

# **Kepner-Tregoe Methodology**

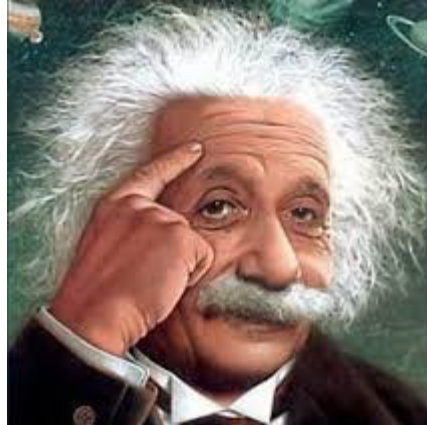
Skorkovský

Department of business economy

Developed by Charles H. Kepner and Benjamin  
B. Tregoe in the 1960s.

The formulation of a problem **is far more essential** than its solution, which may be merely a matter of mathematical or experimental skill”

- Albert Einstein



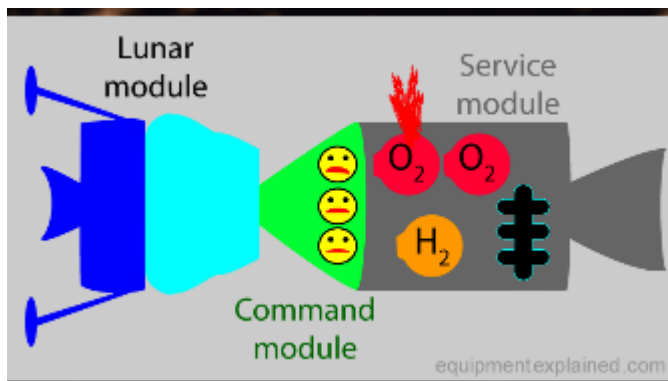
# Apollo 13 – Houston, Houston, do you read me ? We have a big problem....!



The Apollo 13 team is famous for bringing back the astronauts stranded in space by solving difficult and complex problems. The teams solving the problems has used the **Kepner-Tregoe** (KT) methodology !

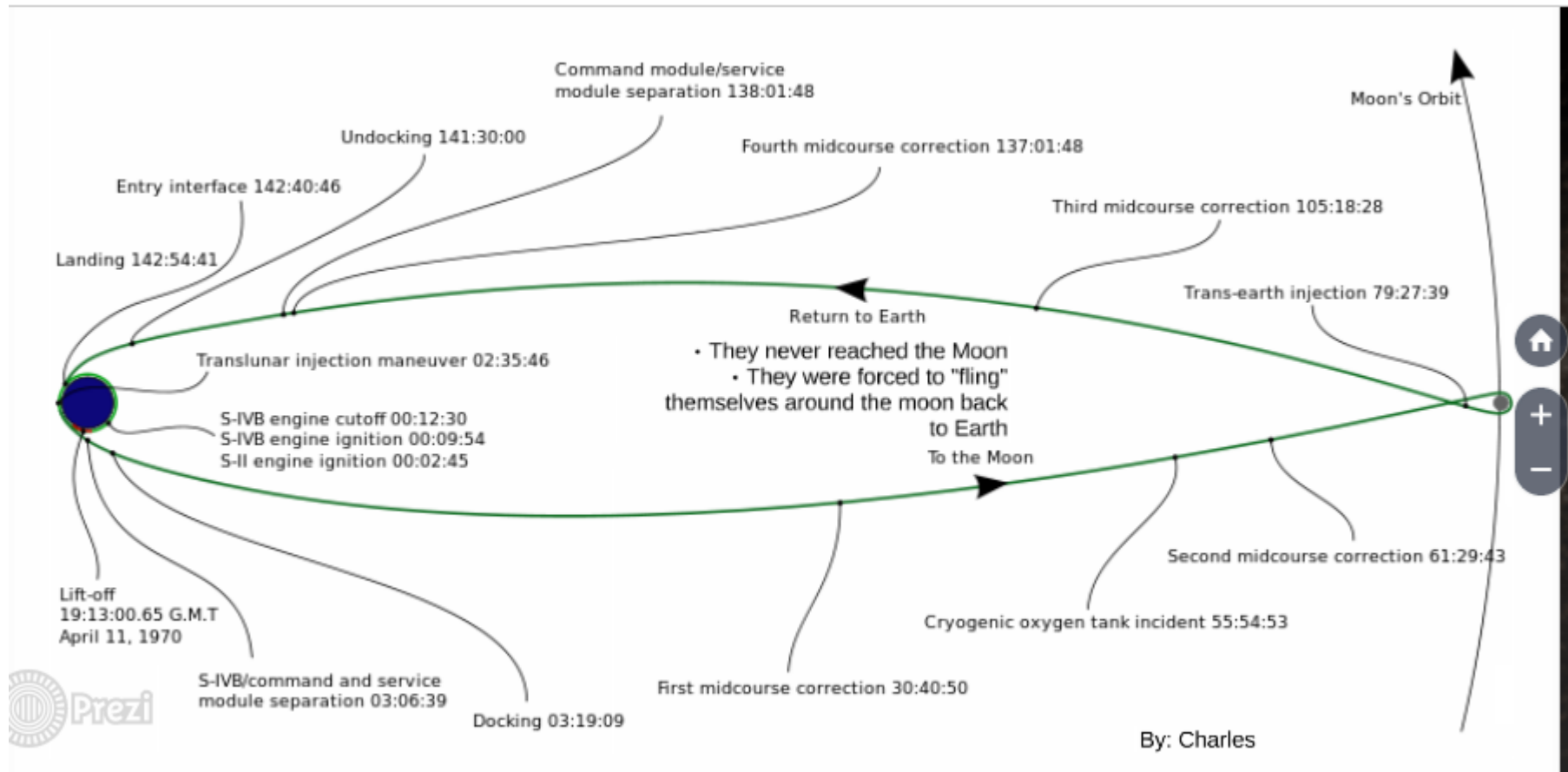
# Apollo 13 – description (problem and solution)

<https://spectrum.ieee.org/tech-history/space-age/apollo-13-we-have-a-solution>



[https://prezi.com/\\_ohiqi4xzcxt/tier-v-problems-and-solutions-on-apollo-13/](https://prezi.com/_ohiqi4xzcxt/tier-v-problems-and-solutions-on-apollo-13/)

# Appolo 13 – description (problem and solution)



# What is it K-T methodology ?

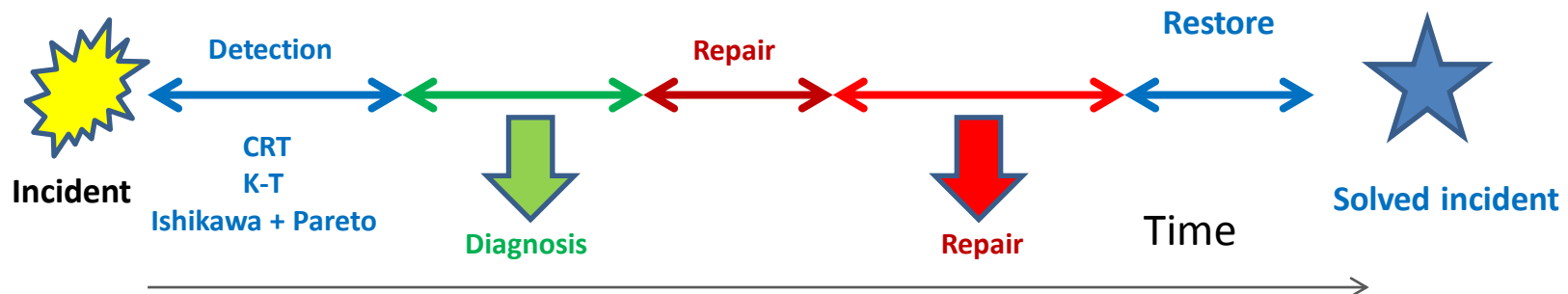
Kepner Tregoe is used for decision making (**finding best possible choice**)

**It is** a structured methodology for **gathering information** and prioritizing and evaluating it.

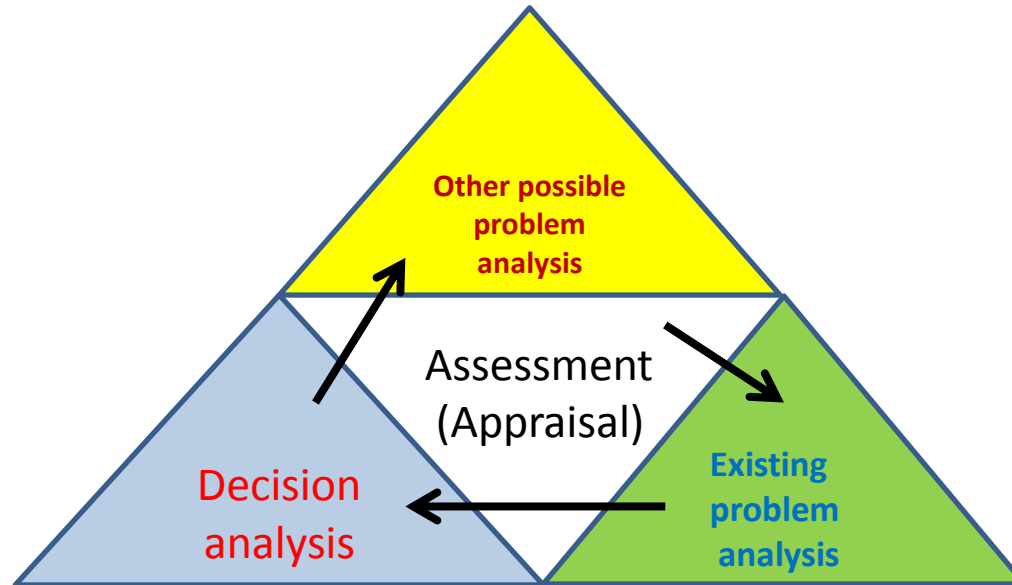
**It is** very detailed and complex method applicable in many areas, which is much broader than just idea selection.

**It is** called also a **root cause analysis** and decision-making method.

**It is** a step-by-step approach for systematically solving problems, making decisions, and analyzing potential risks.

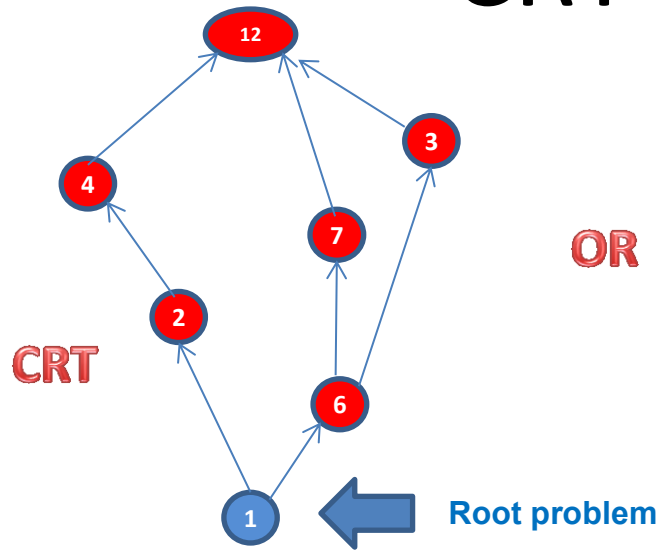


# K-T areas

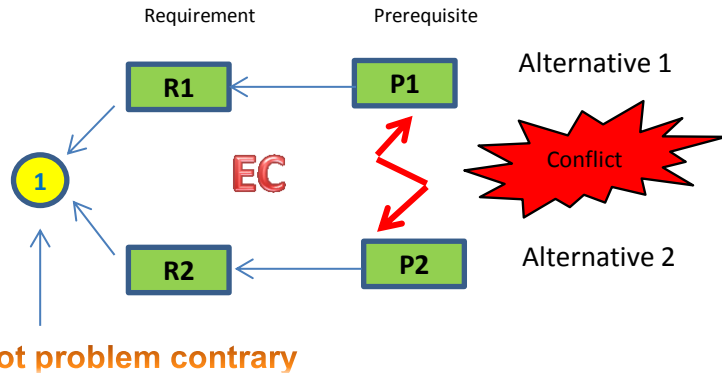
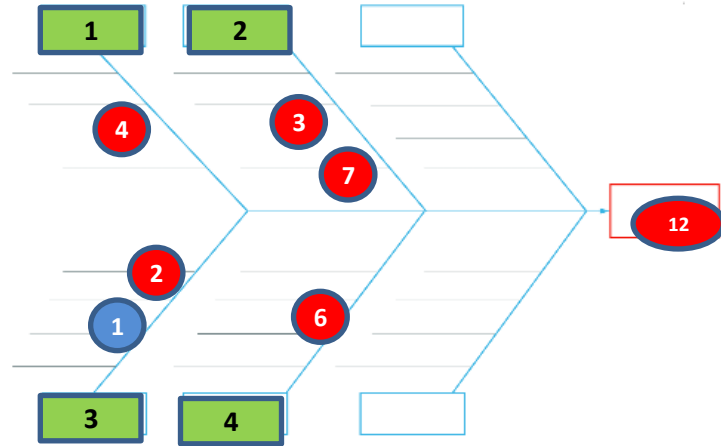


1. Assessment (appraisal) – priorities assigned to current situation
2. **Existing Problem analysis – to find root problem (cause)**
3. **Decision analysis – to select way to react**
4. **Future problem analysis (risk analysis)**

# CRT-Ishikawa



OR



|          | 1   | 2 | 3   | 4   | 6 | 7 |
|----------|-----|---|-----|-----|---|---|
| John     | 8   | 7 | 4   | 3   | 5 | 6 |
| Caroline | 9   | 5 | 7   | 8   | 5 | 6 |
| Mean     | 8,5 | 6 | 5,5 | 5,5 | 5 | 6 |

- 1** = Nature (see, forest, mountains, jungle, river,..)
- 2** = Hotel type
- 3** = Amenities (pool, golf course, wellness,..)
- 4** = Period (spring, summer, fall, winter).

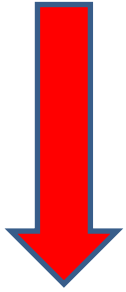
Alternative means how to solve problem and what kind of pay-off you will get




# Access situation (situation appraisal)

- Identify concerns (problems) by listing them (**detection**)
- Separate the level of concern (**importance**, **magnitude** and level of **influence**)
- Set the **priority level** to measure seriousness of impacts (**influence**), urgency and growth potential
- Decide what action to take next (step by step approach)
- Plan for **who** is involved, **what** they will be doing, **where** they will be involved, **when** it happened and the **extent** of involvement (**magnitude**)

# WHO WHAT WHEN WHERE EXTENT



# Make decision *(A choice between two or more alternatives)*

- Identify what is being decided (quality, used methods)
- Establish and classify objectives (main ones, minor ones,..) - *goals*
- Separate the objectives into **must** (*must to have*) and **want** (*nice to have*) categories (we have to assign **importance factors** from 1-10, where 10 is the most important **want** objective) and assign criterion rating (weights)
- Generate the alternatives (*we can do it that way or we can take another way as well*)
- Evaluate the alternatives by scoring the **wants** against the main objective – *see next slides* 
- Review adverse (harmful) consequences of your corrective steps (risk evaluation, risk assessment)
- Make the best possible choice **what to do**

# Criteria rating

| "Must" Criteria           |             | Car 1            |                    | Car 2            |                    | Car 3            |                    | Car 4 |
|---------------------------|-------------|------------------|--------------------|------------------|--------------------|------------------|--------------------|-------|
| Cost under \$9,000        |             | Yes              |                    | Yes              |                    | Yes              |                    | Yes   |
| Available within one week |             | Yes              |                    | Yes              |                    | Yes              |                    | No    |
|                           |             | Car 1            |                    | Car 2            |                    | Car 3            |                    |       |
| "Want" Criteria           | Importance* | Criterion rating | Weighted score     | Criterion rating | Weighted score     | Criterion rating | Weighted score     |       |
| Good gas mileage          | 7           | 5                | $7 \times 5 = 35$  | 6                | $7 \times 6 = 42$  | 8                | $7 \times 8 = 56$  |       |
| Sporty                    | 8           | 5                | $8 \times 5 = 40$  | 7                | $8 \times 7 = 56$  | 4                | $8 \times 4 = 32$  |       |
| Color (blue)              | 3           | 10               | $3 \times 10 = 30$ | 0                | $3 \times 0 = 0$   | 0                | $3 \times 0 = 0$   |       |
| AM/FM stereo              | 5           | 7                | $5 \times 7 = 35$  | 8                | $5 \times 8 = 40$  | 3                | $5 \times 3 = 15$  |       |
| Good condition            | 10          | 5                | $10 \times 5 = 50$ | 6                | $10 \times 6 = 60$ | 8                | $10 \times 8 = 80$ |       |
| Low mileage               | 6           | 6                | $6 \times 6 = 36$  | 4                | $6 \times 4 = 24$  | 5                | $6 \times 5 = 30$  |       |
| Relatively new            | 7           | 3                | $7 \times 3 = 21$  | 5                | $7 \times 5 = 35$  | 5                | $7 \times 5 = 35$  |       |
| TOTAL WEIGHTED SCORE (WS) |             |                  | 247                |                  |                    | 257              | 248                |       |

See similar example on the next slide

Importance can be understood as a Satisfaction score, meaning desirable but not essential.

Criteria rating is related to want criteria and every car property

# Which car to buy ?

| <b>MUSTS</b>   | <b>A</b> | <b>B</b> | <b>C</b> | <b>D</b> |
|----------------|----------|----------|----------|----------|
| Power Brakes   | GO       | GO       | GO       | GO       |
| Power Steering | GO       | GO       | GO       | GO       |
| AM/FM Stereo   | GO       | GO       | NO GO    | GO       |
| Automatic      | GO       | GO       | NO GO    | GO       |
| Under \$15,000 | GO       | GO       | GO       | GO       |

| <b>WANTS</b>    | Weight | Score | W x S      | Score | W x S      | Score | W x S | Score | W x S      |
|-----------------|--------|-------|------------|-------|------------|-------|-------|-------|------------|
| AirCon          | 10     | 10    | 100        | 0     | 0          |       |       | 10    | 100        |
| Cassette        | 7      | 6     | 42         | 10    | 70         |       |       | 10    | 70         |
| Antilock Brakes | 9      | 0     | 0          | 10    | 90         |       |       | 0     | 0          |
| Air Bag         | 8      | 5     | 40         | 10    | 80         |       |       | 5     | 40         |
| Rear Demist     | 6      | 10    | 60         | 0     | 0          |       |       | 0     | 0          |
| Engine Size     | 6      | 8     | 48         | 6     | 36         |       |       | 10    | 60         |
| Central Lock    | 5      | 5     | 25         | 10    | 50         |       |       | 5     | 25         |
| Metal Paint     | 4      | 0     | 0          | 10    | 40         |       |       | 10    | 40         |
| Warranty        | 8      | 10    | 80         | 7     | 56         |       |       | 3     | 24         |
| Resale Value    | 7      | 7     | 49         | 7     | 49         |       |       | 4     | 28         |
| <b>TOTALS</b>   |        |       | <b>444</b> |       | <b>471</b> |       |       |       | <b>387</b> |

Criterion rating

Importance score, meaning desirable but not essential.

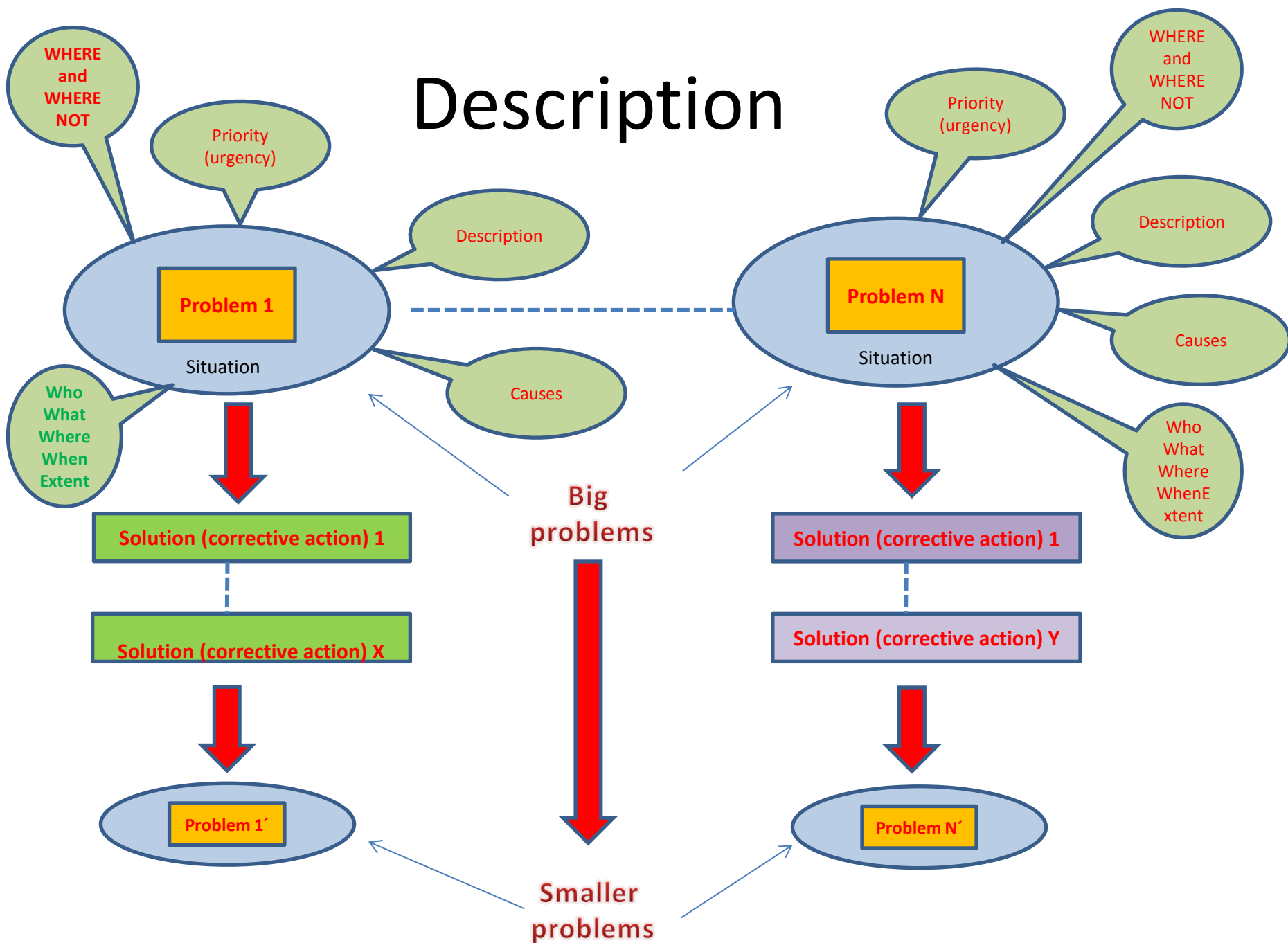
go to slide 38 and then jump back

# Uncover and handle problems

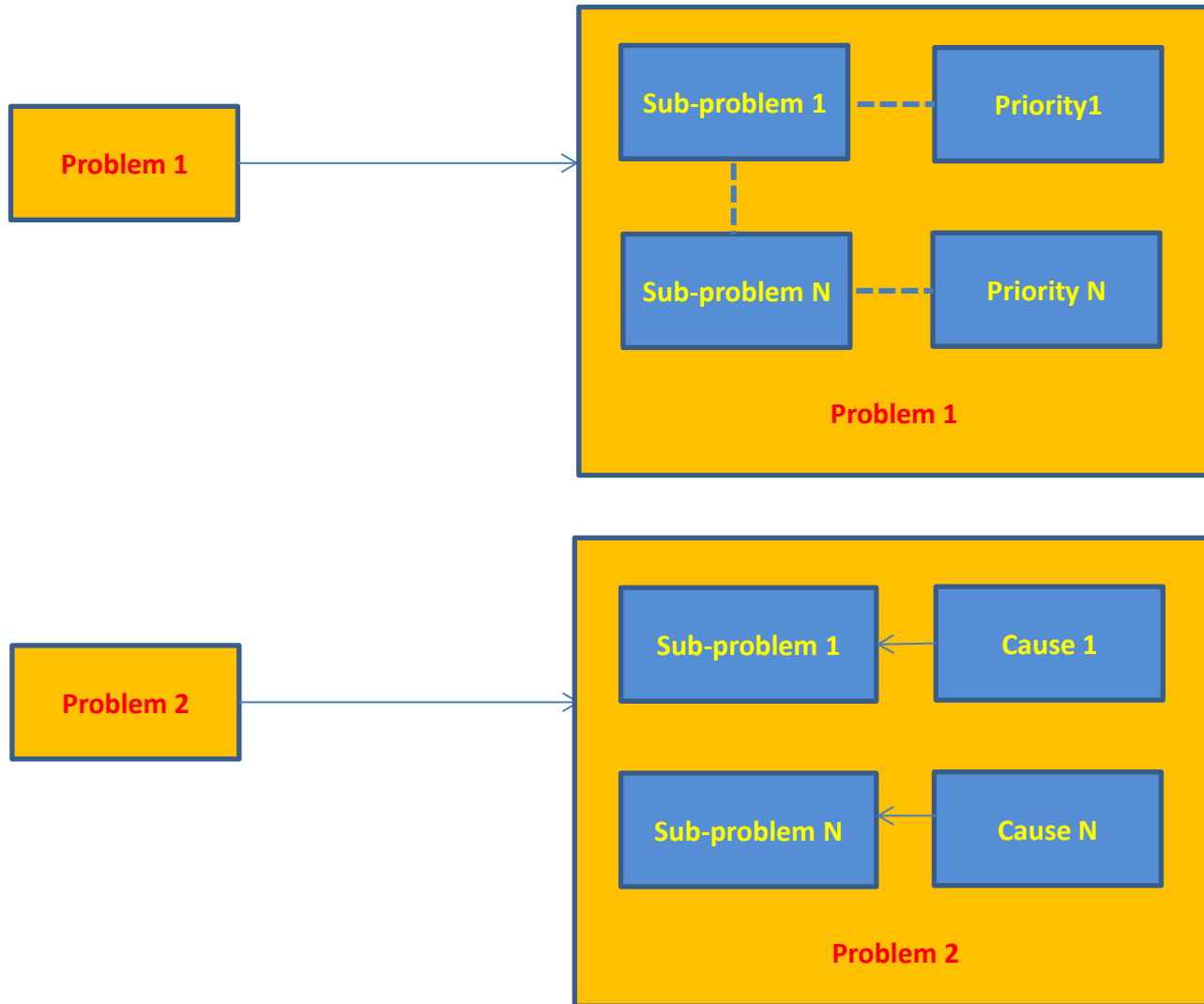
(problem analysis)

- State the problem (definition and description of the problem)
- Specify the problem by asking **what is** and **what is not (who is and who is not...)**
- Develop possible causes of the problem (similar to CRT or Ishikawa) -detection
- Test and verify possible causes
- Determine the most probable cause (**root cause**)
- Verify any assumptions
- Try the best possible solution and monitor what will be a situation after applied correctives step

# Description



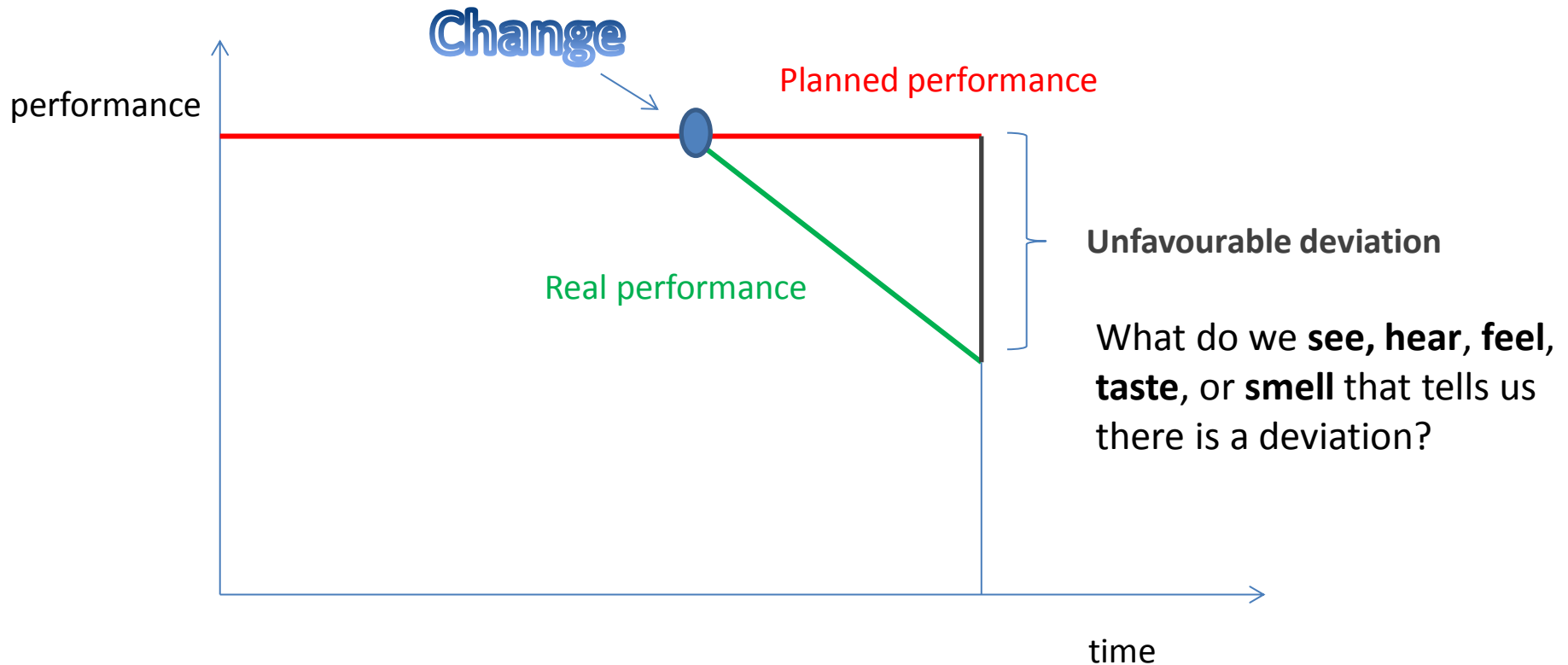
# Decomposition, priorities and causes





# Example of problem manifestation

(decrease of performance)



Final effect of the **Change** = PROBLEM (e.g. server crashed, hard disk with database crashed)

Then we have to ask : Who, What, Where, When, and to what Extent –Size (how much, how many)?

# Server crashed !!!! (home study !!!)

- Server crashed (this is a very poor problem definition)
- The e-mail system crashed after the 3rd shift support engineer applied hot-fix XYZ to Exchange Server 123 (better definition of the problem)
- Comment : WHO is not mentioned here but could be Different staff (3 shift) –see table

|        | IS                   | COULD BE but IS NOT                     | DIFFERENCES | CHANGES |
|--------|----------------------|---|-------------|---------|
| WHAT   | System failure       | Similar systems/situations not failed   | ?           | ?       |
| WHERE  | Failure location     | Other locations that did not fail       | ?           | ?       |
| WHEN   | Failure time         | Other times where failure did not occur | ?           | ?       |
| EXTENT | Other failed systems | Other systems without failure           | ?           | ?       |



|        | IS  | COULD BE but IS NOT                          | DIFFERENCES                                      | CHANGES   |
|--------|---|--|--|---|
| WHAT   | Exchange Server 123 crashed upon application of hot-fix XYZ | Other Exchange Servers getting hot-fix XYZ   | Different staff (3rd shift) applied this hot-fix | New patch procedure from vendor                       |
| WHERE  | 3rd floor production room without vendor/contractor support | Anywhere else with vendor/contractor support | Normally done by vendor                          | New procedure, first time 3rd shift applies hot-fixes |
| WHEN   | Last night, 1:35am  | Any other time or location                   | None noted                                       |   |
| EXTENT | Any Exchange Server on 3rd floor                            | Other servers                                |  |   |

History (and best practice) says that the root cause of the problem is probably due to some **recent change**. **WHAT, WHERE, WHEN and EXTENT will be shown on next slides**

# Test the Most Probable Cause (home study !!!)

Clarifying problem Analysis (example)

| Potential root cause:                           | True if:                                  | Probable root cause? |
|---|---|----------------------|
| Exchange Server 123 has something wrong with it | Only Exchange Server 123 has this problem | Maybe                |
| Procedure incorrect                             | Same procedure crashes another server     | Probably             |
| Technician error                                | Problem did not always reoccur            | Probably not         |

We have to ask (where Qi =QUESTION i) :

| Question                  | IS | IS NOT |
|---------------------------|----|--------|
| <i>What (identify)</i>    | Q1 | Q2     |
| <i>Where (locate)</i>     | Q3 | Q4     |
| <i>When (timing)</i>      | Q5 | Q6     |
| <i>Extent (magnitude)</i> | Q7 | Q8     |



# Problem Analysis - What

## Is

- What specific object(s) has the deviation?
- What is the specific deviation?

### Example for Is :

1. What specific **object IS** related to the defect?  
Inventory Valuation Objects in **database A**
  2. What specifically is the defect (deviation)?  
Inventory Adjustment does not work
- 1-> see setup of the database and see differences  
2-> see algorithm used for calculation and parameters used.  
You can see, that in production calculation related algorithm is not functional

## Is Not

- What similar object(s) could have the deviation, **but does not? (It did not happen)**
- What other deviations could be reasonably observed, **but are not? (It did not happen)**

### Example for Is Not :

1. What specific **object IS NOT** related to the defect?  
Inventory Valuation Objects in **database B**
  2. What specifically is not the defect (deviation)?  
Adjustment is working – good setup in **database B**
- 1 -> Setup has another parameters **ON**  
2-> Algorithm is used also for production where not error occurs

# See two MS Dynamics Setup screens (related to the problem specified recently)

Inventory Setup

General Location Dimensions Numbering

Automatic Cost Posting .

Expected Cost Posting...

Automatic Cost Adjust... **Never** ▼

Average Cost Calc. Type Item ▼

Average Cost Period . . Day ▼

Copy Comments Order...

Copy Comments Order...

Outbound Whse. Han...

Inbound Whse. Handli...

Help

Inventory Setup

General Location Dimensions Numbering

Automatic Cost Posting .

Expected Cost Posting...

Automatic Cost Adjust... **Always** ▼

Average Cost Calc. Type Item ▼

Average Cost Period . . Day ▼

Copy Comments Order...

Copy Comments Order...

Outbound Whse. Han...

Inbound Whse. Handli...

Help

# Back to vampires : Problem Analysis - **What**

## Is

- **What** specific object(s) has the deviation?



- **What** is the specific deviation? - **bites on the neck**

Example for **Is** :

1. Nice young girl's neck and strange look of anemic person



## Is Not

- What similar object(s) could have the deviation, **but does not? (It did not happen)**



**What** could the specific deviation? **but does not? (It did not happen) – bites, anemia**

Example of **Is Not** :

1. Girl with garlic in her hands
2. No bites
3. Healthy

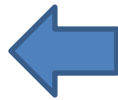


# Example for **What IS** and **What IS NOT**

Customer **X** and Customer **Y** both use product B but only to customer X was sent the wrong product so the object **IS** Customer **X**, but **IS NOT** Customer **Y**



Customer X



Product B



Customer Y

# Problem Analysis - **When**

## Is

- **When** was the deviation observed first (clock and calendar time)?
- **When** since that time has the deviation been observed?
- **When**, in the object's history or life cycle, was the deviation observed first?

## Is Not

- **When else** could the deviation have been observed first, **but was not?**
- **When else** since that time could the deviation have been observed, **but was not?**
- **When else**, in the object's history or life cycle, could the deviation have been observed first, **but was not?**

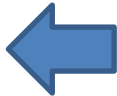
See example next slide





# Example for **When** and **IS** and **IS NOT**

Customer X and Customer Y both use product B but only customer X was sent the wrong product if Salesman Tony was on holiday in this time and Saleswomen Linda was in charge, so the object **IS** Saleswomen Linda , but **IS NOT** Salesman Tony



Linda

Tony

# Another example for **What IS** and **What IS NOT** as well as **Where IS** and **Where IS NOT**

**IS** girl Sarah visited Dracula lower castle without a bunch of garlic, but **IS NOT** not the one (Emily) having bunch of garlic and visiting Špilberk castle in Brno



Dracula Castle  
(Where IS)

Špilberk Brno  
(Where IS NOT)



Sarah  
(What IS)



Emily  
(What IS NOT)

# Problem Analysis - **Where**

## **Is**

- Where is the object when the deviation is observed? (geographically)
- Where is the deviation on the object?

Example for **Is** :

1. Old castle in the mountains (Romania)

**Where IS** : Romanian Carpathian mountains where **it is** very easy to meet a lot of vampires there

## **Is Not**

- Where else could the object be when the deviation is observed, **but is not?**
- Where else could the deviation be located on the object, **but is not?**

Example for **Is Not**

1. Brno castle Špilberk

Where **IS NOT** possible to meet vampires (only lovers and children and seniors)

# Problem Analysis - Extent

## Is

- How many objects have the deviation?
- What is the size of a single deviation?
- How many deviations are on each object?
- What is the trend?
  - Occurrences?
  - Size?

## Is Not

- How many objects could have the deviation, **but don't?**
- What other size could a deviation be, **but isn't?**
- How many deviations could there be on each object, *but are not?*
- What could be the trend, **but isn't?**
  - Occurrences?
  - Size?

# Problem Analysis

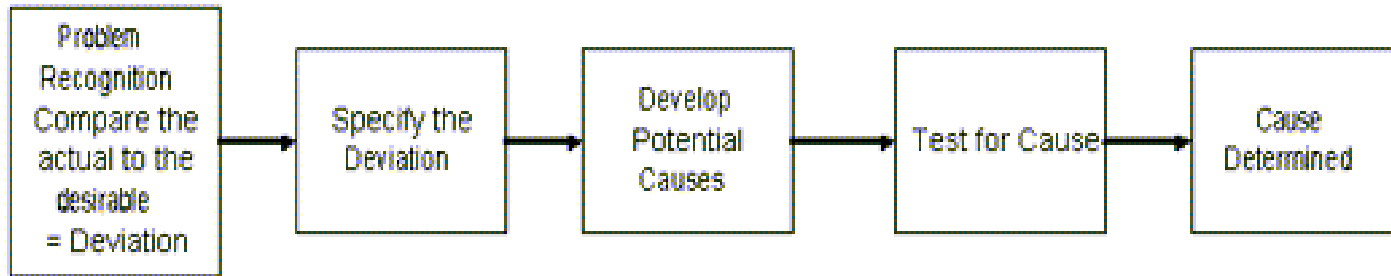
## Confirm True Cause

- What can be done to verify any assumptions made?
- How can this cause be observed at work?
- How can we demonstrate the cause-and-effect relationship (e.g. Current Reality Tree or Ishikawa Fishbone Diagram)?
- When corrective action is taken, how will results be checked?

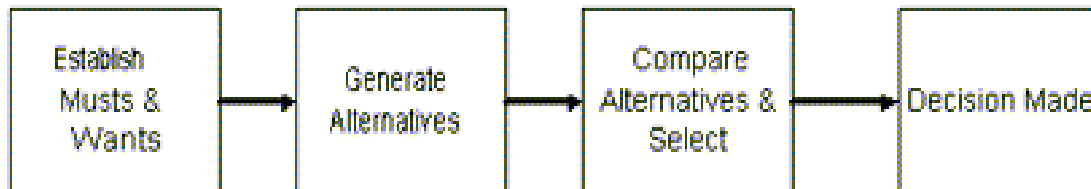
Let's Look At Some Problems!

# Systematic Problem Solving and Decision making Overview

## Problem Definition Process



## Decision Making Process



# Planning the Next Steps

- Problem Analysis
  - Do we have a deviation?
  - Is the cause unknown?
  - Is it important to know the cause to take effective action?
- If the answer is **YES** to **ALL** three listed problems above, than you have a big problem, Huston !!!



# Problem analysis table template

## (Home study)

|        |            | <b>IS</b>                             | <b>IS NOT</b>                             | <b>Distinction</b>                              | <b>Cause</b>            |
|--------|------------|---------------------------------------|---|---|-------------------------|
| What   | Identify:  | What is problem?                      | What is not problem?                      | What difference between is and is not?          | What is possible cause? |
| Where  | Locate:    | Where is problem found?               | Where is problem not found?               | What difference in locations?                   | What cause?             |
| When   | Timing:    | When does problem occur?              | When does problem not occur?              | What difference in timing?                      | What cause?             |
|        |            | When was it first observed?           | When was it last observed?                | What difference between 1 <sup>st</sup> , last? | What cause?             |
| Extent | Magnitude: | How far does problem extend?          | How localized is problem?                 | What is the distinction?                        | What cause?             |
|        |            | How many units are affected?          | How many not affected?                    | What is the distinction?                        | What cause?             |
|        |            | How much of any one unit is affected? | How much of any one unit is not affected? | What is the distinction?                        | What cause?             |

# Problem description (example)

On a new model of airplane, flight attendants develop rash on arms, hands, face (only those places). It only occurs on flights over water.

Usually disappears after 24 hours. No problems on old planes over those routes.

Does not affect all attendants on these flights, but same number of attendants get it on each flight. Those who get rash have no other ill effects.

No measurable chemicals, etc., in cabin air.

Rash arm ->



# Results ????



# Problem analysis real table

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|         | <b>IS</b>            | <b>IS NOT</b>     | <b>DISTINCTION</b>                        |
|---------|----------------------|-------------------|---|
| WHAT:   | Rash                 | Other illness     | External contact                          |
| WHEN:   | New planes used      | Old planes used   | Different materials                       |
| WHERE:  | Flights over water   | Flights over land | Different crew procedures                 |
| EXTENT: | Face, hands, arms    | Other parts       | Something contacting face, hands and arms |
|         | Only some attendants | All attendants    | Crew duties                               |

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**Distinction=Difference**

# Example of analysis

|                        | <b>Is the problem?</b>   | <b>Is as expected?</b>                                       | <b>The point of change</b>  |
|------------------------|--|--|---|
| <b>What</b>            | Weak penalty shooting  | Performance during the match                                 | Difference in penalty shoot-out tactics                           |
| <b>Who</b>             | Two out of the five England players  | German players   | The way some players struck the ball                              |
| <b>When</b>            | After 120 minutes of football  | During the match   | Penalty shoot-out took place after a long and tiring match        |
| <b>Where</b>           | At the points easily reached by the goalkeeper<br>Above the bar  | At the positions near the posts, inside the goal (E2 and E3) | Ball easily caught by the goalkeeper or ended up outside the goal |
| <b>How significant</b> | Two failures out of five attempts  | The German team did not miss out of four attempts            | Very significant  |
| <b>Possible causes</b> | <ol style="list-style-type: none"> <li>1 Some players not following rule 1</li> <li>2 Certain players are incapable of shooting the ball at the right spot</li> <li>3 Some players are affected psychologically by the presence of the goalkeeper and have forgotten about rule 2</li> <li>4 Lack of proper training based on rules 1 and 2</li> </ol> |  |   |

# Thanks for Your attention



# Step 1 and Step 2

**Step 1 Problem:** Pick a replacement vehicle for the motor pool fleet

The definition of the problem dictates the requirements. As the vehicle is for a motor pool, the requirements will differ from those for a family car, for example.

**Step 2 Requirements:**

1. Vehicle shall be made in **U. S. A.**
2. Vehicle shall seat at least **four adults**, but no more than **six adults**
3. Vehicle shall cost no more than **\$28,000**
4. Vehicle shall be **new and the current model year**



Min



Max



Max 28000 USD

New car  
(current model)



interweb.in



# Step 3 and Step 4

## Step 3 Goals:

- Maximize passenger comfort
- Maximize passenger safety
- Maximize fuel-efficiency
- Maximize reliability of the car
- Minimize investment cost

## Step 4 Alternatives:

There are many alternatives but the requirements eliminate the consideration of a number of them:

Requirement 1 eliminates the products not manufactured in the USA

Requirement 2 eliminates vans, buses, and sports cars (Ferrari no !!!!)

Requirement 3 eliminates high-end luxury cars

Requirement 4 eliminates used vehicles

# Step 5

## Step 5 Criteria:

“Maximize comfort” will be based on the combined rear seat leg and shoulder room. (Note: front seat passenger leg and shoulder room was found to be too nearly the same to discriminate among the alternatives.) **5**

“Maximize safety” will be based on the total number of stars awarded by the National Highway Traffic Safety Administration for head-on and side impact. **10**

“Maximize fuel efficiency” will be based on the EPA fuel consumption for city driving. **7**

“Maximize reliability” will be based on the reliability rating given each vehicle by a consumer product testing company. **9**

“Minimize Cost” will be based on the purchase price. **10**

**Weighted criteria vector  $C(5,10,7,9,10)$  are values assigned by decision makers !!!!**

# Kepner-Tregoe table

(for 4 cars : Arrow, Baton, Carefree and Dash)

| Criteria/<br>Want objectives | Criteria<br>Weight | <i>Arrow</i>                                    | Alter-<br>native<br>Score | Total Score |
|------------------------------|--------------------|---|---------------------------|-------------|
| Comfort                      | 5                  | 86 in. rear seat leg and shoulder room, seats 5 | 6                         | 30          |
| Safety                       | 10                 | 14 stars  | 5                         | 50          |
| Fuel efficiency              | 7                  | 21 mpg  | 9                         | 63          |
| Reliability                  | 9                  | 80  | 9                         | 81          |
| Cost                         | 10                 | \$26,000  | 5                         | 50          |
|                              |                    | <b>Total</b>                                    |                           | <b>274</b>  |
|                              |                    | <i>Baton</i>                                    |                           |             |
| Comfort                      | 5                  | 88 in. rear seat leg and shoulder room, seats 6 | 9                         | 45          |
| Safety                       | 10                 | 17 stars  | 8                         | 80          |
| Fuel efficiency              | 7                  | 19 mpg  | 8                         | 56          |
| Reliability                  | 9                  | 70  | 7                         | 63          |
| Cost                         | 10                 | \$21,000  | 8                         | 80          |
|                              |                    | <b>Total</b>                                    |                           | <b>324</b>  |
|                              |                    | <i>Carefree</i>                                 |                           |             |
| Comfort                      | 5                  | 80 in. rear seat leg and shoulder room, seats 5 | 4                         | 20          |
| Safety                       | 10                 | 15 stars  | 6                         | 60          |
| Fuel efficiency              | 7                  | 22 mpg  | 10                        | 70          |
| Reliability                  | 9                  | 65  | 5                         | 45          |
| Cost                         | 10                 | \$17,000  | 10                        | 100         |
|                              |                    | <b>Total</b>                                    |                           | <b>295</b>  |
|                              |                    | <i>Dash</i>                                     |                           |             |
| Comfort                      | 5                  | 89 in rear seat leg and shoulder room, seats 6  | 10                        | 50          |
| Safety                       | 10                 | 19 stars  | 10                        | 100         |
| Fuel efficiency              | 7                  | 21 mpg  | 9                         | 63          |
| Reliability                  | 9                  | 85  | 10                        | 90          |
| Cost                         | 10                 | \$24,000  | 6                         | 60          |
|                              |                    | <b>Total</b>                                    |                           | <b>363</b>  |

# Last step – Validation (check)

## Last Step Validate Solution:

The totals of the weighted scores show that the **Dash** most nearly meets the wants/goals (or put another way, has the most “benefits”). Dash meets all the requirements and solves the problem !!!



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# Thanks for Your attention

