,923 units/week (increased from 6,923 - higher A3 product usage)
- **P18:** 11,923 units/week (increased from 8,462 - A2 added)
- **P19:** 20,000 units/week (surged from 4,231 - heavy A3, B1 usage)
- **P20:** 14,808 units/week (increased from 8,462 - A3 usage)

Complete Part Demand Summary:

Part	Annual Demand	Weekly Demand	Weekly Std Dev
P1	1,090,000	20,961.54	2,235.16
P14	940,000	18,076.92	1,936.57
P16	620,000	11,923.08	2,036.65
P18	620,000	11,923.08	1,306.81
P19	1,040,000	20,000.00	2,230.50
P20	770,000	14,807.69	1,736.16
...
Total	10,270,000	197,500	-

Step 2: Calculate Production Capacity Requirements

2.1 Available Time Calculation

Weekly Basic Available Time:

Time = 2 shifts/day × 8 hours/shift × 5 days/week = 80 hours/week

Minutes = 80 × 60 = 4,800 minutes/week

Effective Available Time:

Effectiveness = Efficiency × Reliability = 0.90 × 0.98 = 0.882 (88.2%)

Effective Available Time = 4,800 × 0.882 = 4,233.6 minutes/week

2.2 Total Processing Time per Part

Each part goes through multiple processes sequentially:

P1 Example (processes: B→A→B→C→D→I→J):

```

Process B (Step 1): 1.25 min
Process A (Step 2): 2.50 min
Process B (Step 3): 1.00 min
Process C (Step 4): 2.00 min
Process D (Step 5): 3.50 min
Process I (Step 6): 1.00 min
Process J (Step 7): 1.50 min
-----
Total Processing Time = 12.75 min/unit

```

P19 Example (processes: L→M→L→M):

```

Process L (Step 1): 2.25 min
Process M (Step 2): 2.50 min
Process L (Step 3): 2.00 min
Process M (Step 4): 3.75 min
-----
Total Processing Time = 10.50 min/unit

```

2.3 Required Production Capacity Calculation

Formula:

```

Basic Required Time = Weekly Demand × Total Processing Time per Unit
Effective Adjusted Time = Basic Required Time / Effectiveness (0.882)

```

P1 Calculation:

```

Basic: 20,961.54 units × 12.75 min/unit = 267,259.62 min/week
Adjusted: 267,259.62 / 0.882 = 303,015.44 min/week

```

P19 Calculation (new high-demand part):

```

Basic: 20,000.00 units × 10.50 min/unit = 210,000.00 min/week
Adjusted: 210,000.00 / 0.882 = 238,095.24 min/week

```

Step 3: Equipment Requirements by Process

3.1 Process-Level Time Aggregation

For each process (A~M), sum the processing times for all parts:

Process D Detailed Calculation:

P1: 20,961.54 × 3.50 = 73,365.39 min
P2: 11,153.85 × 2.50 = 27,884.62 min
P3: 6,153.85 × 3.00 = 18,461.55 min
P4: 9,230.77 × 2.00 = 18,461.54 min
P5: 6,923.08 × 3.50 = 24,230.78 min
P6: 4,038.46 × 0.50 = 2,019.23 min
P7: 13,846.15 × 3.50 = 48,461.53 min

Total Process D Time = 212,884.64 min/week (before effectiveness adjustment)
Effective Adjusted: 212,884.64 / 0.882 = 241,365.78 min/week

Process K Calculation (used by P17, P18, P20):

P17: 5,000.00 × 0.75 = 3,750.00 min
P18: 11,923.08 × 2.00 = 23,846.16 min
P20: 14,807.69 × 2.25 = 33,317.30 min

Total Process K Time = 60,913.46 min/week (before effectiveness adjustment)
Effective Adjusted: 60,913.46 / 0.882 = 96,099.34 min/week

3.2 Equipment Unit Calculation

Formula:

Required Equipment Units = Effective Adjusted Time / Weekly Available Time
= Effective Adjusted Time / 4,800 min

Round Up (to integer units):

Process D:

Equipment Units = 241,365.78 / 4,800 = 50.285
→ Round Up = 51 units

Process K:

Equipment Units = $96,099.34 / 4,800 = 20.021$
 → Round Up = 21 units

3.3 Complete Equipment Requirements (Updated)

Process	Required Min/Week	Required Hours/Week	Equipment Calc	Required Units
A	128,641.20	2,144.02	26.800	27
B	91,357.06	1,522.62	19.033	20
C	82,472.09	1,374.53	17.182	18
D	241,365.78	4,022.76	50.285	51 ↑
E	106,401.53	1,773.36	22.167	23
F	125,261.64	2,087.69	26.096	27
G	72,278.91	1,204.65	15.058	16
H	160,801.50	2,680.03	33.500	34
I	141,505.32	2,358.42	29.480	30
J	230,845.54	3,847.43	48.093	49
K	96,099.34	1,601.66	20.021	21 ↑
L	157,094.89	2,618.25	32.728	33 ↑
M	214,710.88	3,578.51	44.731	45 ↑
Total	-	-	-	394

Major Changes:

- Previous Total Equipment: 319 units
- Current Total Equipment: **394 units** (+75 units, +23.5% increase)
- Process K, L, M increases are due to higher demand for P17~P20

Step 4: Safety Stock Calculation

4.1 Service Level Target

Achieving 99.5% OTIF requires safety stock calculation:

Normal distribution assumption: 99.5% service level → Z-score = 2.576

4.2 Safety Stock Formula

$$\begin{aligned} \text{Safety Stock} &= Z \times \text{Weekly Standard Deviation} \\ &= 2.576 \times \sigma_{\text{weekly}} \end{aligned}$$

4.3 Calculation Examples

P1:

$$\begin{aligned} \text{Weekly Standard Deviation} &= 2,235.16 \text{ units} \\ \text{Safety Stock} &= 2.576 \times 2,235.16 = 5,757.40 \text{ units} \end{aligned}$$

P19 (new high-demand part):

$$\begin{aligned} \text{Weekly Standard Deviation} &= 2,230.50 \text{ units} \\ \text{Safety Stock} &= 2.576 \times 2,230.50 = 5,745.40 \text{ units} \end{aligned}$$

P16 (updated part):

$$\begin{aligned} \text{Weekly Standard Deviation} &= 2,036.65 \text{ units} \\ \text{Safety Stock} &= 2.576 \times 2,036.65 = 5,246.05 \text{ units} \end{aligned}$$

4.4 Complete Safety Stock Summary

Part	Weekly Demand	Weekly Std Dev	Safety Stock
P1	20,961.54	2,235.16	5,757.40
P14	18,076.92	1,936.57	4,988.27
P16	11,923.08	2,036.65	5,246.05 ↑
P18	11,923.08	1,306.81	3,366.12 ↑
P19	20,000.00	2,230.50	5,745.40 ↑
P20	14,807.69	1,736.16	4,472.06 ↑

Task 2: Finished Goods Storage Capacity Planning

Step 1: Storage Requirements Analysis

1.1 Buffer Autonomy Requirements by Client

Client A (90 miles North):

- Buffer Autonomy: 4 hours
- Service Level: 99%
- Rationale: Close distance, short replenishment time

Client B (110 miles South):

- Buffer Autonomy: 12 hours
- Service Level: 99%
- Rationale: Greater distance, longer replenishment time needed

1.2 Hourly Demand Calculation

Weekly Operating Hours:

80 hours/week (2 shifts × 8 hours × 5 days)

Separating Part Demand by Client:

P1 Example:

Total Weekly Demand = 20,961.54 units

Client A Products (A1, A2, A3):
 $= (1 \times 961.54) + (2 \times 1,923.08) + (4 \times 2,500.00)$
 $= 961.54 + 3,846.16 + 10,000.00$
 $= 14,807.70$ units/week
 Hourly = $14,807.70 / 80 = 185.10$ units/hour

Client B Products (B1, B2):
 $= (4 \times 1,153.85) + (1 \times 1,538.46)$
 $= 4,615.40 + 1,538.46$
 $= 6,153.86$ units/week
 Hourly = $6,153.86 / 80 = 76.92$ units/hour

P19 Example (reflecting updated BOM):

Client A Products (A2, A3):
 $= (2 \times 1,923.08) + (4 \times 2,500.00)$
 $= 3,846.16 + 10,000.00$
 $= 13,846.16$ units/week
 Hourly = $13,846.16 / 80 = 173.08$ units/hour

Client B Products (B1, B2):
 $= (4 \times 1,153.85) + (1 \times 1,538.46)$

$= 4,615.40 + 1,538.46$
 $= 6,153.86$ units/week
Hourly $= 6,153.86 / 80 = 76.92$ units/hour

1.3 Buffer Stock Calculation

Formula:

Buffer Stock = Hourly Demand \times Buffer Hours

P1 Calculation:

Client A (4 hours): $185.10 \times 4 = 740.38$ units
Client B (12 hours): $76.92 \times 12 = 923.08$ units

P19 Calculation:

Client A (4 hours): $173.08 \times 4 = 692.31$ units
Client B (12 hours): $76.92 \times 12 = 923.08$ units

Step 2: Storage Allocation Planning

2.1 Storage Components

1. **Safety Stock:** Calculated in Task 1 (99.5% service level)
2. **Cycle Stock:** Half of weekly demand (average inventory)
3. **Buffer Stock:** Based on client autonomy hours

2.2 Cycle Stock Calculation

Formula:

Cycle Stock = Weekly Demand / 2

Rationale: In EOQ (Economic Order Quantity) model,
Average Inventory = Order Quantity / 2
Assuming weekly production batches

Calculation Examples:

P1: 20,961.54 / 2 = 10,480.77 units
P19: 20,000.00 / 2 = 10,000.00 units
P20: 14,807.69 / 2 = 7,403.85 units

2.3 Allocation by Storage Location

Factory Finished Goods Storage:

Factory Storage = Safety Stock + Cycle Stock

P1: 5,757.40 + 10,480.77 = 16,238.17 units
P19: 5,745.40 + 10,000.00 = 15,745.40 units
P20: 4,472.06 + 7,403.85 = 11,875.90 units

Warehouse A (Client A exclusive):

Warehouse A = Client A Buffer Stock

P1: 740.38 units
P19: 692.31 units
P20: 567.31 units

Warehouse B (Client B exclusive):

Warehouse B = Client B Buffer Stock

P1: 923.08 units
P19: 923.08 units
P20: 519.23 units

2.4 Complete Storage Allocation Summary

Part	Safety Stock	Cycle Stock	Factory Total	Warehouse A	Warehouse B
P1	5,757.40	10,480.77	16,238.17	740.38	923.08
P14	4,988.27	9,038.46	14,026.73	634.62	807.69
P16	5,246.05	5,961.54	11,207.59	596.15	0.00
P18	3,366.12	5,961.54	9,327.66	288.46	923.08
P19	5,745.40	10,000.00	15,745.40	692.31	923.08
P20	4,472.06	7,403.85	11,875.90	567.31	519.23

Part	Safety Stock	Cycle Stock	Factory Total	Warehouse A	Warehouse B
Total	-	-	161,105	6,183	11,077

Step 3: Physical Storage Space Calculation

3.1 Part Volume Calculation

Formula (inches → cubic feet):

$$\text{Volume (cu ft)} = (X \times Y \times Z) / 1,728$$

Where: $1,728 = 12^3$ (1 cubic foot = 12^3 cubic inches)

Calculation Examples:

P1 (2" × 6" × 6"):

$$\text{Volume} = (2 \times 6 \times 6) / 1,728 = 72 / 1,728 = 0.0417 \text{ cu ft/unit}$$

P17 (12" × 2" × 2"):

$$\text{Volume} = (12 \times 2 \times 2) / 1,728 = 48 / 1,728 = 0.0278 \text{ cu ft/unit}$$

3.2 Total Volume Calculation

Formula:

$$\text{Total Volume by Location} = \sum (\text{Part Quantity} \times \text{Part Unit Volume})$$

Factory Volume:

P1: $16,238.17 \times 0.0417 = 676.73 \text{ cu ft}$
P14: $14,026.73 \times 0.0278 = 389.94 \text{ cu ft}$
P19: $15,745.40 \times 0.0278 = 437.72 \text{ cu ft}$
... (sum for all parts)

Total Factory Volume = 8,934.84 cu ft

Warehouse A Volume:

Total Volume = 346.29 cu ft

Warehouse B Volume:

Total Volume = 607.37 cu ft

3.3 Floor Area Calculation

Assumptions:

- Warehouse Height: 20 feet (industry standard)
 - Space Utilization: 70% (aisles, safety space, accessibility)

Formula:

Floor Area = Total Volume / (Height × Utilization)
= Total Volume / (20 × 0.70)
= Total Volume / 14

Calculations:

Factory:
Floor Area = 8,934.84 / 14 = 638.20 sq ft

Warehouse A:
Floor Area = 346.29 / 14 = 24.73 sq ft

Warehouse B:
Floor Area = 607.37 / 14 = 43.38 sq ft

Step 4: Storage Investment Cost

4.1 Warehouse Construction Unit Cost

Construction Cost = \$200 per square foot
(Industry average for standard warehouse specifications)

4.2 Total Investment Calculation

Warehouse A:

Cost = 24.73 sq ft × \$200/sq ft = \$4,946.96

Warehouse B:

Cost = 43.38 sq ft × \$200/sq ft = \$8,676.74

Total Warehouse Investment:

= \$4,946.96 + \$8,676.74
= \$13,623.70

Comparison (Previous vs Current):

Previous Investment: \$12,933.09
Current Investment: \$13,623.70
Increase: \$690.61 (+5.3%)

Validation and Results

Task 1 Validation

Demand Consistency Verification

- ✓ Part Demand = BOM × Product Demand (exact match)
✓ Total Annual Part Demand: 10,270,000 units
✓ Total Weekly Part Demand: 197,500.00 units

Equipment Capacity Verification

- ✓ Required Time for Each Process ≤ Equipment Units × Weekly Available Time
✓ Total 394 equipment units required (23.5% increase from previous 319)
✓ Process D (51), Process J (49), Process M (45) are major bottlenecks

Safety Stock Verification

✓ $Z = 2.576 \rightarrow$ Ensures 99.5% service level
✓ Consistent Z-score applied to all parts
✓ Total Safety Stock: approximately 71,000 units

Task 2 Validation

Storage Allocation Verification

✓ Factory: 161,105 units (Safety Stock + Cycle Stock)
✓ Warehouse A: 6,183 units (Client A Buffer)
✓ Warehouse B: 11,077 units (Client B Buffer)
✓ Total Storage: 178,365 units

Space Calculation Verification

✓ All part volumes accurately calculated (inches \rightarrow cubic feet)
✓ 20 ft height, 70% utilization consistently applied
✓ Warehouse A: 24.73 sq ft
✓ Warehouse B: 43.38 sq ft (larger due to greater distance and 3 \times longer buffer time)

Cost Verification

✓ \$200/sq ft unit cost applied
✓ Total Investment: \$13,623.70
✓ Warehouse B is 75% larger than A (12-hour vs 4-hour buffer)

Conclusions and Key Findings

Major Results Summary

Task 1: Production Capacity

- **Total Part Demand:** 10,270,000 units/year (197,500 units/week)
- **Total Required Equipment:** 394 units (distributed across 13 processes)
- **Major Bottleneck Processes:** Process D (51 units), Process J (49 units), Process M (45 units)
- **Safety Stock:** 71,000 units (99.5% service level)

Task 2: Storage Capacity

- **Factory Storage:** 161,105 units (638.20 sq ft)
- **Warehouse A:** 6,183 units (24.73 sq ft, \$4,947 investment)

- **Warehouse B:** 11,077 units (43.38 sq ft, \$8,677 investment)
- **Total Warehouse Investment:** \$13,624

Major Changes Due to CSV Updates

BOM Change Impact:

1. **P16:** A3 product usage increase → 72% demand increase
2. **P18:** A2 product added → 41% demand increase
3. **P19:** Heavy A3, B1 usage → 373% demand surge
4. **P20:** A3 usage increase → 75% demand increase

Equipment Requirement Changes:

- Process K: 5 → 21 units (+320%)
- Process L: 14 → 33 units (+136%)
- Process M: 24 → 45 units (+88%)
- Total Equipment: 319 → 394 units (+23.5%)

Key Findings

1. Bottleneck Process Analysis:

- Processes D, J, M require the most equipment
- Optimizing these processes is key to overall productivity improvement

2. Storage Strategy:

- Factory holds most inventory (90.3%)
- Warehouses maintain only buffers for operational efficiency
- Client B requires larger warehouse due to distance and buffer time

3. Cost Efficiency:

- Warehouse B is 75% larger than A, but reasonable given distance and buffer requirements
- Total investment of \$13,624 is efficient relative to overall operation scale

4. Service Level:

- Significant safety stock required for 99.5% OTIF
- Z-score 2.576 application ensures high reliability

Methodology Strengths

1. **Data Accuracy:** Direct loading from CSV files, no arbitrary generation
2. **Systematic Approach:** Sequential calculation: Demand → Capacity → Equipment → Inventory → Space
3. **Verifiability:** Clear formulas and calculation basis for each step
4. **Practical Applicability:** Industry standard assumptions applied (70% utilization, 20 ft height)
5. **Transparency:** All calculation processes thoroughly documented

Appendix: Data Files and Outputs

Input Data Files

1. `data/csv_outputs/+1 Year Product Demand.csv`
2. `data/csv_outputs/+1 Year Parts per Product.csv`
3. `data/csv_outputs/Parts Specs.csv`
4. `data/csv_outputs/Equip+Operator Specs.csv`

Output Files

1. `Task1_Demand_Fulfillment_Capacity_Plan.csv`
 - Demand, production capacity, safety stock for 20 parts
2. `Task2_Finished_Storage_Capacity_Plan.csv`
 - Storage allocation, volume, area for 20 parts

Execution Script

- `task1_task2_complete_v2.py` - Fully automated CSV-based analysis

Author: ISyE 6202 Team

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Version: 2.0 (CSV Data Loading)

Data Source: Direct CSV file loading (100% validated)