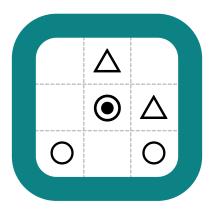
Continuous Improvement Toolkit

Matrix Diagram



The Continuous Improvement Map

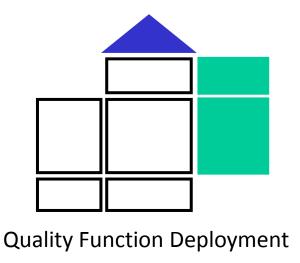
Managing		Deciding & Se	electing	Plann	ning & Project	t Management*
Risk PDPC	Decision Bala	ance Sheet Imp	oortance-Urgend	y Mapping D	aily Planning	PERT/CPM
FMEA RAID Log*	* Force Field Ana	alysis Cos	st Benefit Analy <mark>s</mark>	is <u>MOST</u>	RACI Matrix	Activity Networks
Risk Assessment*	Break-even Ana	llysis Voting	TPN Analysi	s <u>SWOT</u>	Analysis Sta	keholder Analysis
Fault Tree Analysis	Decision Tree	Pick Chart F	our Field Matrix	Project Ch	narter Impro	ovement Roadmaps
Traffic Light Assessme	ent Critical-to Tree	QFD Po	rtfolio Matrix	PDC	A Policy Deploy	yment Gantt Charts
Lean Measures	Kano Analysis Matr	ix Diagram Paire	ed Comparison	DMAIC Kaiz	en Events Co	ontrol Planning
Bøttleneck Analysis**	Cost of Quality* Pu		ization Matrix	A3 Thinking	Standard work	Document control
Process Yield	OEE KPIs	areto Analysis	C&E Matrix	erstanding	Cross Training	Implementing
	Descriptive Statistics	ANOVA Chi-	Sauara	se & Effect	Value Analysis	Solutions**
	Probability Distribution	ons Hypothesis	Testing Desig	n of Experiment	Mistake Proof	fing Ergonomics
	istograms & Boxplots	Multi vari Studi	es Confider	ce Intervals Si	mulation TPI	M Automation
Reliability Analysis Understanding	Graphical Analysis	Scatter Plots (Correlation	Regression	Pull Flow	Just in Time
Performance M	ISA Run Charts	5 Whys Root Ca	ause Analysis	Data Snooping	Visual Manage	ement 5S
Benchmarking**	Control Charts	Fishbone Diagra	m Tree Diagra	m* SIPOC*	Waste Analysis	Quick Changeover
Data collection planner	* Sampling Mor	phological Analysis	How-How D	iagram** Prod	cess Redesign	Time Value Map
Check Sheets Interv	views Brainstorming	SCAMPER**	Attribute Ana	ysis Spaghett	i Diagram Val	ue Stream Mapping
Questionnaires Foo	cus Groups Affinity	Diagram Rel	ationship Mappi	ng* Flow Pr	ocess Charts	Service Blueprints
Data	Mind	Mapping* Late	eral Thinking	Flowcharting	IDEF0	Process Mapping
Collection Obs	ervations Suggestic	n systems Crea	ating Ideas	Desig	ning & Analy	zing Processes

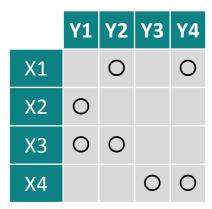
- A table that allows sets of data to be compared.
- Helps make better decisions.
- Displays the existence and strength of relationship between pairs of items of two or more sets.

-	A	В	С	D
1				
2				
3				
4				

□ The relationship is then indicated by a number or symbol in each cell where the two items intersect in the matrix.

Can be used as part of other decision making tools.





Cause and Effect Matrix

Uses:

- Often used to understand the relationship between two lists:
 - Problems and solutions to those problems.
 - Effects and causes to those effects.
 - This connection between variables can be useful in decision making, problem solving and process improvement efforts.
- When the second list is generated as a result of the first list.
 - For example, to generate design specifications that best meet the required operating conditions.



Applications:

- Searching of possible problem causes.
- Matching requirements with specifications.
- Comparing the significance of alternative solutions.
- Identifying opportunities for improvement.
- Assigning responsibilities based on appropriate personnel competencies.



Example:

- A design team may select the most effective design features that meet customer requirements:
 - The first set is the customer requirements.
 - The second set will be the design features.



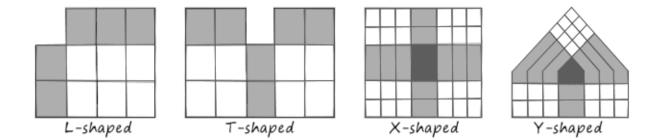
Other Examples:

- A restaurant team selects the most effective work processes that improves customer experience.
- A marketing team selects the most effective sales tools to increase sales.
- A quality team selects the most effective inspection methods to discover product defects.
- A manufacturing team selects the possible causes which affect materials consumption in a production line.



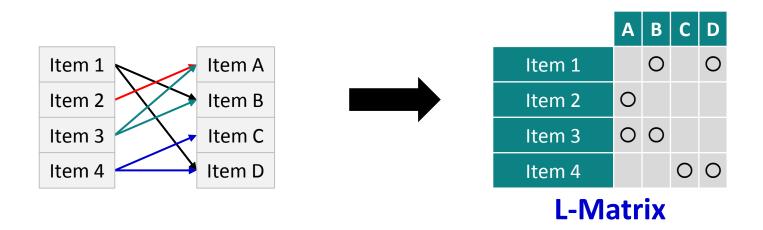


- It has a number of types, each has many applications.
- Other shapes are available to compare more than two lists including: the T-Shaped, X-Shaped, and Y-Shaped matrices.



L-Shaped Matrix Diagram:

- The most basic and the most used one.
- You only compare two sets of data.
- A two-dimensional table is used to represent the diagram.
- The items of the first set are listed in the left hand column while the items of the second set are listed in the top row.

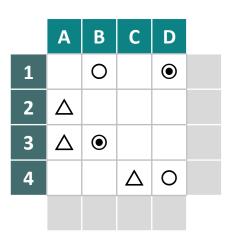


L-Shaped Matrix Diagram:

- Numbers or symbols are indicated in the cells to show the strength of the relationship.
- Weighting can be used for prioritization and ranking.
- Other information can be displayed including:
 - The totals.
 - The overall strength of the relationship.

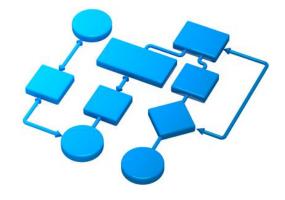
The most common relationship symbols and their corresponding values

Symbol	•	0	Δ
Value	9	3	1
Relationship	Strong	Medium	Weak



How to Build a Matrix Diagram:

- Explain to the team the purpose for building the matrix diagram.
- Select and collect the two sets of data.
- Agree on the symbols and their values.
- Construct a two-dimensional table.
- Insert the first set of data on the left hand column and the second one on top row of the table.
- Work through the matrix and discuss and indicate the relationships.
- Place the appropriate symbol at the intersecting cell of the matrix.
- Review the completed matrix with your team in order to make the best decision for your situation.



Example – How to Make a Better Cup of Tea:

Cause and Effect Matrix Diagram

Cause / Effect	Taste	Volu	ıme	Temperature	
The boil kettle				0	6
Adding water	Δ			•	13
Adding tea	•				9
Adding sugar	0				3
Adding milk	•		7	Δ	11
Stirring	0	0			3
	25	7	7	13	
	Symbol	•	0	Δ	
	Value	9	3	1	
	Relationship	Strong	Mediu	m Weak	

Example – Application of improvement tools:

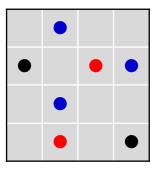
•	Graphical Analysis	SPC	KPIs	Data Collection Methods	Cause and Effect	Process Mapping	Kaizen	5S	
HR	•		•	•	•		•	•	18
Finance	•								9
Purchasing			•	•	•				8
IT				•		•		•	14
Quality	•	•	•	•	•	•	•		32
Marketing	•		•	•					16
Maintenance	•	•		•	•	•		•	34
Production	•	•		•	•	•	•	•	38
Store				•				•	8
	29	18	23	32	21	21	17	18	
	Rela	ationship	St	rong	Mediur	m	Weak		

Example - Allocating Human Resources to Multiple Projects:

Skills	SPC	0	•	0	Δ		Δ
	5S		\triangle	0			
	SOP	•	•	•	•	0	0
	Sampling		0				Δ
	FMEA						
	Employees	Harvey	Sami	Emir	Zekaria	Shadi	Peter
Projects	Energy usage						
	Spoilage reduction	•		•			•
	Safety management				•	•	
	Visual management		•	•	•		
	Involved	⊚ Str	ong	O Med	ium	△ We	ak

Further Information:

- Numbers could be used instead of symbols.
- □ For example from 0 to 5:
 - Where 0 means absolutely unimportant and 5 means very important.
- □ If your intuition tells you that the top scoring item is not the best one, then get back to the weightings that you have applied.
- □ A constraint when using a matrix diagram is in the number of comparisons that you have to apply.
 - For example, a ten-by-ten matrix requires 100 comparisons.



Further Information:

- Arrows maybe used to show the direction of the relationship when the relationships act only in one direction (which influence one another?).
- You may also compare the same items together by using a triangular half-matrix.
- This comparison includes both positive and negative correlation.
- It shows where the items cooperate or conflict.
- □ A negative correlation happens where the presence or increase of one item reduces the value or effect the other item.

Further Information:

- □ The sets can be any collection of:
 - Characteristics.
 - Specifications and features.
 - Functions and tasks.
 - Ideas and solutions.
 - Problems and causes of problems.
 - Methods, tools and techniques.
 - Issues.
 - Measures.

