New 7 QC tools

By Shuai Zhang

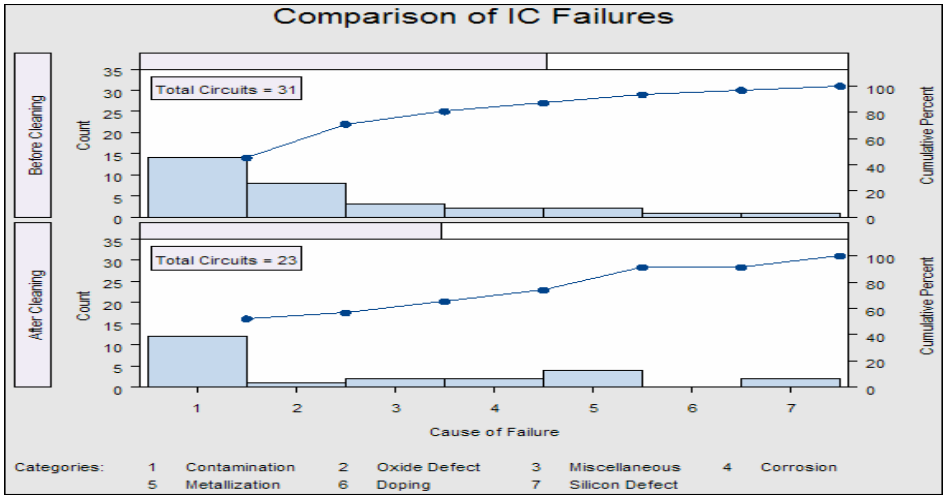
Kun Wang

New vs. Old

- **Old 7 QC tools**
- 1. Check list
- 2. Fishbone diagram
- 3. Control chart
- 4. Histogram
- 5. Pareto chart
- 6. Scatter diagram
- 7. Stratification

Feature:

Data orientation: Focus on numerical data measure and calculation.



New vs. Old

- However, many customer requirements cannot always be adequately expressed by **numerical data** alone.

New vs. Old

- Nevertheless, even verbal statements can be expressions of facts, because it represents facts, we ought to use verbal data as well as numerical data in managing quality.

New vs. Old

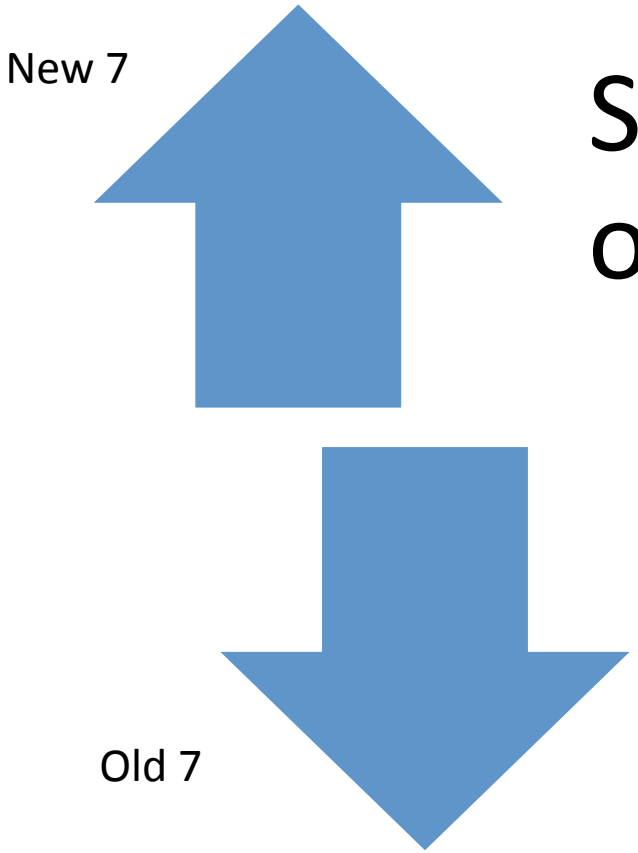
- 1. Relations diagram
- 2. Tree diagram
- 3. Arrow diagram
- 4. Affinity diagram
- 5. Matrix diagram
- 6. Matrix data analysis diagram
- 7. Process decision program chart. (PDPC)

Features

- Combine verbal with numerical
- Looking for root cause
- Clarify, prioritize goals and schedule
- Involve everyone into full cooperation
- Generate ideas

New vs. Old

- New 7 QC tools are compatible with Old 7 QC tools, and complement them.



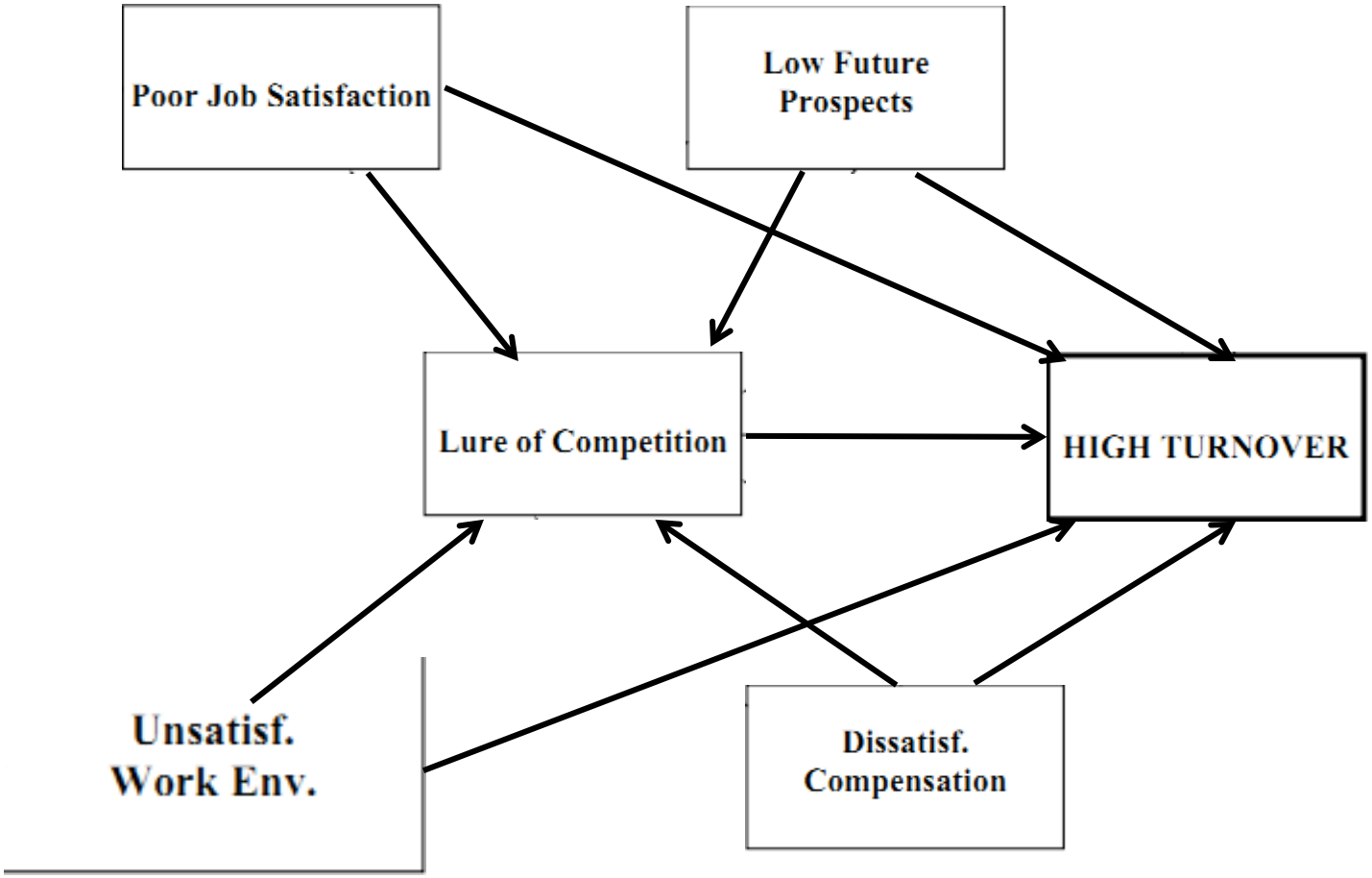
Strategic, orientations

Tactical, measures

1. Relation Ship Diagram

- Decide EFFECTS
- Decide IMMEDIATE CAUSES
- Connect IMMEDIATE CAUSES to Effects
- Taking Immediate Causes as effect to find CAUSES for them
- Explore RELATIONSHIP of Causes and Connect them
- Finding more important causes and prominent links
- Make the link SHORT, make the diagram COMPACT
- Title it

1. Relation Ship Diagram



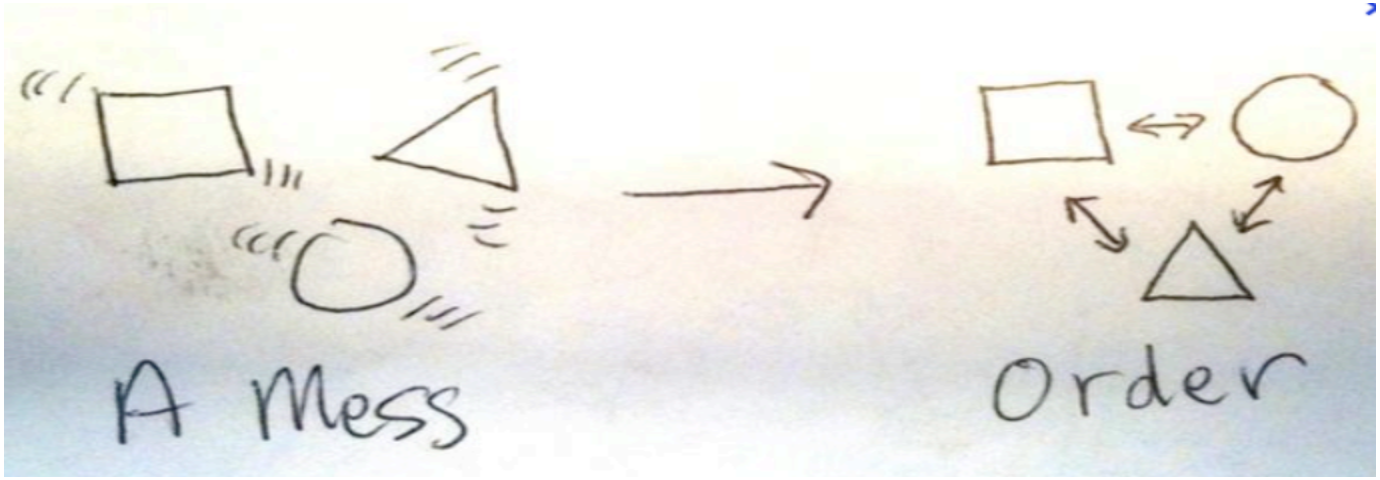
1. Relation Ship Diagram

Applications

- Explore cause and effect relationships
- Especially for complex situations where the causes are likely to be MUTUALLY RELATED

2. Affinity Diagram

- Organize large number of ideas into a logical way, make them into a systematic order to help you plan actions



2. Affinity Diagram

- 1. SUBJECT TOPICS
- 2. Generate a Large Number of IDEAS
- 3. Decide # and Title, create a CARD
- 4. Distribute all the ideas among the cards
- 5. Arrange the cards according to the relationships between the groups
- 6. Title it

2. Affinity Diagram

Applications

- Break up any complex problem or task into smaller more easily manageable bits

How to eat an elephant?

Slice by Slice!

2. Affinity Diagram

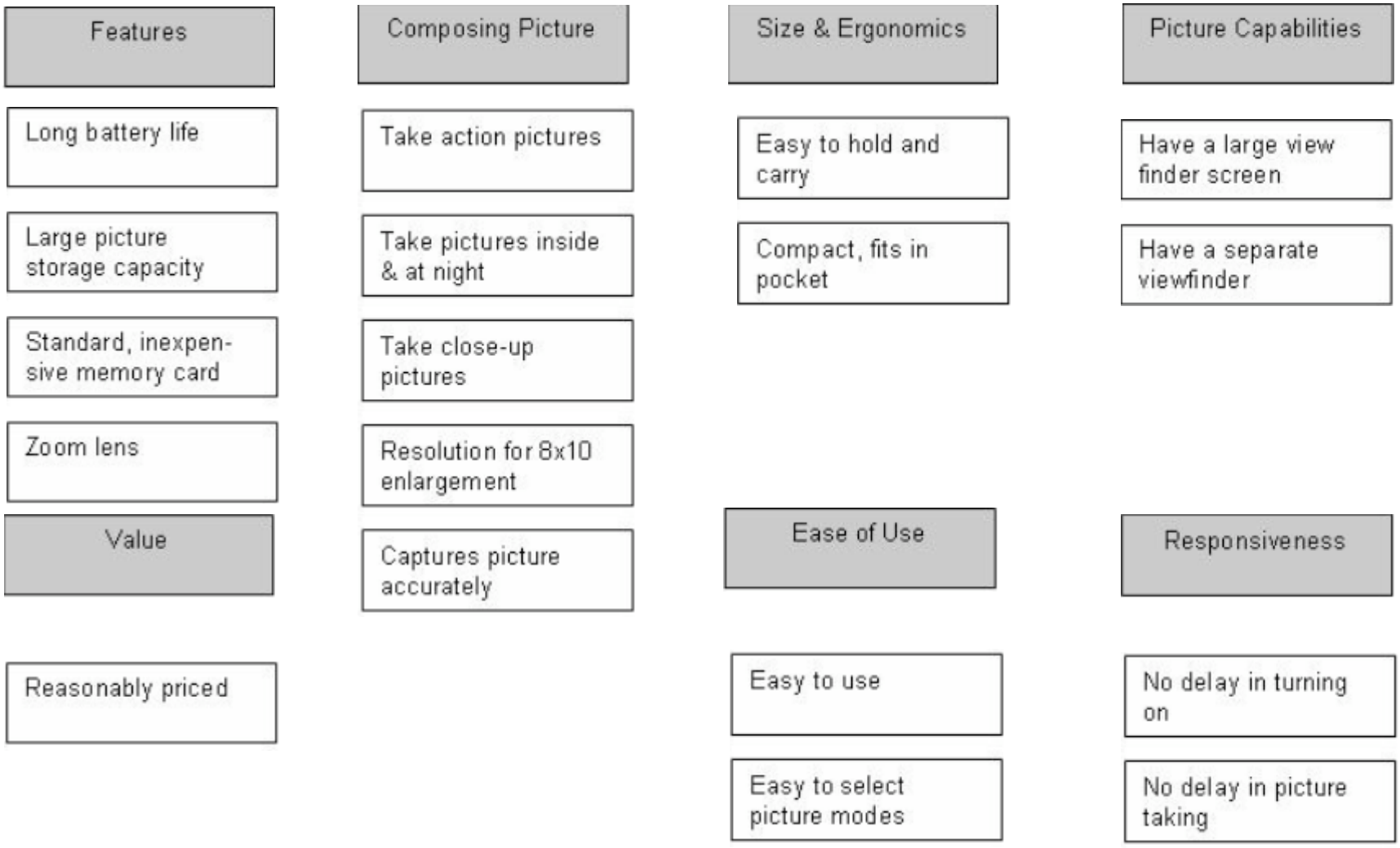
- Example:

Next Generation Digital Camera

You can organize the customer complains and requirements in an Affinity Diagram

2. Affinity Diagram

2. Affinity Diagram

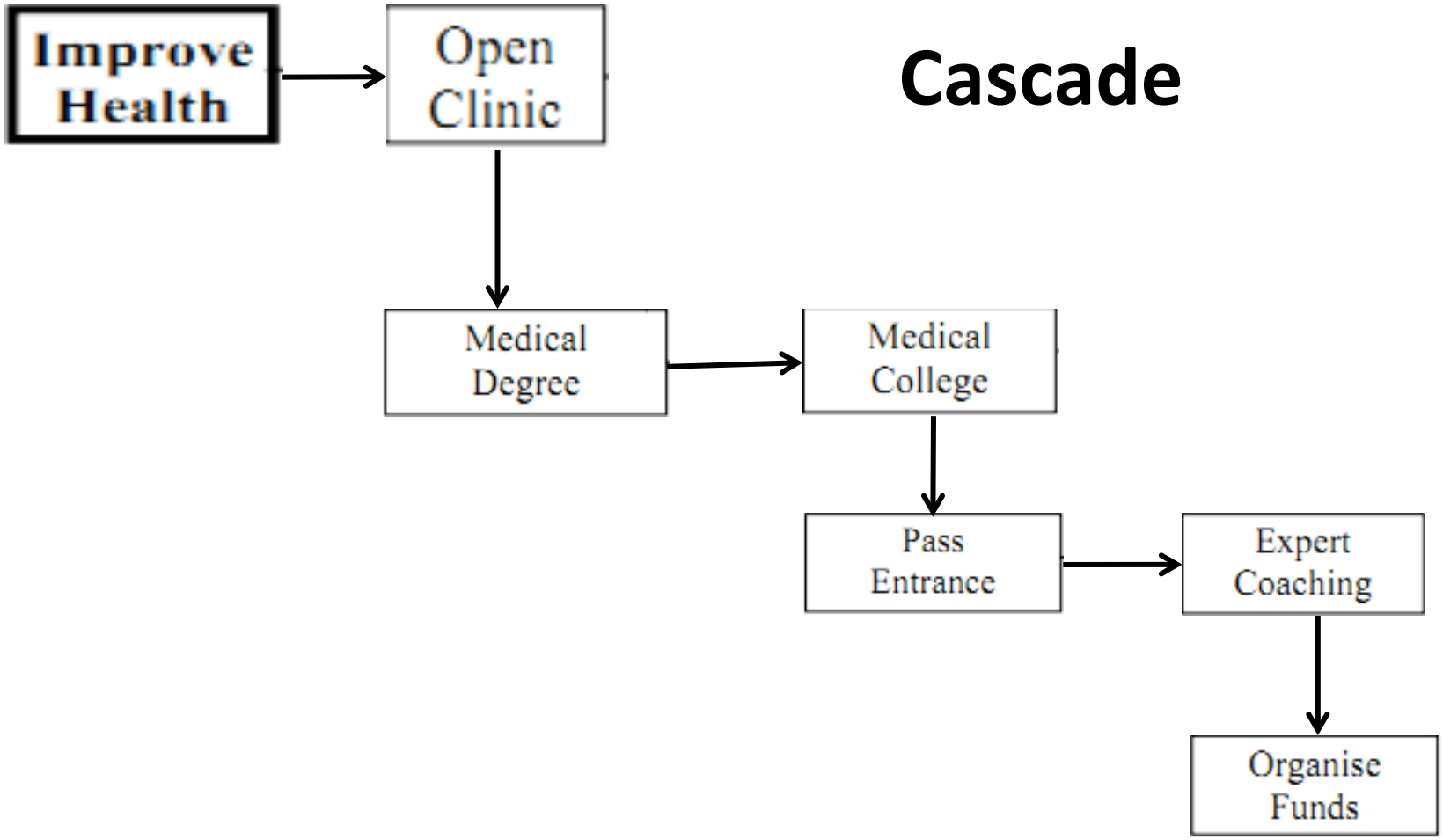


2. Affinity Diagram

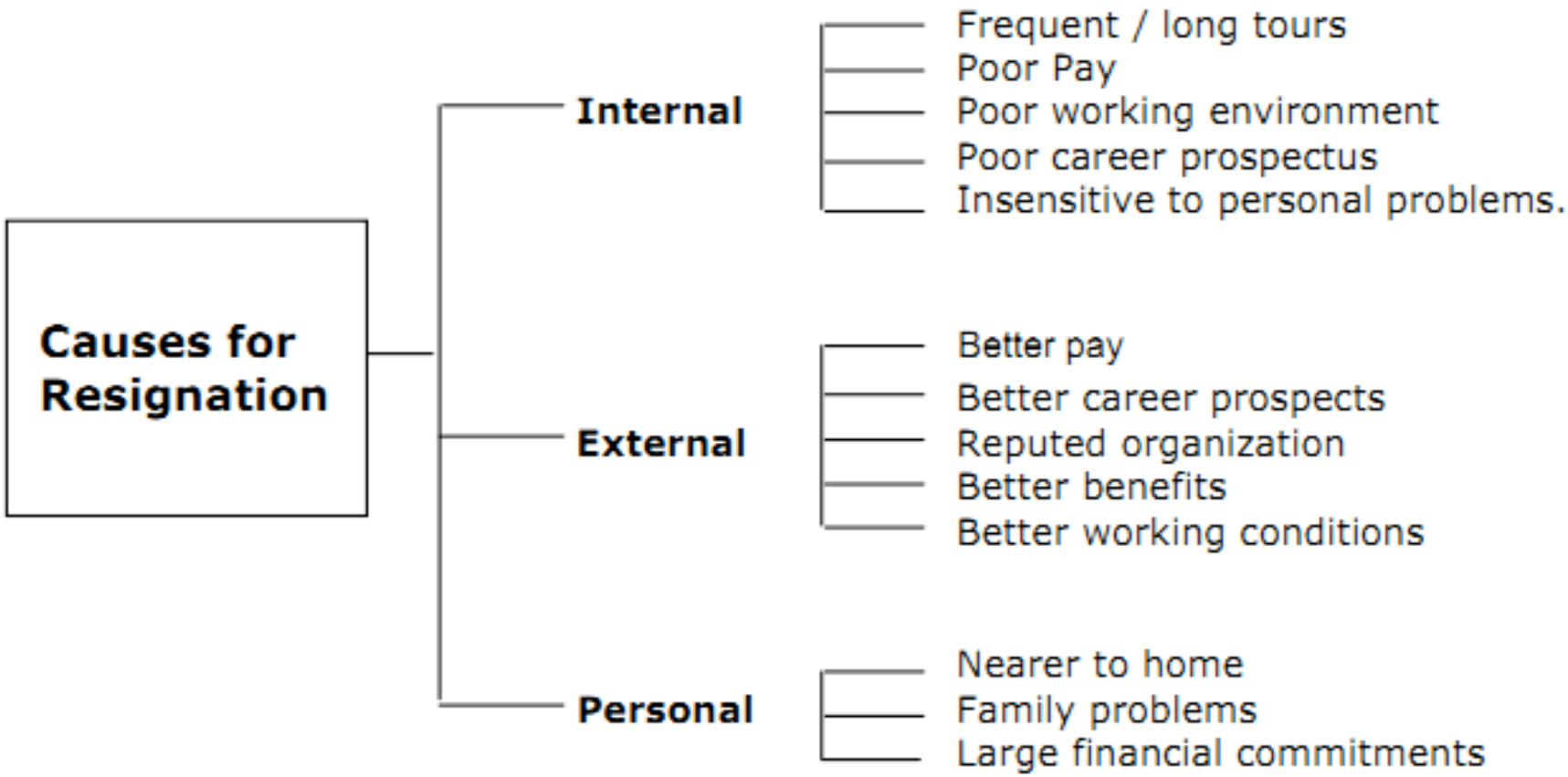
3.Tree Diagram

- Identify a high PRIORITY PROBLEM that need to be solved earliest.
- Choose FORM: Tree or Cascade?
- Identify PRIMARY MEANS
- Identify SECENDARY MEANS for primary means
- TERTIARY MEANS
- Continue the process till the group feels that the END of the line has been reached
- Use of POST-IT PAD
- Consensus of MEANS
- Title it

3.Tree Diagram



3.Tree Diagram



Tree Form

3.Tree Diagram

Applications

- Develop a systematic step by step strategy to achieve an objective.
- Devise solution for problems

Reference

- Application of Seven New QC Tools

By Muhammad Amjad Manager ,

Quality Assurance Newage Cables (Pvt) Limited ,Lahore – Pakistan

- 7 ADVANCED QC TOOLS, Compiled from D L Shah Trust publication By B.Girish, Dy. Director National Productivity Council, Chennai

4. Matrix Diagram

- Purpose: Explore the existence and the extent of relations between individual items in 2 sets of factors or features and characteristics and express them in a symbolic form that is easy to understand.
- Mostly used to understand the relations between the customer expectations as expressed by the customers and product characteristics as designed, manufactured and tested by the manufacturer.

Procedures

1. Determine 2 sets of factors for which the relations are needed to be established.
2. Divide the features and characteristics into primary, secondary and tertiary characteristics.
3. Place the features vertically on the left side of the matrix and characteristics horizontally on top of the matrix.
4. Enter the importance of the features on the column after that for the tertiary features.

Procedures(Continue)

5. In the main body of the matrix, use the symbols to represent the degree of connections between the features and the characteristics.

Application

- Matrix diagram can be used to solve problems by arranging data in such a way that the relations between relevant factors are brought into sharp focus.
- There is no limit to the use of the tool.
- The most important application of matrix diagram is in clarifying relations between individual features of customer requirements and individual product characteristics.

Example of Matrix Diagram

Features P	Features S	Features T	Characteristics P	Physical Tests								Formula				
Importance S				Description			Properties		Foam Height			Detergent		Others		
			T	Col	Cla	Per	SpGr	Visc	Ini	Fin	Den	Typ	%	F.B.	Cond.	Pres.
Appearance	Visual	Col	1	•								o	Δ	Δ		
		Cla.	1		•							Δ	Δ	o		
	Perceived	Perf.	2			•						o	o	o		o
		Str.	2				o	•					o	Δ		
Functional	Lather	Cop.	3						•	Δ	o	•	•	•		
		Dense	2								•	o	o	•		
		Dur.	1							•		o	o	•		
	Effect	Clean Hair	3									•	o	Δ	o	
		Shiny Hair	2									•	Δ	Δ	o	
		No Tang	3												•	
Misc.	Safe	Eyes	3									o	o	o	o	•
		Hair	3									o	o	Δ	•	•

Key : • - Strong o - Medium Δ - Weak

Example of Matrix Diagram – Shampoo Features and characteristics

5. Matrix Data Analysis Diagram

- Purpose: To present numerical data about two sets of factors in a matrix form and analyze it to get numerical output.
- Can be applied in understanding the products and products characteristics.

Procedure

1. Decide the two factors whose relations are to be analyzed.
2. Check the number of individual items in the two factors.
3. Prepare a matrix to accommodate all the items of the two factors.
4. Enter numerical data in the matrix.
5. Give the diagram a suitable title.

Example

Primary	Secondary	Tertiary	Importance	Target Value	W	X	Y	Z
Appear	Visual	Colour	1	5	4	5	4	3
		Clarity	1	4	3	4	5	4
	Perceived	Perfume	2	5	5	3	2	4
		Strength	2	5	4	4	4	3
Functional	Lather	Copious	3	4	3	4	4	5
		Dense	2	5	5	3	4	4
		Durable	1	4	3	3	5	2
	Effect	Clean Hair	3	5	4	2	3	2
		Shiny Hair	2	5	5	2	4	5
		No Tangles	3	4	3	4	3	5
Misc.	Safe	On Eyes	3	5	4	5	5	4
		On Hair	3	5	5	4	3	2

Where **W** denotes our company and **X, Y & Z** are competitors.

6. Process Decision Program Chart

Purpose： To prepare for abnormal occurrences with low probability which may otherwise be overlooked and to present the occurrences as well as the necessary countermeasures to guard against such occurrences in the form of a visual chart.

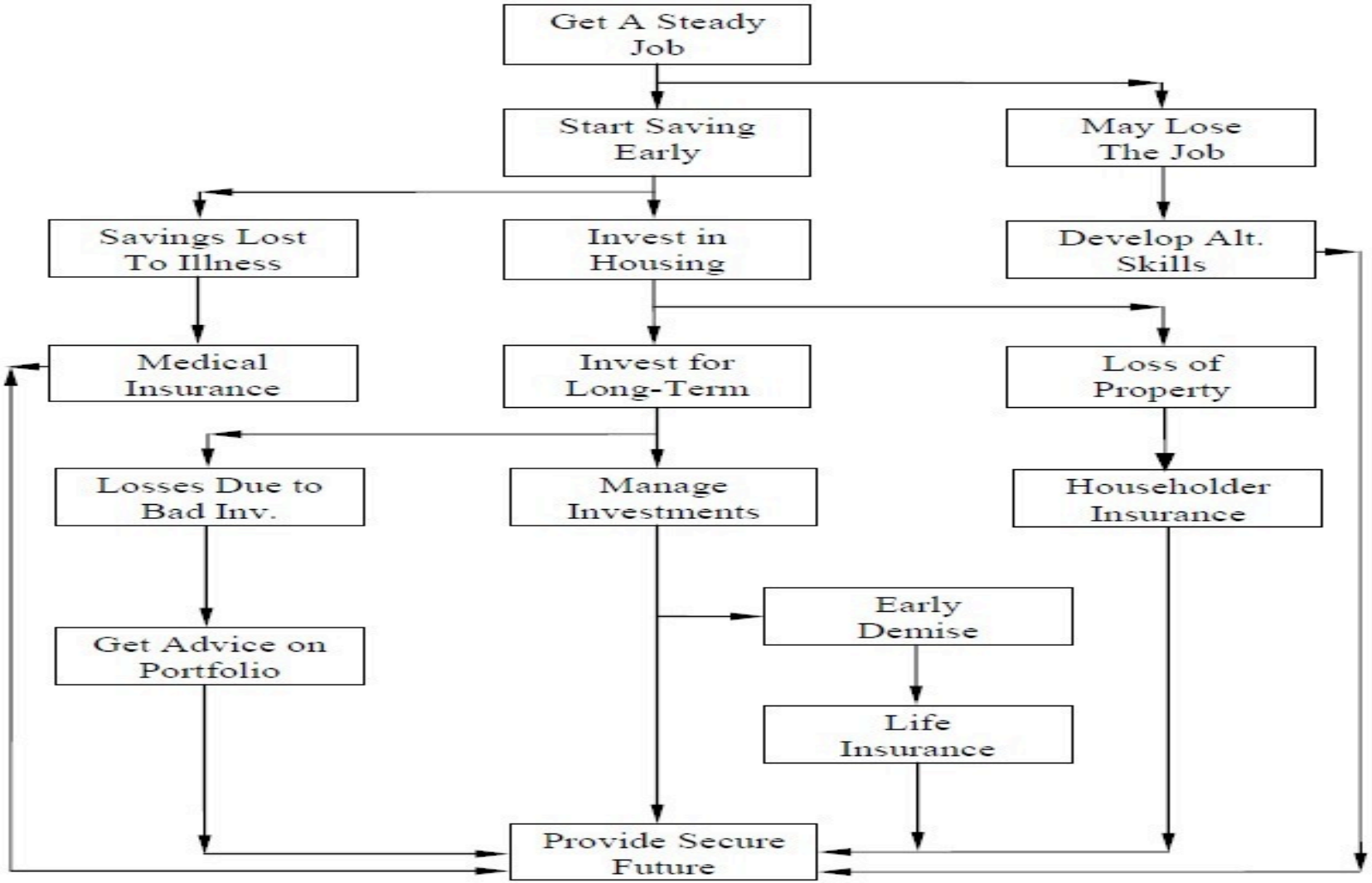
Procedure

1. Prepare a normal flowchart with all expected events in the chart.
2. Consider the possible occurrences that will affect the process and demonstrate through branching at appropriate locations.
3. Consider how the abnormal occurrences will influence the process and find ways to counter them.
4. Show the countermeasures connecting to the abnormal occurrences on one side and the process of the goal on the other.

Applications

- This tool has the widest range of applications from the simplest to the most complex.
- The tool can be used to prevent problems by identifying opportunities for error and devising measures to avoid failure.
- It can be used during the implementation of solutions for predicting resistance and for planning measures to overcome the resistance

Examples


Get A Steady Job
Start Saving Early
May Lose The Job
Savings Lost To Illness
Invest in Housing
Develop Alt. Skills
Medical Insurance
Invest for Long-Term
Loss of Property
Losses Due to Bad Inv.
Manage Investments
Householder Insurance
Early Demise
Get Advice on Portfolio
Life Insurance
Provide Secure Future

7. Arrow Diagram

Purpose: To create a visual presentation of the steps of a process or tasks necessary to complete a project with special emphasis on the time taken for these activities.

Procedure

1. List all the tasks or activities needed to be accomplished before the process of the project.
2. Decide which steps are undertaken in series and which steps can be run in parallel. Arrange the activities in a proper sequence.
3. Prepare ‘Event Nodes’ at the completion of steps and number them.
4. Write the description of the step and decide the time required for completing each step.

Procedure(Contimue)

5. Calculate the earliest time to reach an event node for the start of the process.
7. After the time for all event nodes including the completion of the process or the project is available, one calculates the latest time by which an event node must be reached.

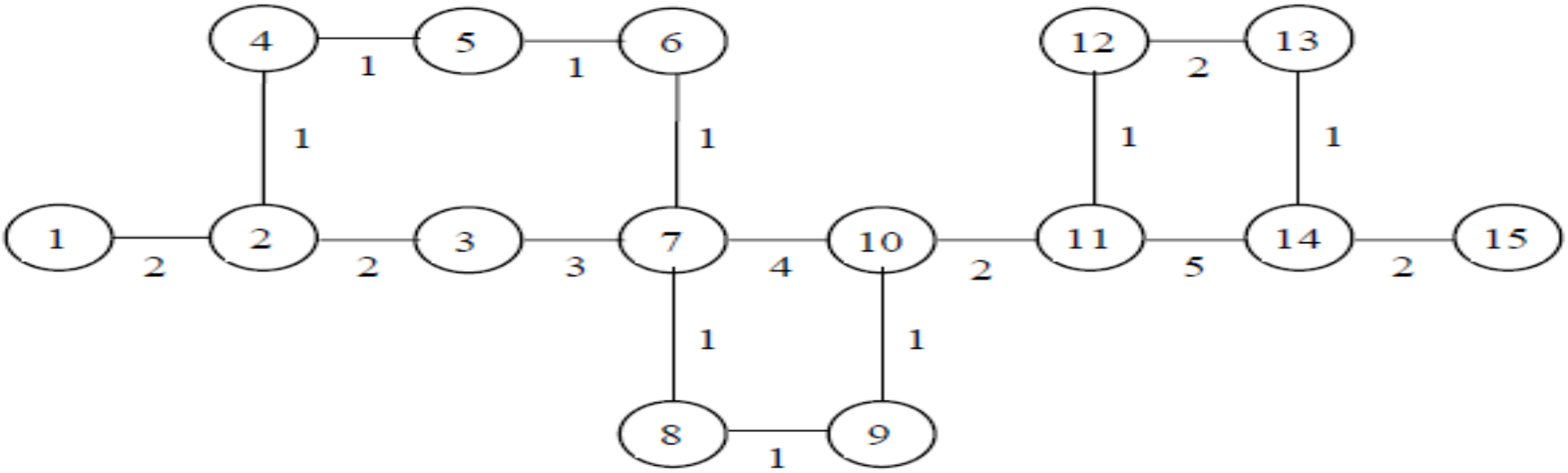
Application

- The diagram is also useful in planning and scheduling steps in complicated processes, especially in planning and scheduling projects which involve a large number of activities.

Example

1. Identify the tasks. E.g: 1,2,3,…,15.
2. Know the time each task needs.
3. Determine which tasks can be run in parallel and in normal sequences.
4. Draw the sequence diagram and find the critical path.
5. Calculate the project duration.
6. Calculate the earliest starting time(or the earliest finishing time of last task) and the latest finishing time of each task(the latest starting time for the followting task).
7. Mark the time indication.

Example.



Arrow Diagram - Structure

With Time Required for Steps Expressed in Hours

Diagram 13

Event Node No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Time (Hours)	0	2	4	3	4	5	7	8	9	11	13	14	16	18	20

Time the event nodes can be reached at the earliest

Example.

Event Node No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Time (Hours)	0	2	4	4	5	5	7	9	10	11	13	15	17	18	20

Time the event nodes can be reached at the latest

Event Node No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Time (Top)	0	2	4	3	4	5	7	8	9	11	13	14	16	18	20
Time (Bottom)	0	2	4	4	5	6	7	9	10	11	13	15	17	18	20

Time indication for event nodes expressed in hours

Example

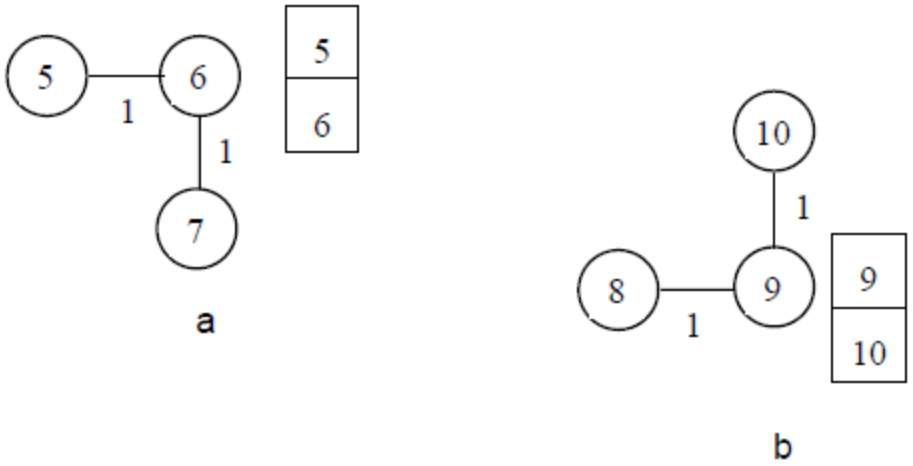


Diagram 14