

Navigating Pandemic Supply Challenges

Vaccine Case

+

.

o

Submitted By,

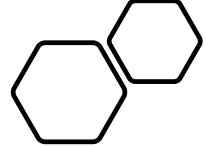
Ruchi Hiralal Mendhegiri

Class: BIA 674 Spring 2021

Under The Guidance Of

Prof. Alkiviadis Vazacopoulos





Goal 1: Supplier Selection

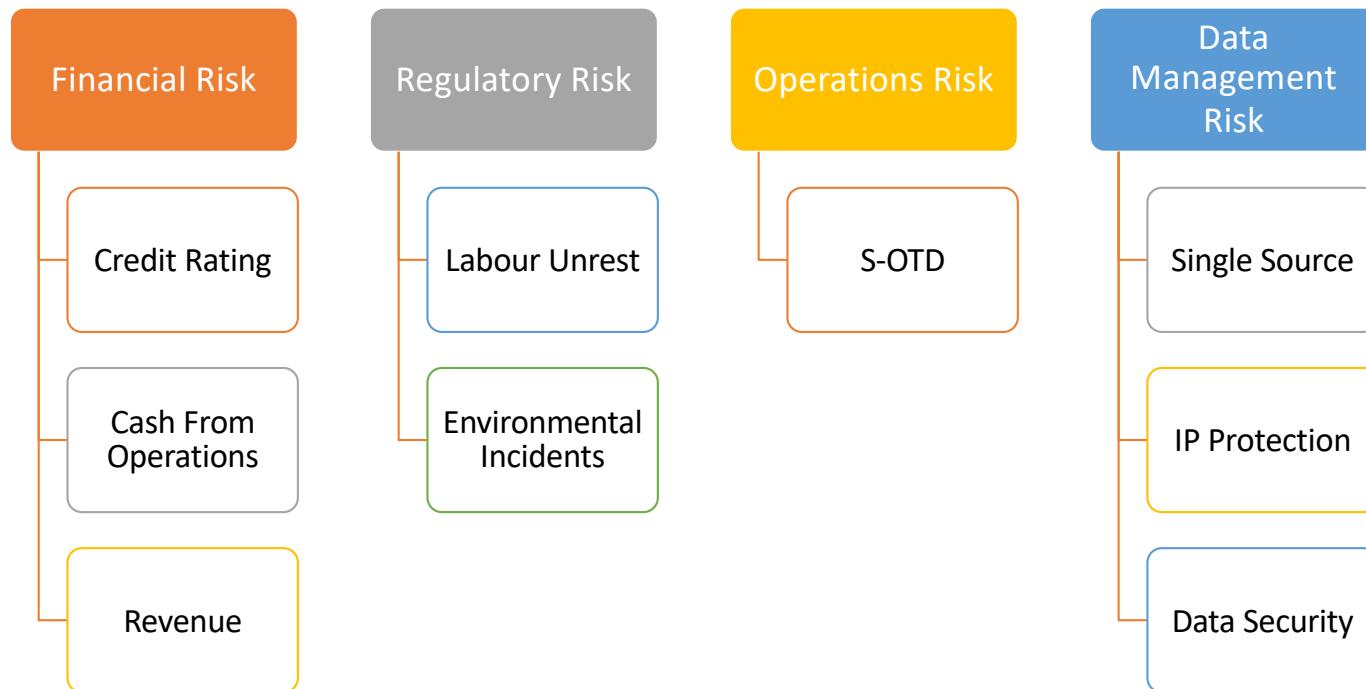
- +
-

- Given Factors:

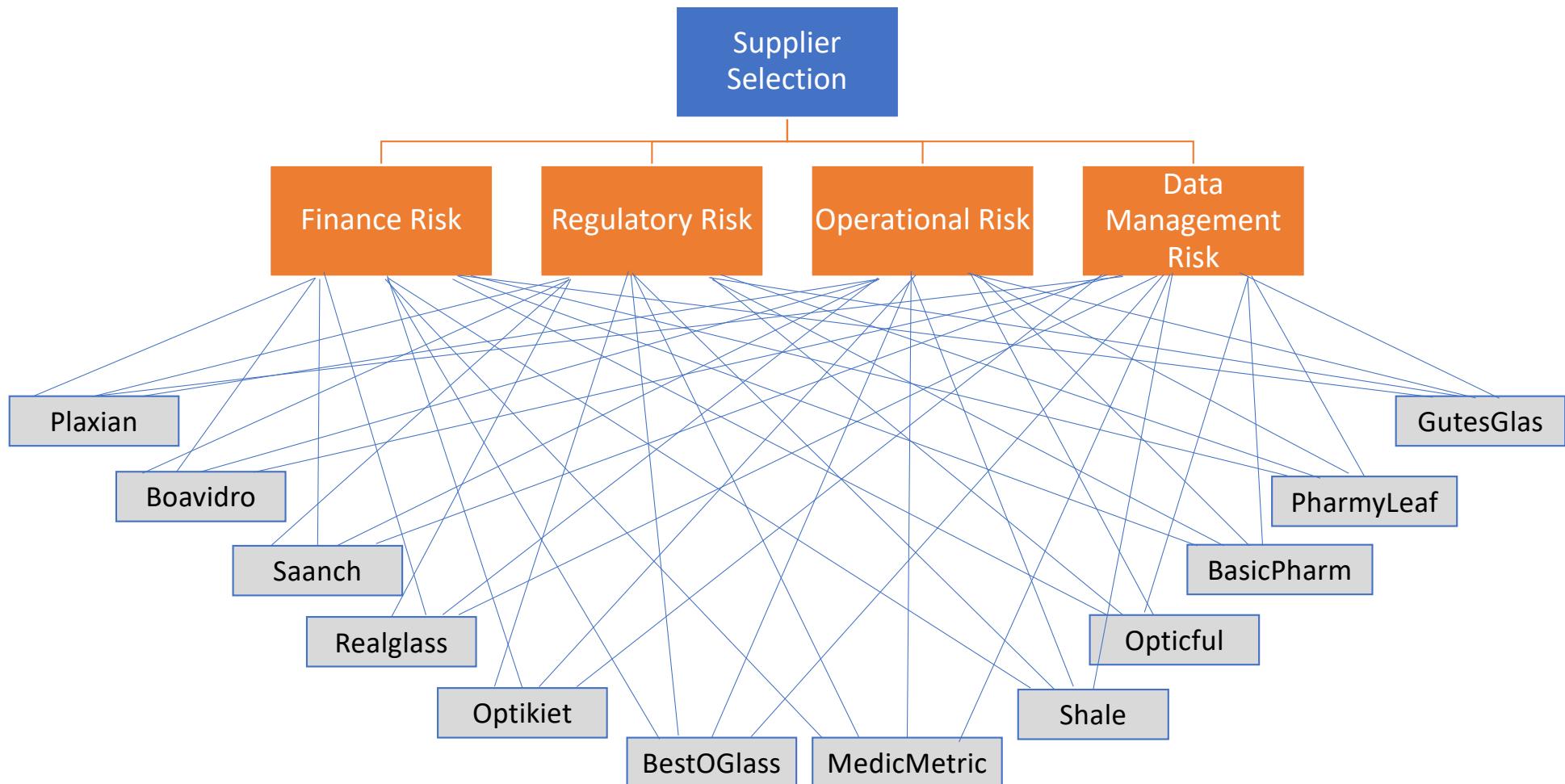
The data about the suppliers of MediCrystals collected by the 'Risk Compliance' team.

- Supplier Name - Name of the supplier
- Location - Location of the supplier warehouse from which the product is supplied to MediCrystals
- Revenue - Revenue of the suppliers for FY 2019
- Cash from Operations - Cash flow from Operations reported by the supplier in their annual financial statements
- Credit Rating - Credit rating provided by D&B
- S-OTD - Supplier On-time delivery (S-OTD) performance for the past 12 months
- Single Source - "Y" - if the supplier is the only qualified source of supply for the product; "N" - if alternate suppliers are available to supply the product
- IP Protection - "Y" - if the supplier owns an IP for the product supplied and "N" if the supplier doesn't own any IP
- Data security - Internal scoring done for each supplier by MediCrystals assessing supplier's systems & Data security on a scale of 0-10 (10 indicates excellent systems & data security and 0 indicates very poor systems & data security)
- Labor Unrests - "Y" indicates if the supplier has faced any labor unrests in the past 12 months. "N" if no labor unrests have been faced by the supplier in the past 12 months.
- Environmental Incidents - "Y" indicates if the supplier has faced any environmental incidents in the past 12 months. "N" if no environmental incidents have been faced by the supplier in the past 12 months.

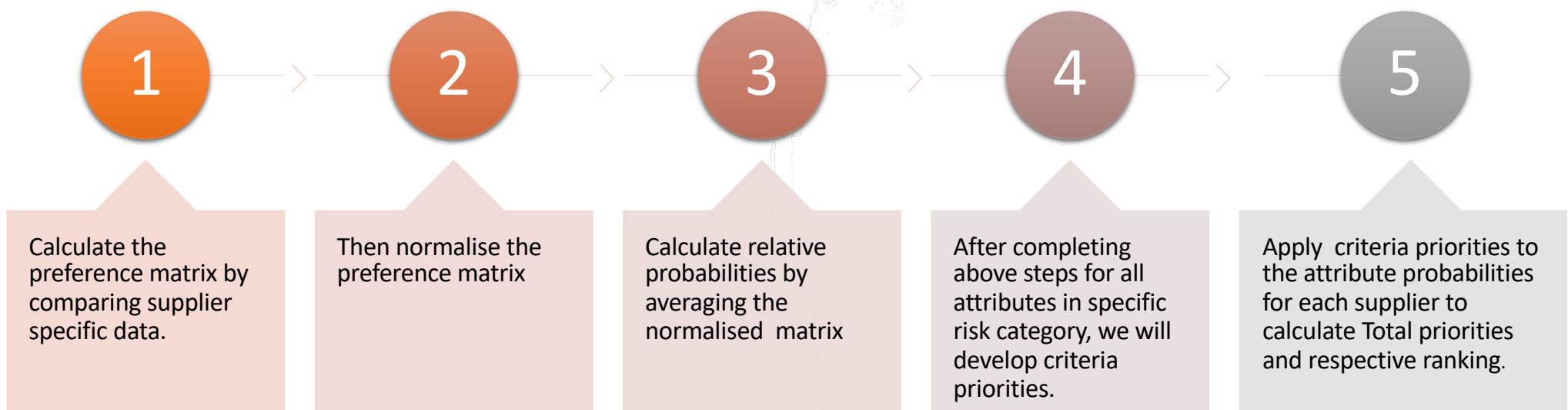
Risk Factors



Establish the Hierarchical Tree: Selecting a Supplier



Steps For AHP





Financial Risk Factors

Step 1: Pair-wise comparisons of all suppliers with respect to each criterion (Credit Rating, Cash From Operations, Revenue, etc.) in order to establish priorities of the alternatives with respect to each criterion.

- Compare Suppliers with respect to Credit Rating
- Compare Suppliers with respect to Cash from Operations
- Compare cars with respect to Revenue

Comparing Suppliers w.r.t. Credit Risk



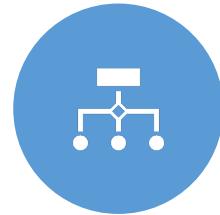
The highest credit rating is 5 and minimum is 1.



The pairwise comparison is carried out by dividing the target supplier credit rating by comparative supplier rating



To calculate normalize matrix, add the elements of each column and then divide the element of each column with the sum of its column



The average across each row of normalized matrix gives the relative priority.

Comparing Suppliers w.r.t. Cash From Operations

Range Start	Value
-\$4,000M	0.20
-\$3,000M	0.25
-\$2,000M	0.33
-\$1,000M	0.50
\$0M	1.00
\$1M	2.00
\$1,001M	3.00
\$2,001M	4.00
\$3,001M	5.00



The highest cash from operations is \$3,996M and lowest is \$6M.



The pairwise comparison is carried out by calculating the difference between the target supplier and comparative supplier Cash from Operations



To calculate normalize matrix, add the elements of each column and then divide the element of each column with the sum of its column



The average across each row of normalized matrix gives the relative priority.

Comparing Suppliers w.r.t. Revenue

Range Start	Value
-\$40,000M	0.20
-\$30,000M	0.25
-\$20,000M	0.33
-\$10,000M	0.50
\$0M	1.00
\$1M	2.00
\$10,001M	3.00
\$20,001M	4.00
\$30,001M	5.00



The highest revenue of suppliers is \$37,719 M and lowest is \$19M.



The pairwise comparison is carried out by calculating the difference between the target supplier and comparative supplier revenue



To calculate normalize matrix, add the elements of each column and then divide the element of each column with the sum of its column



The average across each row of normalized matrix gives the relative priority.

Step 2: Pair-wise comparisons of criteria



Credit Rating is equally to moderately more important than Cash from Operations and moderately more important than Revenue.



Cash From Operations is equally to moderately less important than Credit rating and moderately more important than Revenue.



Revenue is moderately less important than Credit Rating and moderately less important than Cash From Operations.

Calculating the Priorities of the criteria

- We add the items of each column
- We divide each item with the sum of its column
- We calculate the average across each row. This average is the priority of each criterion that is expressed by the corresponding line

Pairwise Comparison of Criterion

Criteria	Credit Rating	Cash from Opeations	Revenue
Credit Rating	1.00	2.00	3.00
Cash from Opeations	0.50	1.00	1.50
Revenue	0.33	0.67	1.00
SUM	1.83	3.67	5.50

Normalized Criterion

Criteria	Credit Rating	Cash from Ope	Revenue
Credit Rating	0.55	0.55	0.55
Cash from Ope	0.27	0.27	0.27
Revenue	0.18	0.18	0.18

Criterion Priorities

Criteria	Priorities
Credit Rating	0.55
Cash from Opeations	0.27
Revenue	0.18

SUPPLIER NAME	PERCENTAGE PRIORITY	RANKING
Plaxian	8.31	6
GutesGlas	9.27	3
Boavidro	8.94	4
Saanach	6.94	9
RealGlass	14.71	1
Optikiet	8.39	5
BestOGlass	5.92	12
MedicMetric	7.95	7
Shale	7.50	8
Opticful	6.30	10
basicPharm	9.75	2
PharmyLeaf	6.01	11

Financial Risk: Total Priorities

**Total Priority of Supplier_i = SUM OVER ALL 3 CRITERIA OF
[(Priority of a CRITERION_j) × (Priority of Supplier_i for that criterion)]**

= Priority of Credit Rating × Priority of Supplier_i for Credit Rating

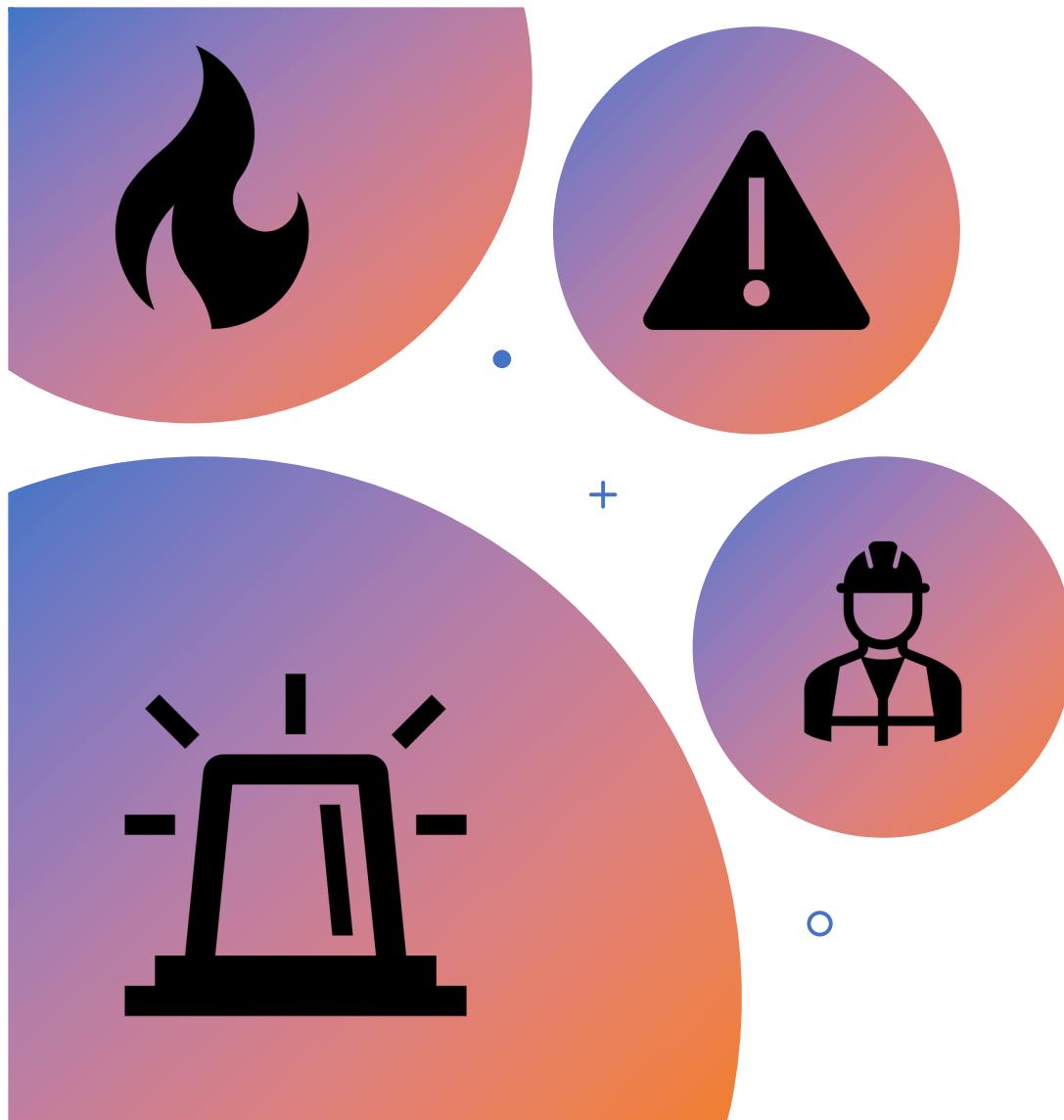
+

Priority of Cash From Operations × Priority of Supplier_i for Cash from Operations

+

Priority of Revenue × Priority of Supplier_i for Revenue

Regulatory Risks



Step 1: Pair-wise comparisons of all suppliers with respect to each criterion (Labor Unrest and Environmental Incidents) in order to establish priorities of the alternatives with respect to each criterion.

- Compare Suppliers with respect to Labor Unrest
- Compare Suppliers with respect to Environmental Incidents

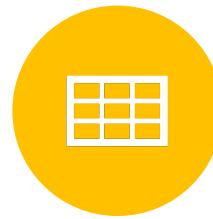
Comparing Suppliers w.r.t. Labor Unrests



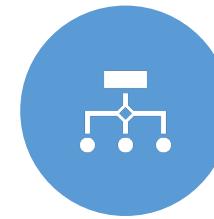
"Y" indicates if the supplier has faced any labor unrests and "N" if no labor unrests have been faced by the supplier in the past 12 months.



The pairwise comparison is carried out by comparing status of both target and comparative supplier and it takes value 1 if both have equal status or if no labor unrest happened at target supplier



To calculate normalize matrix, add the elements of each column and then divide the element of each column with the sum of its column



The average across each row of normalized matrix gives the relative priority.

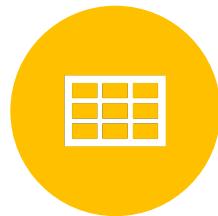
Comparing Suppliers w.r.t. Environmental Incidents



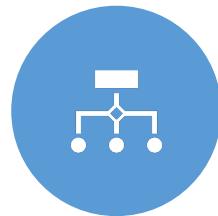
"Y" indicates if the supplier has faced any Environmental Incidents and "N" if no Environmental Incidents have been faced by the supplier in the past 12 months.



The pairwise comparison is carried out by comparing status of both target and comparative supplier and it takes value 1 if both have equal status or if no Environmental Incident happen at target supplier



To calculate normalize matrix, add the elements of each column and then divide the element of each column with the sum of its column



The average across each row of normalized matrix gives the relative priority.

Step 2: Pair-wise comparisons of criteria



Labor Unrests is equally to moderately more important than Environmental Incidents



Environmental Incidents is equally to moderately less important than Labor Unrests.

Calculating the Priorities of the criteria

- We add the items of each column
- We divide each item with the sum of its column
- We calculate the average across each row. This average is the priority of each criterion that is expressed by the corresponding line

Pairwise Comparison of Criterion

Criteria	Labor Unrest	Environmental Incidents
Labor Unrest	1	2
Environmental Incidents	0.5	1
SUM	1.5	3

Normalized Criterion

Criteria	Labor Unrest	Environmental Incidents
Labor Unrest	0.67	0.67
Environmental Incidents	0.33	0.33

Criterion Priorities

Criteria	Priorities
Labor Unrest	0.67
Environmental Incidents	0.33

Supplier Name	Percentage Priority	Ranking
Plaxian	4.167	3
GutesGlas	9.722	1
Boavidro	9.722	1
Saanch	9.722	1
RealGlass	1.389	4
Optikiet	9.722	1
BestOGlass	9.722	1
MedicMetric	9.722	1
Shale	6.944	2
Opticful	9.722	1
basicPharm	9.722	1
PharmyLeaf	9.722	1

Regulatory Risk: Total Priorities

Total Priority of Supplier_i = SUM OVER ALL 2 CRITERIA OF

$$[(\text{Priority of a CRITERION}_j) \times (\text{Priority of Supplier}_i \text{ for that criterion})]$$

= Priority of Labor Unrests × Priority of Supplier_i for Labor Unrests

+

Priority of Environmental Incidents × Priority of Supplier_i for Environmental Incidents



Operational Risk

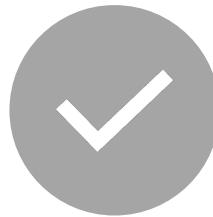
Step 1: Pair-wise comparisons of all suppliers with respect to each criterion S-OTD in order to establish priorities of the alternatives with respect to each criterion.

- Compare Suppliers with respect to Supplier On-time delivery (S-OTD) performance for the past 12 months

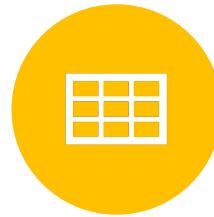
Comparing Suppliers w.r.t. S-OTD



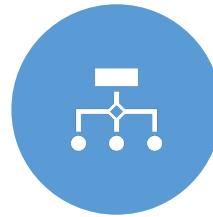
Supplier On-time delivery (S-OTD) performance takes value from 0.00 to 1



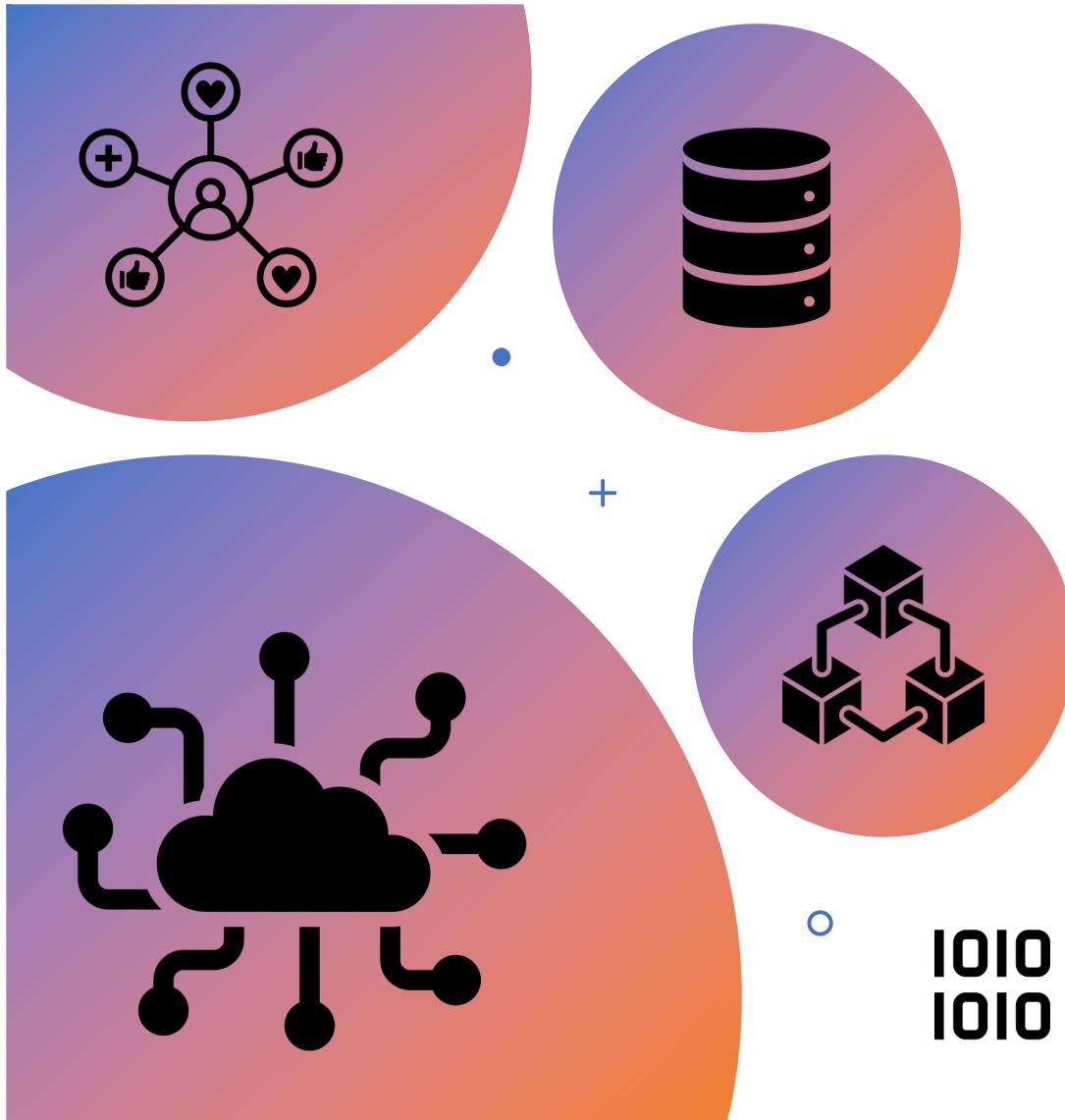
The pairwise comparison is carried out by dividing the target supplier S-OTD value by comparative supplier S-OTD Value



To calculate normalize matrix, add the elements of each column and then divide the element of each column with the sum of its column



The average across each row of normalized matrix gives the relative priority.



Data Management Risk

Step 1: Pair-wise comparisons of all suppliers with respect to each criterion (Single Source, IP Protection, Data Security) in order to establish priorities of the alternatives with respect to each criterion.

- Compare Suppliers with respect to if supplier is the only qualified source for supply of the product
- Compare Suppliers with respect to if the supplier owns an IP for the product supplied or not
- Compare Suppliers with respect to if excellent systems and Data Security

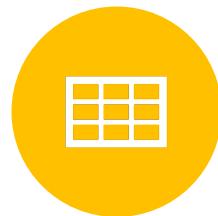
Comparing Suppliers w.r.t. Single Source



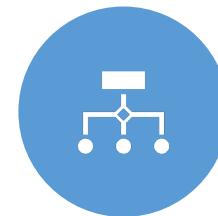
"Y" indicates if the supplier is the only qualified source of supply for the product;
"N" indicates if alternate suppliers are available to supply the product



The pairwise comparison is carried out by comparing status of both target and comparative supplier and it takes value 1 if both have equal status if the target supplier is the only qualified source of supply for the product

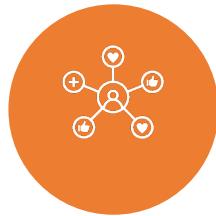


To calculate normalize matrix, add the elements of each column and then divide the element of each column with the sum of its column



The average across each row of normalized matrix gives the relative priority.

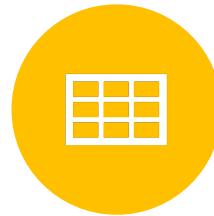
Comparing Suppliers w.r.t. IP Protection



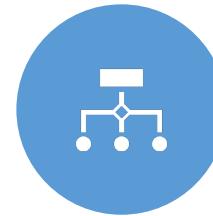
"Y" indicates if the supplier owns an IP for the product supplied and "N" indicates if the supplier doesn't own any IP



The pairwise comparison is carried out by comparing status of both target and comparative supplier and it takes value 1 if the supplier owns an IP for the product supplied



To calculate normalize matrix, add the elements of each column and then divide the element of each column with the sum of its column



The average across each row of normalized matrix gives the relative priority.

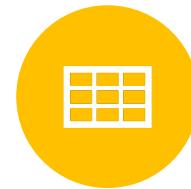
Comparing Suppliers w.r.t. Data Security



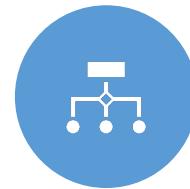
Internal scoring done for each supplier by MediCrystals assessing supplier's systems & Data security on a scale of 0-10 (10 indicates excellent systems & data security and 0 indicates very poor systems & data security)



The pairwise comparison is carried out by dividing the target supplier Data Security rating by comparative supplier Data Security



To calculate normalize matrix, add the elements of each column and then divide the element of each column with the sum of its column



The average across each row of normalized matrix gives the relative priority.

Step 2: Pair-wise comparisons of criteria



Single Source is moderately more important than IP Protection and Data Security.



IP Protection is moderately less important than Single source and equally important than Data Security.



Data Security is moderately less important than Single source and equally important than IP Protection.

Calculating the Priorities of the criteria

Pairwise Comparison of Criterion

We add the items of each column

Criteria	Single Source	IP Protection	Data Security
Single Source	1.00	0.33	0.33
IP Protection	3.00	1.00	1.00
Data Security	3.00	1.00	1.00
SUM	7.00	2.33	2.33

Normalized Criterion

We divide each item with the sum of its column

Criteria	Single Source	IP Protection	Data Security
Single Source	0.14	0.14	0.14
IP Protection	0.43	0.43	0.43
Data Security	0.43	0.43	0.43

Criterion Priorities

We calculate the average across each row. This average is the priority of each criterion that is expressed by the corresponding line

Criteria	Priority
Single Source	0.14
IP Protection	0.43
Data Security	0.43

Supplier Name	Percentage Priority	Ranking
Plaxian	8.18	4
GutesGlas	6.55	6
Boavidro	6.55	6
Saanch	6.99	5
RealGlass	12.20	1
Optikiet	10.86	2
BestOGlass	8.63	3
MedicMetric	10.86	2
Shale	6.55	6
Opticful	5.21	8
basicPharm	10.86	2
PharmyLeaf	6.55	6

Data Management Risk: Total Priorities

Total Priority of Supplier_i = SUM OVER ALL 3 CRITERIA OF [(Priority of a CRITERION_j) × (Priority of Supplier_i for that criterion)]

= Priority of Single Source × Priority of Supplier_i for Single Source

+

Priority of IP Protection × Priority of Supplier_i for IP Protection

+

Priority of Data Security × Priority of Supplier_i for Data Security

Total Priorities

- All the 4 Risk Factors : Financial, Regulatory, Operational and Data Management has the equal importance
- **Total Priority of Supplier_i = SUM OVER ALL 4 RISK CRITERIA OF [(Priority of a CRITERION_j) × (Priority of Supplier_i for that criterion)]**
= Priority of Financial Risk Factors × Priority of Supplier_i for Financial Risk Factors
+
Priority of Regulatory Risk Factors × Priority of Supplier_i for Regulatory Risk Factors
+
Priority of Operational Risk Factors × Priority of Supplier_i for Operational Risk Factors
+
Priority of Data Management Risk Factors × Priority of Supplier_i for Data Management Risk Factors

Supplier Selection :Results

Criteria Priorities	0.25	0.25	0.25	0.25	Total Priorities	Percentage Priority	Ranking
Criteria	Regulatory Factors	Financial Factors	Data Management Factors	Operational Factors			
Supplier Name							
Plaxian	0.04	0.08	0.08	0.09	0.074	7.4047	11
GutesGlas	0.10	0.09	0.07	0.08	0.085	8.4776	5
Boavidro	0.10	0.09	0.07	0.06	0.079	7.8535	8
Saanch	0.10	0.07	0.07	0.09	0.081	8.1296	6
RealGlass	0.01	0.15	0.12	0.08	0.091	9.0940	4
Optikiet	0.10	0.08	0.11	0.09	0.094	9.4086	3
BestOGlass	0.10	0.06	0.09	0.08	0.080	7.9871	7
MedicMetric	0.10	0.08	0.11	0.09	0.094	9.4475	2
Shale	0.07	0.07	0.07	0.08	0.074	7.3637	12
Opticful	0.10	0.06	0.05	0.09	0.076	7.5710	9
basicPharm	0.10	0.10	0.11	0.09	0.097	9.7484	1
PharmyLeaf	0.10	0.06	0.07	0.08	0.075	7.5145	10
					SUM	1.000	

Part 2:

Inventory Management



Given Factors:

SKU - SKU Number

Std. Price (\$) - Price of each unit of SKU

On-Hand Stock (\$) - Total stock on-hand as of 30th Sep'20

APU (units) - Average monthly consumption (30 days) of the SKU

APU Trend - Anticipated APU trend provided by marketing (e.g. 50% indicates 50% increase in APU consumption)

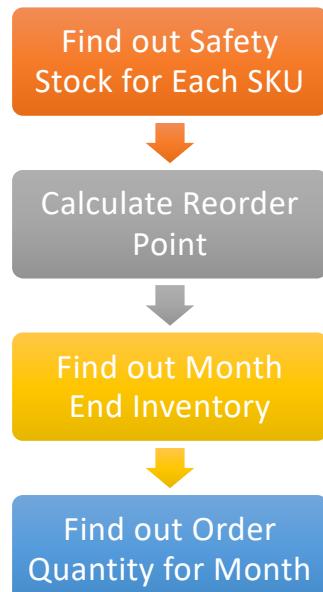
S-OTD - Supplier On-time delivery (S-OTD) performance for the past 12 months

Demand variability (COV) - Demand Coefficient of variance for the past 12 months

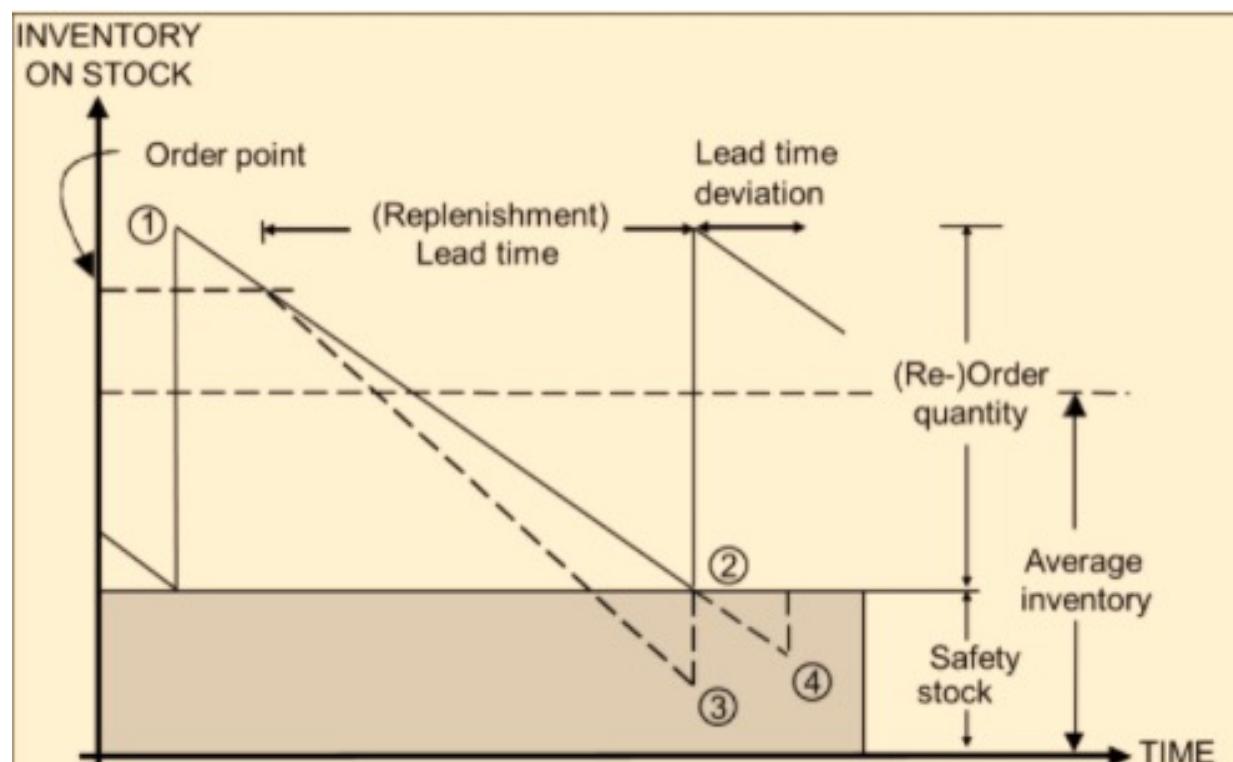
Lead Time (days) - Lead time in days to procure the SKU

Goal 1: Inventory Management

Find Out Order Quantity To Manage Desired Inventory Level For A Given Month



*We need to repeat this process for all 12 months



1. Finding Safety Stock For Each SKU For Starting Month(oct 2020)

Sep 2020 Ending Inventory

From the given Std Price and On-Hand stock for Sept 2020, we can calculate Sept 2020 Inventory Stock (Starting inventory for Oct 2020 Month) count as:

- On Hand Stock(\$)/ Std Price(\$)

Oct 2020

Standard deviation of this demand= **Demand Variability*Mean value of demand**

*For given month, Mean value of demand= Anticipated Demand per day

Using APU trend(assuming it is monthly trend), the Anticipated Demand per day for Next Month (OCT 2020) calculated as:

$$\text{APU(For Sept)}/30 * (100\% + \text{APU Trend})$$

Oct 2020



Oct 2020 (Remains constant for whole year)

Standard Deviation of Lead time in Days calculated as:

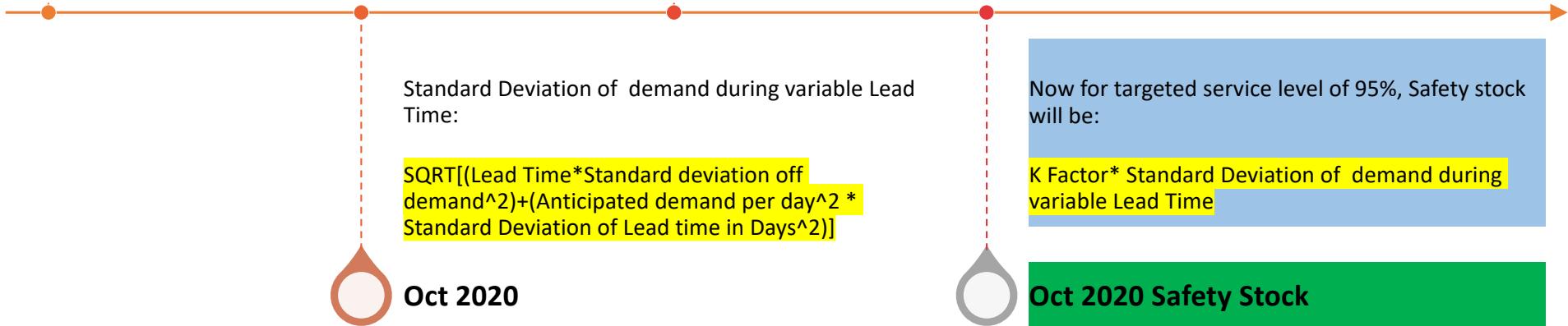
$$\begin{aligned} &\text{SQRT(Variance in lead time)} \\ &= \text{SQRT}((1-\text{STOD})*\text{Lead Time}) \end{aligned}$$



Oct 2020 (Remains constant for whole year)

As the targeted service level is 95%, k factor for safety stock is calculated as:

$$\text{NORM.INV}(95/100,0,1)$$



Oct 2020



Oct 2020 Safety Stock

Now for targeted service level of 95%, Safety stock will be:

$$\text{K Factor} * \text{Standard Deviation of demand during variable Lead Time}$$

Calculate Reorder Point

- It is a minimum amount of an item which a firm holds in stock, such that, when stock falls to this amount, the item must be reordered.
- Factors considers :
 - i. Anticipated demand
 - ii. Lead time
 - iii. Safety stock
- Formula:

Safety Stock +
(Lead Time(in days)* Anticipated Demand Per Day for given month)

Calculate Month End Inventory

Inventory At the Starting of Month – (Anticipated demand per day for given month*30)

Find out order quantity for Month



If the ending **Inventory < Reorder Point**, then we need to **Reorder** the SKUs



The given Minimum Order Quantity (MOQ) is equal to one lead-time demand which is calculated as:

Anticipated demand per day * Lead Time



The SKUs Order Quantity will be largest value among Minimum order quantity and difference between (End Inventory & Reorder Point)

Goal 2: Find Absolute Inventory

- The expiry for all the mentioned SKUs is one year.
- The part of starting inventory which remains still in stock after 1 year will be called as obsolete inventory.
- To minimize absolute inventory, we will use FIFO method for inventory management.
- Formula:

Absolute Inventory = Starting Inventory – Total Demand in a
year

Results:

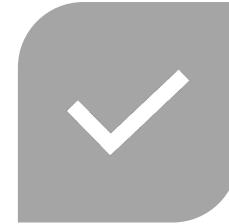
+

O

.



THE CHANGE IN INVENTORY LEVEL
AND ORDER QUANTITY FOR EACH
MONTH CAN BE TRACKED DOWN AT
EACH INDIVIDUAL SKU LEVEL (TOTAL
2007 SKUS)



NO OF SKUS WITH NO ABSOLETE
INVENTORY = 1828

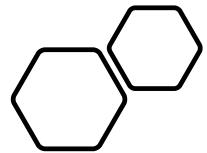


NO OF SKUS OF ABSOLETE
INVENTORY = 179



TOTAL VALUE OF ABSOLETE
INVENTORY = \$22,11,693.96

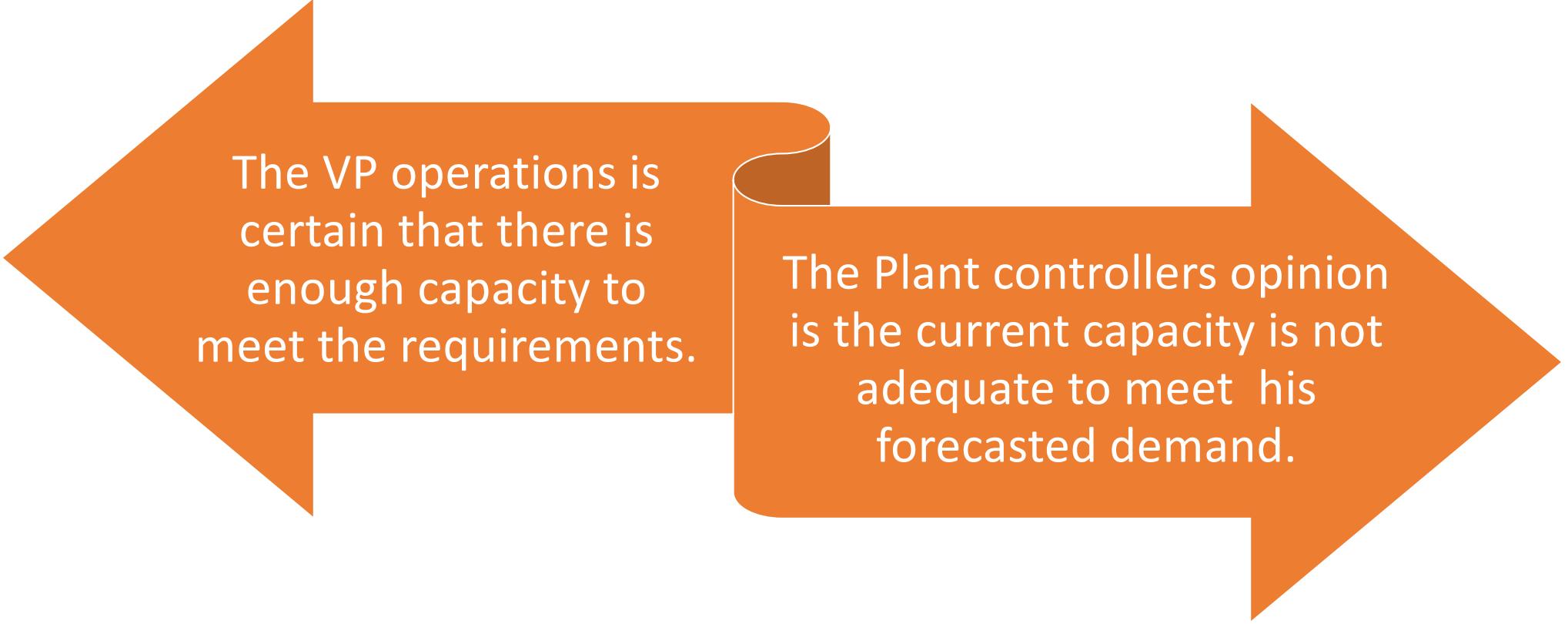




Part 3:

Capacity constraint for Fabricadas,
Chicago Facility

Problem Statement



The VP operations is certain that there is enough capacity to meet the requirements.

The Plant controllers opinion is the current capacity is not adequate to meet his forecasted demand.

2 Approaches

Production plan for
1 year (all quarters
combined)

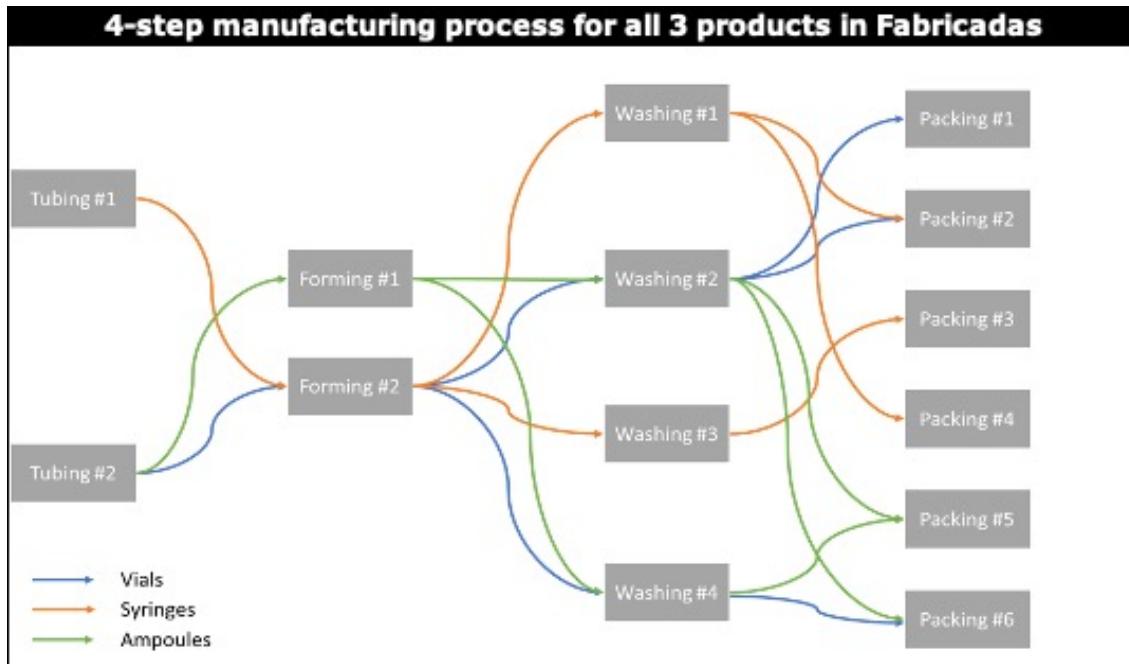
Production Plan for
each quarter



Capacity constraint Management

- Given Data:
 - Data Exhibit 3:Demand History and projections for 4 quarters, Cycle time breakup, Rejected lots in quarter.
 - Data Exhibit 4: Manufacturing process overview, plant Utilization and stoppage days.
 - We are considering 3 product Lines: Ampoules, Tubular Vials and Glass Syringes
 - Manufacturing Step processes :
 - Glass tubing capacity
 - Hot-forming process unit that creates the required shape
 - Washing and inspection unit
 - Packing and Distribution unit.
- Assumptions:
 - All downtime is equally distributed in all quarters
 - Net lot equivalent rejected in a quarter 1 remains constant throughout all quarters
 - Loading and Unloading time for each process already counted in the given cycle time
 - In ideal case, plant can operate 24 hours a day for 365 days in a year

Step 1: Setting Up capacity and Process Matrix:



- Each product has its own separate movement through the manufacturing chain which is shown in the figure.
- Formulate the Process Matrix (Binary values in which 1 indicates movement through manufacturing chain) for all manufacturing units and 3 products.
- Calculate total available time capacity for each manufacturing unit.

Step 2: Production plan for 1 year (all quarters combined)

- For Each manufacturing unit and each product line(Ampoules, Vials, Syringes) construct:
 - Cycle Time matrix using data exhibit 3
 - Process Matrix from previous step (step 1)
 - The changing cells will be Assignment Lots. Initially we will input any random numbers into it.
- The Used Hours calculated as:
 $\text{sumproduct}(\text{Cycle time}, \text{Process Matrix}, \text{Assignment Lots})$

Unit	Cycle Time			Process			Assignment Lots			Used Hours	Capacity Hours
	Ampoules	Vials	Syringes	Ampoules	Vials	Syringes	Ampoules	Vials	Syringes		
Tubing #1	6	9	6	0	0	1	0.00	0.00	516.62	3099.69	<= 5400
Tubing #2	6	9	6	1	1	0	496.95	255.36	0.00	5280.00	<= 5280
Forming #1	12	9	9	1	0	0	450.00	0.00	0.00	5400.00	<= 5400
Forming #2	12	9	9	0	1	1	0.00	131.45	441.88	5160.00	<= 5160
Washing #1	18	21	18	0	0	1	0.00	0.00	241.97	4355.41	<= 5400
Washing #2	18	21	18	1	1	0	293.33	0.00	0.00	5280.00	<= 5280
Washing #3	18	21	18	0	0	1	0.00	0.00	241.97	4355.41	<= 5280
Washing #4	18	21	18	1	1	0	158.76	121.06	0.00	5400.00	<= 5400
Packing #1	24	24	24	0	1	0	0.00	182.50	0.00	4380.00	<= 5280
Packing #2	24	24	24	0	1	1	0.00	18.46	42.13	1454.00	<= 5280
Packing #3	24	24	24	0	0	1	0.00	0.00	206.17	4948.11	<= 5160
Packing #4	24	24	24	0	0	1	0.00	0.00	206.17	4948.11	<= 5400
Packing #5	24	24	24	1	0	0	220.00	0.00	0.00	5280.00	<= 5280
Packing #6	24	24	24	1	1	0	220.00	0.00	0.00	5280.00	<= 5280

- The lots produced for each product at manufacturing step is calculated as:
 $\text{sumproduct}(\text{Process Matrix}, \text{Assignment lots})$
- The Total available useful lots produced at each step will be:
 $\text{Lots produced} - \text{Defective lots in quarter} * 4$
- As for a product all 3 steps needs to be completed one by one, the total product produced(Product Lot) will be:
 $\text{Min(Available Lots)}$

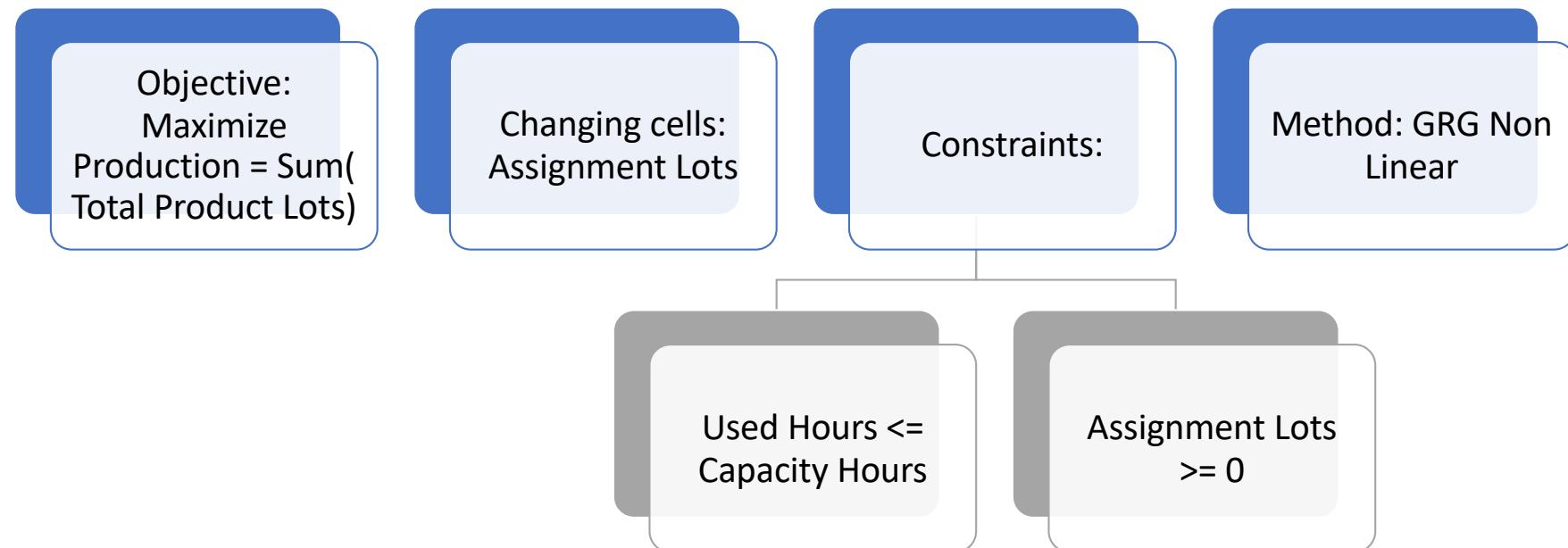
	Lots Produced				Defective lot in year				Available Lots				Final Product Lots Produced		
	Tubing		Hot-forming		Washing		Packing		Tubing		Hot-forming		Washing		
	Bend tubing Rejects	Contamination rejects	Glass breakages	Air bubbles	Tubing	Hot-forming	Washing	Packing	Tubing	Hot-forming	Washing	Packing	Washing	Packing	
Ampoules	496.95	450.00	452.10	440.00	4	22.8	14	11.2	492.95	427.20	438.10	428.80	427.20	427.20	427.20
Vials	255.36	131.45	121.06	322.02	11.2	24	12.8	12	244.16	107.45	108.26	310.02	107.45	107.45	107.45
Syringes	516.62	441.88	483.93	454.47	13.6	20.8	11.2	10.4	503.02	421.08	472.73	444.07	421.08	421.08	421.08

Use of solver for optimal production plan

+

•

○



Step 3: Production plan for each quarter

For Each Quarter, Similar to step 2 we will build Cycle time, Process Matrix and Assignment Lots matrix

The Next Step will be calculate :Used Hours in each quarter, Available lots and Final product lots Produced.

For Each Quarter (Q3-2020, Q4-2020, Q1-2021 and Q2-2021) We will run solver individually to find out optimal production plan.

Results: Production plan for 1 year (all quarters combined)

- The VP Operations for MediCrystals is may be looking at a broader picture of capacity, May be Total capacity for whole year and Total demand for a year. It can be observed that , when we calculate the production plan for all quarters combined, the demand for all the 3 products has been fulfilled.
- Hence VP operations is certain that there is enough capacity to meet the requirements.

Product Line	Demand	Production Supply	Status
Ampoules	195	427.20	Meet Demand
Vials	90	107.45	Meet Demand
Syringes	130	421.08	Meet Demand

Results: Production Plan For Each Quarter

- As the Plant Controller have detailed view of production process, maybe he is considering quarter wise production capacity. When we focus on quarter wise production plan, there is unmet demand for 3 quarters.
- For Quarter 3, 2020, the demand for all 3 products(Ampoules, Vials, Syringes) has been fulfilled.
- For Quarter4 2020, Quarter1 2021 and Quarter2 2021 the demand for Vials has not fulfilled while demand for Ampoules and Syringes has been fulfilled.
- Hence the plant controllers opinion is the current capacity is not adequate to meet his forecasted demand.

		Q3-2020		Status
Product Line	Demand	Production Supply		
Ampoules	15	106.80		Meet Demand
Vials	5	27.07		Meet Demand
Syringes	10	105.07		Meet Demand

		Q4-2020		Status
Product Line	Demand	Production Supply		
Ampoules	55	106.48		Meet Demand
Vials	20	10.55		Unmet Demand
Syringes	35	121.58		Meet Demand

		Q1-2021		Status
Product Line	Demand	Production Supply		
Ampoules	60	106.80		Meet Demand
Vials	30	27.07		Unmet Demand
Syringes	40	105.07		Meet Demand

		Q2-2021		Status
Product Line	Demand	Production Supply		
Ampoules	65	106.80		Meet Demand
Vials	35	27.07		Unmet Demand
Syringes	45	105.07		Meet Demand

Thank You

