Theory Of Constraints

A chain is no stronger than its weakest link

Objectives of this session

1 understand the definition of constraint

2 Steps involved in application of TOC

3 TOC Thinking process tools

4 Case Study : Lovely Pet Bottles
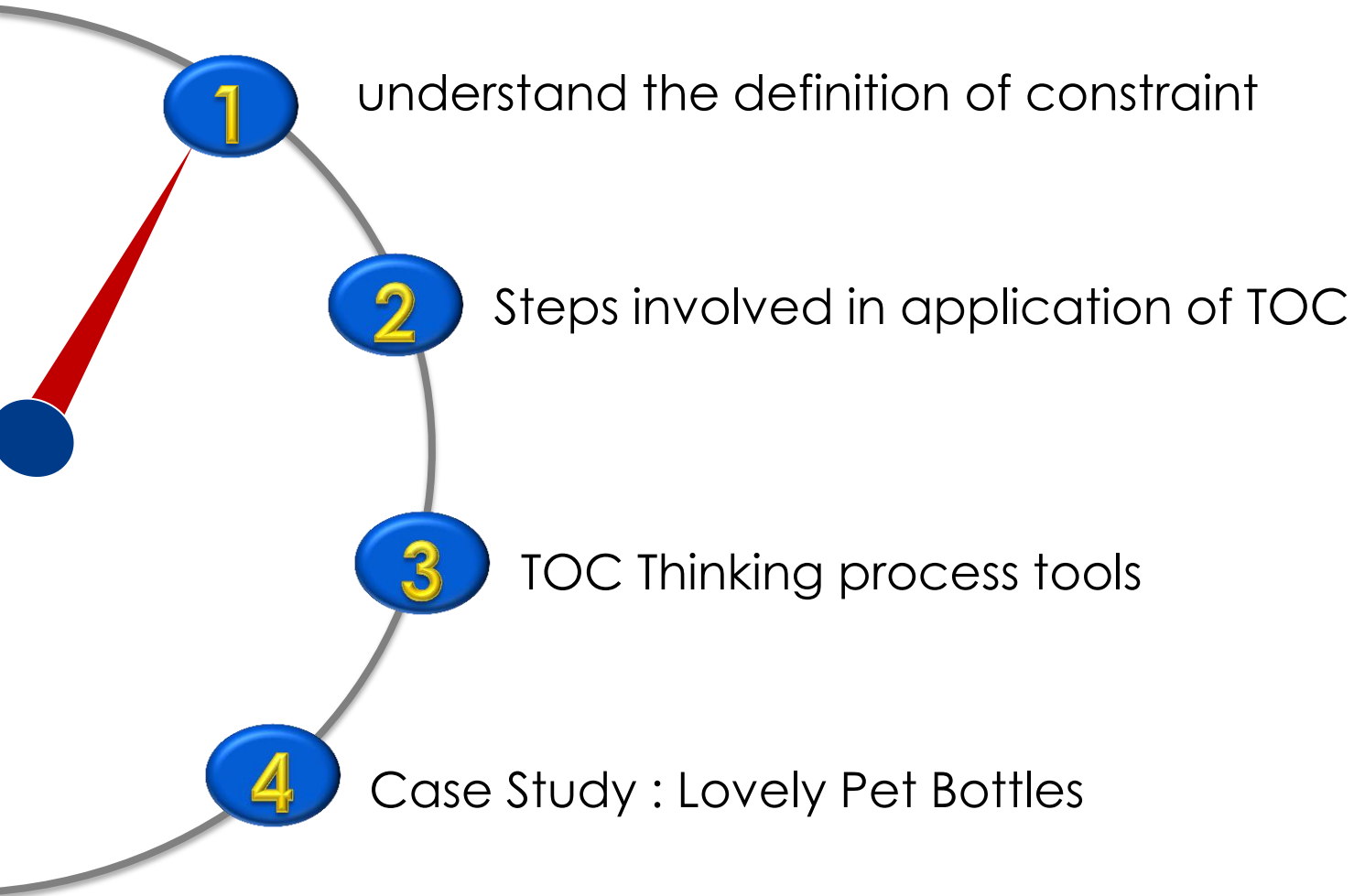
What is Theory of Constraints ?

The Theory of Constraint is a methodology for identifying the most important limiting factor (i.e., constraint) that stands in the way of achieving the goal and then systematically improving that constraint until it is no longer the limiting factor.

What is constraint ?

Constraint is an element, factor, or subsystem that works as a bottleneck.
It restricts an entity, project, or system(such as a manufacturing or decision making process) form achieving its potential (or higher level of output) with reference to its goal.

Assumptions:

1   Every organization has set of processes working on together to achieve the common goal

2   Every process has a constraint that limits it from maximum performance.

Some examples of constraints :

1. Raw materials
2. Machines
3. Time
4. Capacity
5. Human resources
6. Financial resources

Five Focusing steps in TOC

Repeat

Identify

Elevate

Exploit

Subordinate
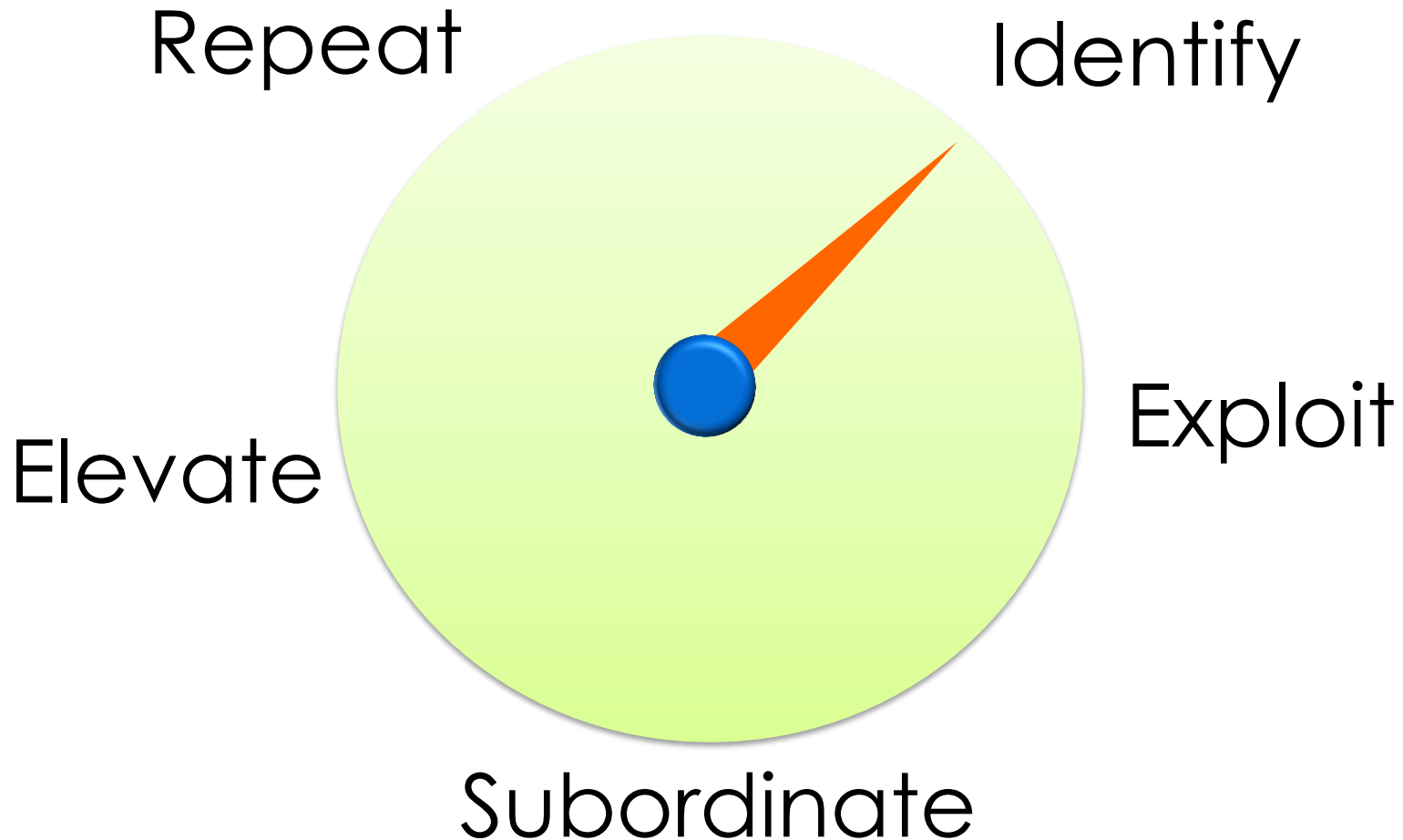
Keys to Success :

❖ Focus on the constraint

❖ Use the Right measures

❖ Understand relationships in the system

     - Reexamine polices and procedures

     - Involve people, Understand the behaviors

     - Consider wider context

Capturing the whole while focusing on the important parts.

Managing the change :

Three key questions in any improvement in process

❑ **What to change?**

❑ **What to change to?**

❑ **How to cause that change?**

(Any improvement is a change, but not every change is an improvement)   Eliyahu M. Goldratt

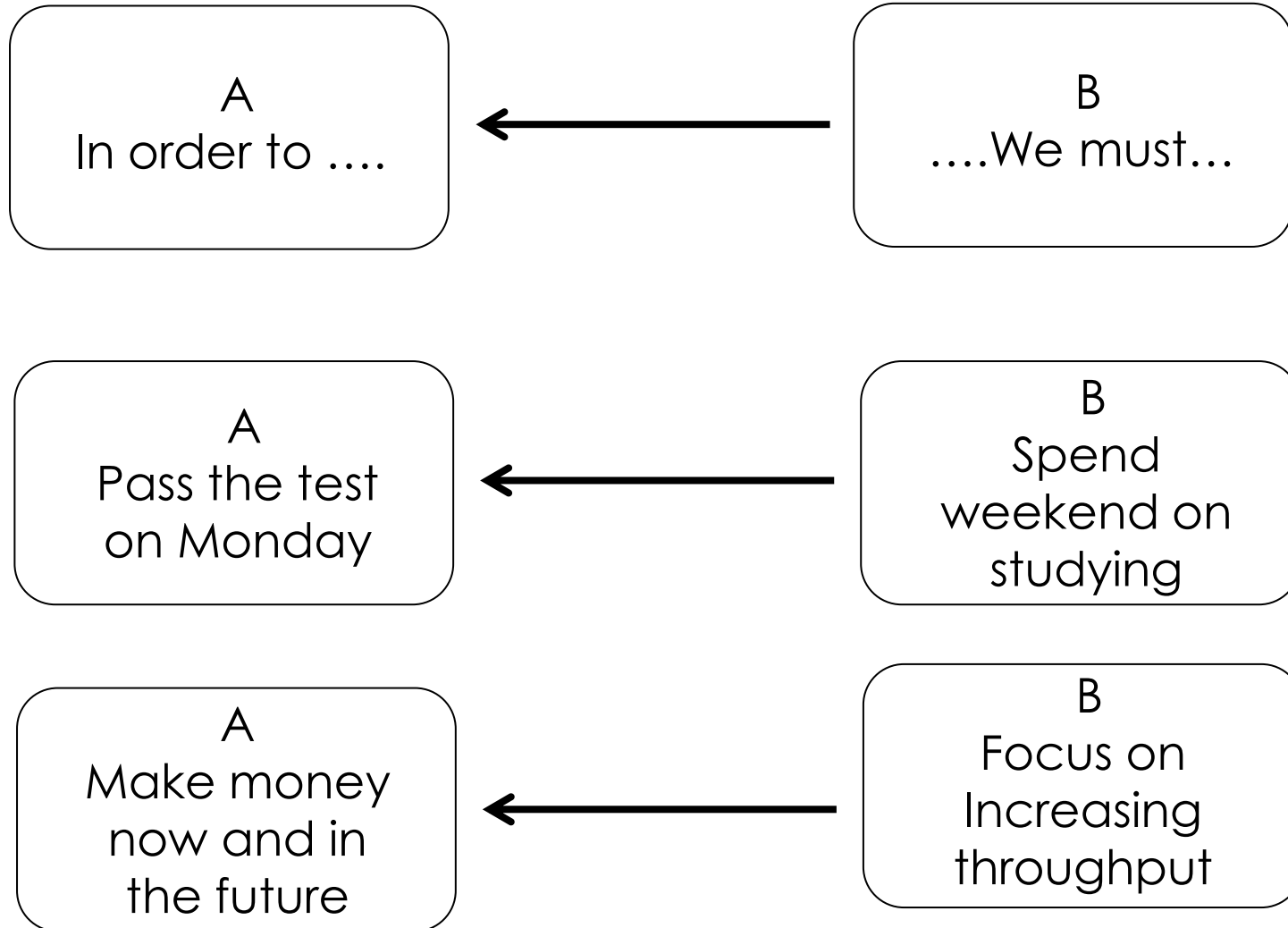**Basic logics that need to understand the TOC thinking process Tools :**

1. Necessity Logic :

 - In order to achieve 'A', 'B' must be true
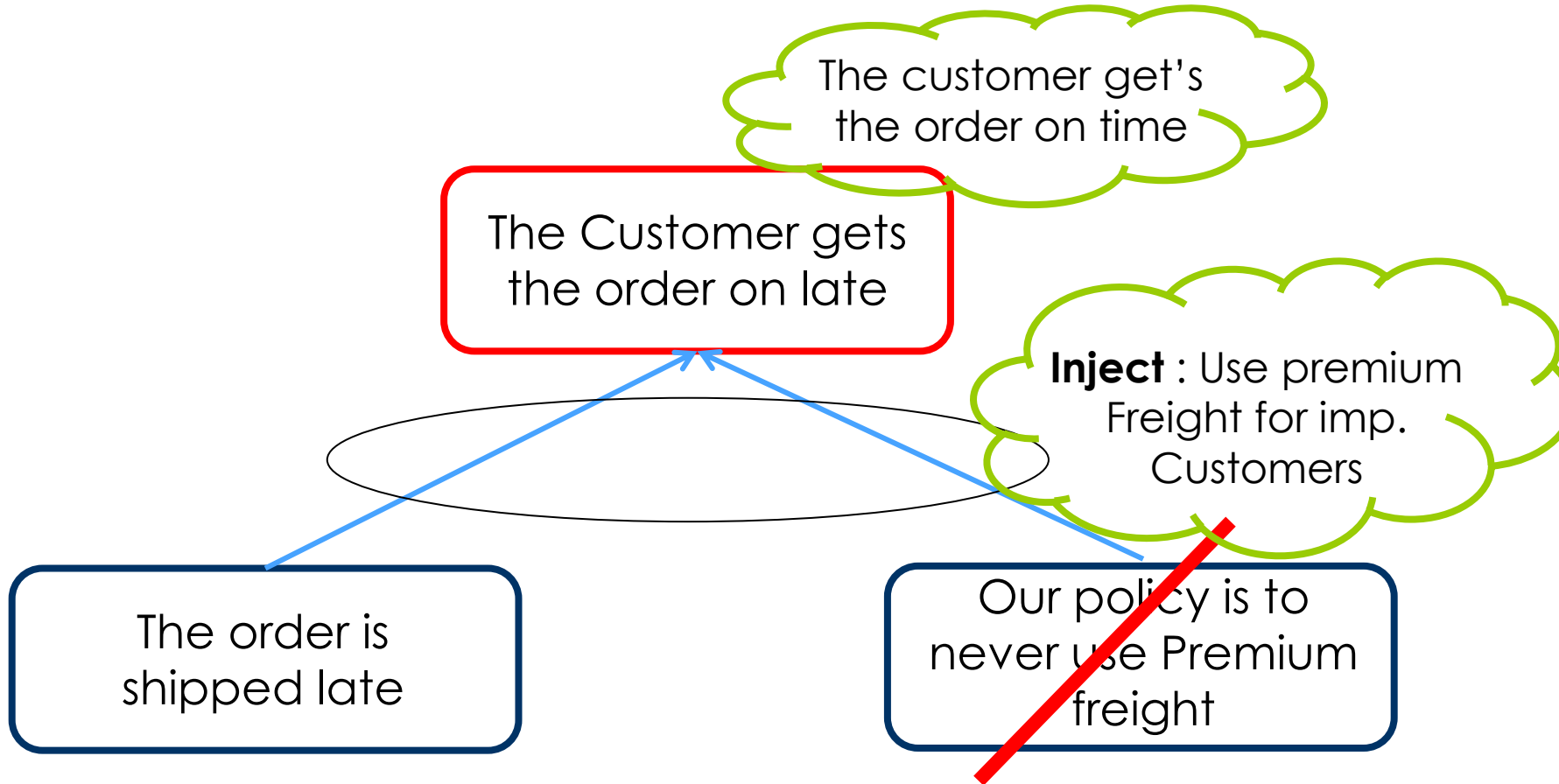 - In order to pass the test on Monday, spend the weekend on study

2. Sufficiency Logic :

-    If 'X' and 'Y' then 'z'
     ('X' and 'Y' are sufficient or enough to cause Z.)

Building tree's based on Necessity logic :

A In order to ….	←	B ….We must…

A Pass the test on Monday	←	B Spend weekend on studying

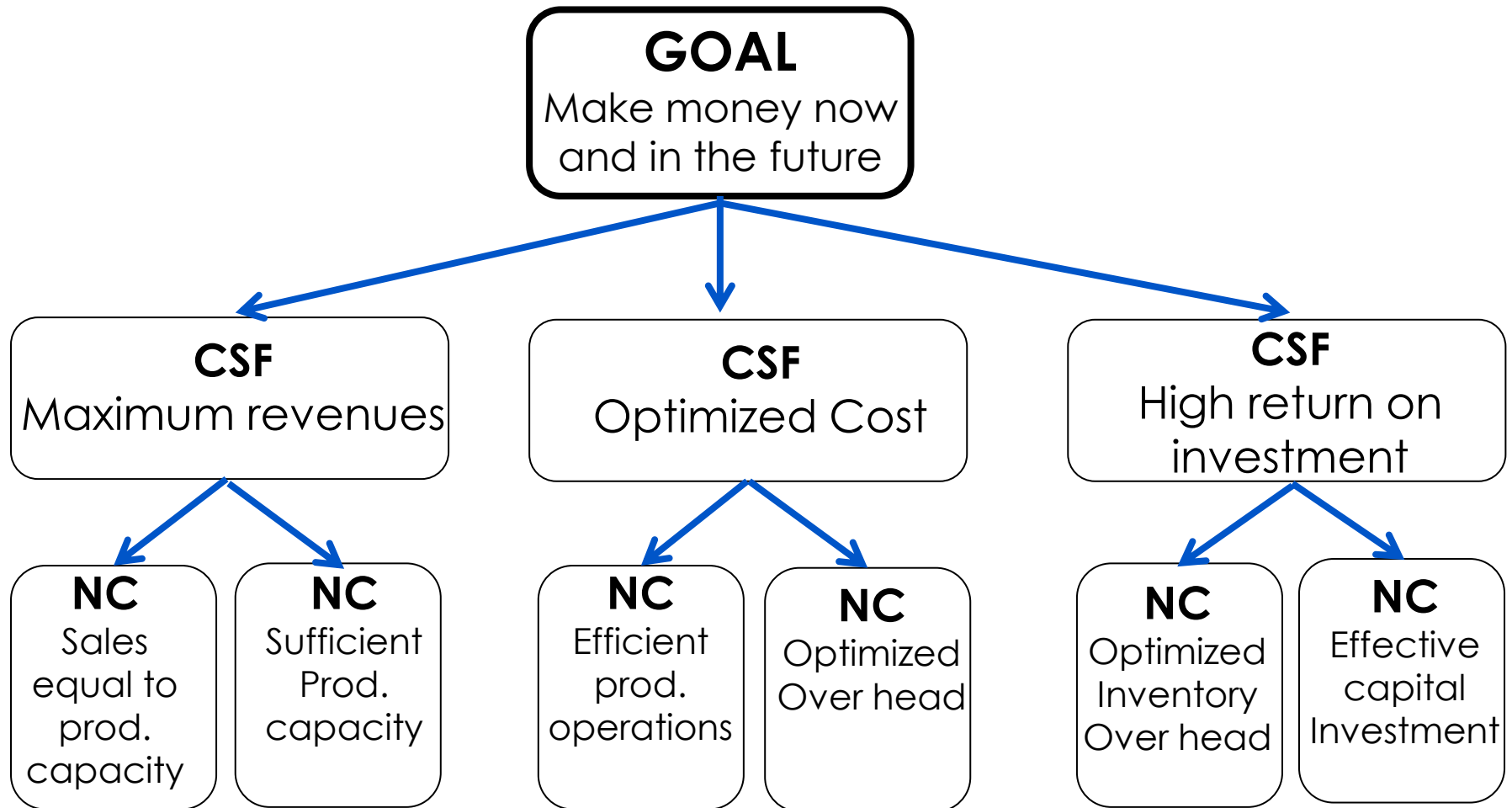| A Make money now and in the future	←	B Focus on Increasing throughput

Building tree's based Sufficiency logic :
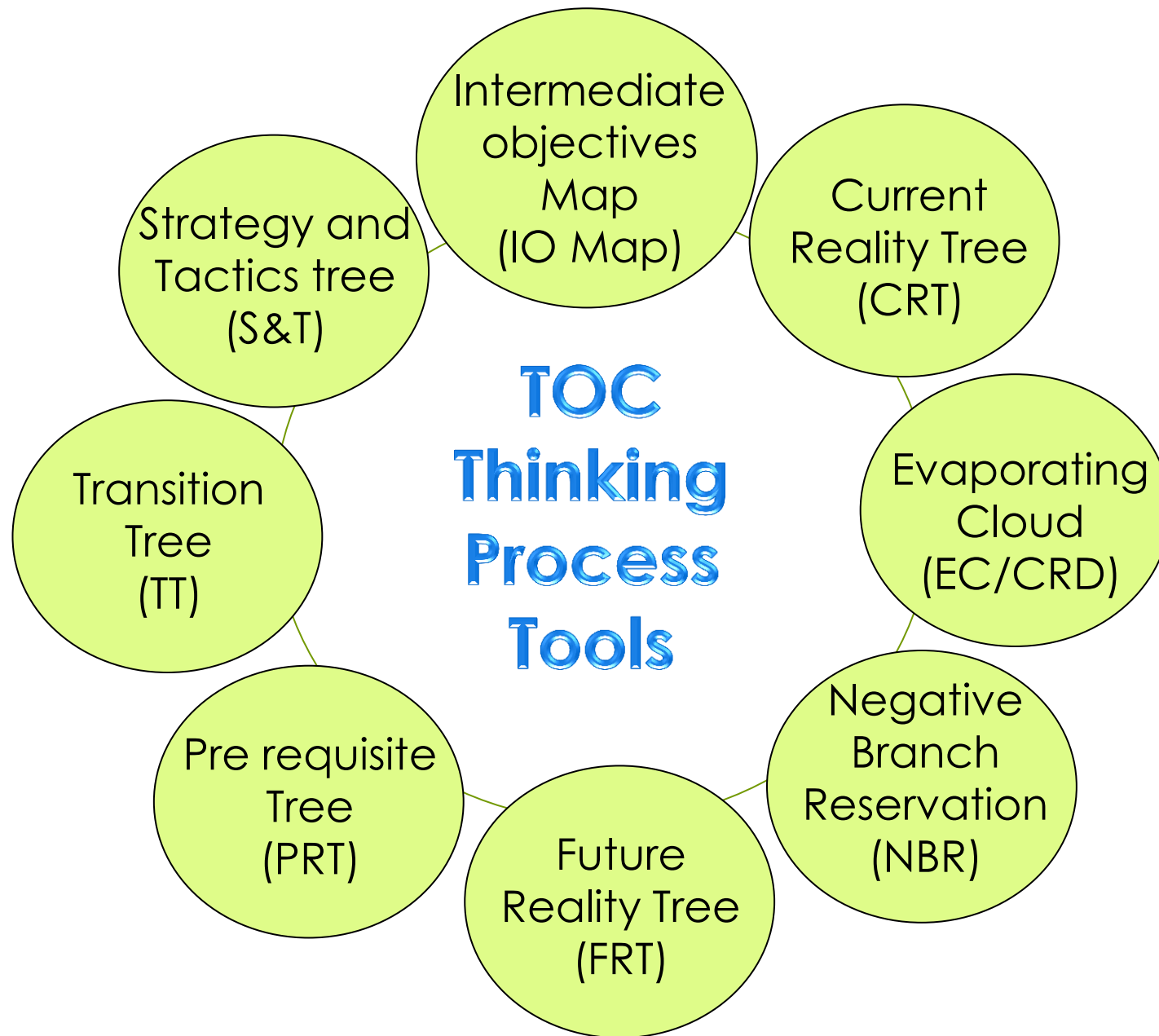
Necessity – based logic
- IO Map
- Evaporating Cloud
- Pre requisite Cloud

Sufficiency – based logic
- Current Reality Tree
- Future Reality Tree
- Negative Branch Tree
- Transition Tree

IO Mapping (Dettmer's version)

GOAL
Make money now and in the future

CSF
Maximum revenues

CSF
Optimized Cost

CSF
High return on investment

NC
Sales equal to prod. capacity

NC
Sufficient Prod. capacity

NC
Efficient prod. operations

NC
Optimized Over head

NC
Optimized Inventory Over head

NC
Effective capital Investment

CSF – Critical Success Factor
NC – Necessary condition
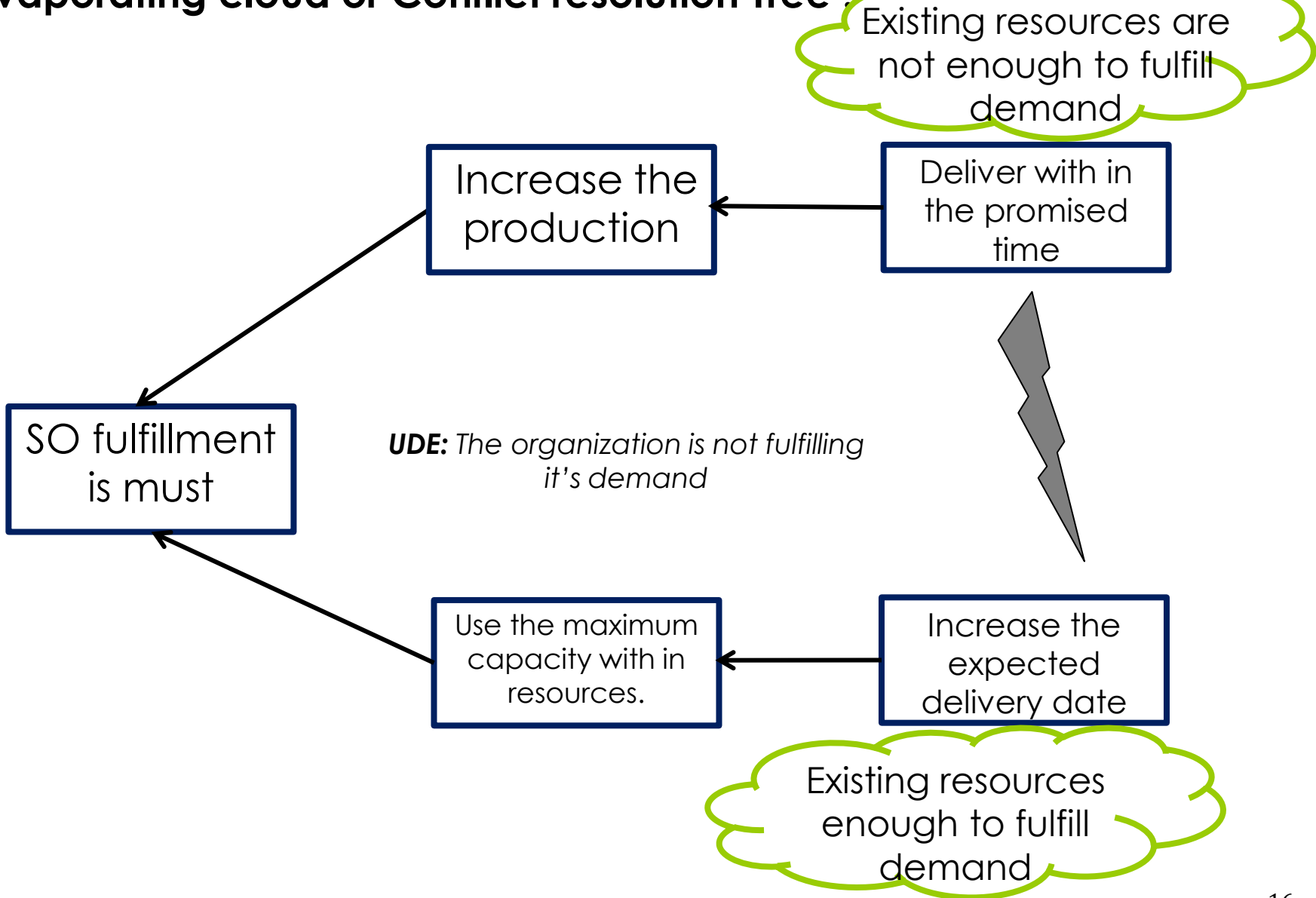
Current Reality Tree :

- Analyze the current situation full of Undesired Effects (UDE's) using cause and effect. (sufficiency logic)
- Explain how the 'root cause or core problem leads to the current UDE's.
- Connect UDE's using cause-effect relationships until all are connected.
- Keep building until the root cause or core problem is identified.
- Use bottom up, using if ….. And …..then…..
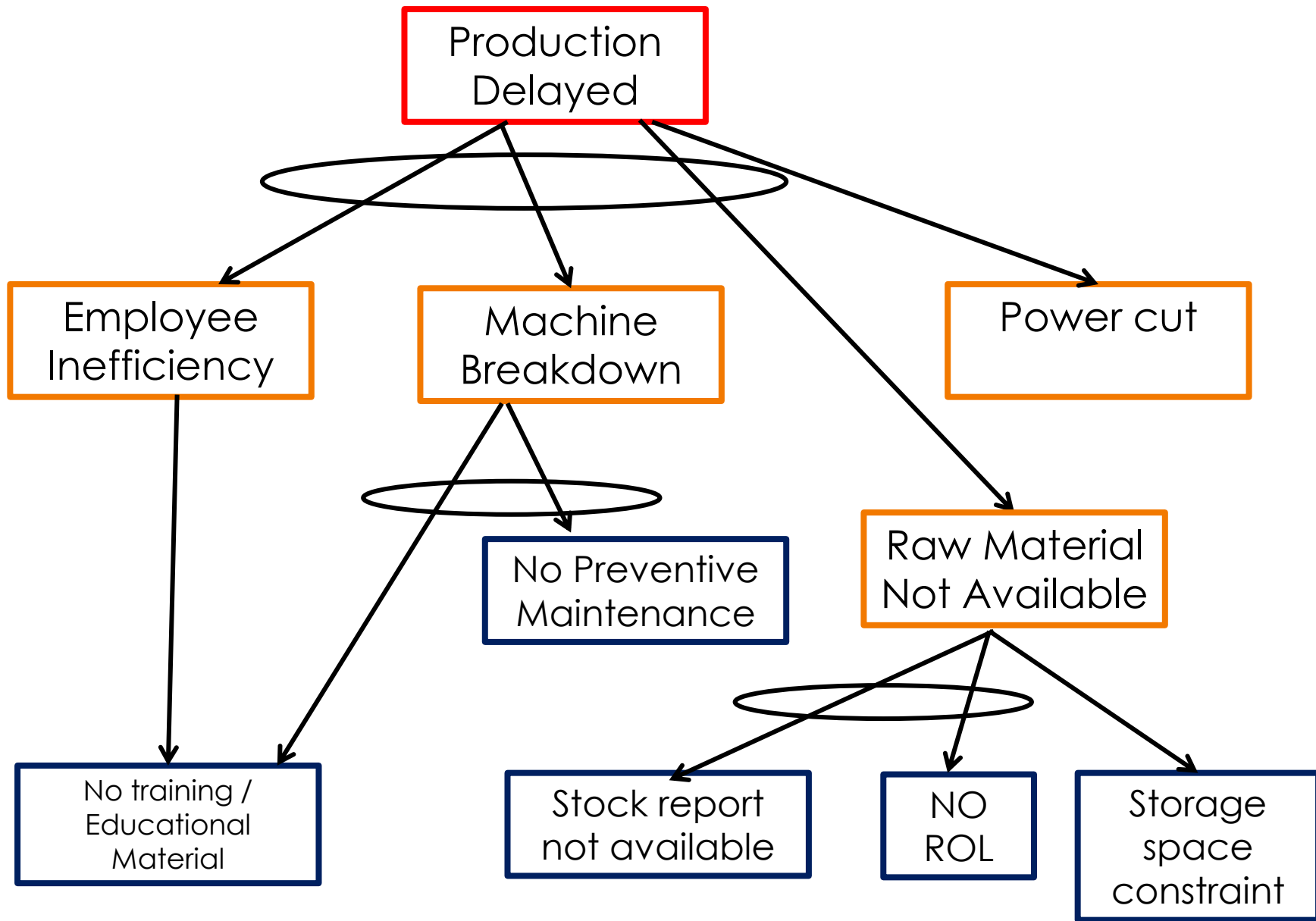
Evaporating cloud or Conflict resolution cloud :

❑ Frame the problem by taking both sides into account.

❑ Surface assumptions.

❑ Challenge assumptions till win-win solution is found.

Evaporating cloud or Conflict resolution Tree :

Existing resources are not enough to fulfill demand

| Increase the production | ← | Deliver with in the promised time |

UDE: *The organization is not fulfilling it's demand*

SO fulfillment is must

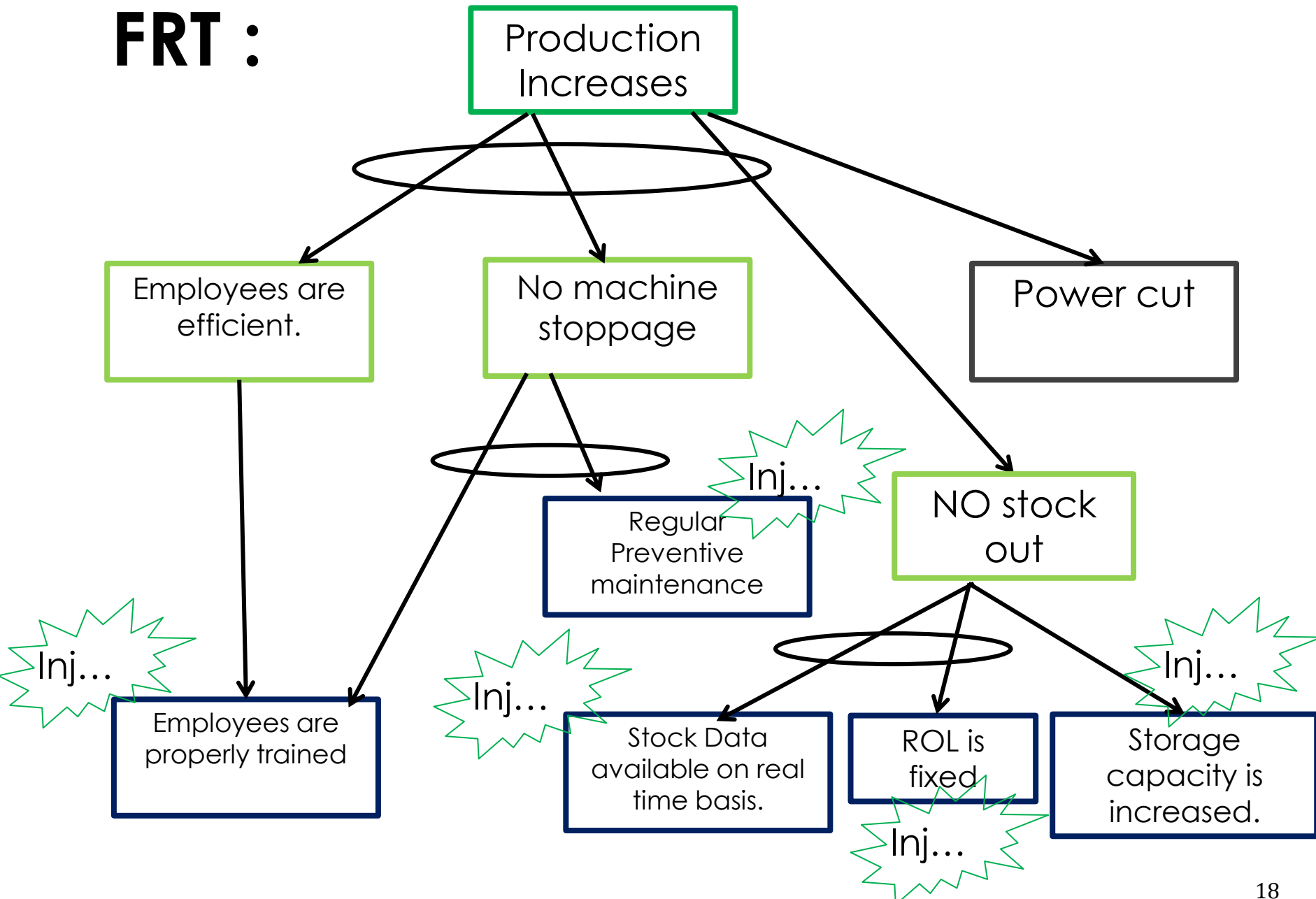| Use the maximum capacity with in resources. | ← | Increase the expected delivery date |

Existing resources enough to fulfill demand

Future Reality Tree (FRT) :

❖ Show how the injection leads to desirable effect (DE's)

❖ Incorporate the extra injections as needed to ensure that all

  effects at top are DE's.

❖ When ever you encounter "Yes, but……." use Negative branch

  reservation tool to prevent possible Negative effects

   (*Every NBR improves the FRT)*

FRT :

Production Increases

Employees are efficient.

No machine stoppage

Power cut

NO stock out

Regular Preventive maintenance

Inj…

Employees are properly trained

Inj…

Stock Data available on real time basis.

Inj…

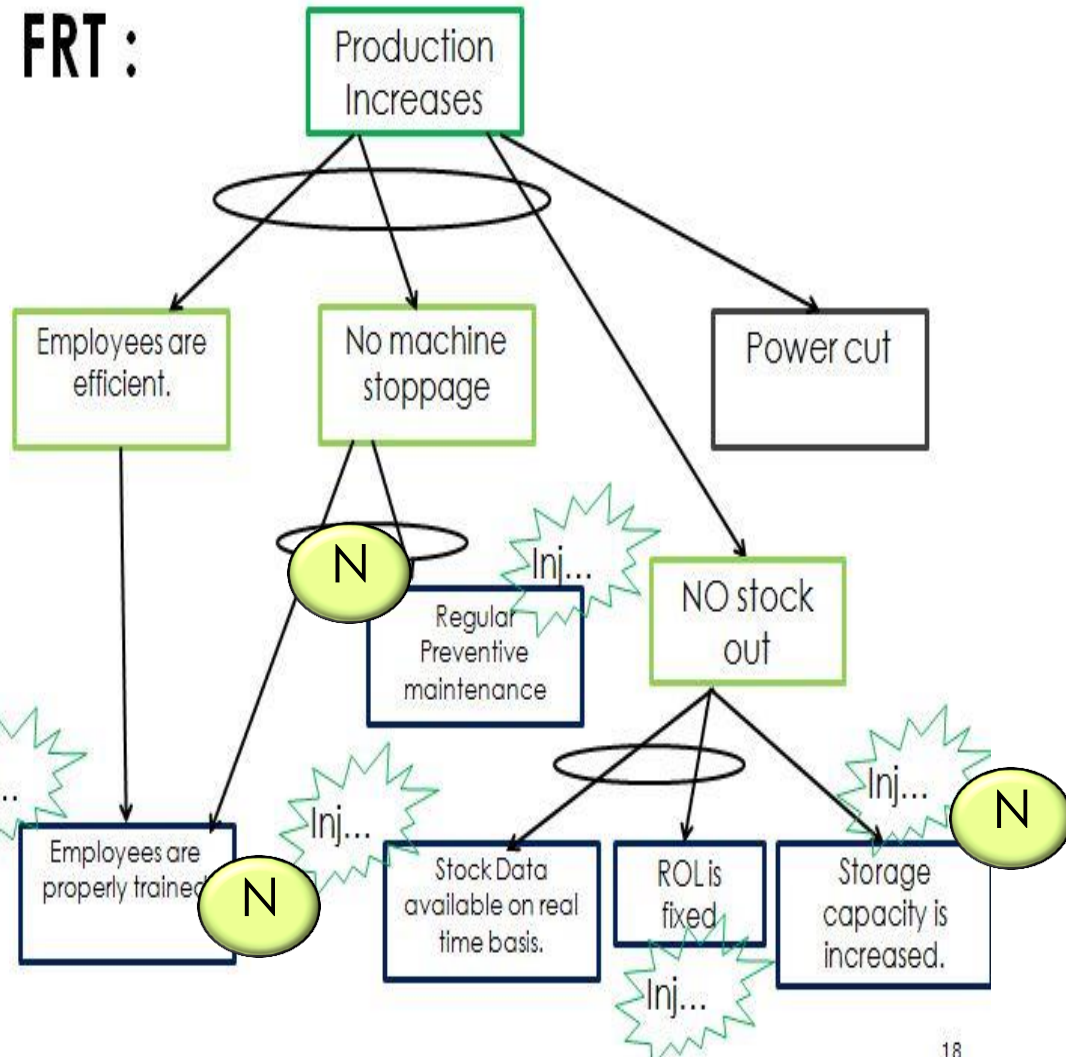ROL is fixed

Inj…

Storage capacity is increased.
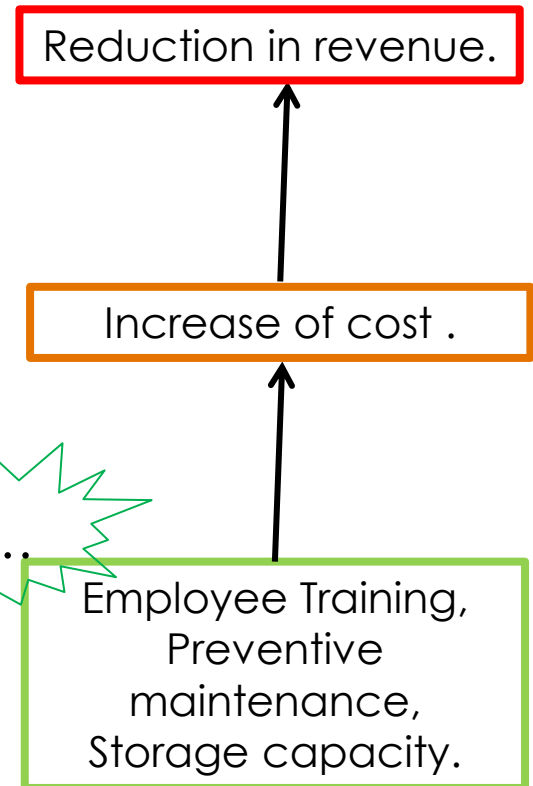
Inj…

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Negative Branch Reservation Tree (NBR) :

❖ Anticipating and Preventing unintended negative consequences of a proposed action.

❖ It helps in checking and improving the injections from the Evaporating Cloud (EC)

❖ It helps in improving the half beaked Ideas.

❖ It helps in dealing with chronic conflict.

Negative Branch Reservation Tree (NBR) :

FRT :

UDE….

Reduction in revenue.

Increase of cost .

Employee Training, Preventive maintenance, Storage capacity.

Pre Requisite Tree (PRT) :

❖ State the target clearly. (*some thing that looks hard to achieve – even an injection)*

❖ List the all obstacles.   *

                                    *

                                    *

❖ Next list the IO's.   *

                                    *

                                    *

❖ Lastly place the IO's in time or preceding order, then rearrange the all obstacles list according to the IO's order.

(E.g.: suppose there are 3 obstacles and 3 IO's then we must do IO 3 in order to overcome Obstacle 3 , before we can achieve IO2)

Pre Requisite Tree (PRT) :

List of obstacles

1. Employees are inefficient and illiterate.

2. Proper Induction program not available.

3. Getting the proper information related to FG is challenging.

4. Production entry in software is challenging.

5. With out Proper stock report ROL can't be implemented.

IO's

A. Employees should be properly trained.

B. Proper induction program for training should be designed.

C. Proper FG information should be reached to the software.

D. Accurate production entry should be passed to get accurate stock report.

E. ROL should be accurate.

ROL report should be accurate.

↑

Accurate stock report should be given to the mgmt.

↑

FG information from the production should be captured in Job card.

↑

Employees should be properly trained.

↑

Proper induction program will be developed

With out proper stock report ROL can't be accurate.

Production entry in tally is challenging.

Getting Proper FG information from the production is challenging.

Employees are inefficient and no proper training.

Transition Tree (TR) :

❖ Planning the things, how to cause the change by the knowledge of

how the people will behave.

❖ It is nothing but entities

   - CRT combined with

   - statement of need (EC) and

   - action(injection)

to create a new reality (expected effect)

Strategy and Tactic's Tree (S & T) :

➢ It's an on going improvement on TP tools of TOC.

➢ It's combines the all the above tools

➢ It's takes into the consideration of strategy of the organization in the long term improvement and helps the organization to reach the long term goal.

➢ It covers the entire chain of organization or system and it combines the both logics of necessity as well as sufficiency.

4 Pillars of TOC :

Inherent Simplicity: Reality is simple and Harmonious

Every conflict can be removed. Don't accept conflicts as given.

People are good. Avoid blaming, There is always a win-win

Never say "I know" Every situation can be substantially improved

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