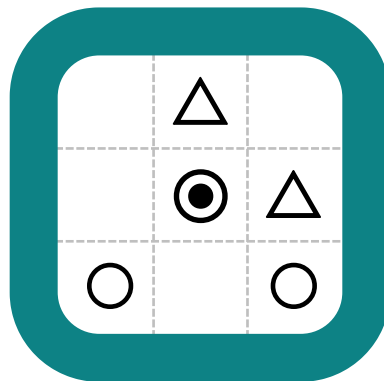
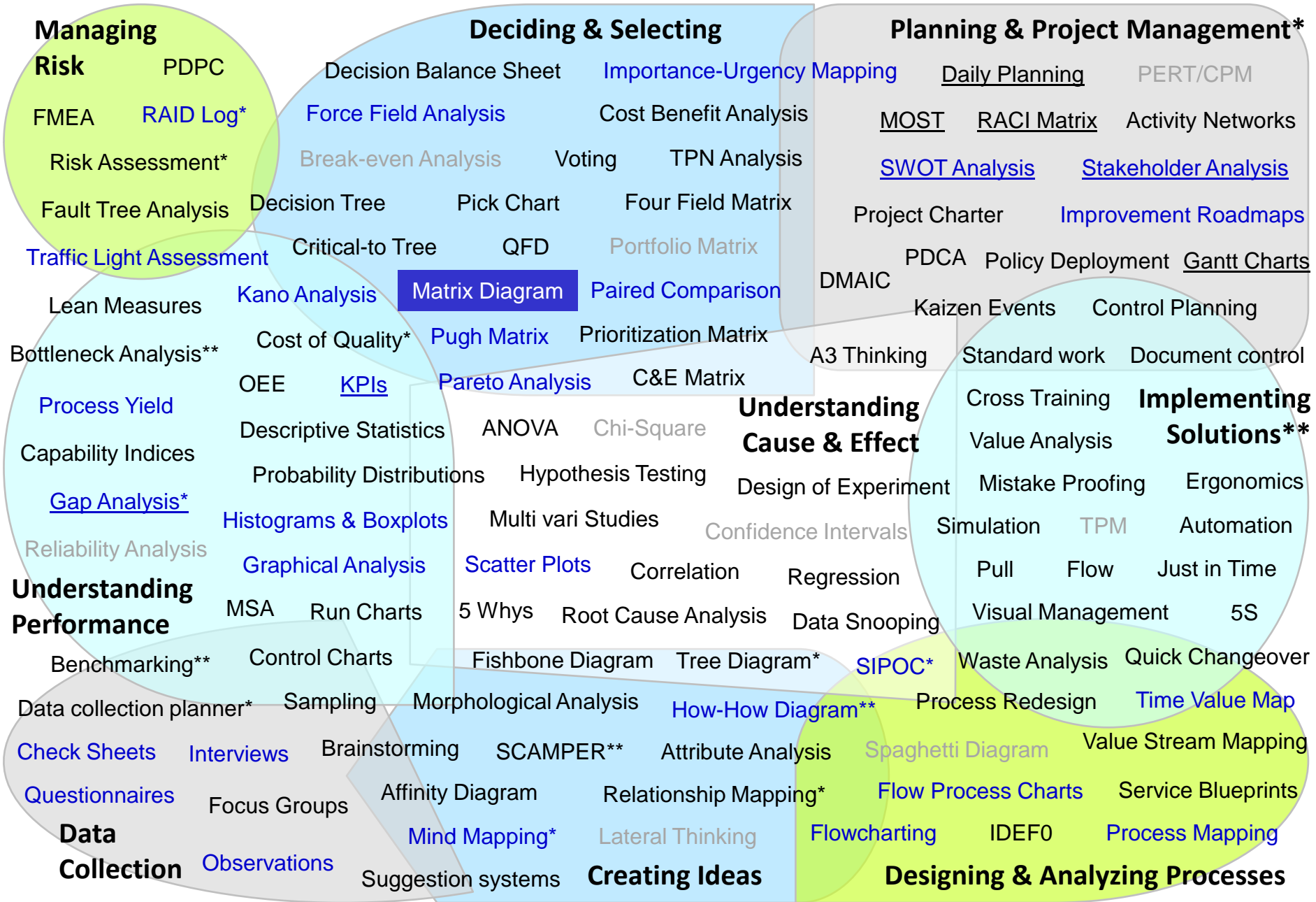


Continuous Improvement Toolkit

Matrix Diagram



The Continuous Improvement Map



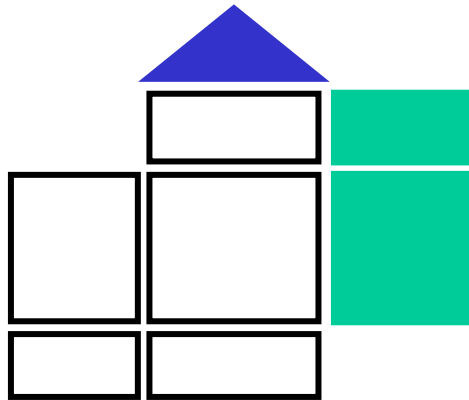
- Matrix Diagram

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

	A	B	C	D
1				
2				
3				
4				

- Matrix Diagram

- Can be used as part of other decision making tools.



Quality Function Deployment

	Y1	Y2	Y3	Y4
X1		○		○
X2	○			
X3	○	○		
X4			○	○

Cause and Effect Matrix

- Matrix Diagram

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.

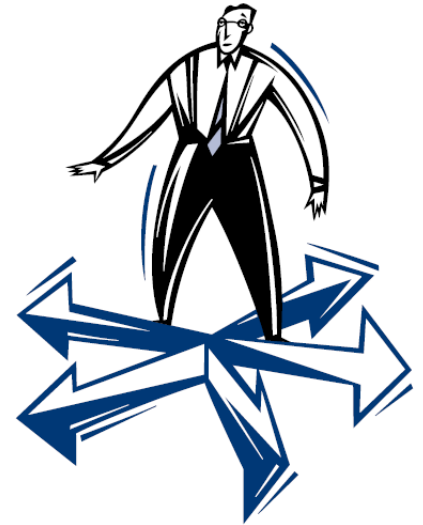
- ❑ When the second list is generated as a result of the first list.
 - For example, to generate design specifications that best meet the required operating conditions.



- Matrix Diagram

Applications:

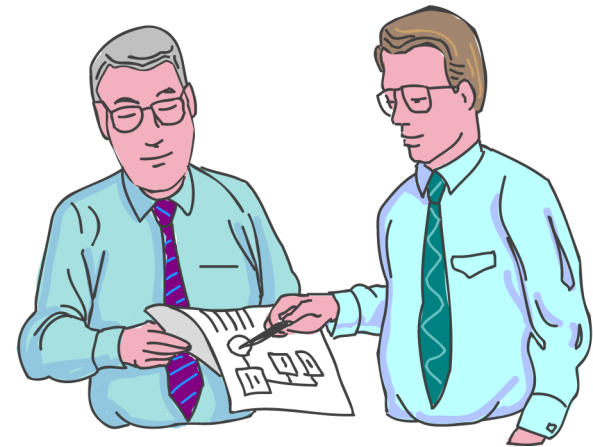
- ❑ Searching of possible problem causes.
- ❑ Matching requirements with specifications.
- ❑ Comparing the significance of alternative solutions.
- ❑ Identifying opportunities for improvement.
- ❑ Assigning responsibilities based on appropriate personnel competencies.



- Matrix Diagram

Example:

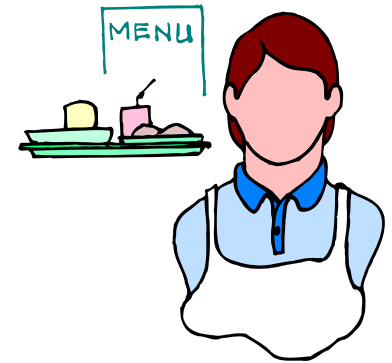
- ❑ A design team may select the most effective design features that meet customer requirements:
 - The first set is the customer requirements.
 - The second set will be the design features.



- Matrix Diagram

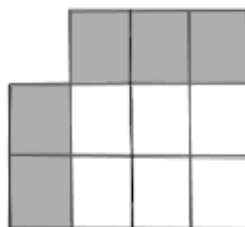
Other Examples:

- ❑ 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.

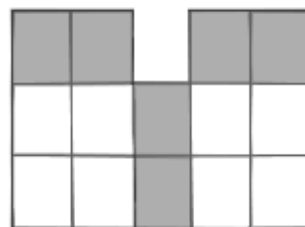


- Matrix Diagram

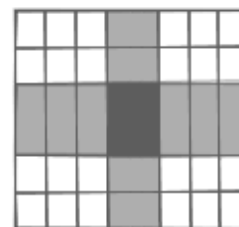
- ❑ It has a number of types, each has many applications.
- ❑ Other shapes are available to compare more than two lists including: the **T-Shaped**, **X-Shaped**, and **Y-Shaped** matrices.



L-shaped



T-shaped



X-shaped

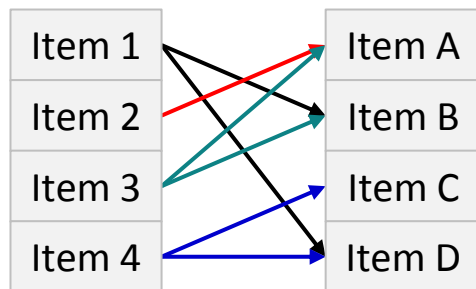


Y-shaped

- Matrix Diagram

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.



	A	B	C	D
Item 1		○		○
Item 2	○			
Item 3	○	○		
Item 4			○	○

L-Matrix

- Matrix Diagram

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

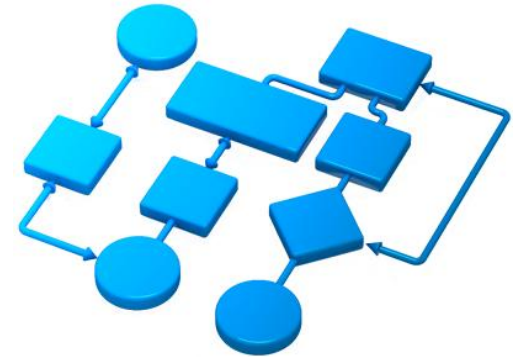
Symbol	⊙	○	△
Value	9	3	1
Relationship	Strong	Medium	Weak

	A	B	C	D	
1		○		⊙	
2	△				
3	△	⊙			
4			△	○	

- Matrix Diagram

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.



- Matrix Diagram

Example – How to Make a Better Cup of Tea:

Cause and Effect Matrix Diagram

Cause / Effect	Taste	Volume	Temperature	
The boil kettle		○	○	6
Adding water	△	○	⊙	13
Adding tea	⊙			9
Adding sugar	○			3
Adding milk	⊙	△	△	11
Stirring	○			3
	25	7	13	

Symbol	⊙	○	△
Value	9	3	1
Relationship	Strong	Medium	Weak

- Matrix Diagram

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	

Relationship

● Strong

● Medium

● Weak

- Matrix Diagram

Example - Allocating Human Resources to Multiple Projects:

Skills	SPC	○	⊙	○	△		△
	5S		△	○			
	SOP	⊙	⊙	⊙	⊙	○	○
	Sampling		○				△
	FMEA						
Employees		Harvey	Sami	Emir	Zekaria	Shadi	Peter
Projects	Energy usage						
	Spoilage reduction	●	●	●			●
	Safety management	●			●	●	
	Visual management		●	●	●		

● Involved

⊙ Strong

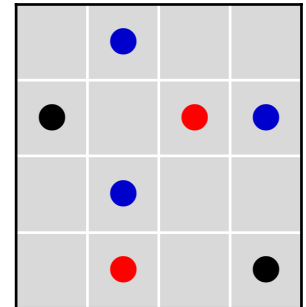
○ Medium

△ Weak

- Matrix Diagram

Further Information:

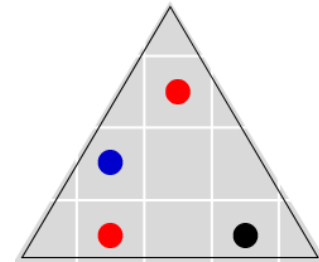
- ❑ Numbers could be used instead of symbols.
- ❑ For example from 0 to 5:
 - Where 0 means absolutely unimportant and 5 means very important.
- ❑ If your intuition tells you that the top scoring item is not the best one, then get back to the weightings that you have applied.
- ❑ A constraint when using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



- Matrix Diagram

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.



- Matrix Diagram

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.

