

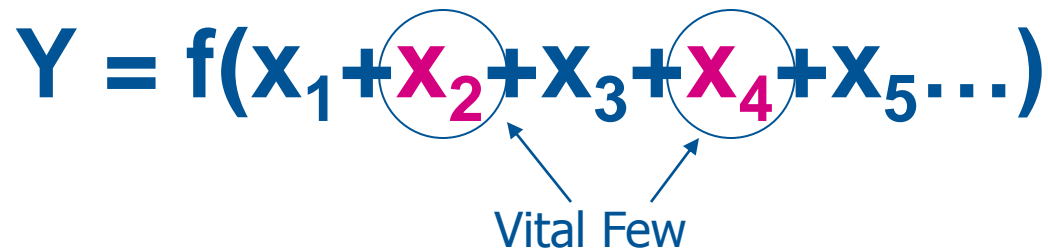
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THE NETWORK FOR SIX SIGMA

Cause and Effect Matrix

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Vital Few Identification

- We must identify the Vital Few root causes from the many probably root causes
- The Vital Few are those input and process factors (Xs)
 - That can be most affected
 - That most significantly influence critical to customer (CTCs) characteristics.
- Project teams may not need to prioritize when
 - Only a few root causes were identified.
 - It is clear which factors are the most influential on the process output.

$$Y = f(x_1 + x_2 + x_3 + x_4 + x_5 \dots)$$


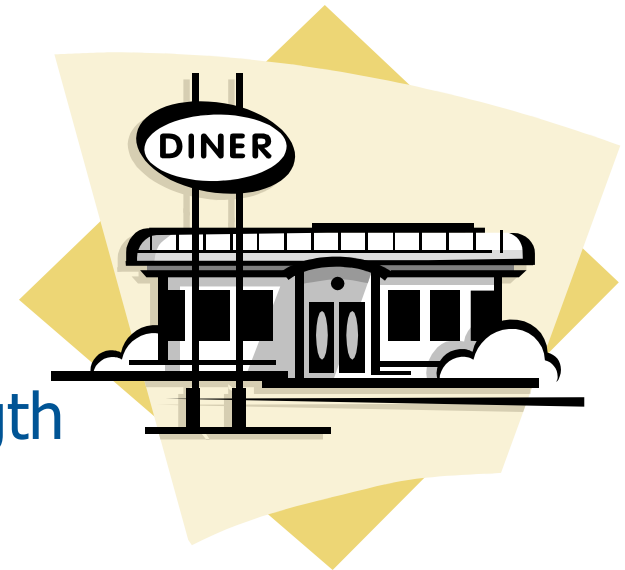
Vital Few

C&E Matrix: Steps to Create

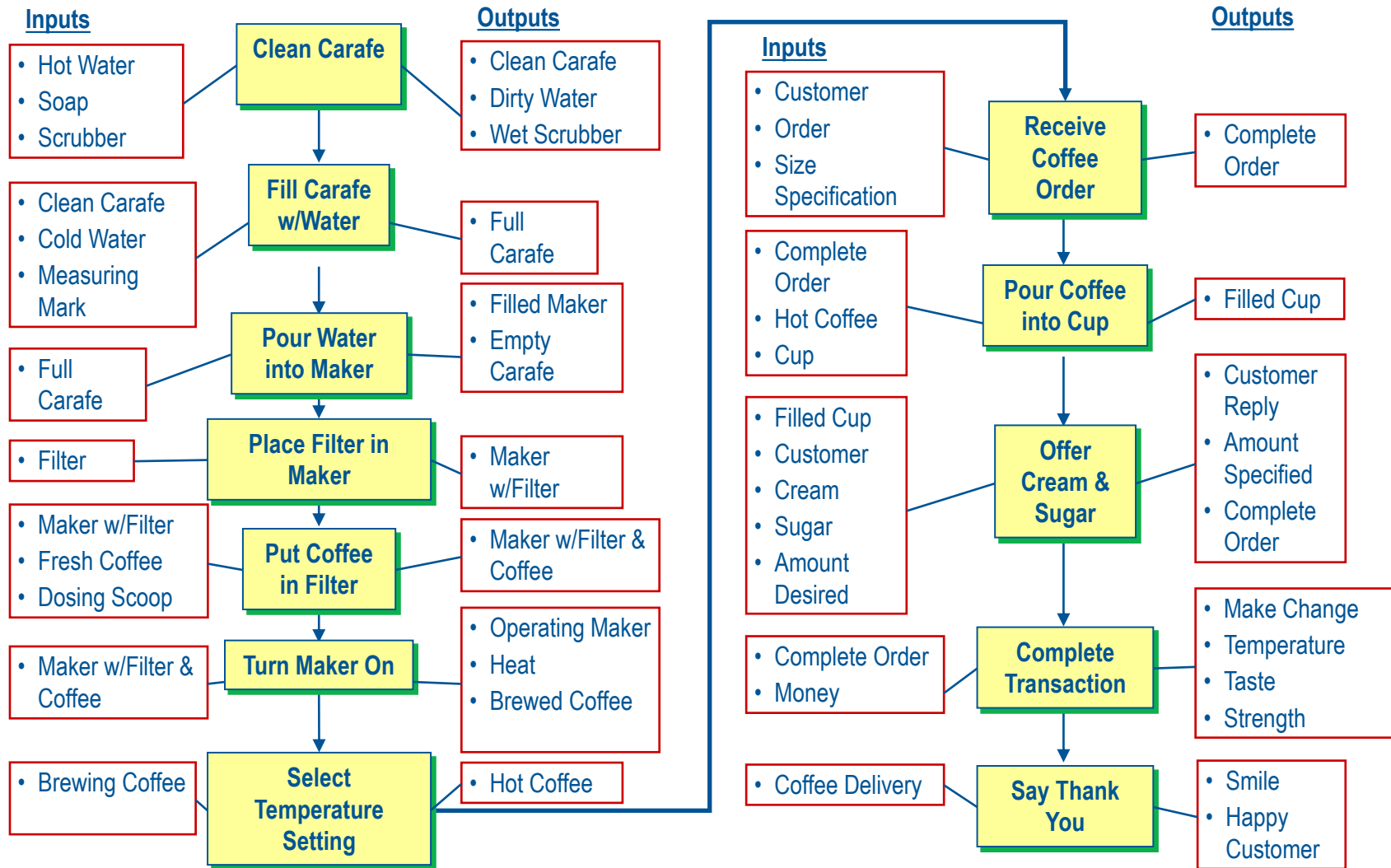
1. Select Key Customer Requirements (CTCs)
2. Determine a Priority Score for the CTCs
3. Enter Process Steps and Inputs from SIPOC, Swim-Lane Map, Fishbone
4. Rate the Correlation of Steps to CTCs
5. Cross Multiply Correlation Values with Priority Factors and Sum for each Input
6. Pareto the Results
7. Update SIPOC and Analyze Further

C&E Matrix: Example

- A manager at a local diner wants to improve customer satisfaction with the coffee they serve
- The team has completed a process map and they are ready to create a C&E matrix to identify the inputs that have the largest impact on customer satisfaction
- The team chose 3 aspects of customer satisfaction to focus upon: temp, taste and strength



Coffee Service Process Map



Create a C&E Matrix

Step 1: Select Key Customer Requirements

Process Outputs –
CTCs

		Temp of Coffee	Taste	Strength		Process Outputs Importance
Process Steps	Process Inputs	Correlation of Input to Output				Total

Create a C&E Matrix

Step 3: Enter Process Steps

		Temp of Coffee	Taste	Strength		Process Outputs
		8	10	6		Importance
Process Steps	Process Inputs	Correlation of Input to Output				Total
Clean Carafe						
Fill Carafe with Water						
Pour Water into Maker						
Place Filter in Maker						
Put Coffee in Filter						
Turn Maker on						
Select Temp Setting						
Receive Coffee Order						
Pour Coffee into Cup						
Offer Cream and Sugar						
Complete Transaction						
Say Thank You						

Process Steps

Step 4: Add Process Step Inputs and Rate Impacts on CTCs

		Temp of Coffee	Taste	Strength		Process Outputs
		8	10	6		Importance
Process Steps	Process Inputs	Correlation of Input to Output				Total
Clean Carafe	Hot Water	0	6	3		78
Fill Carafe with Water	Cold Water	3	6	9		138
Pour Water into Maker	Full Carafe	3	9	9		168
Place Filter in Maker	Filter	0	3	3		48
Put Coffee in Filter	Coffee	0	9	9		144
Put Coffee in Filter	Coffee Maker w/ Filter	3	1	0		34
Put Coffee in Filter	Dosing Scoop	9	3	3		120
Receive Coffee Order	Order	0	0	0		0
Pour Coffee into Cup	Hot Coffee	9	6	6		168
Offer Cream and Sugar	Cream	0	6	6		96
Complete Transaction	Money	0	0	0		0
Say Thank You	Coffee Delivery	0	0	0		0

Process Step Correlation Scores

A higher number indicates stronger correlation

Create a C&E Matrix

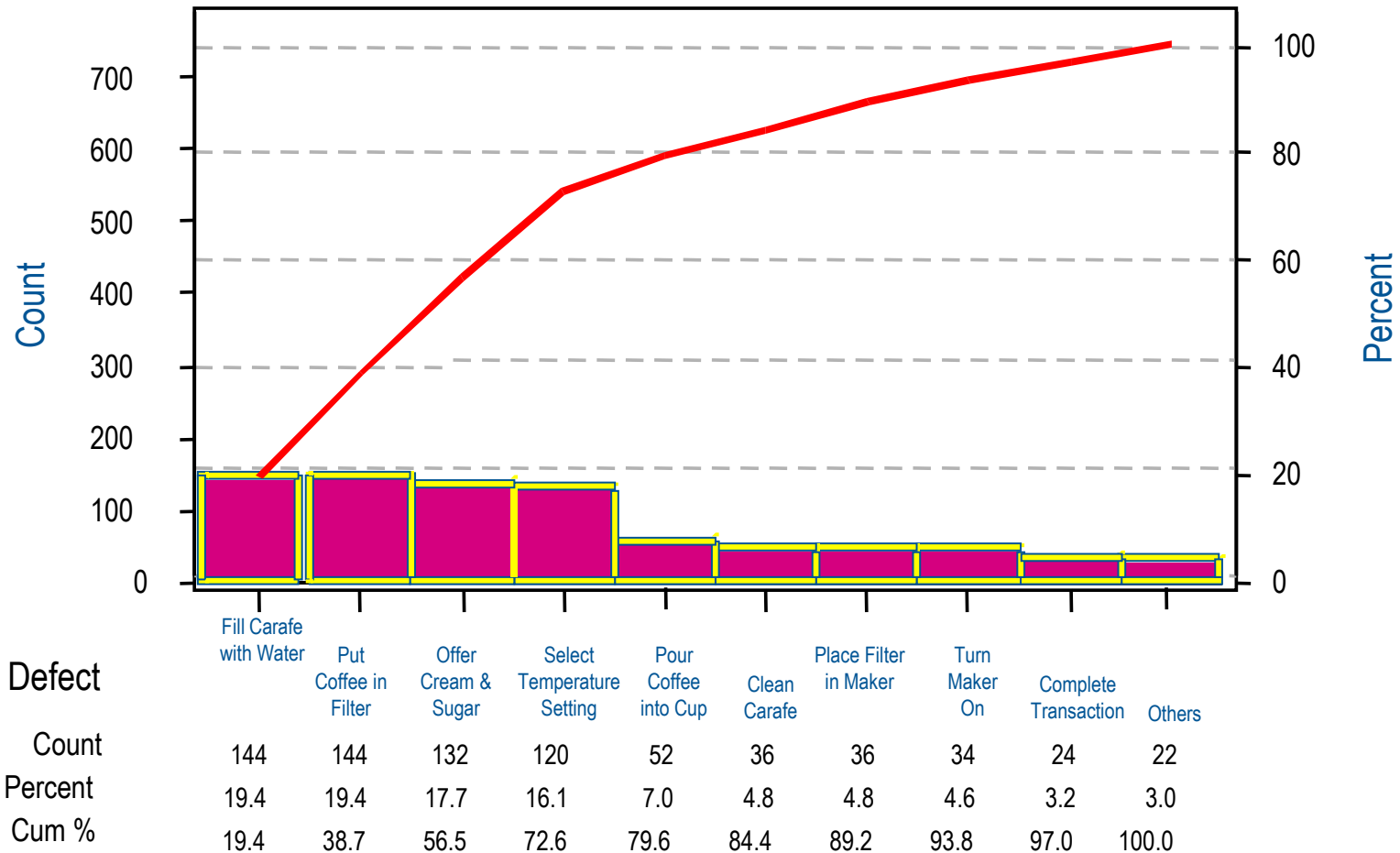
Step 5: Calculate Totals

		Temp of Coffee	Taste	Strength		Process Outputs
		8	10	6		Importance
Process Steps	Process Inputs	Correlation of Input to Output				Total
Clean Carafe	Hot Water	0	6	3		78
Fill Carafe with Water	Cold Water	3	6	9		138
Pour Water into Maker	Full Carafe	3	9	9		168
Place Filter in Maker	Filter	0	3	3		48
Put Coffee in Filter	Coffee	0	9	9		144
Put Coffee in Filter	Coffee Maker w/ Filter	3	1	0		34
Put Coffee in Filter	Dosing Scoop	9	3	3		120
Receive Coffee Order	Order	0	0	0		0
Pour Coffee into Cup	Hot Coffee	9	6	6		168
Offer Cream and Sugar	Cream	0	6	6		96
Complete Transaction	Money	0	0	0		0
Say Thank You	Coffee Delivery	0	0	0		0

Process Outputs -
Totals

Step 6: Create Pareto Chart

Step 7: Update SIPOC and Analyze Further (as necessary)



Linking the C&E Matrix to Other Lean Six Sigma Tools

C&E Matrix

		Rating of Importance to Customer															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Process Step	Process Inputs																Total
		1															
2																	0
3																	0
4																	0
5																	0

FMEA

Process/Product Failure Modes and Effects Analysis (FMEA)										
Process or Product Name:	Prepared by:			FMEA Date (Orig):						(Rev):
Responsible:	Process Step:	Potential Failure Mode:	Potential Failure Effects:	S.E.C.	Potential Cause:	D.S.C.	Current Controls:	D.S.C.	R.P.N.	
	Door Drive Process	Door Breakout	Unintended pinning, High SD (door break-out)	3	Dirty separator	8	Visual Inspection of Wheel and Sensor Elements	3	144	
				10	Filament motion	2	Visual Sight glass	3	60	
				10	Polypipe motion	2	Visual Light	3	60	
				2					12	

Key Inputs are explored

Control Plan Summary

Control Plan										
Process	Process Step	Input	Output	Process or Output (Yield Target)	Cpk Allow	Measurement Technique	Sample Size	Sample Frequency	Control Method	Reaction Plan
DCV	Scan Beam on	Scan Beam	Scan Beam							
DCV	Load DMP	Load DMP	Load DMP							
DCV	Load DMP	Load DMP	Load DMP							
DCV	Load DMP	Load DMP	Load DMP							
DCV	Load DMP	Load DMP	Load DMP							
DCV	Load DMP	Load DMP	Load DMP							
DCV	Load DMP	Load DMP	Load DMP							
DCV	Load DMP	Load DMP	Load DMP							
DCV	Load DMP	Load DMP	Load DMP							
DCV	Load DMP	Load DMP	Load DMP							
DCV	Load DMP	Load DMP	Load DMP							

The Key Inputs are evaluated