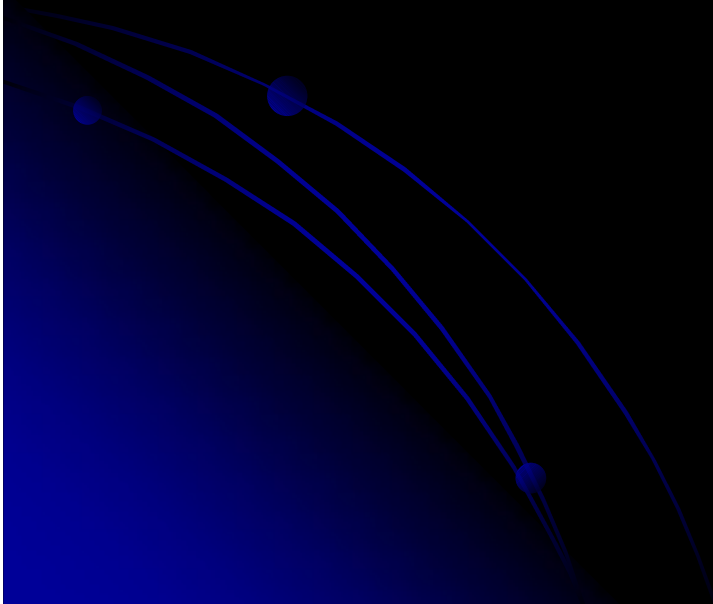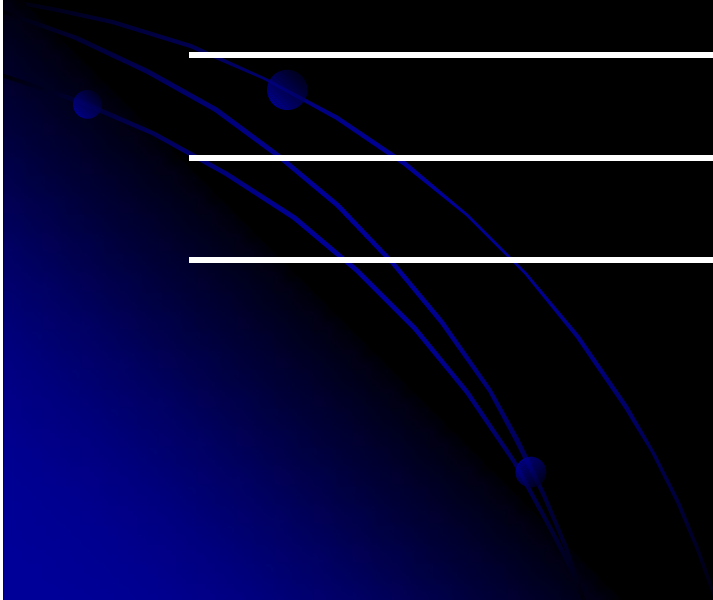# PROBLEM SOLVING SKILLS

Kepner Tregoe Solution

By Deepak Bharara

Introduction

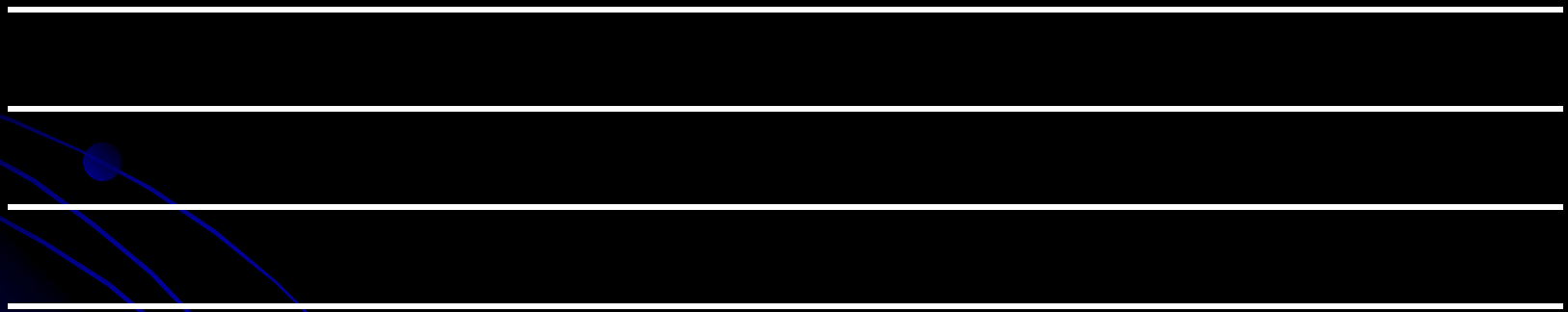- Identify Job Problem & list it here

Objectives

- Look at how you handle problem now
- Look at systematic approach to:
  - Analyze Problem
  - Make Decision
  - Avoid Future Problems
  - Handle Complex Issues
- Learn to ask questions systematically
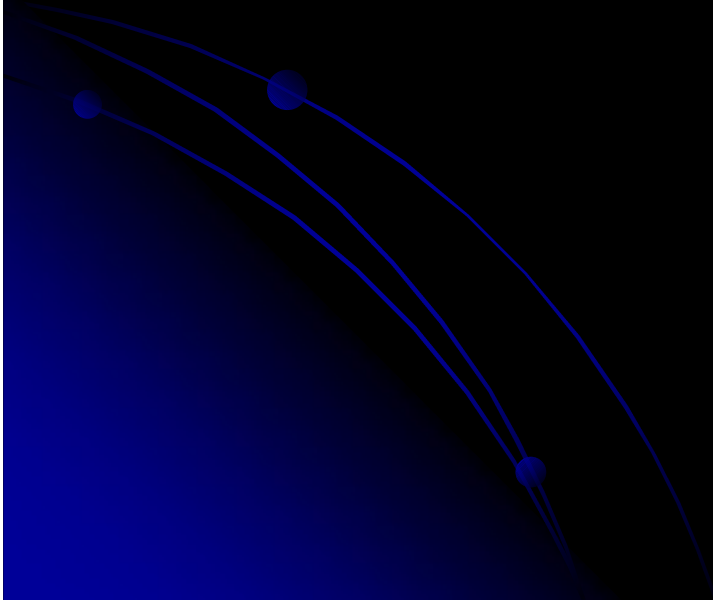- Practice what we learn
- Apply what we learn

Process

- A Systematic Sequence of steps to meet a Goal
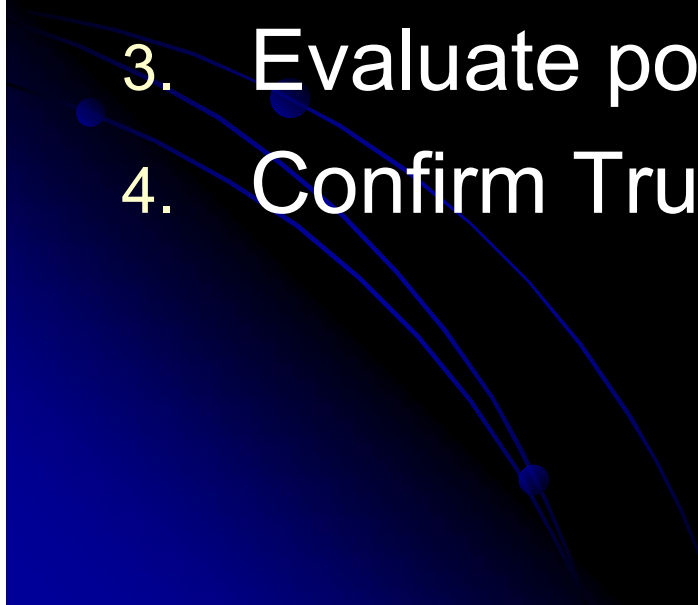
Problem Solving Skills

- Problem Analysis

- Decision Analysis

- Potential problem analysis

- Situation Appraisal
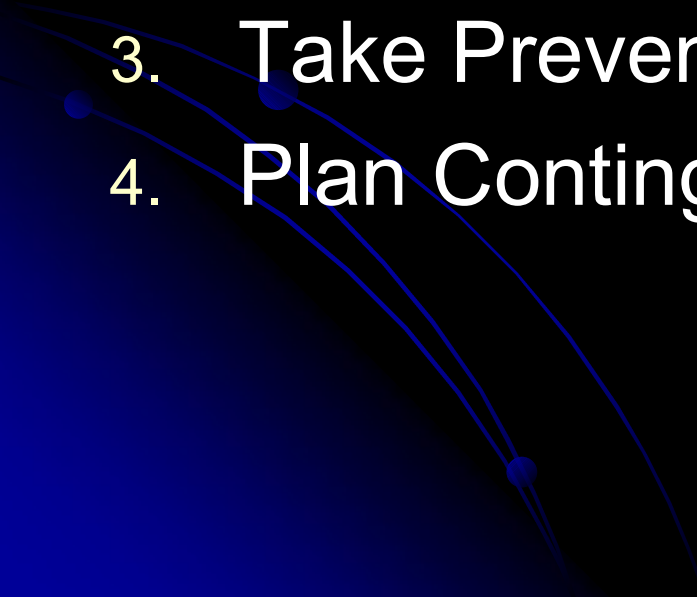
Problem Analysis

- Find cause of a deviation

1. Describe Problem
2. Identify Possible clause
3. Evaluate possible causes
4. Confirm True cause
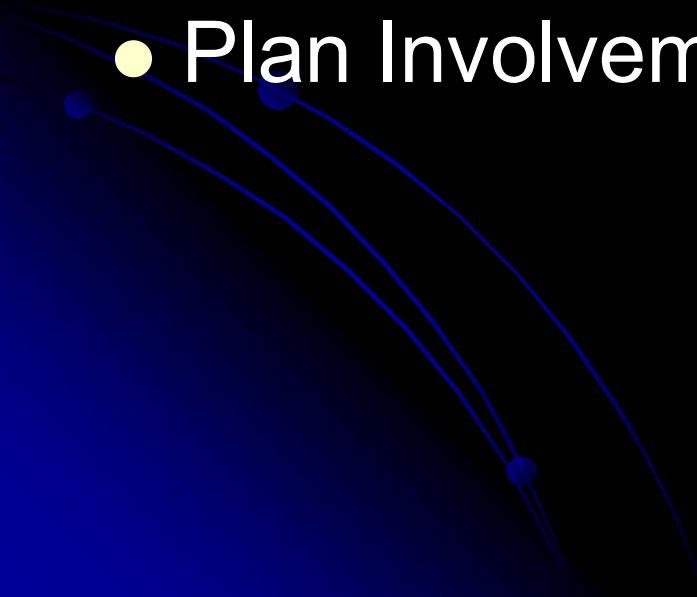
Decision Analysis

- Make Best Balanced Choice

1. Clarify Purpose
2. Evaluate Alternatives
3. Assess Risks
4. Make Decision
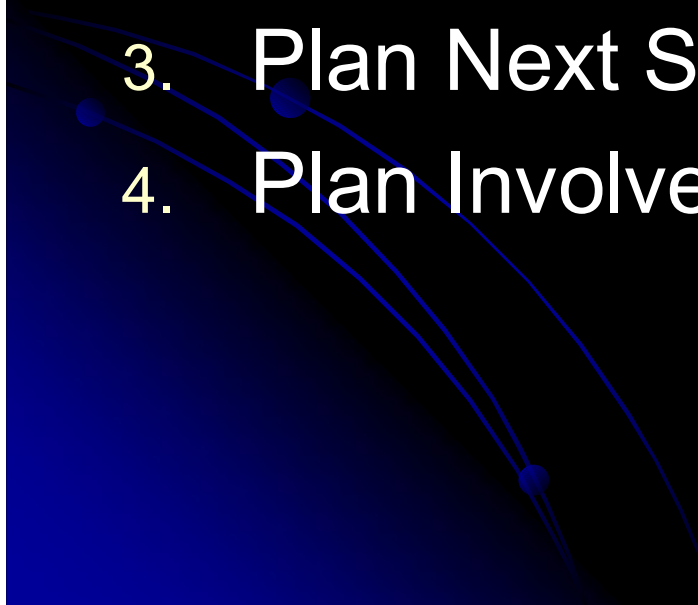
Potential Problem Analysis

- Protect an action or plan

1. Identify Potential problems
2. Identify Likely Cause
3. Take Preventive Action
4. Plan Contingent Acton Triggers
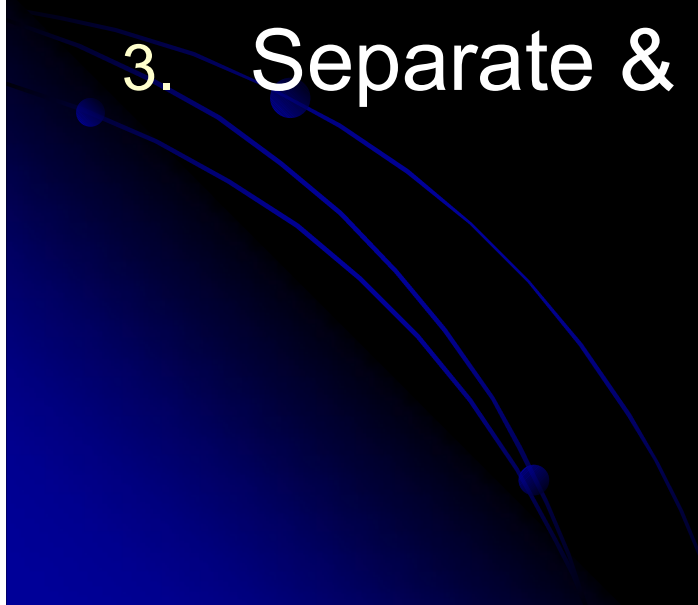
Situation Appraisal

- Sort out priority Concerns
- Identify Concerns, List Concerns
- Set Priority
- Plan Next Steps
- Plan Involvement

Situation Appraisal

- Sort out priority Concerns

1. Identify Concerns
2. Set Priority
3. Plan Next Steps
4. Plan Involvement

Situation Appraisal

- Identify Concerns

1. List Concerns
2. What is a concern
3. Separate & Clarify

List Concerns

- To make them visible
- Ask:

1. What problem do I have to solve?
2. What Choices do I face?
3. What Action do I have to take?
4. What Bothers me?

List without Discussion

What is Concern?

- A feeling that you need to do something…..

1. Fix a problem
2. Make a choice
3. Make sure an action works

- Different kinds of concerns need different process tools

Separate & Clarify

- Work on one at a time
- Ask

1. What do you mean by…?
2. What Specific thing…?
3. How do you know…?

- Answer may be different words for the same concern, or a list of concerns

Set Priority

- Choose which concern to work on first
- Ask:

1. Which issue or concern should we work on first

- If still unclear, consider:

1. Seriousness – impact
2. Urgency – deadline
3. Growth - Trend
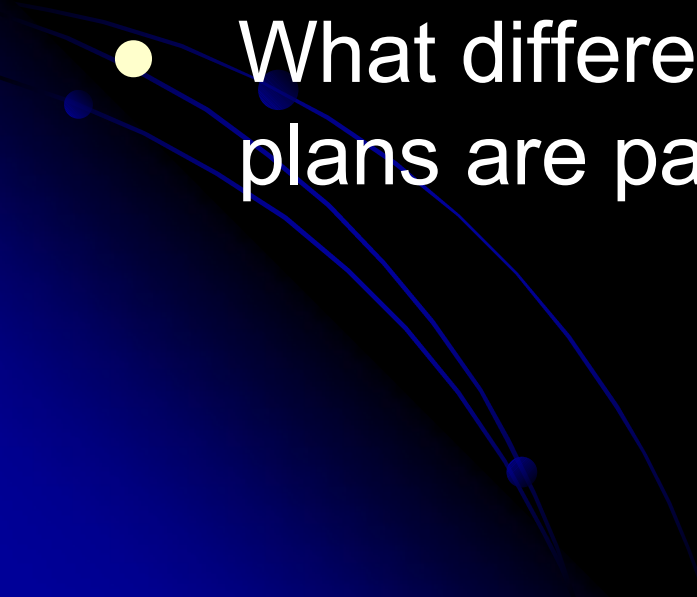
Set Priority

- Choose which concern to work on first
- Ask:

1. Which issue or concern should we work on first

- If still unclear, consider:

1. Seriousness – impact
2. Urgency – deadline
3. Growth - Trend

List Concerns

- What deviation are occurring?

- What decision need to be made?

- What plan should be implemented?

- What changes are anticipated?

- What opportunities exist?

Clarify Concerns
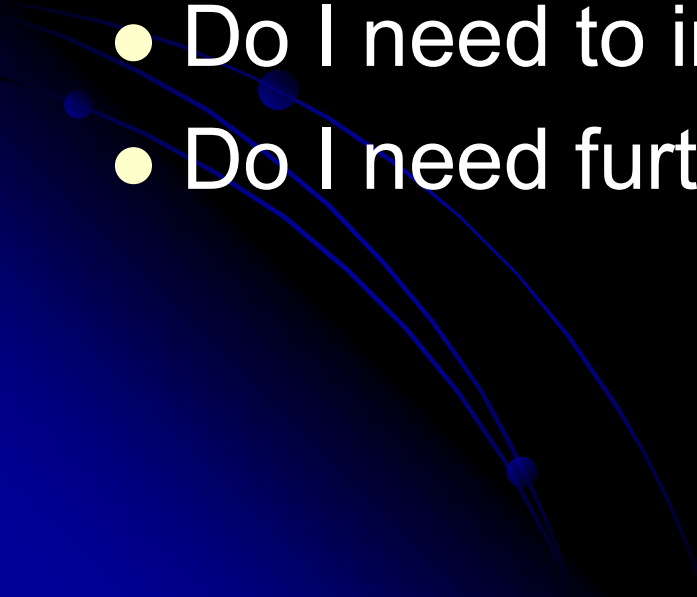
- What do you mean by…?

- What exactly is…?

- What else concerns you about…?

- What evidence do you have…?

- What different deviations, decisions or plans are part of this concerns?

Set Priority

- Consider Seriousness, urgency and growth

1. What is the impact?
2. Who is concerned
3. What is the deadline for taking action?
4. What do we need to start?
5. What is the future trend?
6. What will happen if nothing is done?

Plan Next Steps

Determine analysis needed

- Do I need to know the cause of a deviation?
- Do I need to make a choice?
- Do I need to implement an action or plan?
- Do I need further clarification?

Plan Involvement

Identify who does what and when

- What needs to be done and when?
- Who needs to be involved for?

- Information?
- Analysis?
- Creativity?
- Commitment?
- Approval?
- Implementation?
- Training?

Case Study

- Discuss the case study of Late Equipment

- Divide the group in four groups. The assigned roles are of:

1. Corporate Manager
2. Project Administrator
3. Purchase Supervisor
4. Receiving supervisor

Describe Problem

- State Problem
- Specify Problem
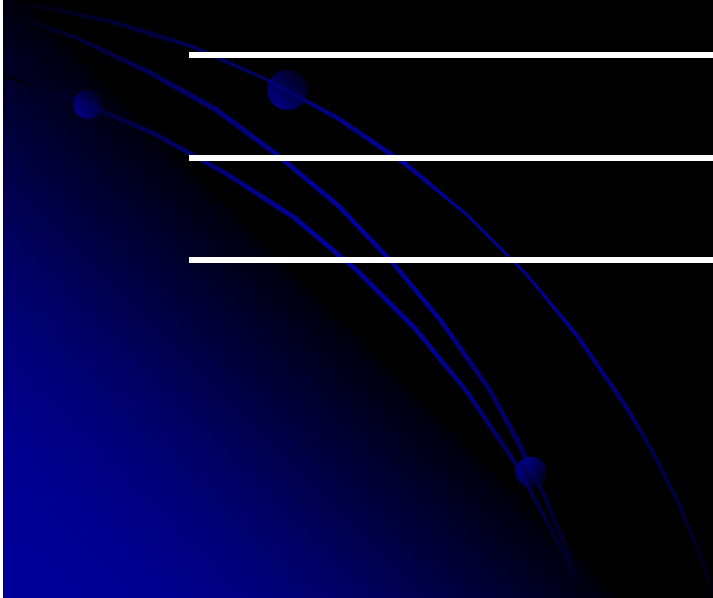
State Problem

- Help stay on track

- Ask:

1. What thing or group of things has the problem?
2. What problem does it have?

- Write a short statement

Object/Defect

- Be Specific

Specific Problem

- Get a full and accurate description of the problem
- Ask question in four areas:

1. What – Identify
2. Where – Location
3. When- Timing
4. Extent- Size

IS	IS NOT
Describe the problem in detail	Tighten is data. Helps Eliminate possible causes

Specify the is not

- Data that shows the boundary or limit of a problem.
- Helps eliminate causes which don't make sense
- Ask question in pairs

- For each IS ask questions to find IS NOT's that are:
1. Similar to the IS
2. Related to the IS
3. Specific
4. Factual!

- …Could be, but is not

Describe Problem

	IS	IS NOT
What	What thing or group of things are you having problems with What is wrong with it or them?	What things or group of things could you be having problem with but are not? What could be wrong with it or them but is not?
Where	**Where geographically is the thing when the problem is noticed?** **What is the problem located on the thing?**	Where could the things be when the problem is noticed, but was not? Where could the problem be located on the thing, but is not?
When	**When was the problem first noticed?** **When has problem been noticed since then?** **When in the history or life cycle of the things was the problem first noticed?**	When could the problem have first been noticed, but was not? When could the problem have been noticed since then but was not? When in the history or life cycle of the thing could the problem have first been noticed but was not?
Extent	**How many units of the things have the problem?** **What is the size of a single defect?** **How many flaws or defects are on any one unit & what is the trend?**	How many units of the thing could have the problem but do not? What other size could a defect be but is not? How many flaws or defects could be on any one unit but are not? What could the trend be but Is not?

Evaluate Possible causes

- Test Possible causes
- Identify Most possible cause
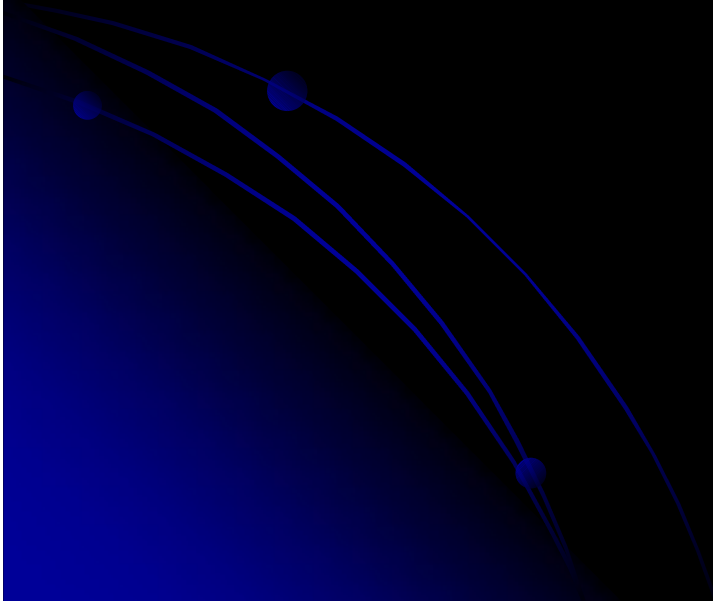
Identify possible Clauses

- Make Statements we can test against the facts

- Ask:

1. What could cause this problem?

- Write a short statement for each possible cause

- Object/Defect format

- Explain how the cause works

Test Possible Causes

- Get rid of causes which don't make sense

- Ask:

1. If____ is the cause of _____, how does that explain both the IS and IS NOT?

- Ask about each pair of IS/IS NOT data

1. Eliminate any cause which fails

2. List all assumptions

Identify Most probable Cause

- Pick the possible cause to verify first
- Ask:

1. Which of these possible causes makes the most sense?
- Most probable cause has:

1. Reasonable assumptions
2. Fewest assumptions
3. Overall simplest

Confirm True Causes
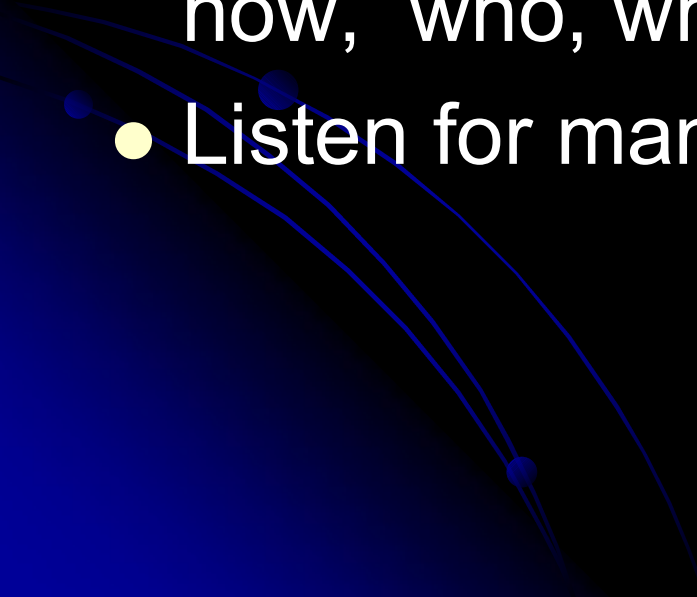
- Avoid unnecessary fixes
- Way to verify:

1. Factual – Check assumptions
2. Observe – go look!
3. Research – Experiment
4. Results- Try a fix & monitor

- Use the easiest, quickest, cheapest, safest, surest way

Questioning Skills

- Open Questions
- Closed Questions
- Question to the void
- Handling Answers
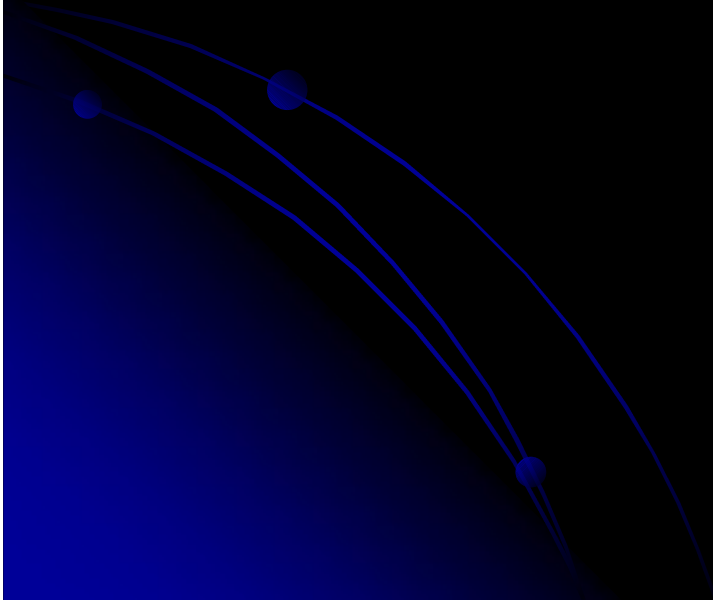
Open Questions

- Questions that prompt answers in phrases or sentences.

- Used to gather new information

- Start questions with " what, where, when, how, who, why…"?

- Listen for many different possible answers.

Closed Questions

- Questions that define the possible answers by the way they are asked

- Used to check answers and show that you understand them

- Start questions with " do, have, will, can, are, is…"?

- Be ready for a long answer even though you expect a short one

Question to the void

- Re- asking a question to get the most specific answer

- Make concerns specific and easier to work on

- Ask:

1. Turnaround questions
2. What else…? Questions

Handling Answers

- Make sure you can use the inform you get
- After you ask:

1. Listen (Clarify if necessary)
2. Acknowledge
3. Confirm
4. Record

- If the answer you get doesn't match your question, acknowledge and ask again

Identify possible Clauses

- Make Statements we can test against the facts

- Ask:

1. What could cause this problem?

- Write a short statement for each possible cause

- Object/Defect format

- Explain how the cause works

Look for Distinction

- Help sort out relevant changes
- Ask:

1. What is different, odd, special, unusual or distinctive about each IS compared to its IS NOT?
2. What Else…?

- Write them down!

1. Facts
2. New Information
3. True only for the IS

Look for Changes

- Changes help us find cause
- Ask:

1. What changed in, on, around or about this distinction?
- What else…?

1. Write them down
2. Date each change in clock/calendar time

Using distinction and changes

- They help us make casual statement we can test
- Ask:

1. How could this change
2. Change & distinction
3. Change & change
4. Distinction
5. …cause this problem?

- Write a short statement in object/defect form
- Explain how the cause works

Case Study

- Discuss the case study of Micro Computer Cabinets

- Divide the group in two groups. The assigned roles are of:

1. System Test Specialist
2. Industrial Engineer

More Tools & Technique

- Start up problems
- Recurring problems
- Think beyond the fix
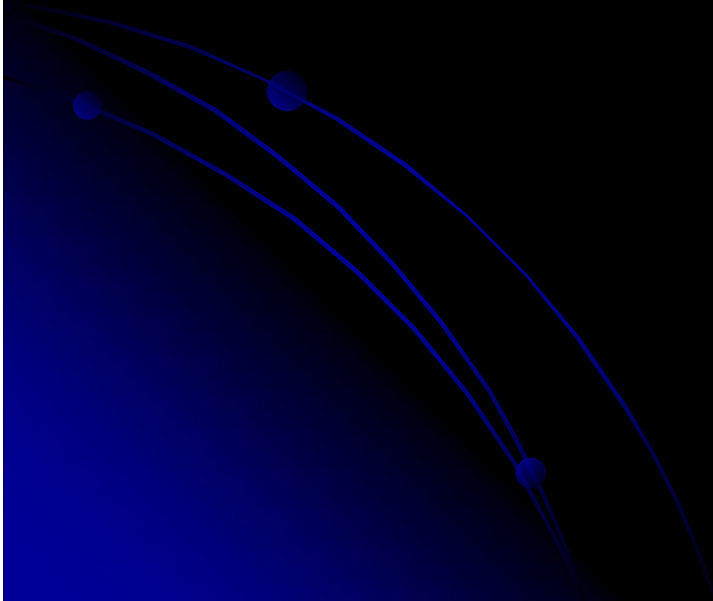
Start up Problems

- Problems where should has never been met
- They cost in time, money & aggravation

1. Confirm the should
2. Check/refine actual data
3. Find the best IS NOT
4. Get cause from Distributions

Question to Confirm the Should

- Who set it?
- Was it ever reached?
- When was it set?
- What assumptions were made?
- Does this should apply here?
- Under what conditions was it set?

  Be careful not to lower the should without good reason

Finding Good IS NOT's

	Same Equip	Like
Same Job	Best	2nd Best
Like Job	3rd Best	4th Best

Same Job is more helpful than same equipment to get is not?

Recurring Problems

- Problems we see (and may be fix) over and over

1. Fix them permanently

- Find the root cause

1. Treat these like any other problem… Use PA
2. Keep special track of WHEN data
3. Be specific about life cycle
4. Use distinctions and change

Think Beyond the Fix

- Prevent Recurring problems and make your property
- Ask questions to:
- Extent the cause..

1. What other damage…?
2. Where else…?
3. What caused the cause?

- Extend the Fix

1. What identical things need the same fix?
2. What problems could this fix cause?

Identify Possible Cause

Use knowledge and Experience to Develop possible cause statements	From experience, what could have caused this deviation?
use distinction and changes to Develop possible cause statements	What is different or unique about an IS as compared to its IS NOT?
	What has changed in, on, around or about each distinction
	When did the change occur?
	How could each change have caused this deviation?
	How could a change plus a distinction have cause this deviation?
	How could a change plus a change have caused this deviation?

Evaluate Possible Cause

|	
Test possible cause against the IS and IS NOT to Determine most Probable cause	If "X" is the true cause, how does it explain both the IS and IS NOT. What assumptions have to be made to explain the specification? Of the causes tested against the specification, which best explains the IS and IS NOT data?

Confirm True Cause

Verify Assumptions Made in testing: Conduct observations; Fix and check result	What can be done to verify any assumptions made in testing this cause? How can this cause be observed at work? When corrective action is taken, how will results be checked ?
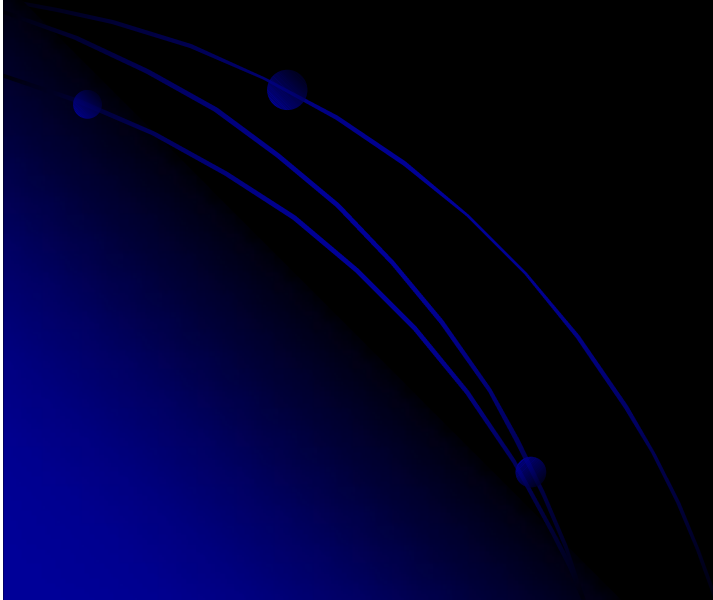
Module Objectives

- Review common statistical tools
- Learn how statistical tools fit into the problem solving process
- Show how problem solving process enhances the use of statistical tools
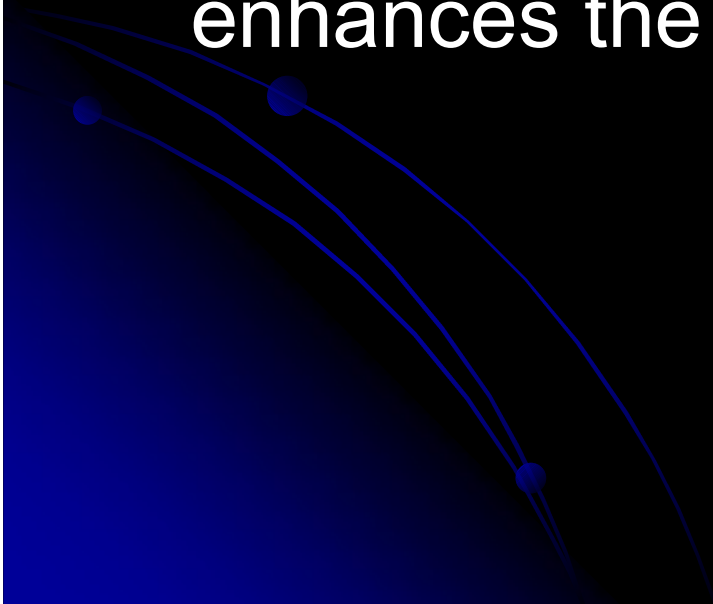
Statistics

- Statistics are numbers with meaning
- Used for analysis

1. Understand what is happening
2. Solve Problems
3. Make Improvements
4. Create a data base

- Use of control
- Maintain quality target monitor repeatability

Common Quality Tools

- Flow Charts
- Check Sheets
- Pareto Charts
- Histogram
- Run Charts
- Control Charts
- Cause & effect Diagram
- Scatter Diagram

Flow Charts

- Diagram of the steps of a process
- To help everyone understand the steps and how they relate
- Developed by

1. Describing the steps
2. Drawing symbols for the steps
3. Connecting the symbols

- Flow charts are very helpful to answer the "when in the life Cycle" question

Check Sheets

- A form used to record data about a problem
- Used to answer WHERE questions and provide data for other statistical tools

- Developed by
1. Choosing the data to collect
2. Make a work Sheet
3. Recording the data

- Check sheet often have
1. Diagrams of the thing they are recording data about

Pareto Charts

- Way to show which problems occur most often
- To help set priority, choose which problem to work on Ist

- Developed by
1. Choosing categories to look at
2. Gathering data
3. Graphing the data in
4. Descending order – left to right

- Use pareto with other information to set priority
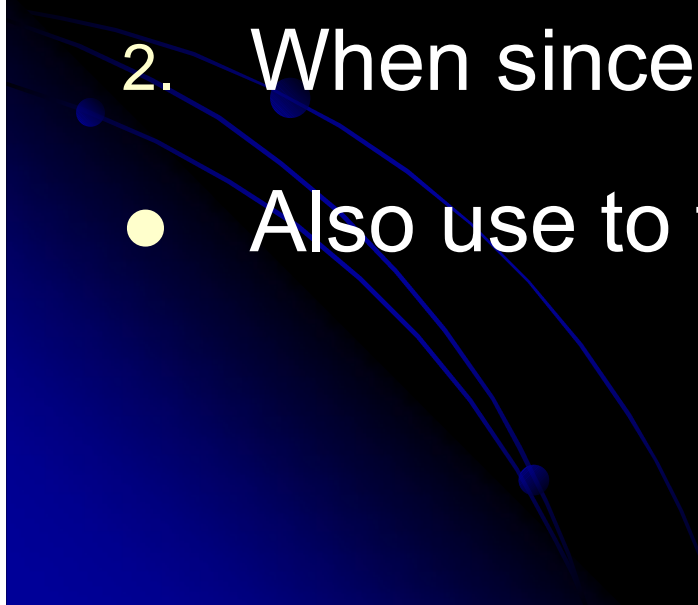
Histograms

- A bar chart that shows variation in a group of data

- To help identify deviations

- Used as should/actual diagram

- Use this tool to answer WHAT and EXTENT questions or to monitor result of a fix

Variations

- The degree that measurements of the same things are different
- Goal is to reduce variations to improve quality
- Variation is the enemy!!
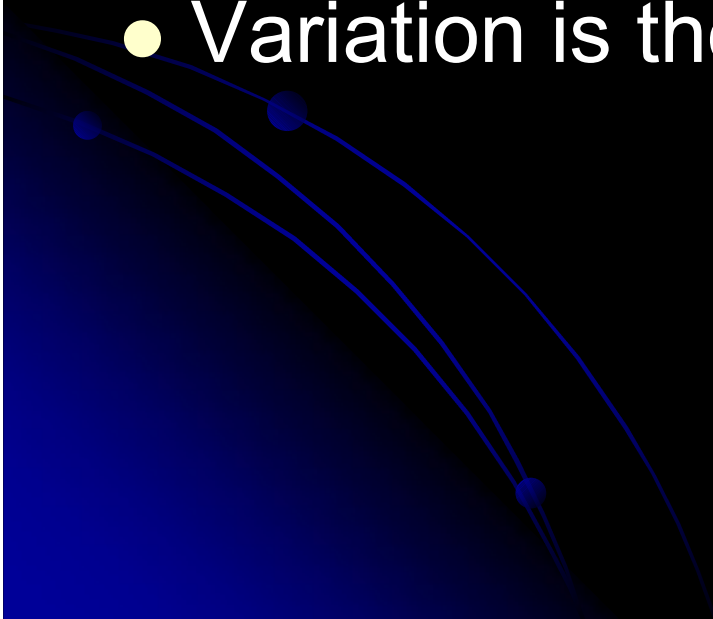
Run Charts

- Graph of measurements over time
- To show trends or patterns
- Use run charts to answer
1. When first…
2. When since…any pattern

- Also use to tell us we have deviation

Control Charts

- Graph that show how a measurement varies over time

- To tell if a process is in control or not

- Look at graphs to see if a process varies within expected limits or not

- Too much variation= deviation

- Look at:

1. Average Control chart and range control chart

Process in Control

- A process that only varies randomly within set limits
- Variation is the enemy we want to eliminate
- Examine a control chart for out of control indicators

1. Any point outside the limits
2. 7 points in a row on the side of center line
3. Increasing or decreasing trends of 7 or more points
4. Few or all points near the average
5. Pattern

Cause & effect Diagrams

- Diagram showing possible causes of a problem
- Also called ishikawa or fish bone diagrams
1. To help organize our experience when developing possible causes

- Developed by
1. Doing problem statement and specification first!!
2. Creating "Fish Bone" with other major headings
3. Adding specific possible causes then testing and verifying true cause

Scatter Diagrams

- Diagram showing how one measure is related to another measure (show correlation)

- To see if one measure may be affected by the other

- Developed by

1. Collecting data for the 2 measures

2. Drawing chart with 2 measure plotted on each axis

3. Studying diagram or calculating the relationship

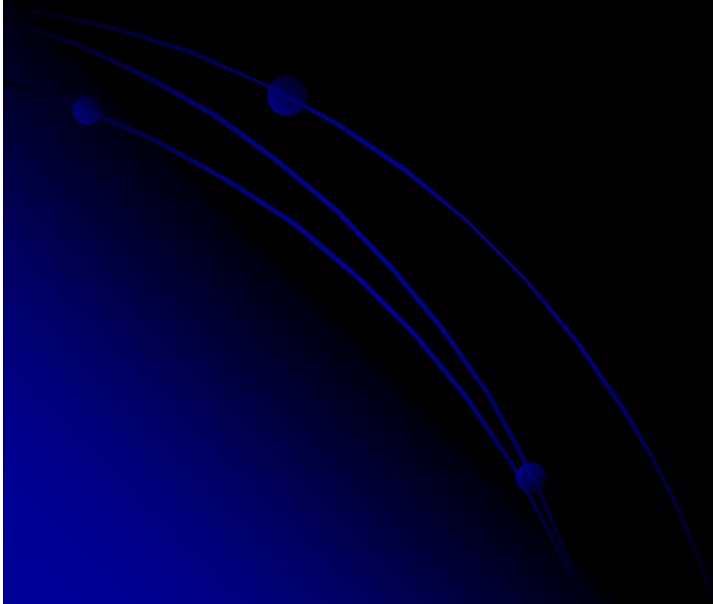- Can be used to very some true causes

Case Study

- Discuss the case study of Hefto Hoist

- Divide the group in two groups. The assigned roles are of:

1. A

2. B

Clarify Purpose

- State Decision

- Develop Objective

- Classify Objective

State Decision

- Keep decision makers on track
- Ask:

1. What do we need to decide?
2. What are we trying to do?

- Write a short statement that includes:

1. Choice word
2. Results
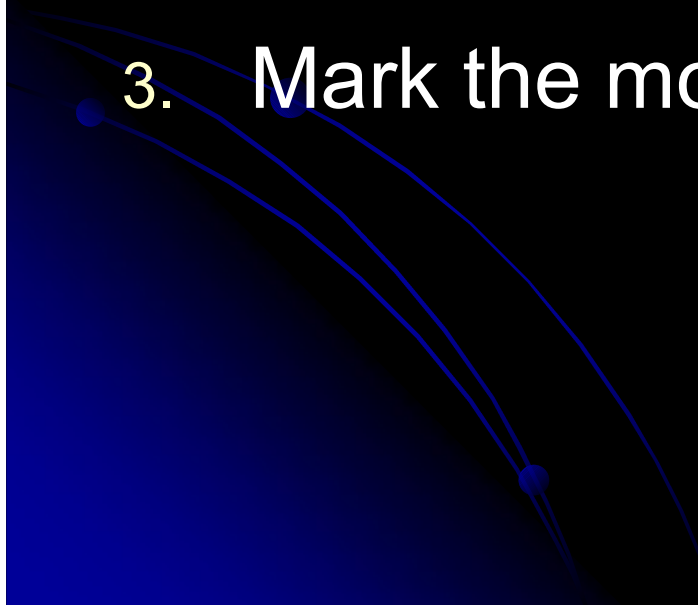3. 1or 2 key modifiers

- Language changes the range of choice

Develop Objectives

- Help us evaluate alternatives fairly
- Ask:
- What result do we want? (Correct Cause, Prevents future trouble)
- What resources should we use or save? (people, equipment, $, Time, Space…)
- What law, regulation or policy restrictions should we consider?
- List in short statements

Classify Objectives

- Be clear about what we need and what we want

- Ask: Is this objectives ….

1. …Mandatory – required?
2. …Measurable - Set limits?
3. …Realistic - Can Be met?

- Yes to all 3 = MUST label (M)

- All others are wants

- Mark the most important WANT's

Most Important Wants

- Show how much each WANT will influence our choice

1. Identify the most important WANT
2. Check for others that are as important
3. Mark the most important

Evaluate Alternatives

- Generate Alternatives

- Screen through the must's
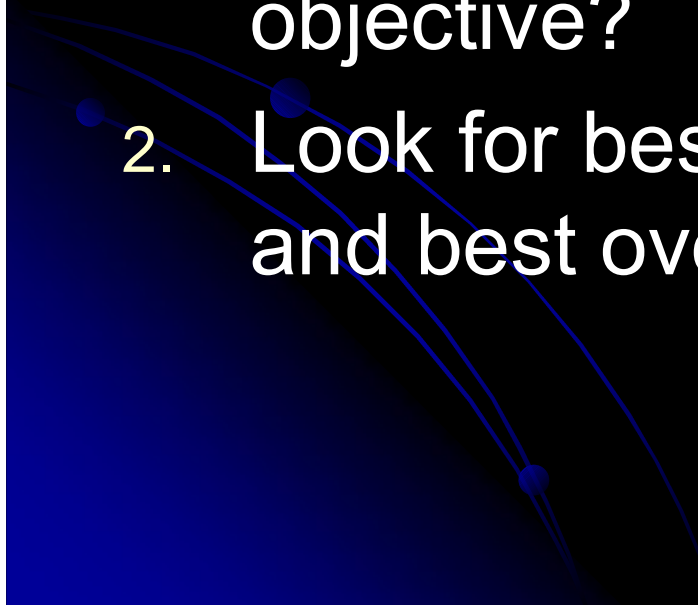
- Compare against the WANTs
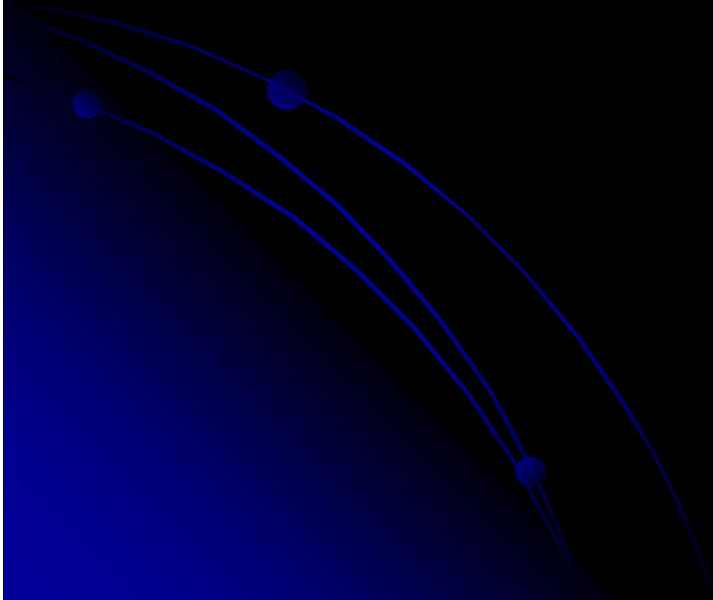
Generate Alternatives

- Expand the number of choices to increase the chances of picking a winner.

- Ask:

- What choices do we have?

- Look at –
1. Decision Statement
2. Key objectives
3. Information sources:
4. Experts, catalogs…

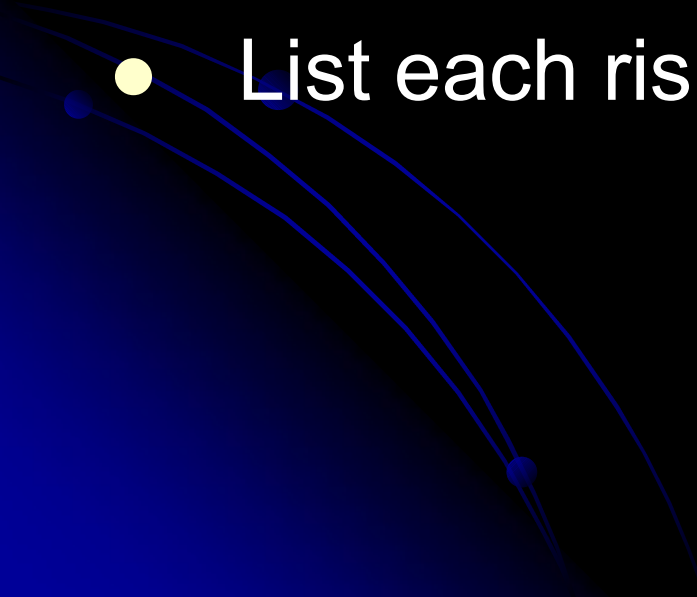- List alternatives without evaluation or discussion

Screen through the must

- Eliminate choices that don't make sense

- Ask:

1. Does this alternatives satisfy this objectives? (Yes or No)

- Mark each go or no GO

- Eliminate any no Go Choices!

Compare against the WANT's

- Compare performance of possible choices

- Ask:

1. How does this alternative satisfy this objective?

2. Look for best against the important wants and best overall

Assess Risk

- Understand what might go wrong if you make a choice

- Ask:

1. If we do this, what could go wrong?

- List each risk you find for the top choices

Make Decision

- Commit to a Choice
- For the best performing alternative ask;
1. Am I willing to accept the risk (s) to gain the benefit for this choice?

- If yes – pick it!
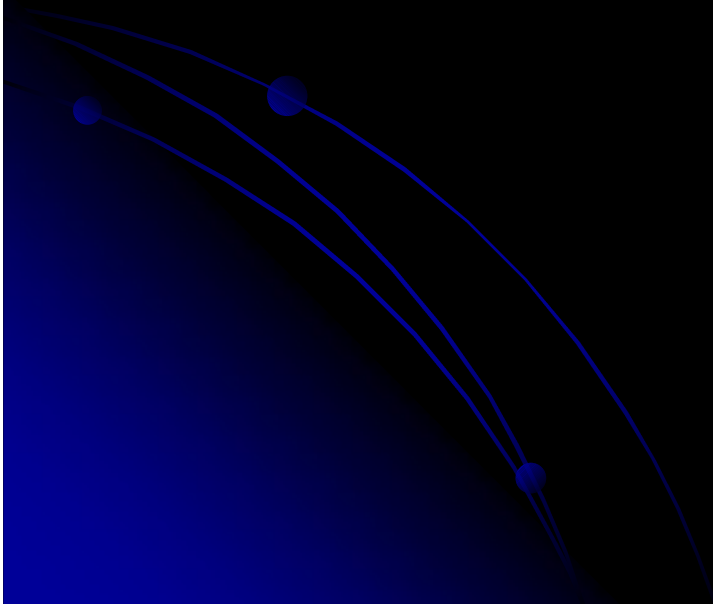- If no – repeat for the next best alternative

Case Study

- Discuss the case study of Fixing the paint Gaps

- Divide the group in two groups. The assigned roles are of:

1. A
2. B

Decision Analysis Refinements

- Level of Decision
- Audit objectives
- Weigh the wants
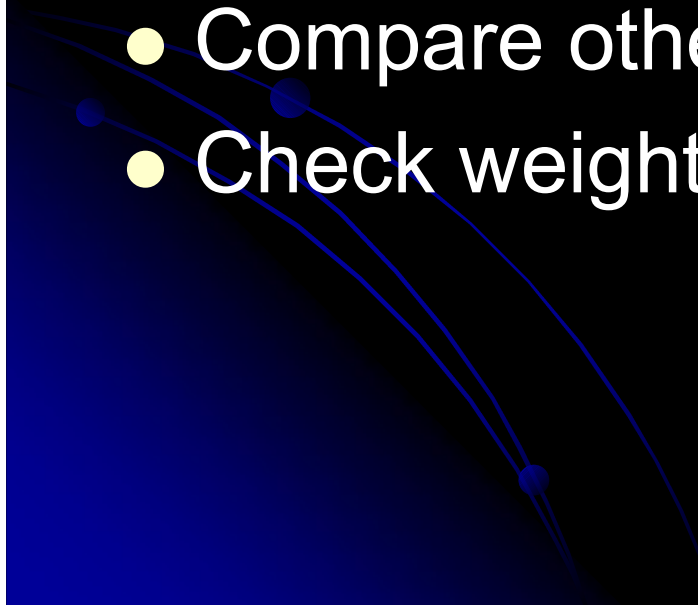- Score against the wants

Level of Decision

- Set type and range of alternatives to be considered

- Be conscious of any prior implied decisions

- Examine each word in your decision statement and ask:

1. What impact does this have on my choice?
2. What happens if we use a different word?
3. What need does this decision address?

Audit objectives

- See if the objective truly represent the decision we want to make

- Ask:

1. How does each objectives relate to the decision statement?

2. Are the objective separated?

3. Are any objective duplicates?

4. Are any objective features of one alternative?

5. Are MUSTs mandatory measurable and realistic?

Weigh the wants

- Show how much each WANT will influence our choice

- Identify the most important WANT

- Give it (them) a 10

- Compare others to it and assign weights

- Check weights by comparing pairs

Score against the WANTs

- Compare performance of possible choices

- Ask:

1. How does this alternative satisfy this objective (with a 10)

2. Multiply objectives weight X Scores

3. Look for best against the important WANTs and best overall

Assess Risks

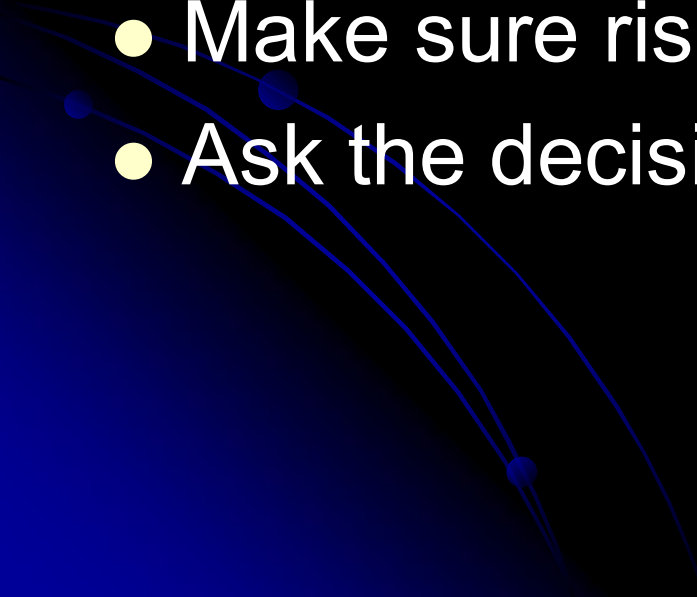- Adverse Consequences
- Assess Threats
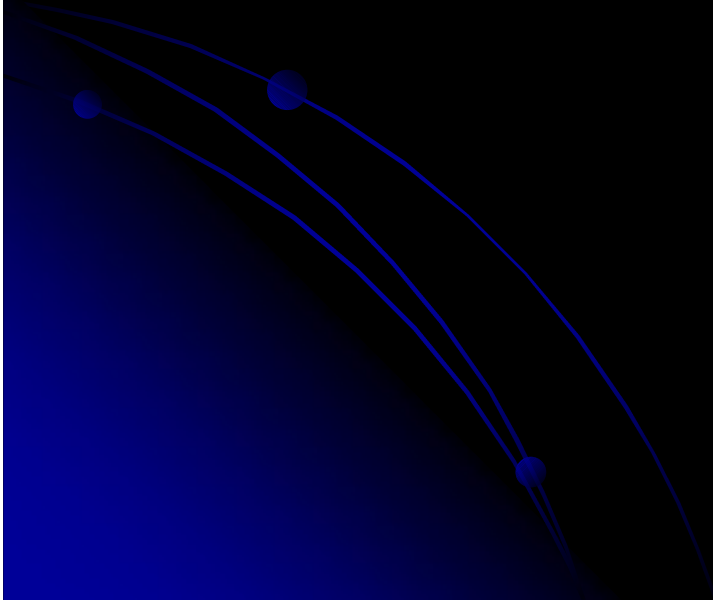
Adverse Consequences

- Understand what might go wrong if you make a choice.

- Ask:

1. If we do this, what could go wrong?

2. Is this alternative close to a MUST limit

3. Is my information for this alternative clear and correct?

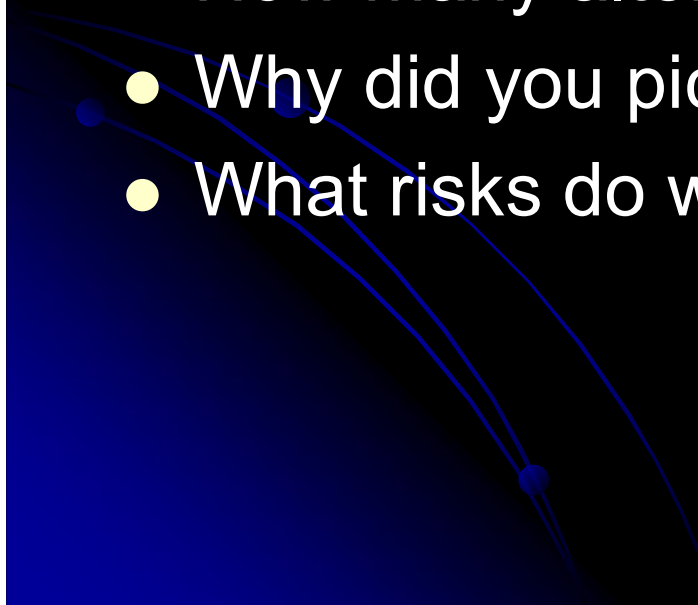- List each risk you find for the top choice

Assess Threat

- Help determine which risks are acceptable

- Ask:

1. How likely is this threat

2. If this happens, what is the impact?

3. Mark each threat H/M/L (High/Medium/ Low) for both probability and seriousness

Presenting Recommendation

- Help others make a best balanced choice
- Use process to make the choice yourself
- Show your choice and your process to the decision maker
- Make sure risks are visible
- Ask the decision maker to choose

Assessing Recommendation

- Improve your confidence in the recommendation
- Ask:
- What were the most important things you considered when you worked on this decision?
- How many alternatives did you look at?
- Why did you pick this one?
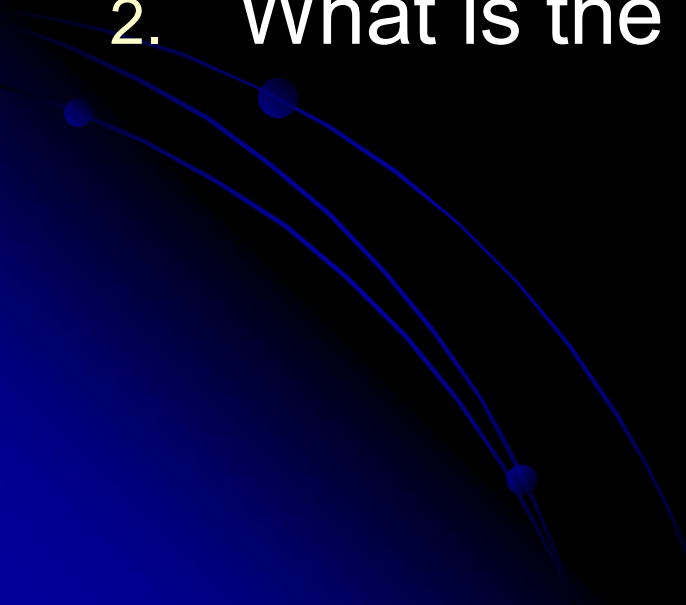- What risks do we face with this alternative?

Things to do

- Get agreement on the decision statement and objective first (ahead of time if possible)
- Describe the most important objectives at the start
- Tell how many alternatives you considered
- Describe how any "Pet" alternatives were considered
- Show why your choice performs well
- Be sure any risk for your choice are understood

Things to Avoid

- Don't hand out the matrix during your presentation
- Don't use K-T jargon that the decision maker doesn't understand
- Don't be too negative about any "pet" alternative
- Don't use vague or doubtful information
- Don't hide risks!

Decision Analysis

- Clarify Purpose

- State Decision

1. What is the purpose of this decision
2. What is the appropriate decision level?

Decision Analysis

- Develop Objectives

1. What short and long term results should be accomplished?
2. What resources can be used or conserved?
3. What restriction influence this choice?
4. What are the objectives related to:

   People, Organisation, Clients, Personal, Equipment, Products/service, Competition, Productivity, Research, Policies, Government, Legal/ regulation, Money, Time, Material, Facilities

- Which objectives need to be clarified by making them more specific?

Decision Analysis

- Classify Objectives into musts and wants

1. Which objectives are mandatory

2. What is the measurable limits for each

3. Which objectives are desirable, but not mandatory?

4. Which must objectives should be reflected in the wants?

- Weigh the Wants

1. What is the relative importance of each want

Evaluate Alternatives

- **Generate Alternatives**

1. What are the different choices available

- **Screen Alternatives through the must**

1. Does this alternative meet each must limit

- **Compare alternatives against the wants**

1. How do the alternatives compare against each want objective?

Assess Risks

- Develop Adverse Consequences
1. What are the implications of being close to a must limit?
2. Where might information about this alternative be invalid? What are the implications?
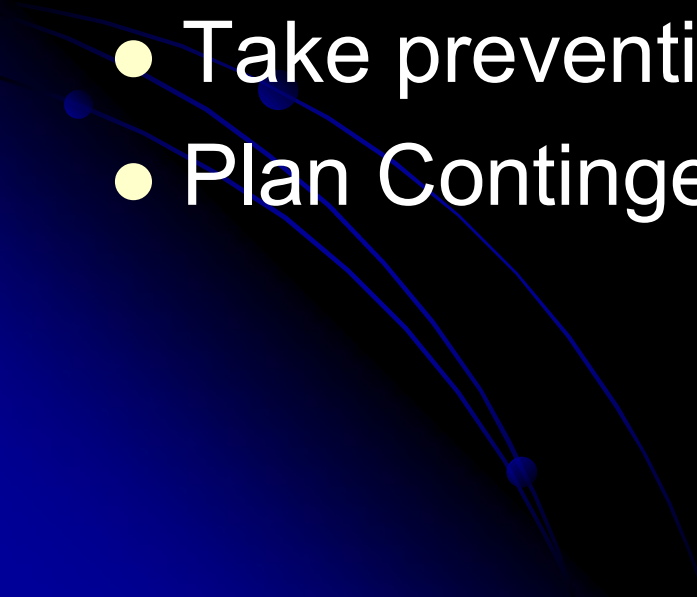3. What could go wrong, short term and long term, if this alternatives were chosen?

- Assess Threat
1. What is the probability that each adverse consequence will occur?
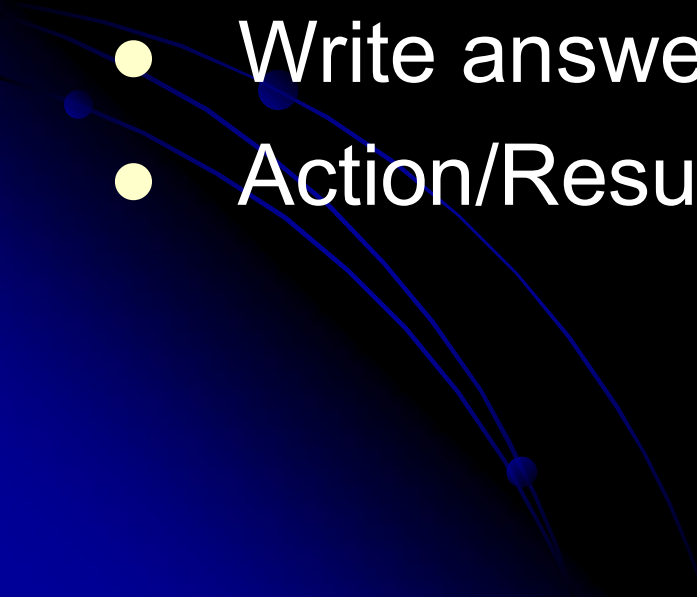2. What will be the seriousness if it does occur?

Make Decision

- Make Best Balanced

1. Which alternatives provides the greatest gain with acceptable risk?
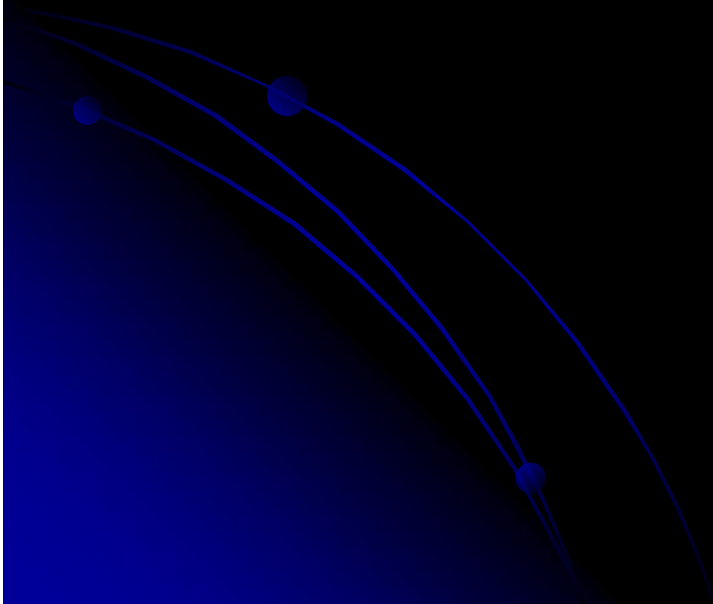
Potential Problem Analysis

- Identify Potential Problem

- State Action

- List potential Problems

- Identify Likely causes

- Take preventive action

- Plan Contingent Action plan & triggers

State Action

- Make what you will do clear & visible
- Ask:
1. What do we need to Do?
2. What Else…?
- Write answer as short statements
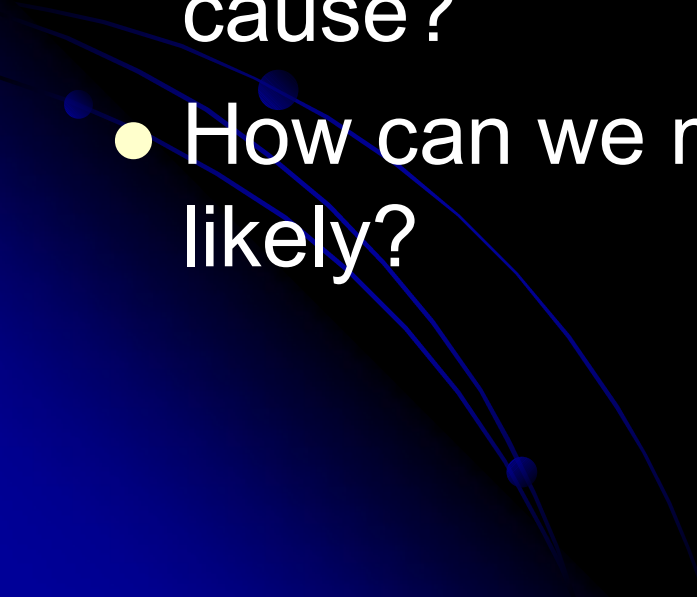- Action/Results/Modifiers

List Potential Problems

- Prepare for future problem
- Ask:
1. If we do this, what could go wrong?
2. What problem Could my fix Cause?
3. List quickly without discussion
4. Be specific – Separate
5. Revise into object/defect form

Identify Likely Causes

- Help prevent or reduce the threat
- Ask:
1. What could cause this potential problem?
2. What else…?
3. List likely causes for each potential problem
4. Use object/defect form

Take Preventive Action

- Try to keep the likely cause from happening

- For each likely cause ask:

- What can we do to prevent this likely cause?

- How can we make this likely cause less likely?

Plan Contingent Action

- Limit the damage if something does go wrong
- For each potential problem ask:
- What will we do if this happens?
- What will minimize the effect if this happens?
- For serious potential problem, consider likely effect first
- Plan contingent action in advance

Set Triggers

- Start a contingent action at the proper time

- Ask:

1. How will we know the potential problem has occurred

2. What will cause the contingent action to start?

- Usually, automatic triggers are preferred

Set Priority

- Seriousness, urgency and growth
- Resolve priority conflict
- Ask:
1. What is the impact…?
2. Which concern is most serious?
3. What is the deadline…?
4. Which concern is most urgent?
5. What if we do nothing…?
6. Which is growing fastest?

Plan Next Steps

- Use the best approach to work on each concern
- Ask:
- Do we have a deviation?
- Is cause unknown?
- Do we need to know cause?
- Do we face a choice?
- Do we have an action or plan to protect?
- Mark Problem "P" Decisions "D" and Action " A"

Plan Involvement

- Identify who does what, when
- Help ensure successful use of process
- Ask:
1. What needs to be done?
2. What does it need to be done?
3. Who should be involved for….
- Approval?
- Information?
- Commitment?
- Training?
- Creativity?
- Implementation?
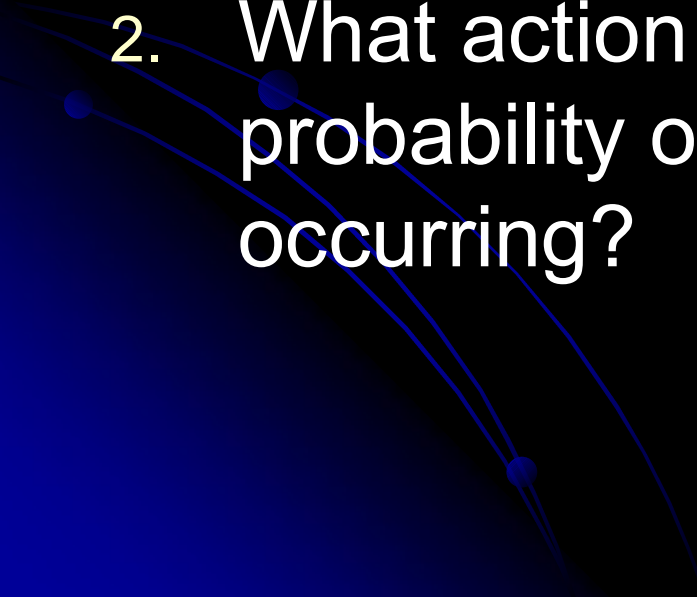
Identify Potential Problems

- State Action:
1. What is the end result to be achieved
- Develop Plan
1. What actions needs to be taken to reach the end result? Which of these are critical
- List Potential problems
1. What could go wrong?
- Assess Threat
1. What is the probability that the potential problem will occur?
2. What will be the seriousness, if it does occur

Identify Likely Causes

- Consider what could cause the Potential Problem

1. What could cause the potential problem to occur? What else?
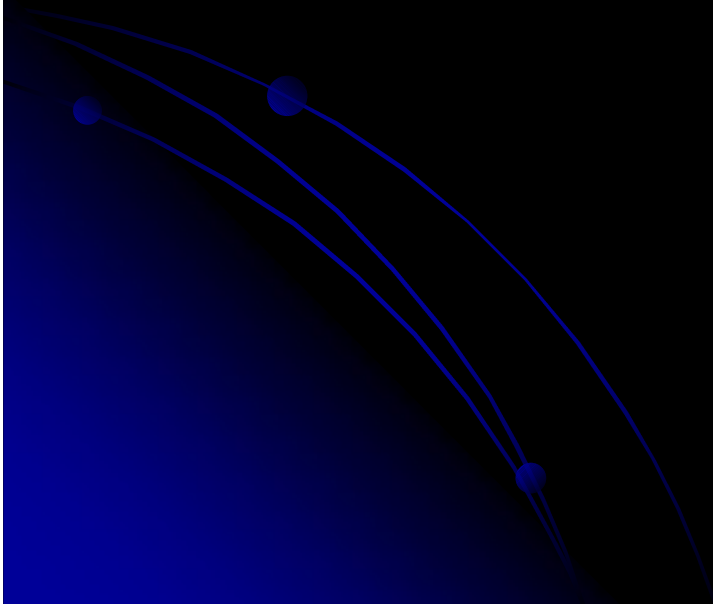
Take Preventive Action

- Develop actins to address likely causes

1. What actions can be taken to address each likely cause?

2. What action can be taken to reduce the probability of the potential problem occurring?

Plan Contingent Action

- Develop Action to reduce likely causes
1. What actions will minimize the effects of the potential problem if it does occur?
2. What action will reduce the seriousness of the potential problem?
- Set triggers for contingent actions
1. What will activate each contingent action?
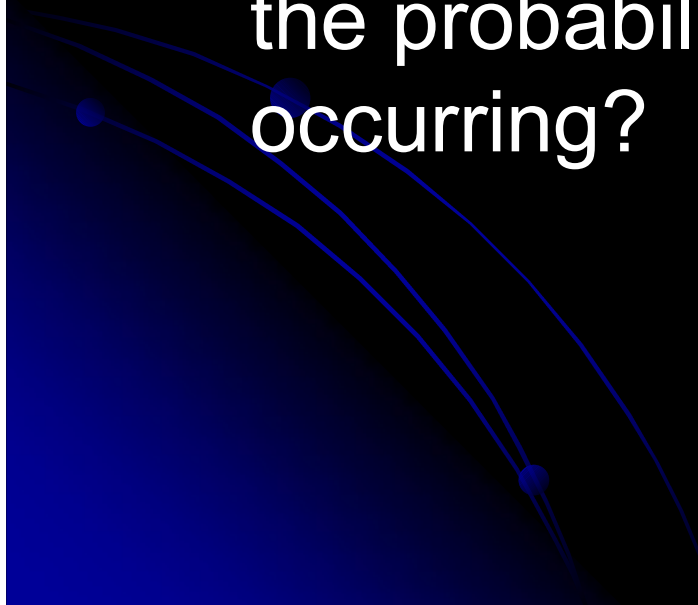
Identify Potential Opportunity

- State Action
1. What is the end results to be achieved/
- Develop Plan
1. What Actions need to be taken to reach the end result? Which of these are critical?
- List Potential opportunity
1. What could go better than expected?
- Assess Threat
1. What is the probability that the potential opportunity will occur?
2. What will be the seriousness, if it does occur

Identify Likely Causes

- Consider What could cause the potential opportunity

1. What could cause the potential opportunity to occur? What else?
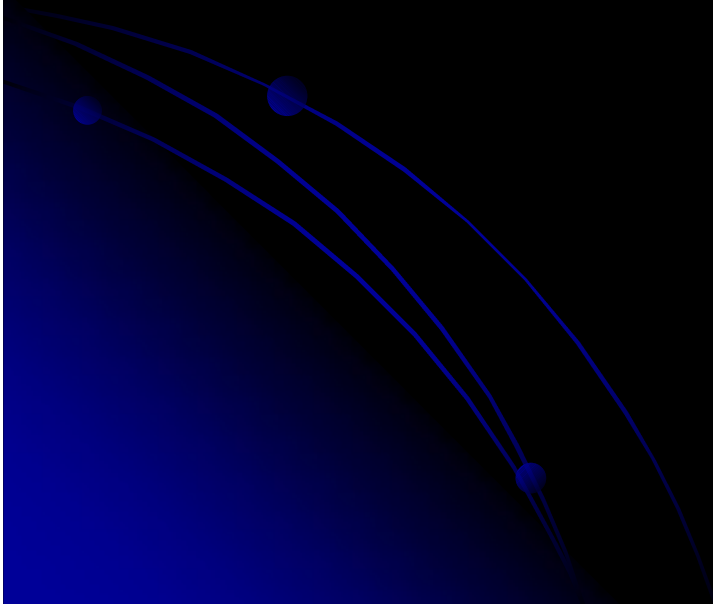
Take Prompt Action

- Develop Actions to address likely causes

1. What actions can be taken to address each likely cause?

2. What actions can be taken to increase the probability of the potential opportunity occurring?

Plan Exploiting Actions

- Develop Action to Enhance likely effects
1. What action will maximize the effects of the potential opportunity
2. What actions will increase the impact of the potential opportunity?
- Set Triggers for Exploiting Actions
1. What will activate each exciting action

Thank you very much