NC Circle Training: Module 1

Quality Tools

Introduction

- Brainstorming
- Types of Data
- Graphs (Bar, Column, Line)
- Pie Charts
- Stratification
- Flowcharts
- Checksheets
- Pareto Charts
- Cause/Effect Diagrams

Brainstorming

- Process to generate ideas
- Can be unstructured (everyone spits out ideas randomly) or structured (a specific process is used)
- Success depends on everyone's participation

Brainstorming: Unstructured

- Everyone writes down ideas on post it notes, a white board or chart paper
- Team eliminates ideas that are not of value to the team
- Team reaches consensus on which ideas to use, study, implement etc.
- Can be done in silence or out loud

Brainstorming: Structured

- Many different methods
- One method is Brainwriting 6:3:5
  - 6 People
  - 3 Ideas
  - 5 Minutes
- Everyone given a sheet of paper and five minutes to write down 3 ideas
- After five minutes the paper is passed to the left or right
- Everyone is given another five minutes to write down three more ideas on the new sheet of paper
- Keep repeating the process until each sheet of paper has three ideas from each of the six people

Types Of Data

- **Three types of Data:**

  1. Measurable
  - **also known as variable data**
  - **i.e. temperature, weight, length**

  2. Countable
  - **also know as attribute data**
  - **i.e. number of items**
  - **can be expressed as a fraction or percent**

Types Of Data

- **Three types of Data (continued):**

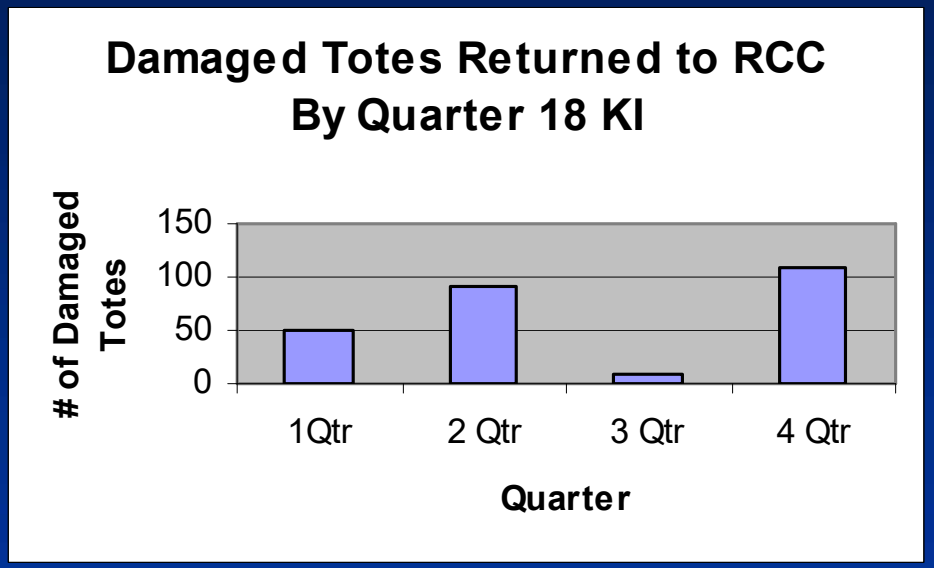
  3. Descriptive

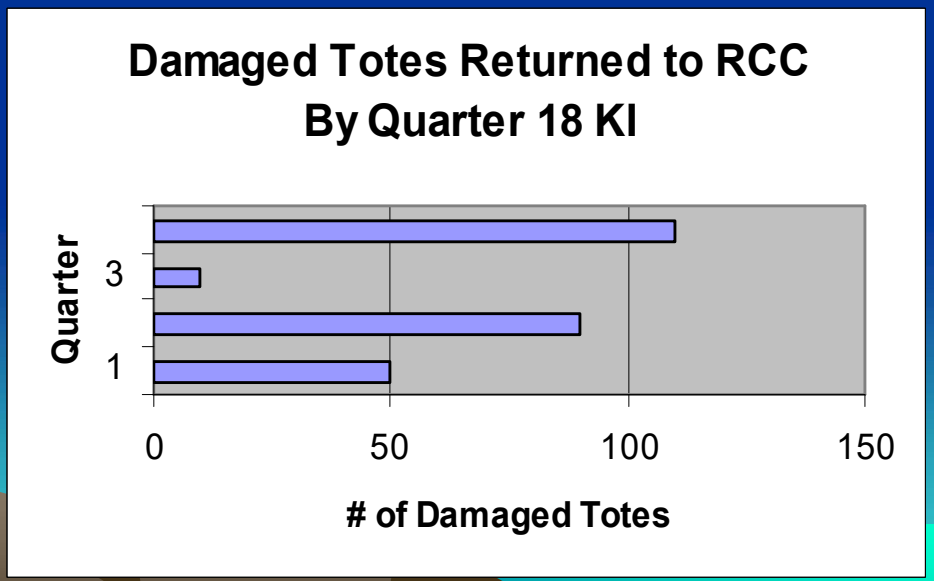
  - described in words, not numbers

  - represents what is known in regards to who, what, where, when, why and how.

Graphs

- **Bar and Column graphs are used to compare different data**





Graphs

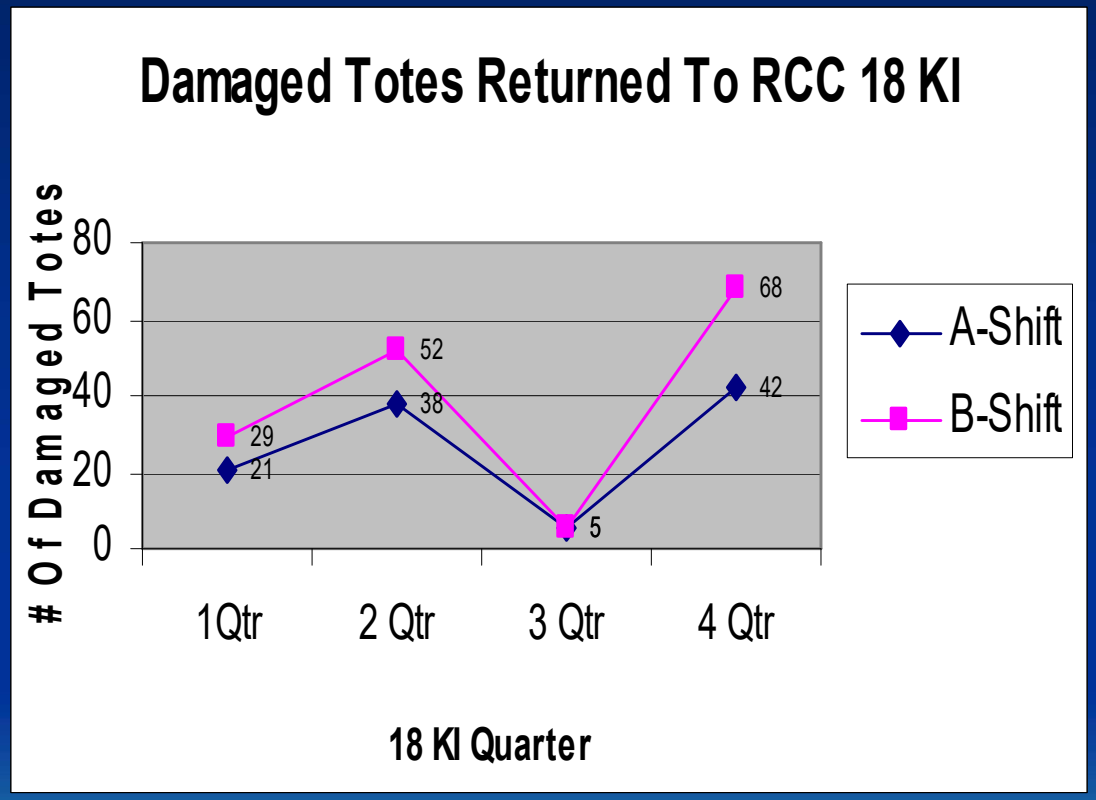
- Line Graphs (aka run charts) are used to study developing trends or patterns over a period of time
- If more than 1 line is used then the line graph is also being used to compare data sources
- Line graphs can also be used to pinpoint a specific time/event where the established trend changed

Graphs

This line graph tells us several things:

1) How many damaged totes were returned through RCC each quarter of 18 KI

2) How many damaged totes were returned through each shift in 18 KI



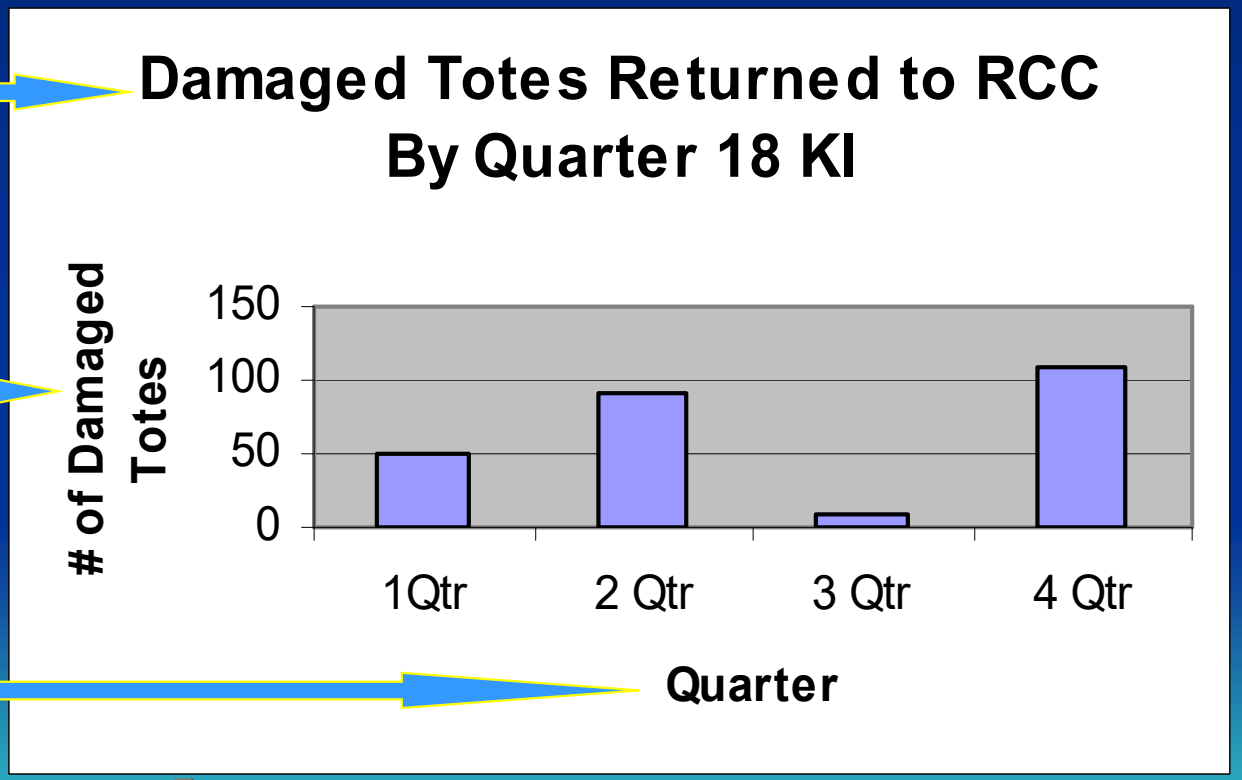
Graphs

- **Regardless of the type of graph it must be fully labelled:**

Title

Y Axis Title

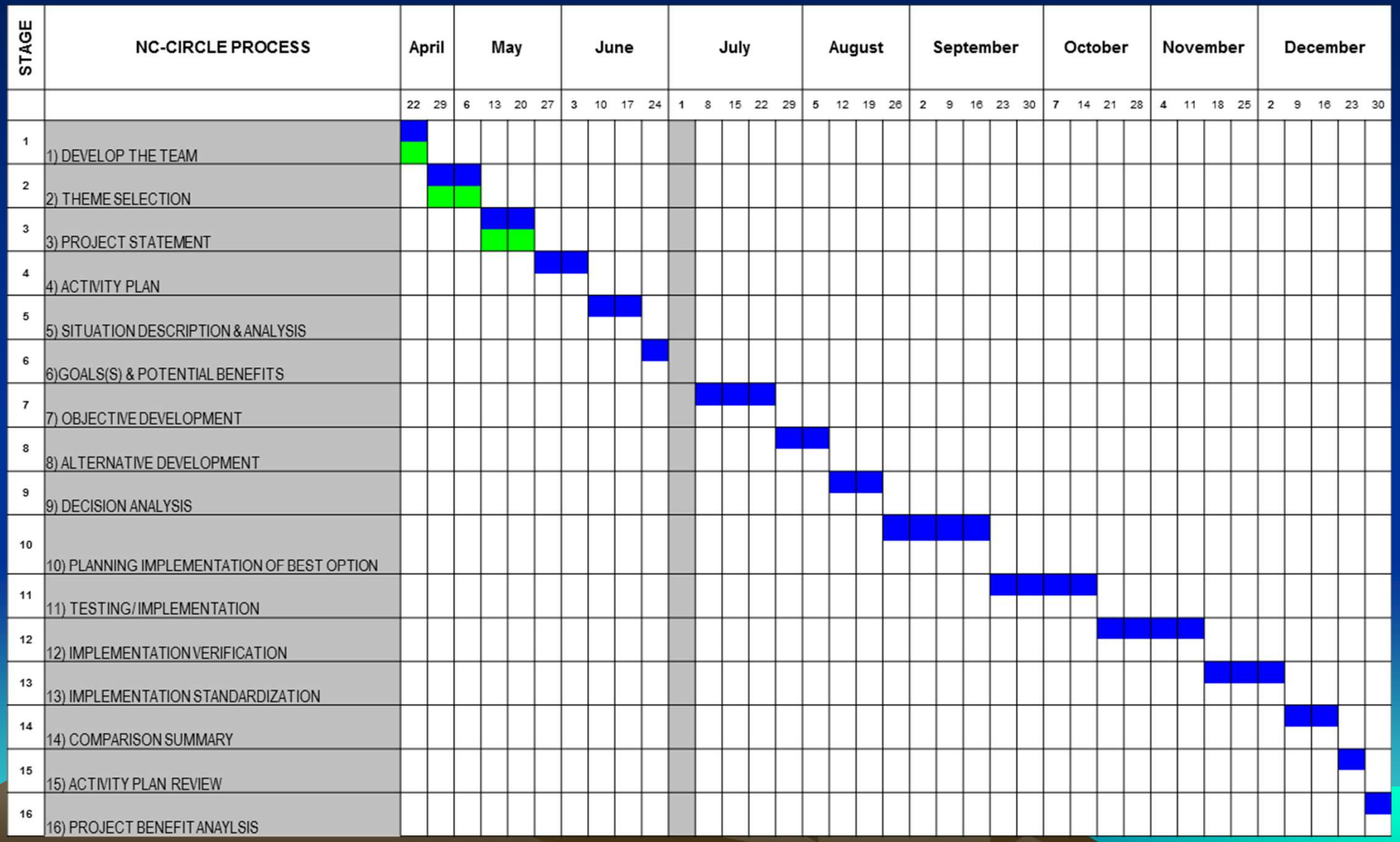
X Axis Title



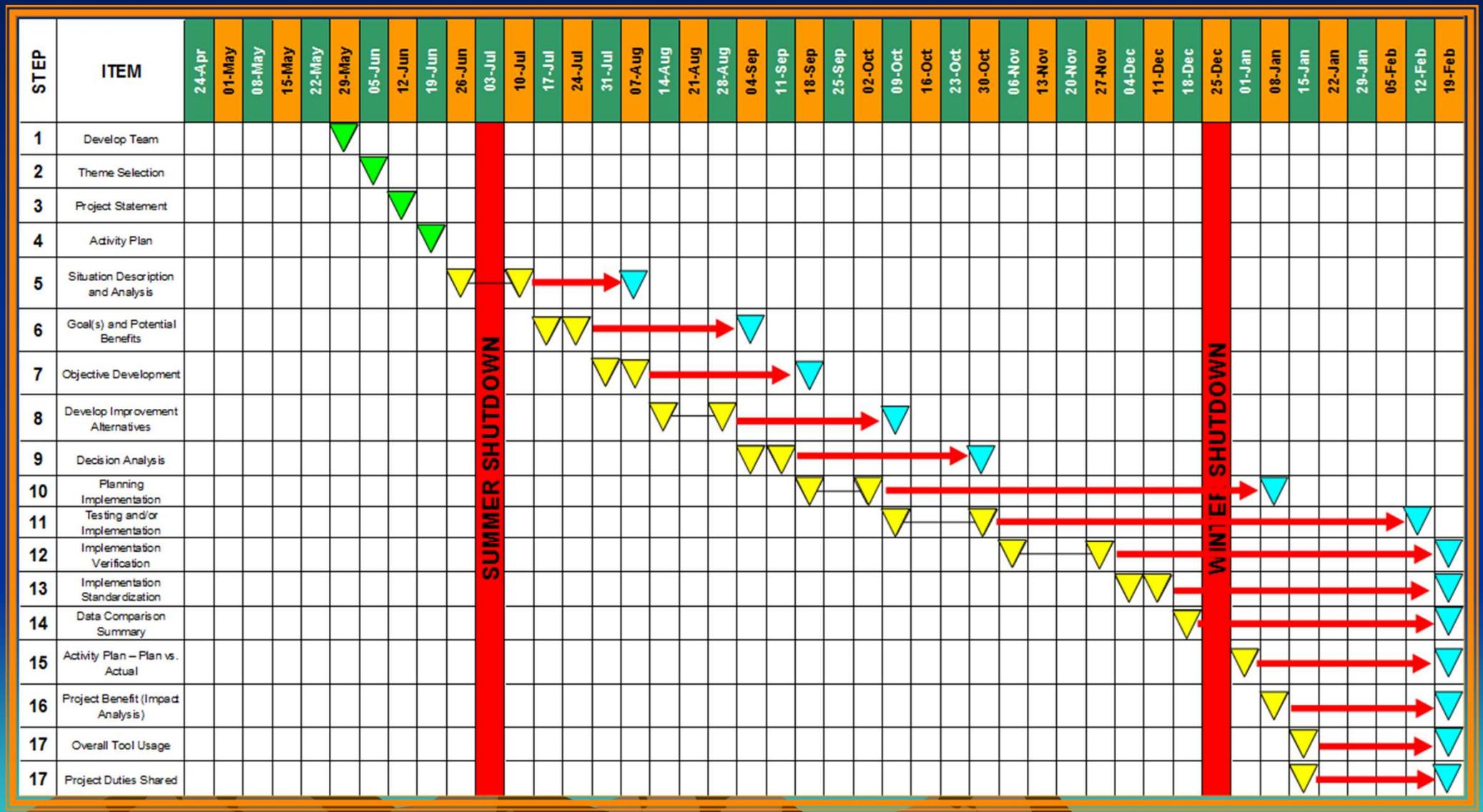
Gantt Chart

- Gantt Charts are used to show a schedule of events step by step
- Can be adapted to show a planned schedule versus the actual timing of when events happened

Gantt Chart: Example #1

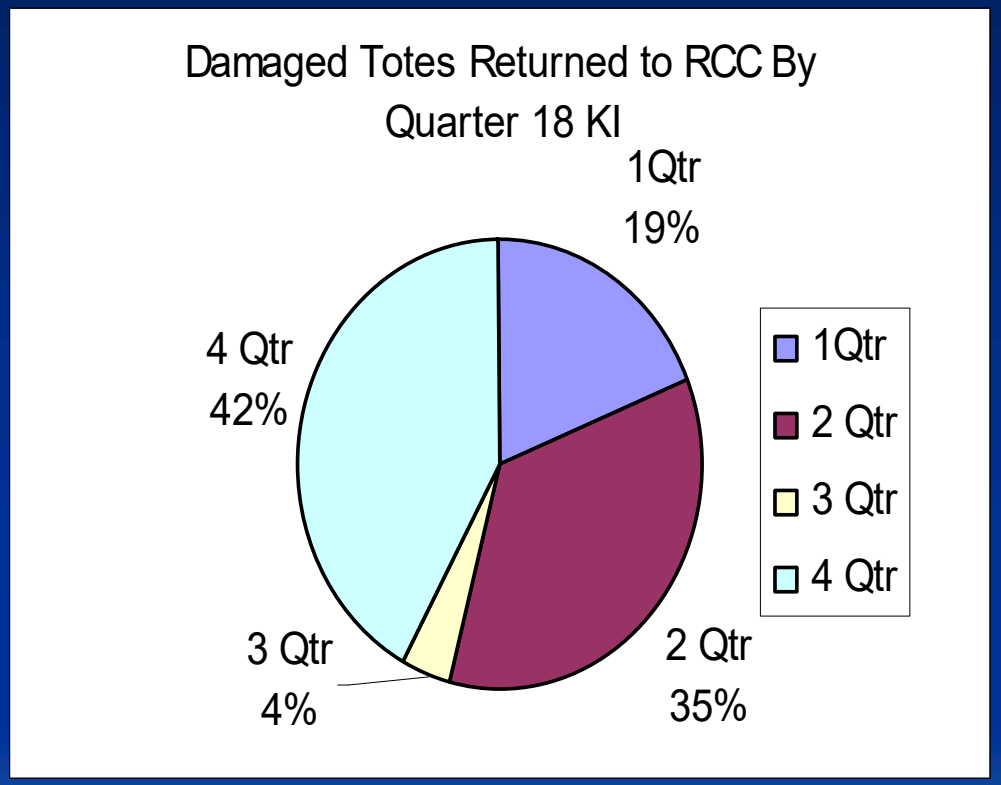


Gantt Chart: Example #2



Pie Charts

- Pie Charts are used to represent countable data as a piece of the whole picture
- Once again remember to fully label the graph



Pie Charts

- To determine how big a slice of "pie" each piece of data receives we must first determine how much pie we have in total:
  - 1st Qtr = 50 Totes
  - 2nd Qtr = 90 Totes
  - 3rd Qtr = 10 Totes
  - 4th Qtr = 110 Totes

  TOTAL = 260 Totes = Total amount of "pie"

Pie Charts

- Once you have 100% of the pie (260 totes) you divide each quarter's number of totes by the total number of totes:
  - 1st Qtr- 50 divided by 260= .1923
  - 2nd Qtr- 90 divided by 260= .3461
  - 3rd Qtr- 10 divided by 260= .0384
  - 4th Qtr- 110 divided by 260= .4230

Pie Charts

- At this point you multiply each quarter's result by 100 to determine the quarter's contribution to the total pie expressed as a percentage:

  1st Qtr- .1923 x 100 = 19.23 = 19%

  2nd Qtr- .3461 x 100 = 34.61 = 35%

  3rd Qtr- .0384 x 100 = 3.84 = 4%

  4th Qtr- .4230 x 100 = 42.30 = 42%

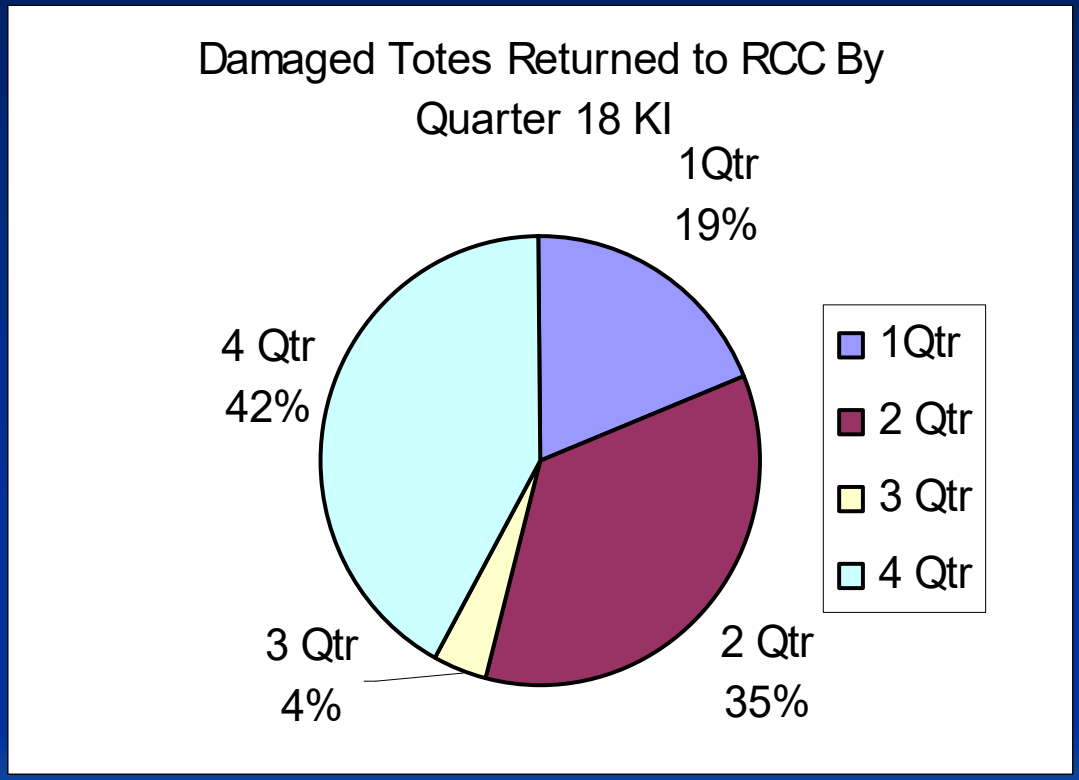
- All percentages rounded to the closest whole number

Pie Charts

- At this point you divide your “pie” into four “slices” each representing 1 quarter of 18 KI during which damaged totes were returned to RCC
  - 1st “slice” represents the first quarter and consists of 19% of the whole “pie”
  - 2nd slice represents the second quarter and consists of 35% of the whole pie
  - 3rd slice represents the third quarter and consists of 4% of the whole pie
  - 4th slice represents the fourth quarter and consists of 42% of the whole pie

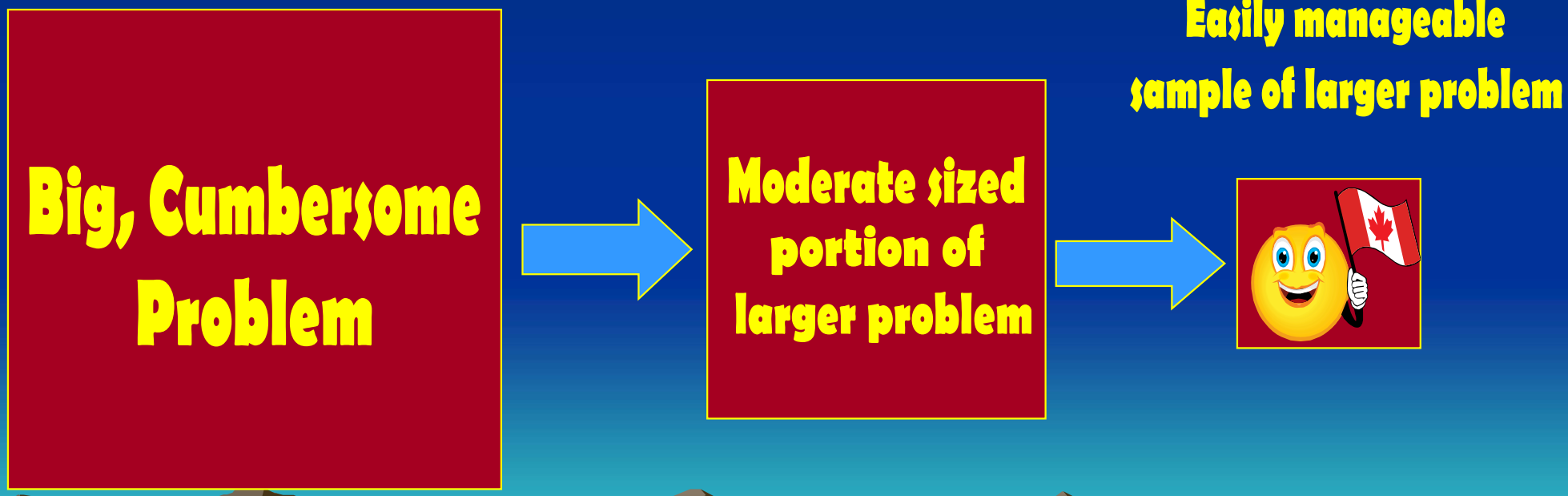
Pie Charts

- Once you have figured out how big each slice of pie is you divide the pie into those sizes
- Do not forget to properly label and legend your chart



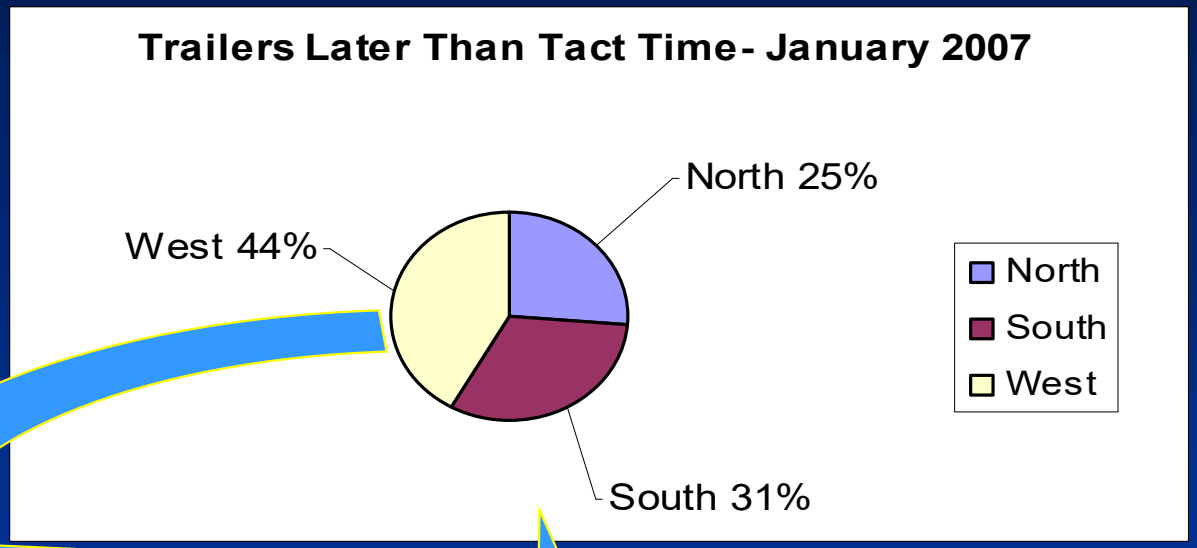
Stratification

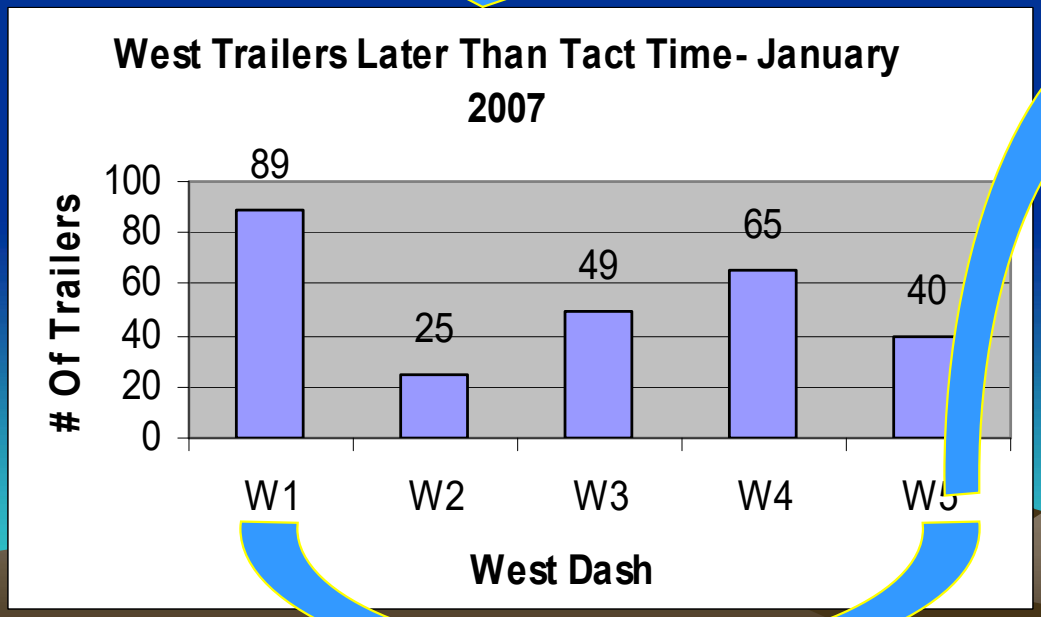
- Stratification is the process of breaking down a large problem into a smaller, more manageable issue

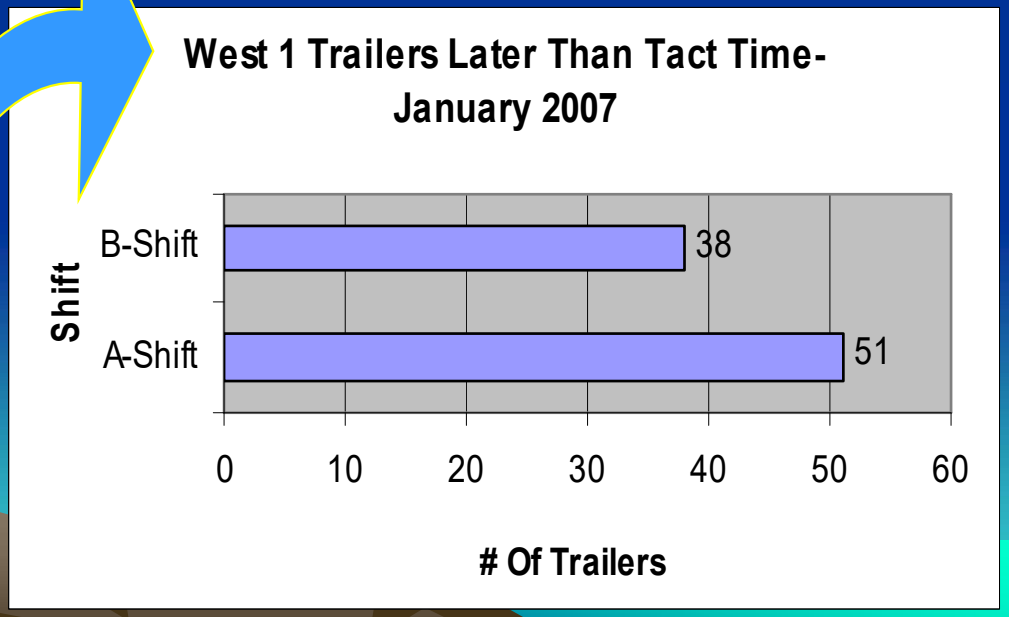


Stratification

- **EXAMPLE:**







Stratification

- From the charts we can see that we broke the original problem (Trailers Later than Tact Time) down to West Trailers down to West 1 Trailers down to West 1 Trailers on A-Shift Later than Tact Time.

Stratification

- Therefore “West 1 Trailers On A-Shift Later Than Tact Time” has become our CORE DATA
- By concentrating on the core data often you will find that other issues that you past while stratifying are also resolved

Flowcharts

- A flowchart allows the steps in a current process to be visually communicated or can be used to determine the order of steps in a new process
- Uses various shapes to symbolize certain actions

Flowcharts

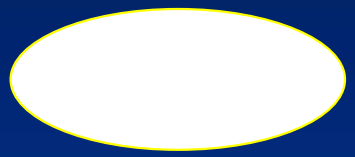
Steps to a solid flowchart:

1) Determine the start/finish points and how detailed the flowchart will be
2) Determine the steps in the process
3) Sequence the steps in the process
4) Draw the flowchart
5) Review for accuracy, and completeness
6) Finalize the flowchart

Flowcharts

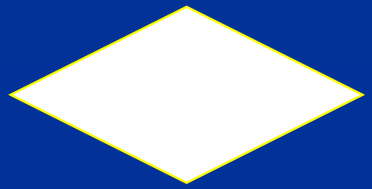
- **Basic shapes are:**

Oval: Start or end of the flowchart-



Rectangle: Task or activity in the process-

Diamond: Yes or no decision required-

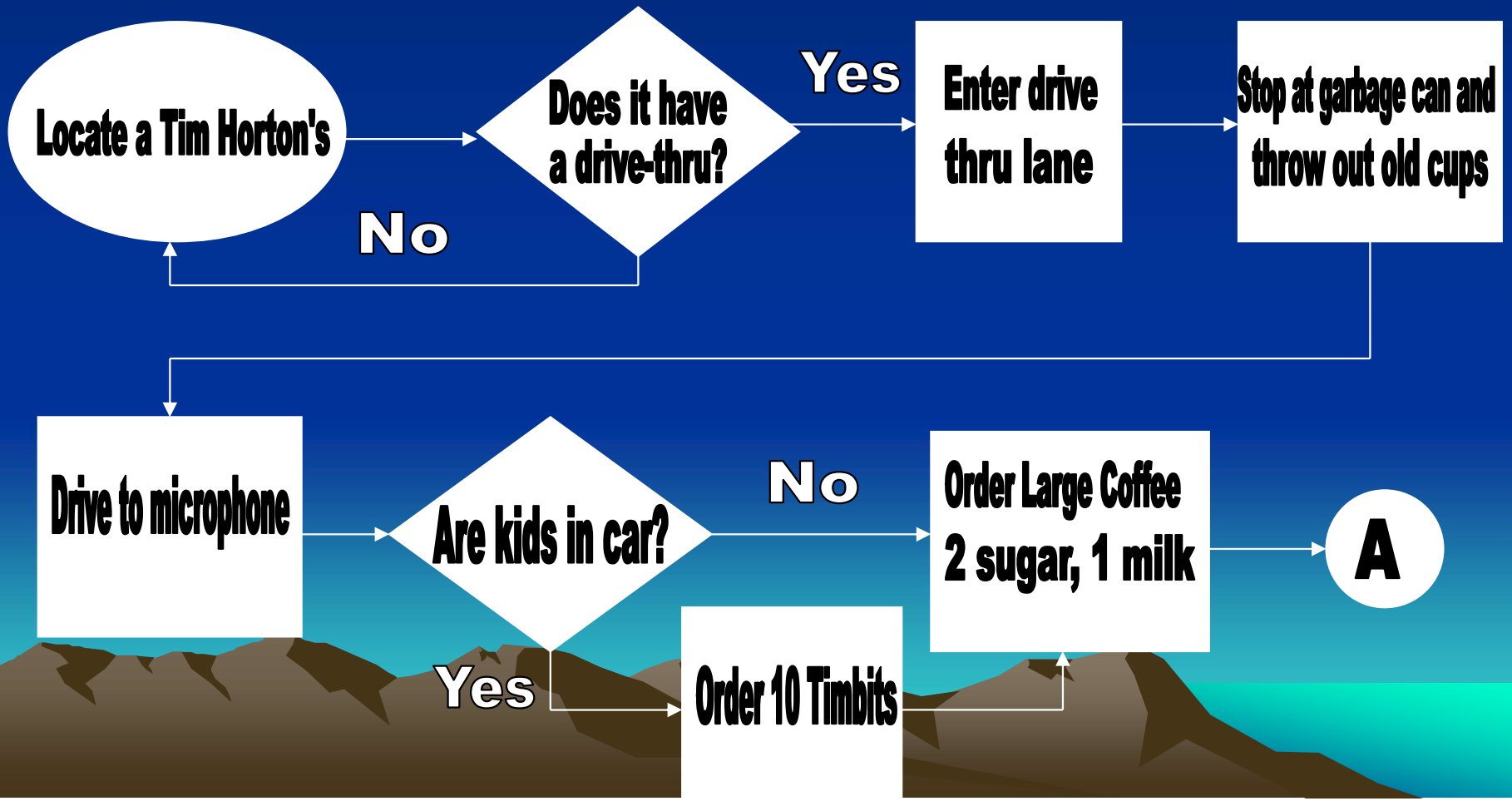


Small circle: Flowchart continued elsewhere on page-

Arrows: Direction (flow) of process-

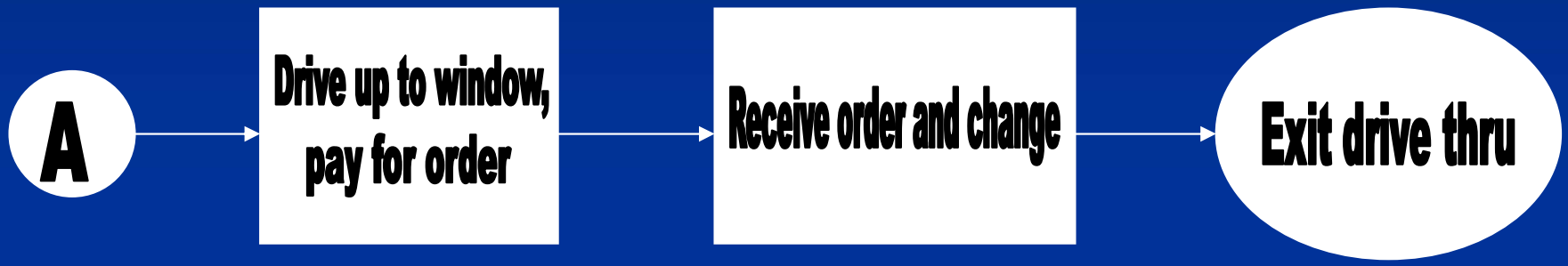
Flowcharts

- **Example: Going through a Tim Horton's drive through lane**



Flowcharts

- Going through a Tim Horton's drive through lane continued….



Checksheets

- Checksheets are charts or tables used to collect and/or organize data
- Three types of checksheets:
  1) Counted
  2) Measured
  3) Location

Checksheets

- **Counted**
  - Records how many or how often over an specified period

SPS1A Missing Parts Tracking July 9 to 13 2012					
QTR	09-Jul	10-Jul	11-Jul	12-Jul	13-Jul
1st	𝍸	𝍸	𝍸	𝍸	𝍸
2nd	𝍸 𝍸	𝍸	𝍸	𝍸	𝍸
3rd	𝍸	𝍸	𝍸 𝍸	𝍸	𝍸
4th	𝍸	𝍸	𝍸 𝍸	𝍸	𝍸
TOTALS	15	6	15	4	11

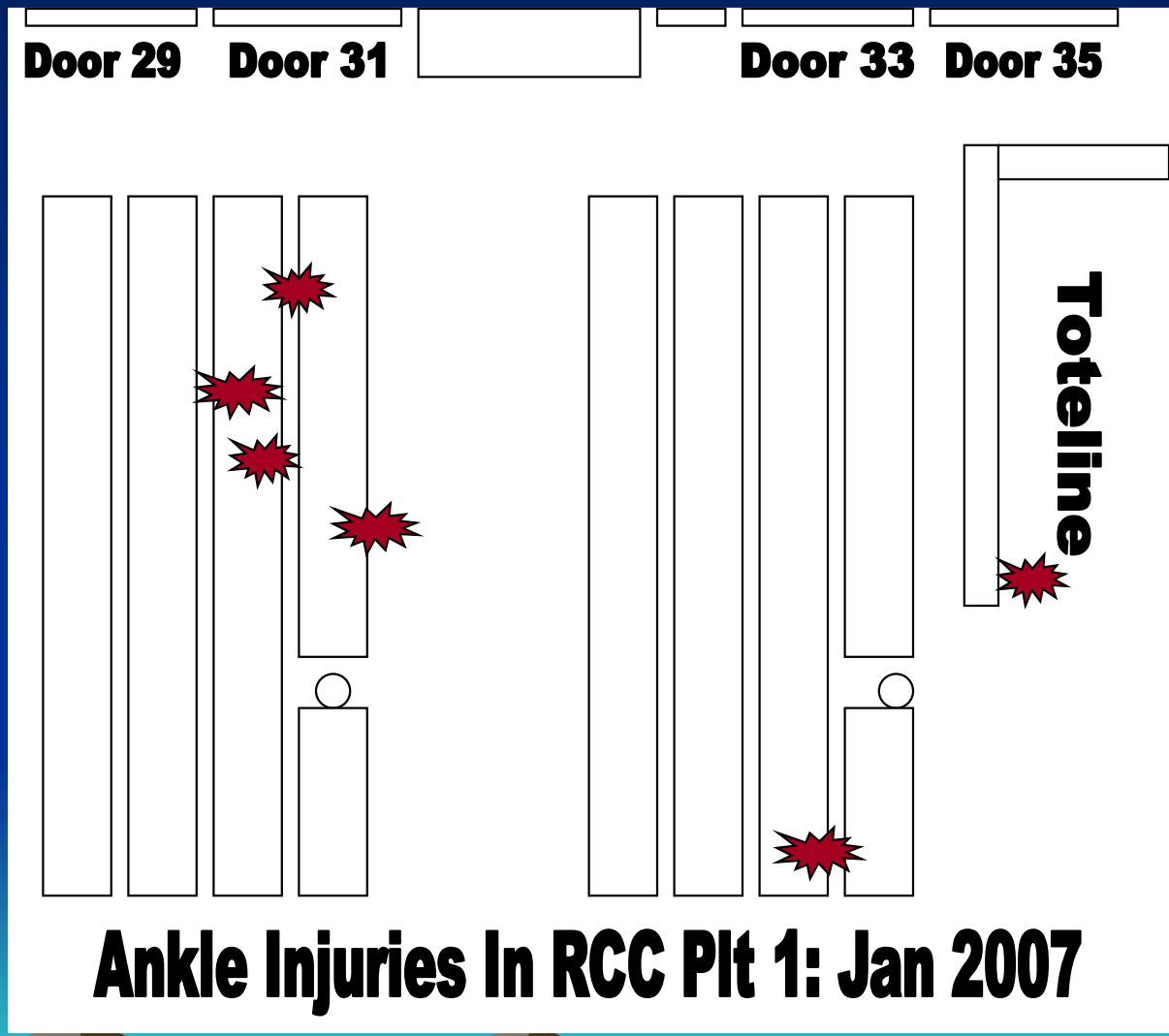
Checksheets

- **Measured**
  - **Records a series of measurements over a specified time period**

Cart Handling Initial Pull Force Survey									
Location:		SPS1 RCC			SPS2 RCC, PSS			SPS1 RCC,PSS	
Date:		05/08/2012			05/08/2012			05/08/12	
Completed by J.Gaffiero		Loaded			Ld Avg	Empty			Empty Avg
		Test 1	Test 2	Test 3		Test 1	Test 2	Test 3	
F2s	4 carts	65.1	61.2	85.2	70.5	46.4	31.9	51.9	43.4
	3 carts	59.5	58.3	75.4	64.4	30.3	30.4	30.5	30.4
	2 carts	59.4	43.9	49.6	51.0	27.2	30	29.1	28.8
H2s	4 carts	84.4	78	53.5	72.0	56.6	84.4	84.7	75.2
	3 carts	62.3	38.8	76.3	59.1	60	92.8	69.4	74.1
	2 carts	74.7	53.4	64.1	64.1	59	74.9	81.3	71.7
	1 carts	43.4	46.1	35.2	41.6	32.1	32.9	36.4	33.8
H4s	4 carts	88.9	83.7	101	91.2	63.9	104.4	67.9	78.7
	3 carts	97.3	78	80.8	85.4	45.2	98.3	50.6	64.7
	2 carts	71.2	52.8	74.1	66.0	47.4	63.1	76.2	62.2
	1 carts	64.3	52	44.7	53.7	41.7	40	36.3	39.3

Checksheets

- Location
  - Records where data points are located or occurring on a diagram.



Checksheets

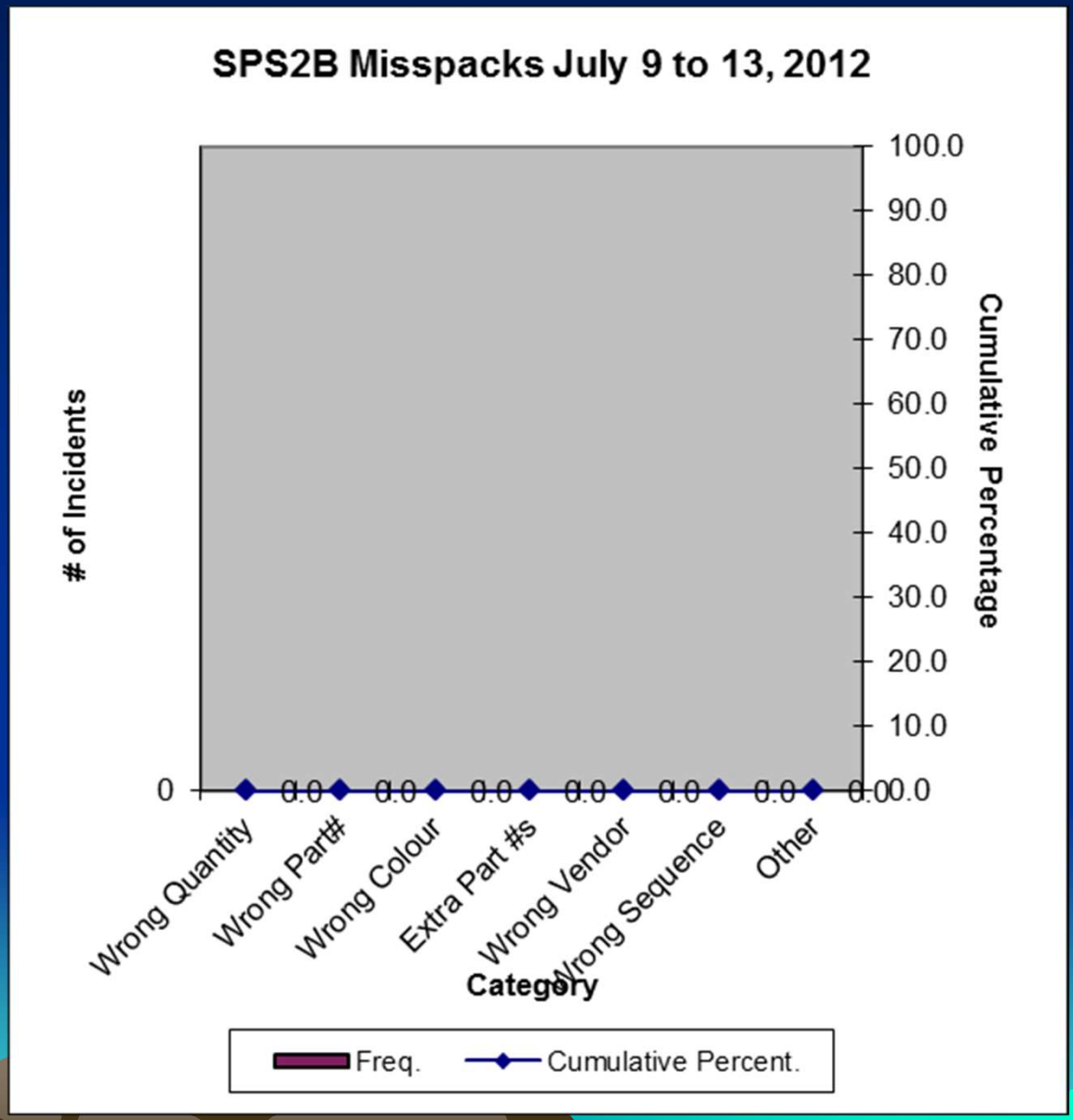
- Keep checksheet simple
- Only include relevant data
- Maintain different checksheets for different investigators, shifts etc.
- Trial checksheet before use to ensure it captures the data you require

Pareto Chart

- Type of graph that ranks problems or causes in descending order from left to right on the horizontal (X) axis
- Focuses attention on the critical few, high impact issues
- Reinforces the concept that 80% of the problems are a result of 20% of the root causes: address 20% of the root causes and you will solve 80% of your problems!

Pareto Chart

- Y-axis: Quantity or amount for each data point
- X-axis: Data points to be measured
- Right side of chart: cumulative percentage (must always total 100%)



Pareto Chart

- **Creating a Pareto Chart:**

  1) List problems or causes (data points) that merit investigation

  2) Collect data using a checksheet

Issue	Tally	# Of Incidents
Wrong Quantity	𝍸 𝍸 𝍸𝍸𝍸 𝍸 𝍸 𝍸 𝍸𝍸	49
Wrong Part#	𝍸 𝍸 𝍸𝍸𝍸 𝍸 |	31
Wrong Colour	𝍸 𝍸 |	11
Extra Part #s	𝍸	5
Wrong Vendor	||	2
Wrong Sequence	||	2
Other	|	1

Pareto Chart

3) List all your data points on a chart from largest to smallest. If there are several minor data points they can be grouped together under “Other”. This heading will always be listed last.

Issue	# Of Incidents
Wrong Quantity	49
Wrong Part#	31
Wrong Colour	11
Extra Part #s	5
Wrong Vendor	2
Wrong Sequence	2
Other	1

Pareto Chart

4) Calculate the accumulative total for each data point

Issue	# Of Incidents	Accumulative # Of Incidents
Wrong Quantity	49	49
Wrong Part#	31	80
Wrong Colour	11	91
Extra Part #s	5	96
Wrong Vendor	2	98
Wrong Sequence	2	100
Other	1	101

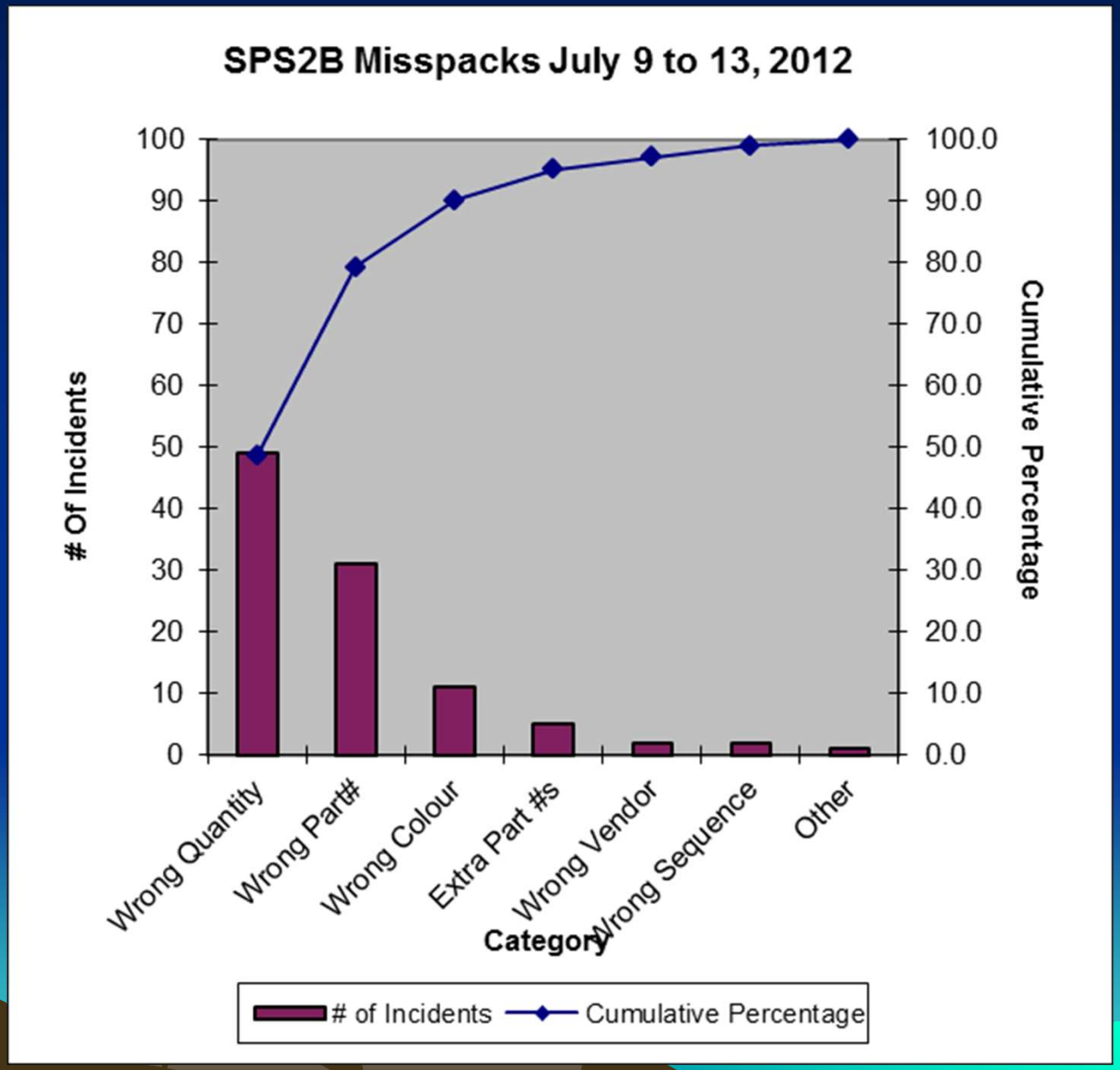
Pareto Chart

5) Calculate the accumulative percentage for each data point

Issue	# Of Incidents	Accumulative # Of Incidents	Accumulative Percentage
Wrong Quantity	49	49	49
Wrong Part#	31	80	79
Wrong Colour	11	91	90
Extra Part #s	5	96	95
Wrong Vendor	2	98	97
Wrong Sequence	2	100	99
Other	1	101	100

Pareto Chart

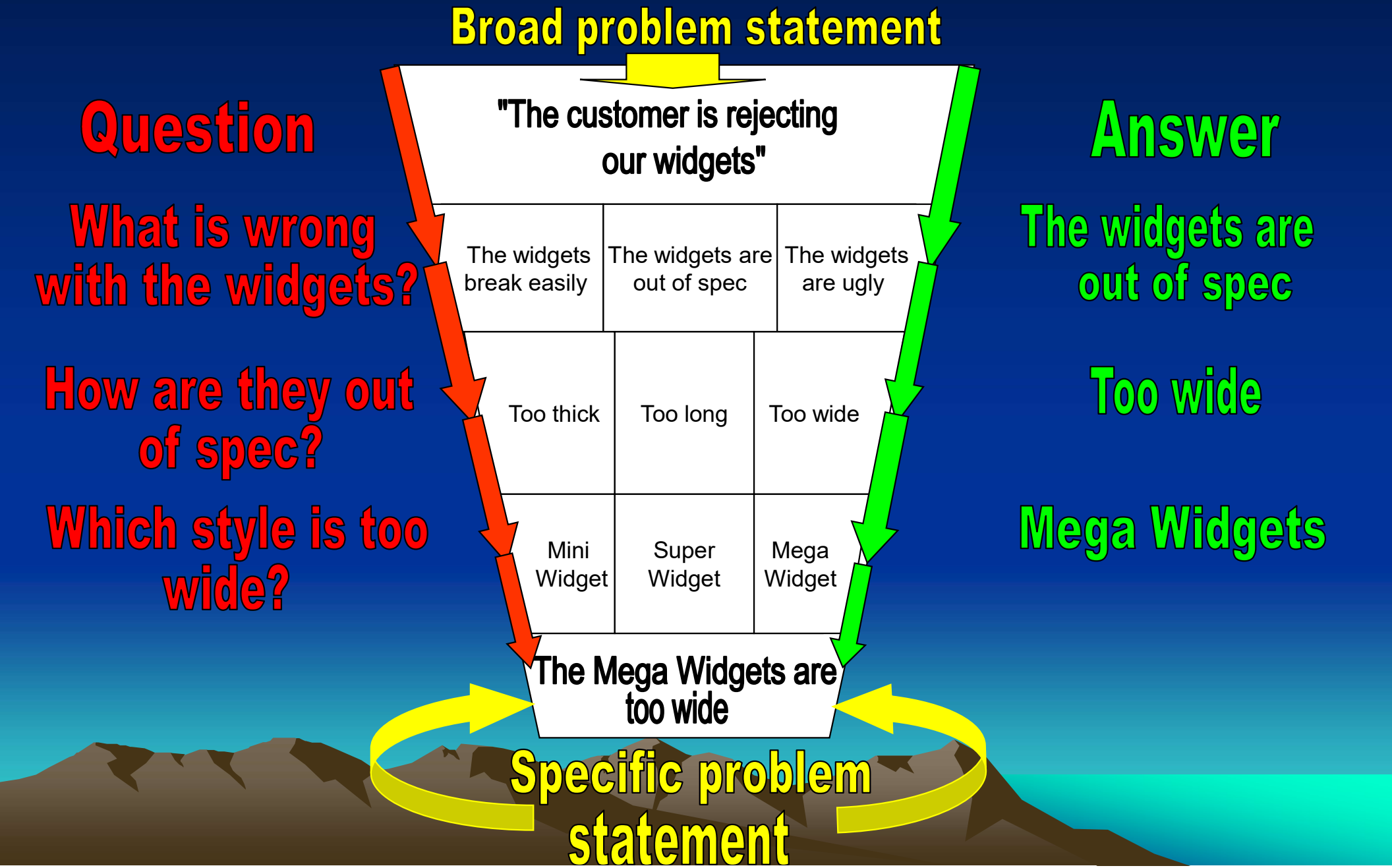
By interpreting the pareto chart, if the issue of wrong quantities is resolved, almost 50% of all misspacks will be eliminated



Narrowing Process

- A process used to clearly define the problem and build a problem statement
- Similar to stratification: stratification breaks a broad amount of data down to core data while the narrowing process breaks a broad problem statement down to a specific problem statement.
- In order for any cause and effect diagram to be effective there must be an accurate statement of the problem

Narrowing Process



Narrowing Process

- Original problem statement: “The customer is rejecting our widgets”
  - was very broad and panic inspiring
  - hard to counter-measure.
- By using the narrowing process the problem statement became very specific: “The Mega Widgets are too wide”
  - eliminates false leads for the investigation.

Cause & Effect Diagrams

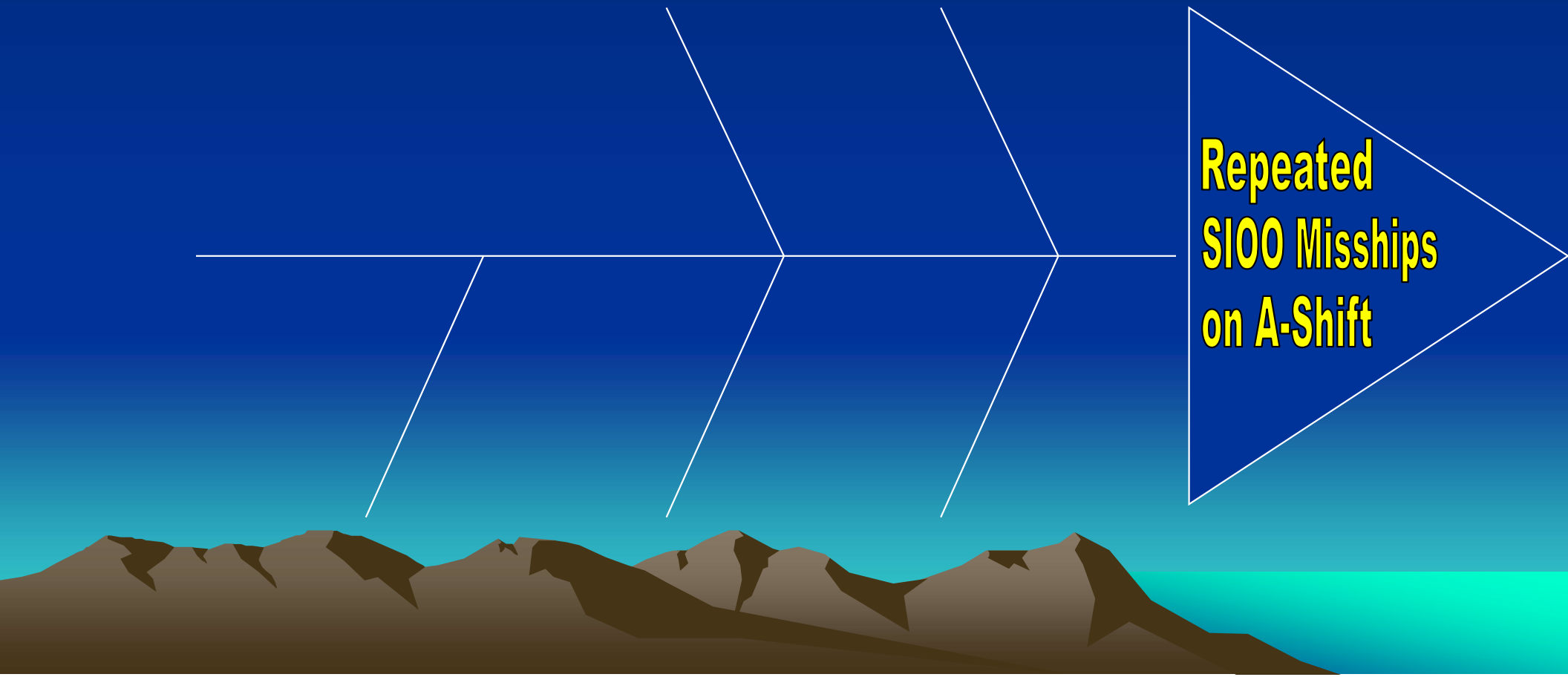
- Will help identify and display in increasing detail possible causes of a problem to determine it's true root cause.
- Three types:
  1) Fishbone
  2) Mind Map
  3) Organigram

Cause & Effect Diagrams

- Five types of causes
  - Possible: Results from brainstorming, any and all possibilities considered
  - Probable: Results from filtering possible causes, probable causes kept for analysis
  - True: Investigation into probable cause proves correct
  - Underlying: Answers WHY? WHY? analysis of true causes
  - Root: Last underlying cause that can be counter-measured

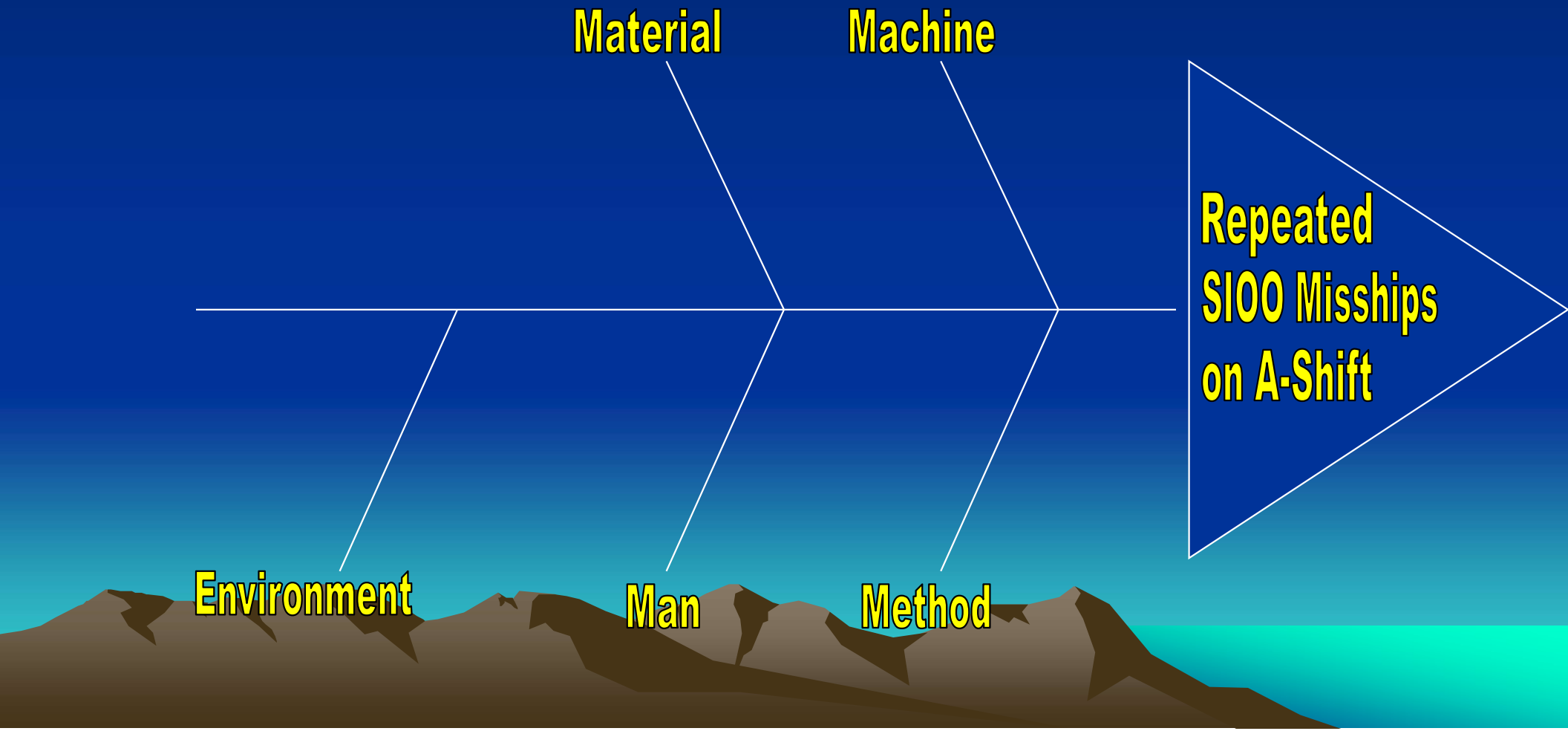
Fishbone

- Looks like a fish's skeleton with the problem statement as the "head"



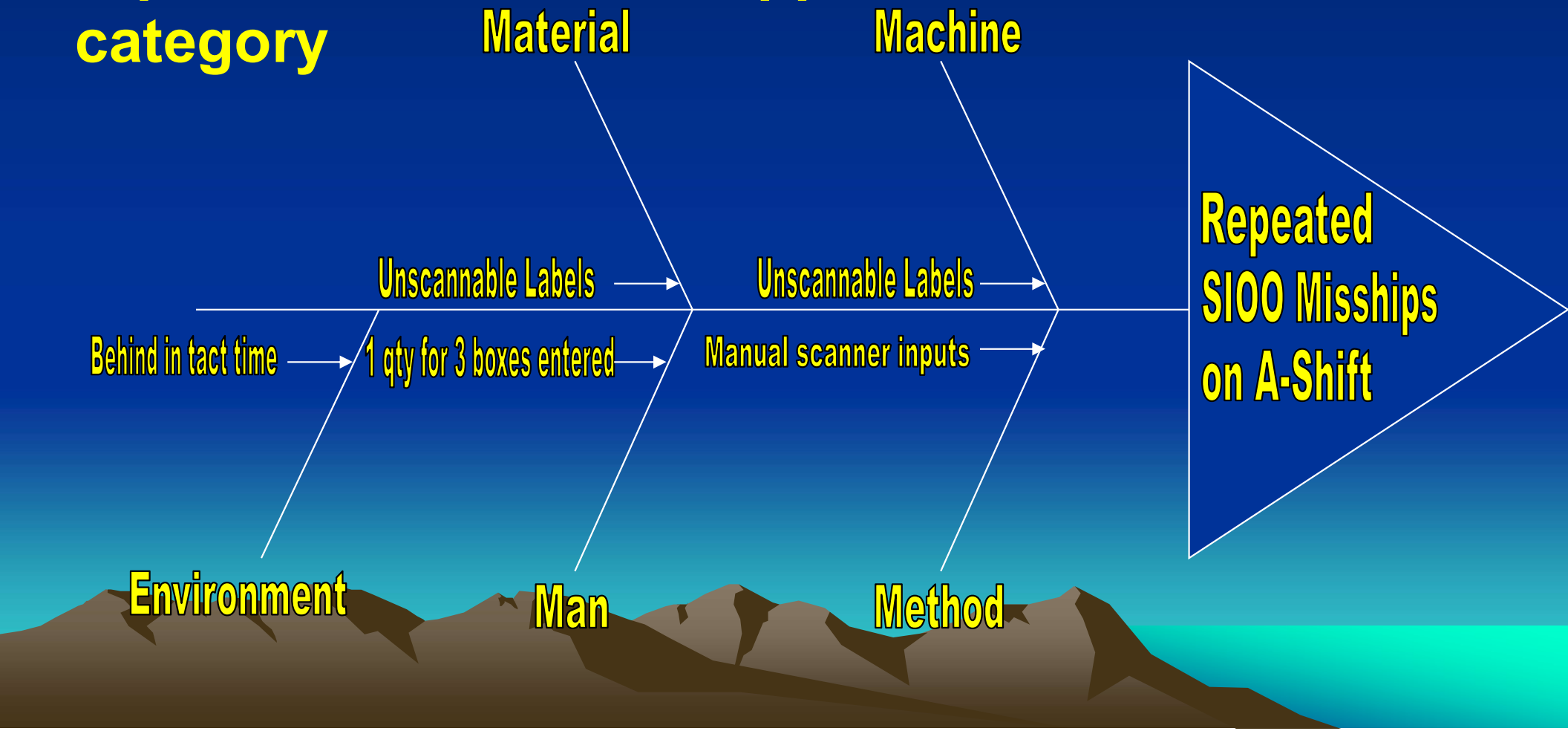
Fishbone

- Each “rib” off of the fish’s “spine” represents a category of possible cause



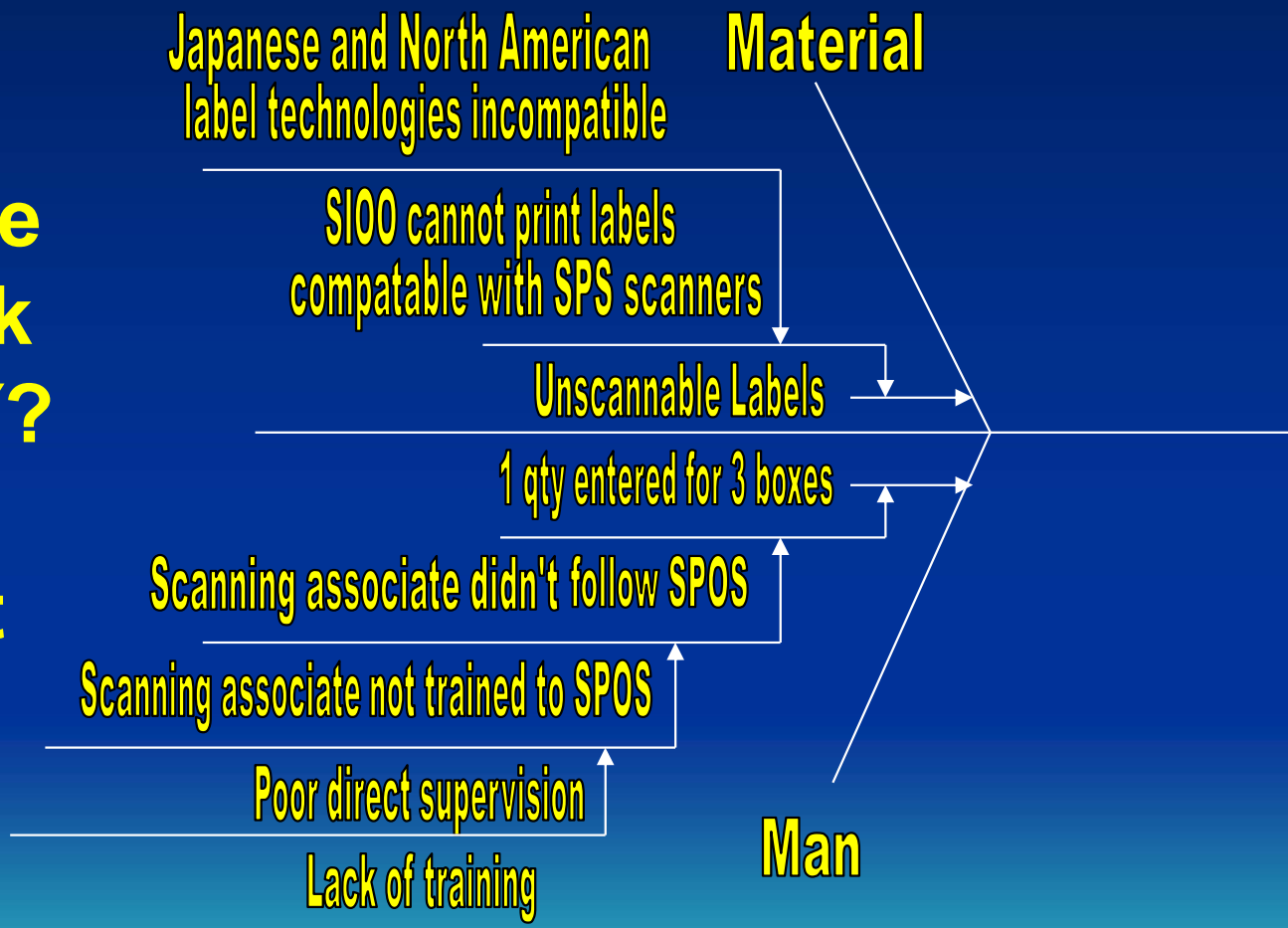
Fishbone

- To use the fishbone apply any probable causes to the proper category
- A probable cause can appear in more than one category



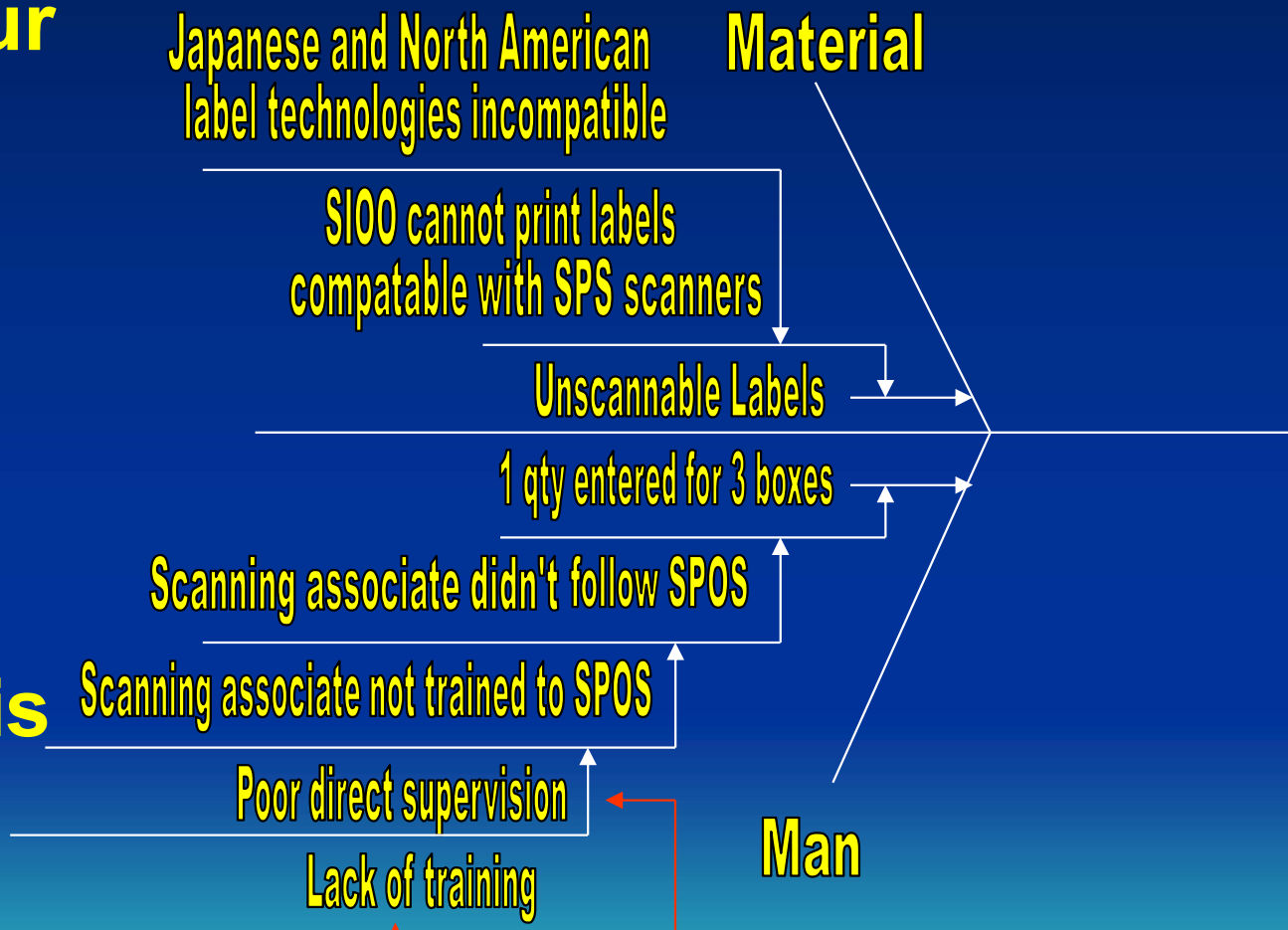
Fishbone

Once all the probable causes are on the fishbone you proceed to ask WHY? WHY? WHY? for each probable cause until you hit the root cause.



Fishbone

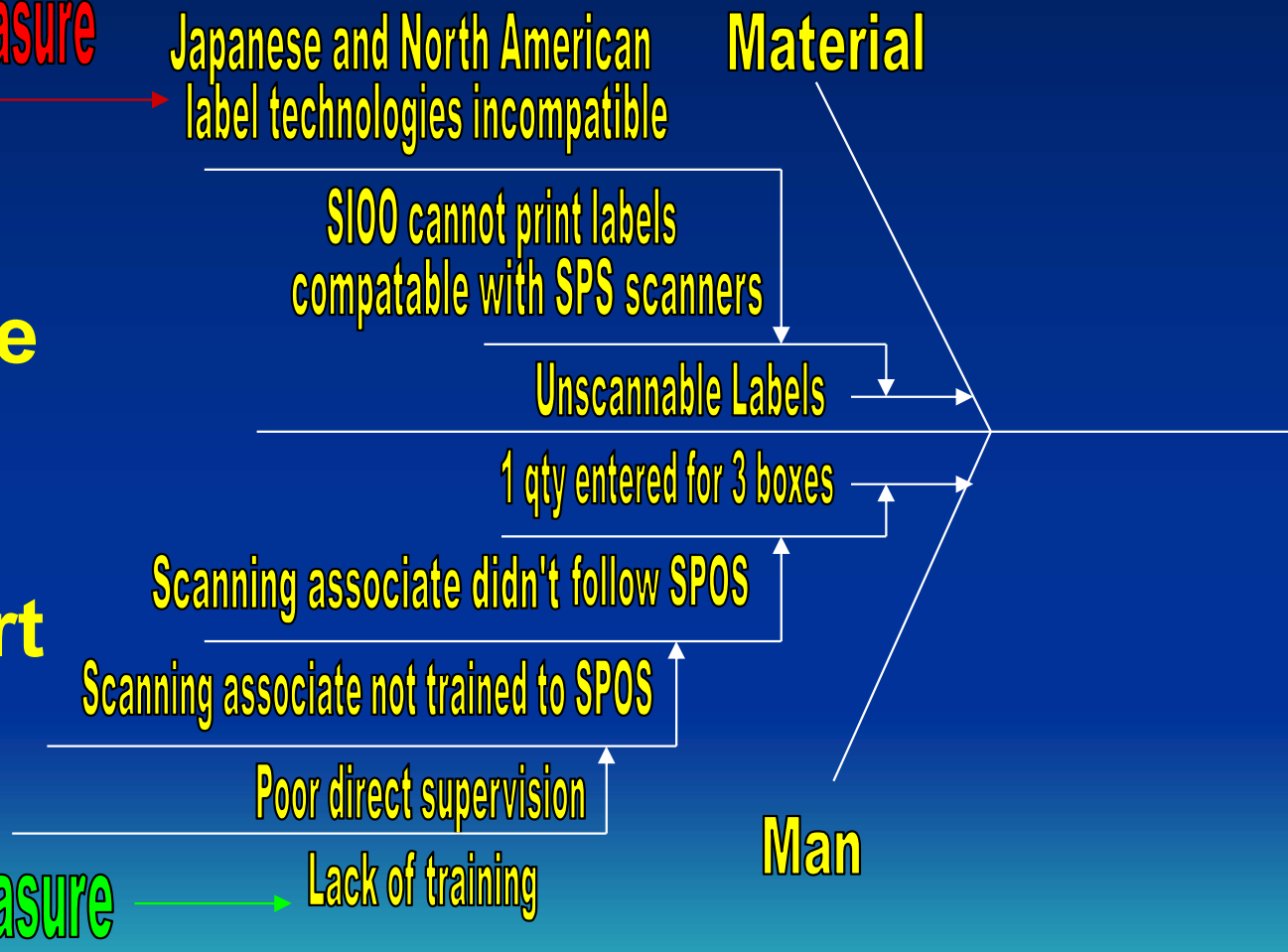
After you have your root causes work the fish bone backwards from each root cause. Ask yourself "could this situation cause this effect to result?"



Fishbone

Cannot countermeasure

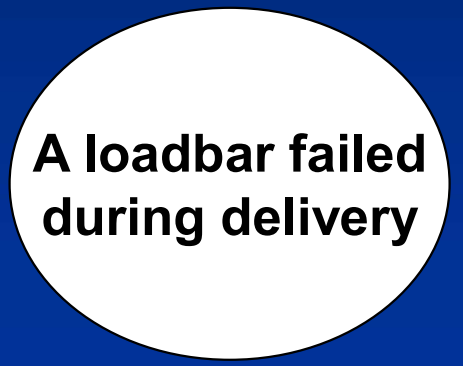
Once the root causes have been determined choose the ones that can be counter-measured and start the process.



Can countermeasure

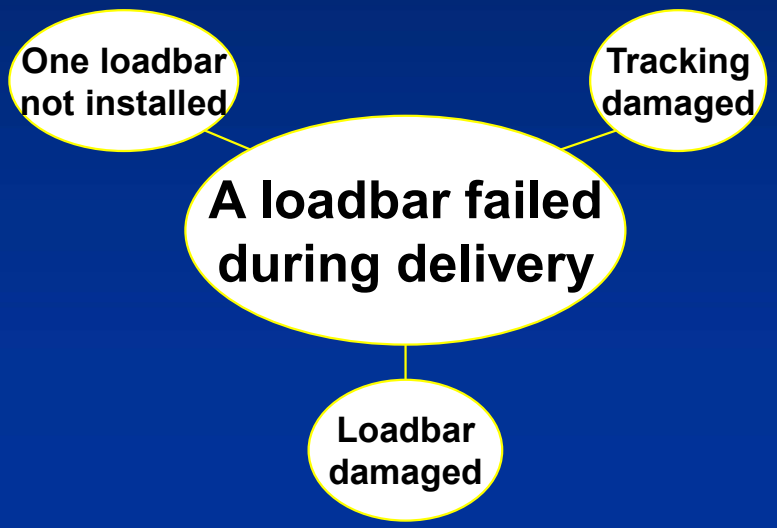
Mind Mapping

- Less formatted than a fishbone
- Easier to use for brainstorming
- Start off with your problem statement as the start of your mind map



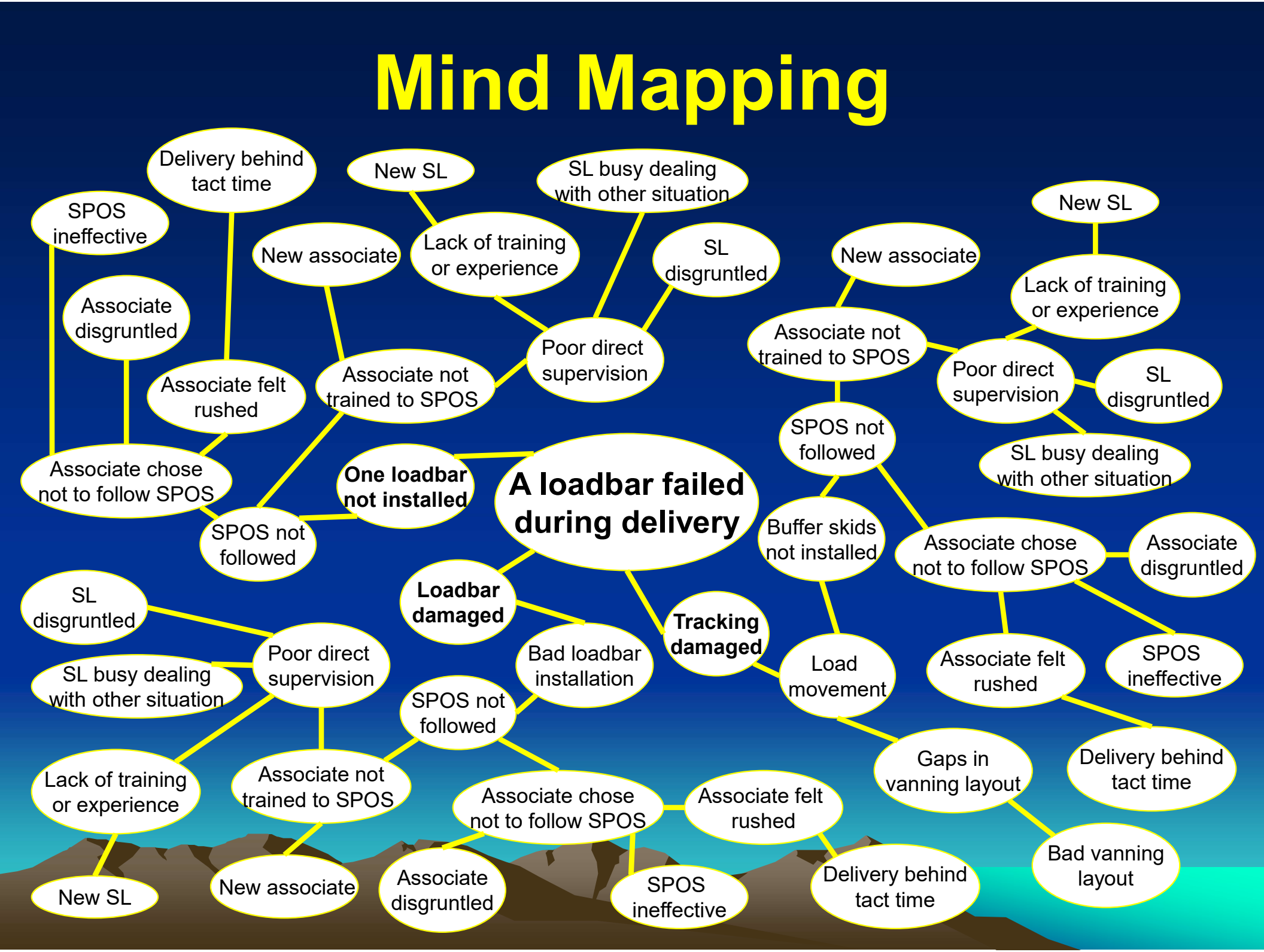
Mind Mapping

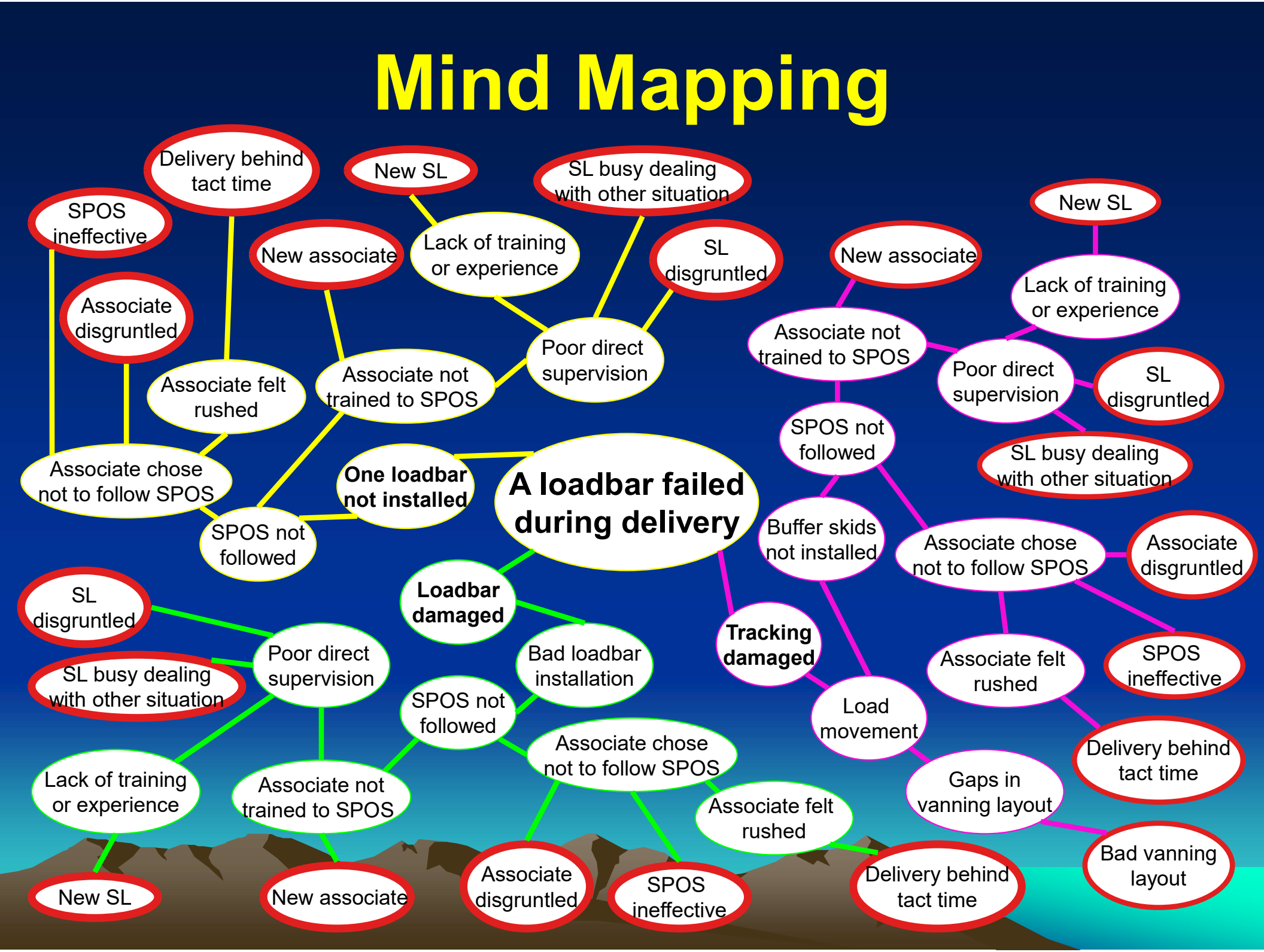
- Connect any probable causes to the problem statement



- Do a WHY? WHY? WHY? analysis on each probable cause and connect each step to the mind map

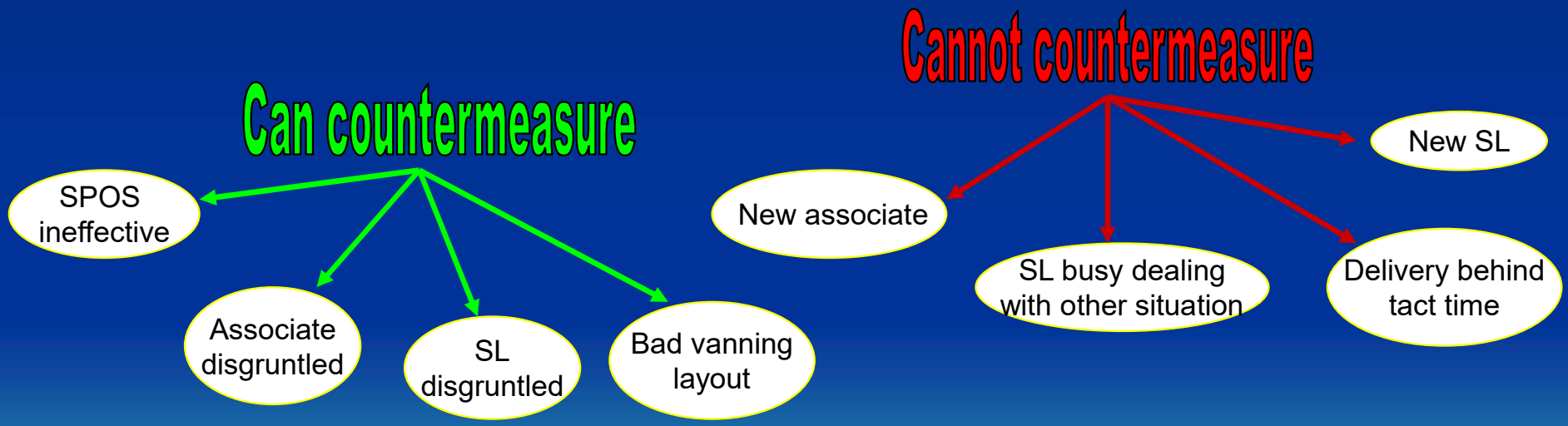
Mind Mapping




Mind Mapping
A loadbar failed during delivery
One loadbar not installed
Delivery behind tact time
SPOS ineffective
New SL
SL busy dealing with other situation
New associate
Lack of training or experience
SL disgruntled
Associate disgruntled
Associate felt rushed
Associate not trained to SPOS
Poor direct supervision
Associate chose not to follow SPOS
SPOS not followed
Loadbar damaged
SL disgruntled
Poor direct supervision
SL busy dealing with other situation
Lack of training or experience
New associate
Bad loadbar installation
SPOS not followed
Associate chose not to follow SPOS
Associate not trained to SPOS
New SL
Associate disgruntled
SPOS ineffective
Tracking damaged
Buffer skids not installed
Load movement
Associate felt rushed
Gaps in vanning layout
Delivery behind tact time
Bad vanning layout
New associate
Lack of training or experience
Associate not trained to SPOS
Poor direct supervision
SL disgruntled
SPOS not followed
SL busy dealing with other situation
Associate chose not to follow SPOS
Associate disgruntled
Associate felt rushed
SPOS ineffective

Mind Mapping

Once the root causes have been determined choose the ones that can be counter-measured and start the process.



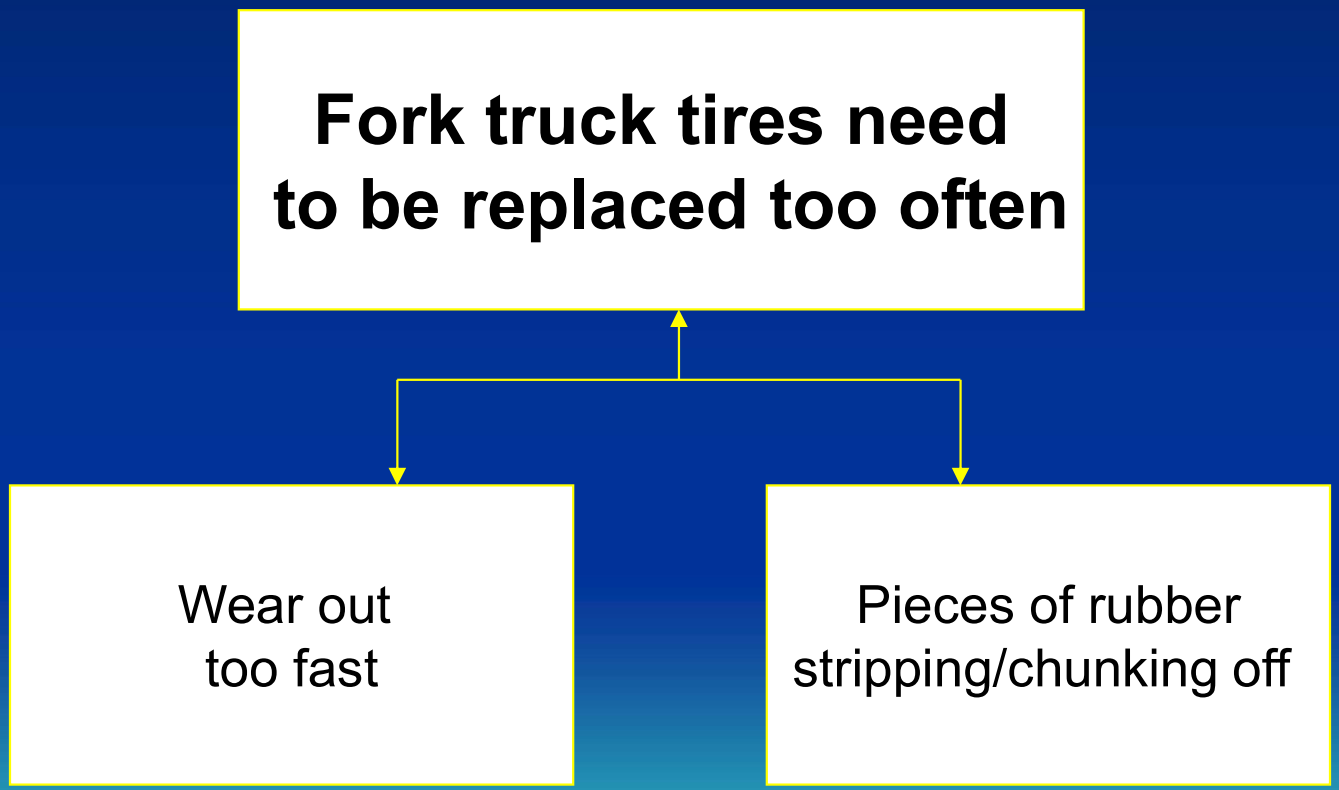
Organigram

- Cross between a mind map and a flowchart
- As always start off with your problem statement

Fork truck tires need to be replaced too often

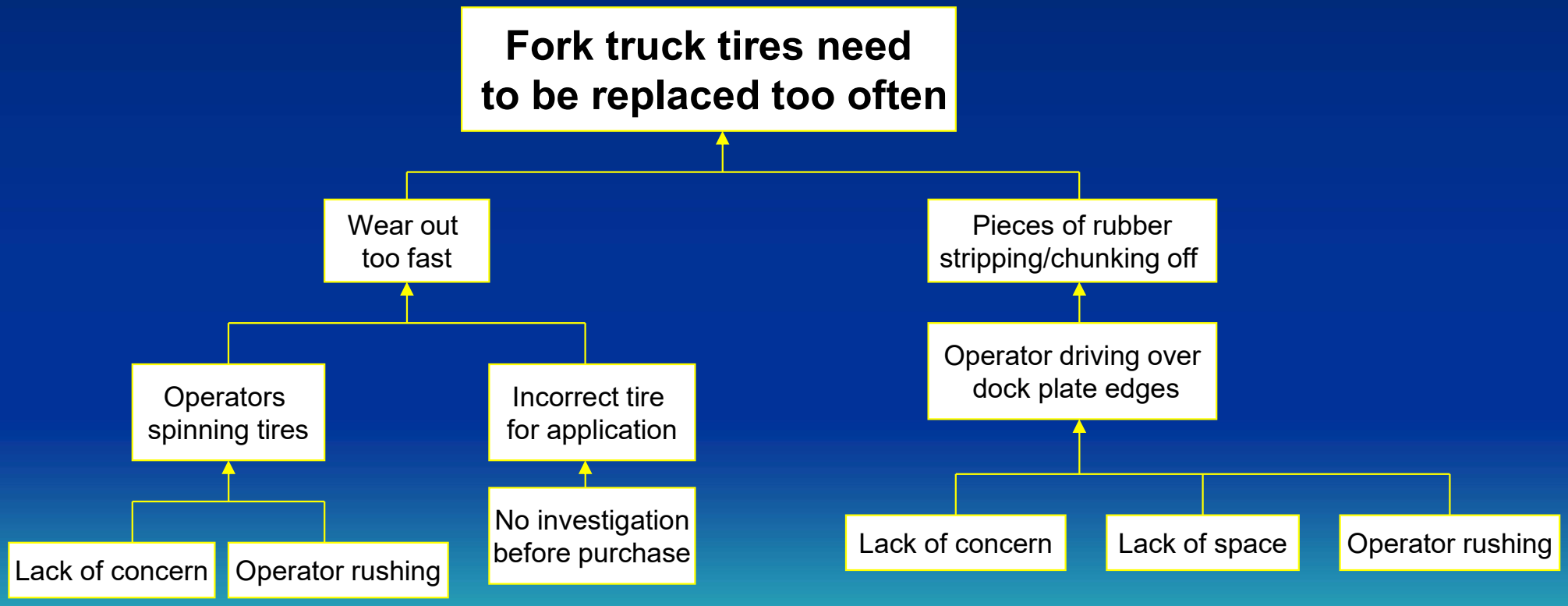
Organigram

- **Next add your true causes**



Organigram

- **Ask WHY?WHY?WHY until root causes are determined**



Organigram

Once the root causes have been determined choose the ones that can be counter-measured and start the process.

Can countermeasure

Lack of space

No investigation before purchase

Lack of concern

Operator rushing

Resources

- T:\PUB\NC Circle\TRAINING PACKAGES
- All Three Training Modules
- Individual modules on specific quality tools
- Darby's Tools Folder:
  - Working templates in Excel format where you to copy and paste the worksheet, plug in your data and the chart is done for you!
- Your Peers, Supervisors, Section Leaders and Managers