

AQS 200

ROOT CAUSE INVESTIGATION

This material is based upon work supported
by the National Science Foundation under
Grant No. 1304474



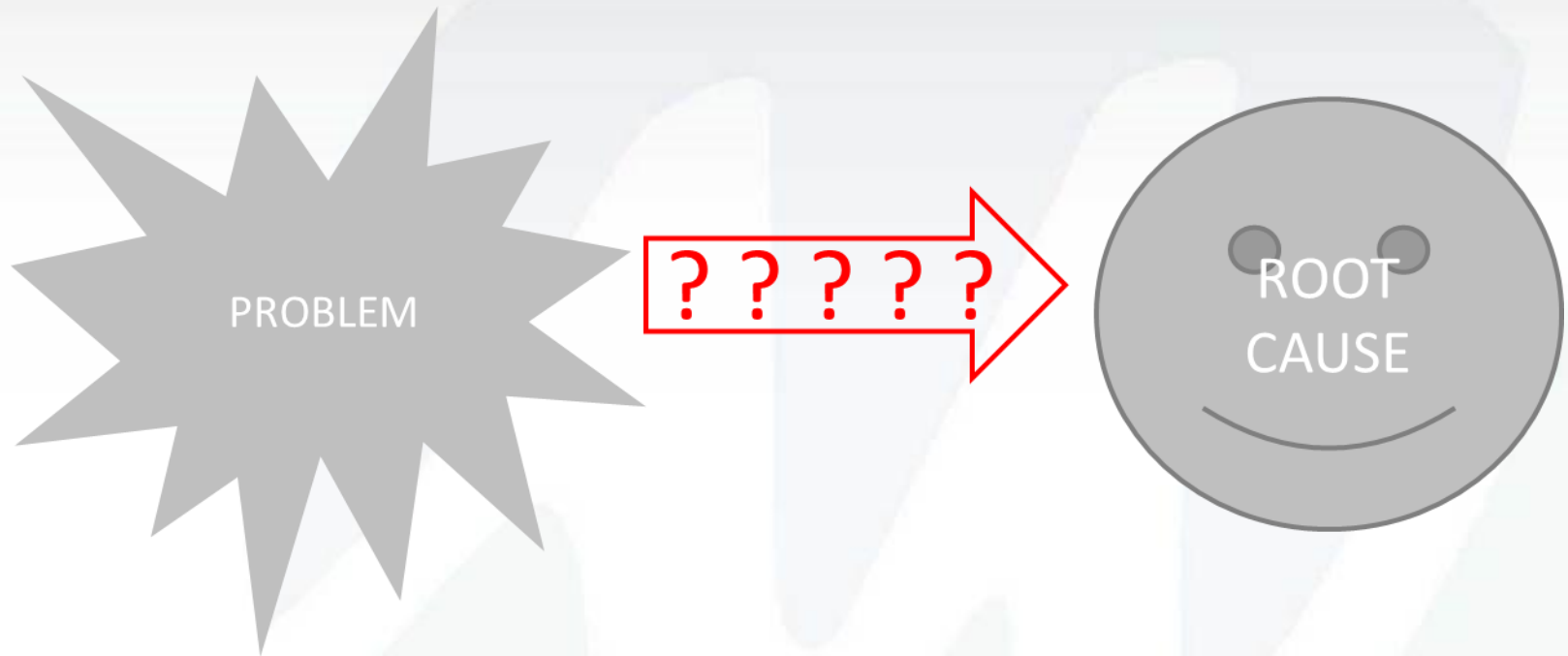
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Lecture 9

Tools for Data Analysis – Part 2

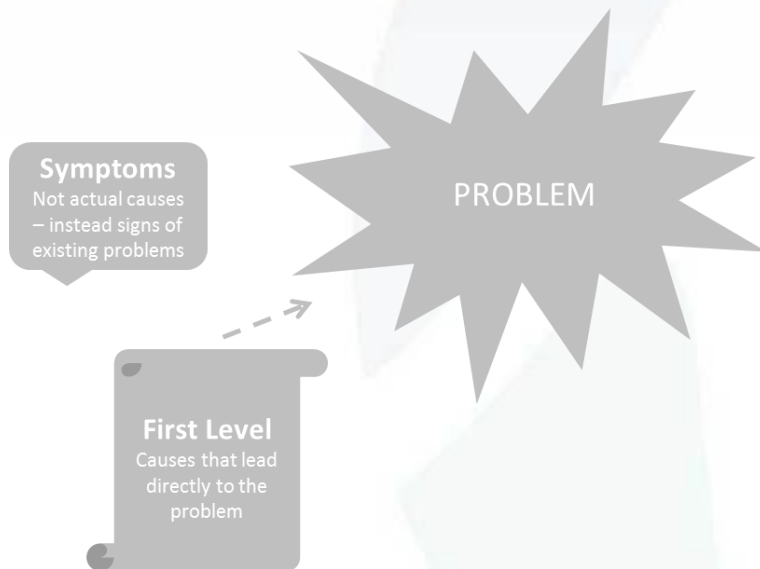
- Histograms
- Pareto Charts
- Scatter Charts
- **Problem Concentration Diagrams**
 - **Relations Diagram**
 - **Affinity Diagrams**





CAUSE INVESTIGATION

- Root Cause – The fundamental (true) reason a product or process nonconformance occurred.



- Define the issue
- Understand scope of investigation
- Generate ideas and reach agreement for potential causes
- Data collection - verify ideas and gather new information

Data analysis – clarify possible causes
Evaluate: connected to problem?
which do most harm?
etc.

A large, faint, stylized logo in the background, consisting of a light blue circle with a white 'S' shape inside, and a light green 'W' shape below it.

Problem Concentration Diagrams

Problem Concentration Diagram

- Reveal patterns of problem reoccurrence
 - especially when in physical systems or facilities.

Reject shirts Check Sheet Date: 22-May Batch: 23

Shirts rejected
|||||
|

○ = flaw
□ = tear
△ = mark

Front

Back

The check sheet is a form used to record defects on shirts. It includes a title 'Reject shirts Check Sheet', fields for 'Date' (22-May) and 'Batch' (23). A 'Shirts rejected' counter shows 6 shirts (5 vertical bars and 1 horizontal bar). A legend indicates that circles represent flaws, squares represent tears, and triangles represent marks. The form features two diagrams of a shirt: 'Front' and 'Back'. The 'Front' diagram shows defects: a circle on the left chest, a square on the right chest, a circle on the left sleeve, a triangle on the right sleeve, and two circles on the lower front. The 'Back' diagram shows defects: a triangle on the left shoulder, a circle on the left chest, a triangle on the right shoulder, a square on the right chest, a circle on the right sleeve, a triangle on the right sleeve, and a circle on the lower back.

Notice use of check sheet

Problem Concentration Diagram

How To

1. Determine whether suitable problem occurrence data already exist
 - a) if yes, skip to step 3
2. Define what events (defects) are to be recorded
 - a) Assign a symbol to each type of problem or event
 - b) Define data recording parameters
 - i. Frequency (intervals)
 - ii. Time frame

Problem Concentration Diagram

How To

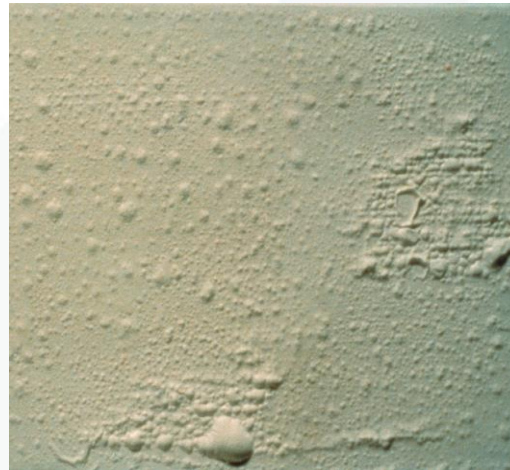
Define what events (defects) are to be recorded

a) Assign a symbol to each type of problem or event

- Car door – coating operation



crackling



bubbling



streaks / drips



Problem Concentration Diagram

How To

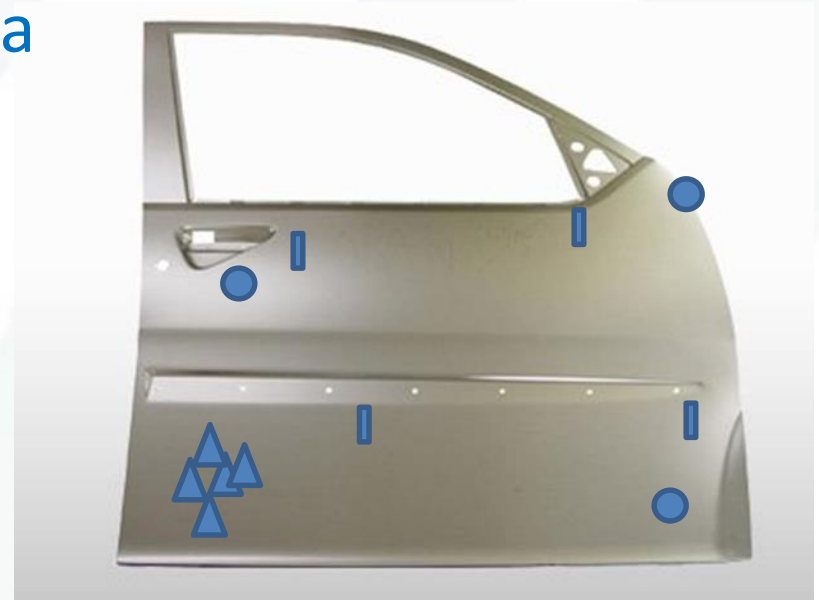
2. Define what events (defects) are to be recorded
 - a) Assign a symbol to each type of problem or event
 - b) Define data recording parameters
3. Design diagram
 - a) Draw map of system, object, area



Problem Concentration Diagram

How To

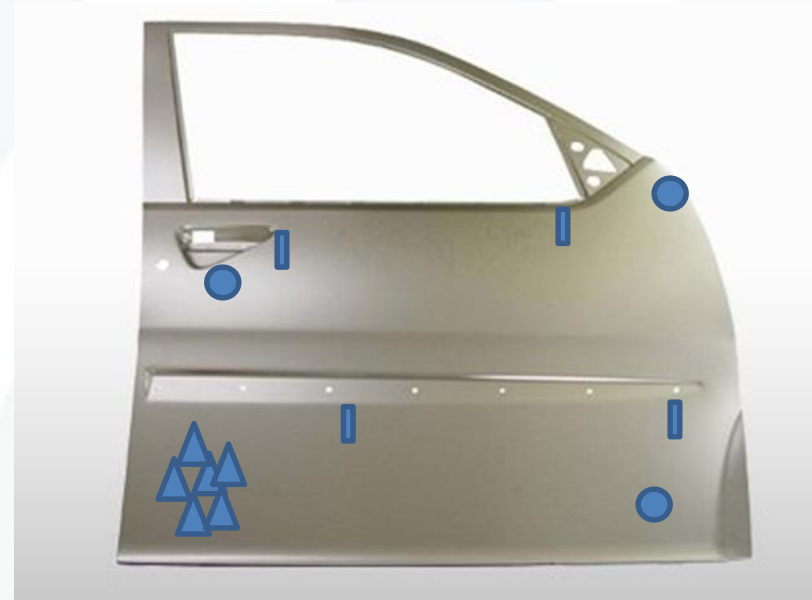
2. Define what events (defects) are to be recorded
 - a) Assign a symbol to each type of problem or event
 - b) Define data recording parameters
3. Design diagram
 - a) Draw map of system, object, area
4. Populate diagram with data
 - a) Plot existing
 - b) Gather directly on diagram



Problem Concentration Diagram

How To

2. Define what events (defects) are to be recorded
 - a) Assign a symbol to each type of problem or event
3. Design diagram
4. Populate diagram with data
5. Analyze for patterns



Crackling occurs most often
Concentrated in lower left

Problem Concentration Diagrams

How To

Exercise



Relations Diagram

Analyze Brainstorming Results

Relations Diagram

- Identify relationships not easily recognizable
 - Understanding how difficult aspects are connected.
 - Identify problem/cause relationships for further analysis
- Two types
 - Qualitative
 - Quantitative

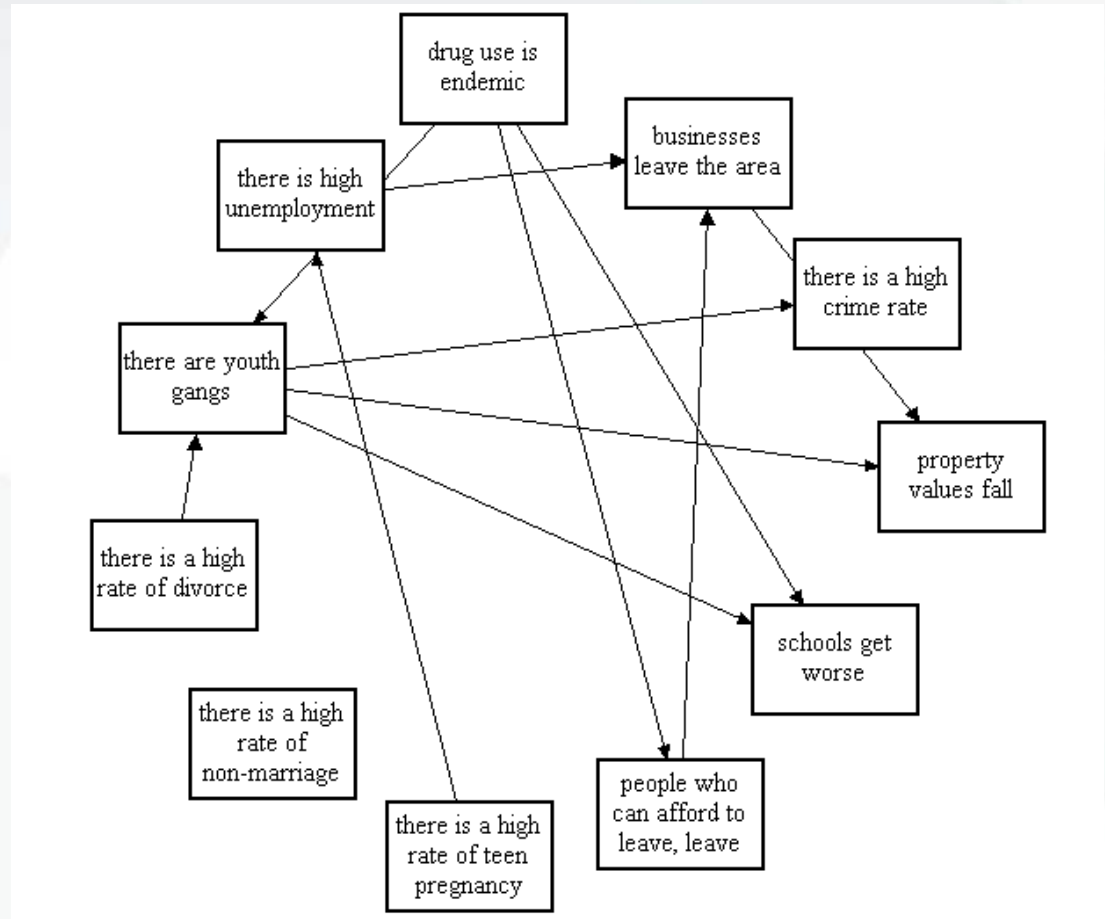
Relations Diagram

- Qualitative
 - Factors plotted on empty chart
 - Relationships found by connecting based on intuitive understanding

Relations Diagram

- Qualitative

- Factors plotted on empty chart
- Relationships found by connecting based on intuitive understanding



Relations Diagram

- Qualitative
 - Factors plotted on empty chart
 - Relationships found by connecting based on intuitive understanding

Note: unreliable results can be generated

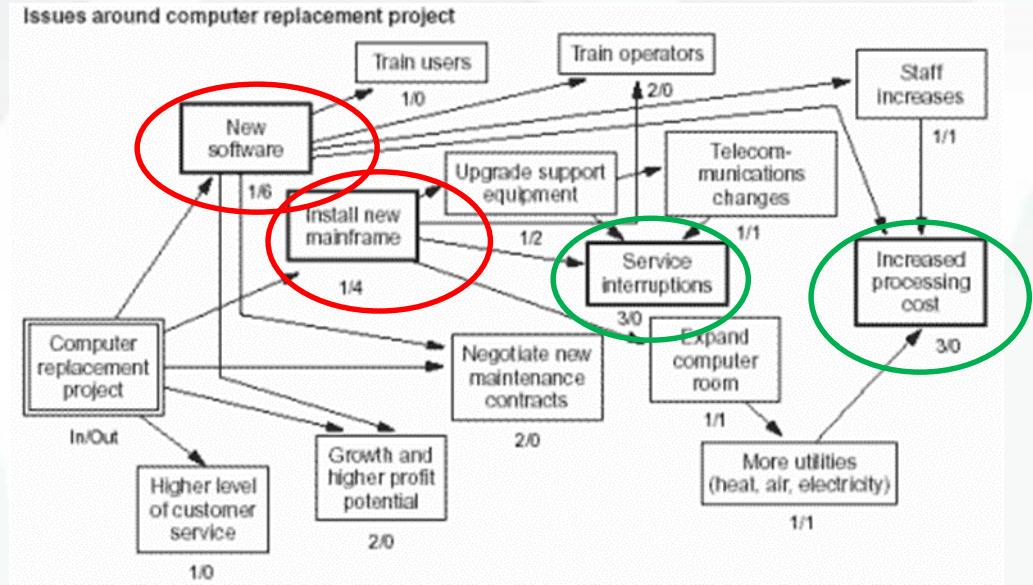
Relations Diagram

- Quantitative
 - Numerical approach to determine relationships
 - Generally more structured
 - Looking for drivers and indicators
 - Drivers are factors that have more outbound arrows
 - Indicators are factors that have more inbound arrows

Relations Diagram

- Quantitative

- Numerical approach to determine relationships
 - Generally more structured
 - Looking for drivers and indicators



Driver(s) - New Software
Mainframe install

Indicator(s) – Service interruptions
Increased processing costs

Relations Diagram – HOW TO

1. Determine the factors to be analyzed for possible relationships
 - a) label using brief and succinct definitions
 - b) Use brainstorm results
2. Plot the factors on an empty chart / whiteboard
 - a) Roughly circular shape.

Relations Diagram – HOW TO

Quantitative

1. *Determine* the factors to be analyzed for possible relationships
2. Plot the factors on an empty chart / whiteboard
3. Assess what impacts each factor and which factors are impacted by it
 - a) Draw arrow from the factor that creates impact on another
 - b) Continue until all relationships assessed

Relations Diagram – HOW TO

1. Determine the factors to be analyzed for possible relationships
2. Plot the factors on an empty chart / whiteboard
3. Assess what impacts each factor and which factors are impacted
4. Determine input and output for each factor
 - a) Count the number of arrows pointing into
 - b) Count number of arrows point away
 - c) denote this information on the diagram.
 - i. Input / Output
5. Analyze number of arrows and direction, to determine role
 - a) Driver - more arrows away from than into (i.e. 1 / 6)
 - b) Indicator – more arrows into than away from (i. e. 3 / 1)

Relations Diagram – HOW TO

Exercise



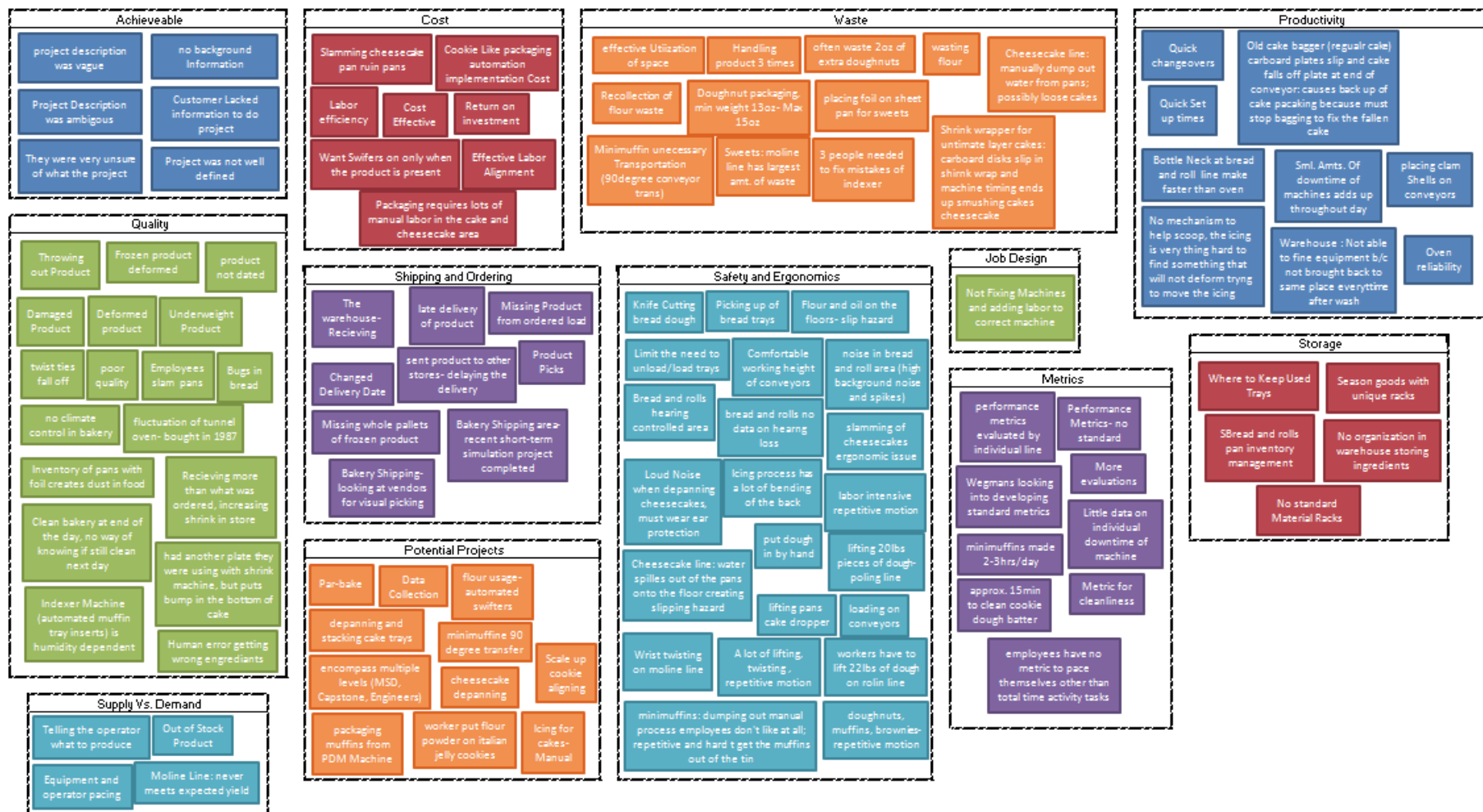
Affinity Diagram

Analyze Brainstorming Results

Affinity Diagram

- Analyzes qualitative data
 - Groups data to determine underlying relationships or connections
- Group related ideas (causes) into classes
- Exploring relationships between ideas at different levels
- *Typically used after brainstorming to organize ideas prior to next steps*

Affinity Diagram



Affinity Diagram – HOW TO

1. Write the topic(s) to be analyzed in large letters at the top of the board
2. Write causes/ideas on adhesive notes.
 - a) Clearly stated but not as a single word
 - b) Attach the notes to the board in a totally random pattern
3. Without discussion, group moves notes around creating columns of common ideas
 - a) Notes may be moved many times
 - b) Allot time for this to occur

Affinity Diagram – HOW TO

4. Discuss final shape of chart
 - a) Small changes may occur based on rationale of individual ideas / categories
 - b) Limit number of categories (columns) 5 -10
5. Create titles for each category
 - a) Subtitles within columns is also appropriate
6. Draw boxes around groups
 - a) Add arrows if applicable for additional relationships
7. Determine next steps

Affinity Diagram – HOW TO

Exercise

Data Analysis Tools - Summary

- Checklist for assessing data collection /analysis prior to moving toward root cause
 - Use of multiple data sets to evaluate causes
 - Assess collected data
 - Correlation(s)?
 - Complexity
 - Compare results from multiple tools
 - Histogram, pareto chart, scatter diagram, relations diagram, problem concentration diagram, affinity diagram

