



# TOC

in short...

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Saint Petersburg, Russia

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# What's TOC

## A New management Philosophy

As TQM, JIT, Flow manufacturing, Lean Manufacturing, BPR, SMED...

- Do not contradict them: Help focusing effort.

Continuous improvement and Business/organizations reengineering

## Thinking Process

Tools and methods

## Applications

Production scheduling, Finances, Marketing, Project management, Conflict resolution,

# Where does it come from

Created by Eliyahu Goldratt, a « Business Guru »

The Goal (1984, 1986, 1992)

It's not Luck (1994)

Critical Chain (1997)

...

Many « disciples »

Supported by APICS

[www.apics.org](http://www.apics.org), CM SIG

Mainly in the US (Almost ignored in France)

# Systems

Understanding of the system is mandatory to improving it

Any system has a Goal

Goal or Necessary Conditions

Profit => Customer satisfaction, Technology leadership,  
Competitive advantage, Satisfied, secure workforce

The Manager is responsible for the Goal

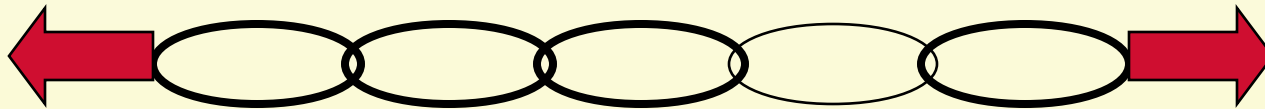
Everyone may be considered as a Manager of something (Large corporation, department, small team, his live, career...) that is supported by a System

Theory of Constraints is about Management

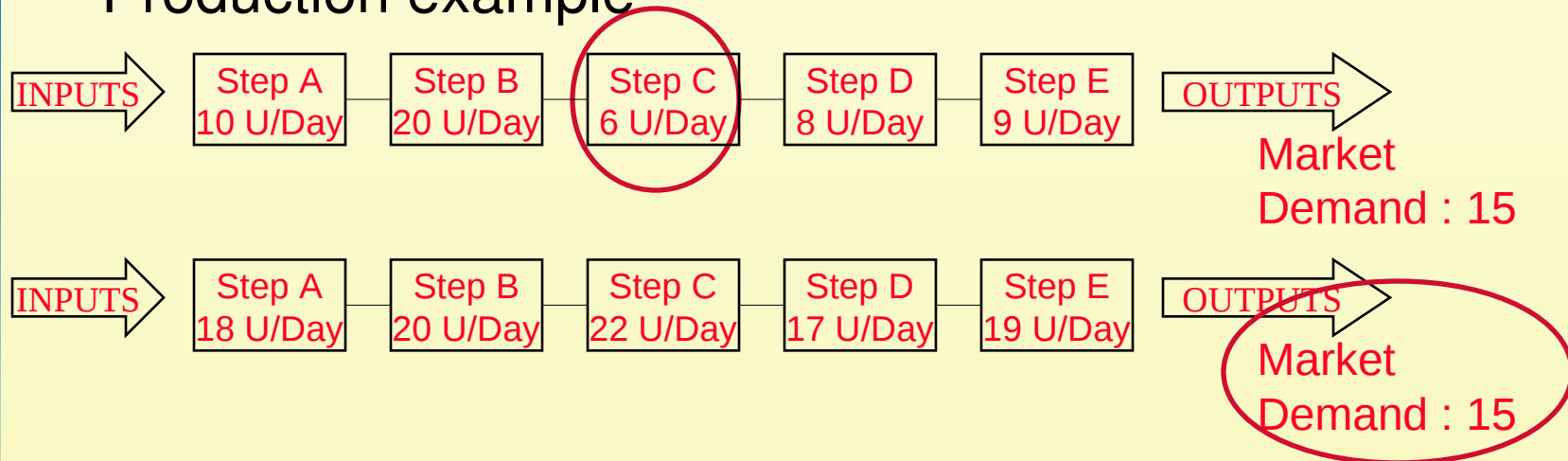
# TOC Concept 1 : System constraints

A simple example

As the chain, any system has one – and only one – weakest link called the Constraint



Production example



# TOC Concept 2 : Measurement

How to measure the effects of local decisions  
(breaking a constraint) on our overall system

## Throughput (T)

- The rate at which the entire system generates money through sales
- For non-for-profit organizations, money may be replaced by service or products

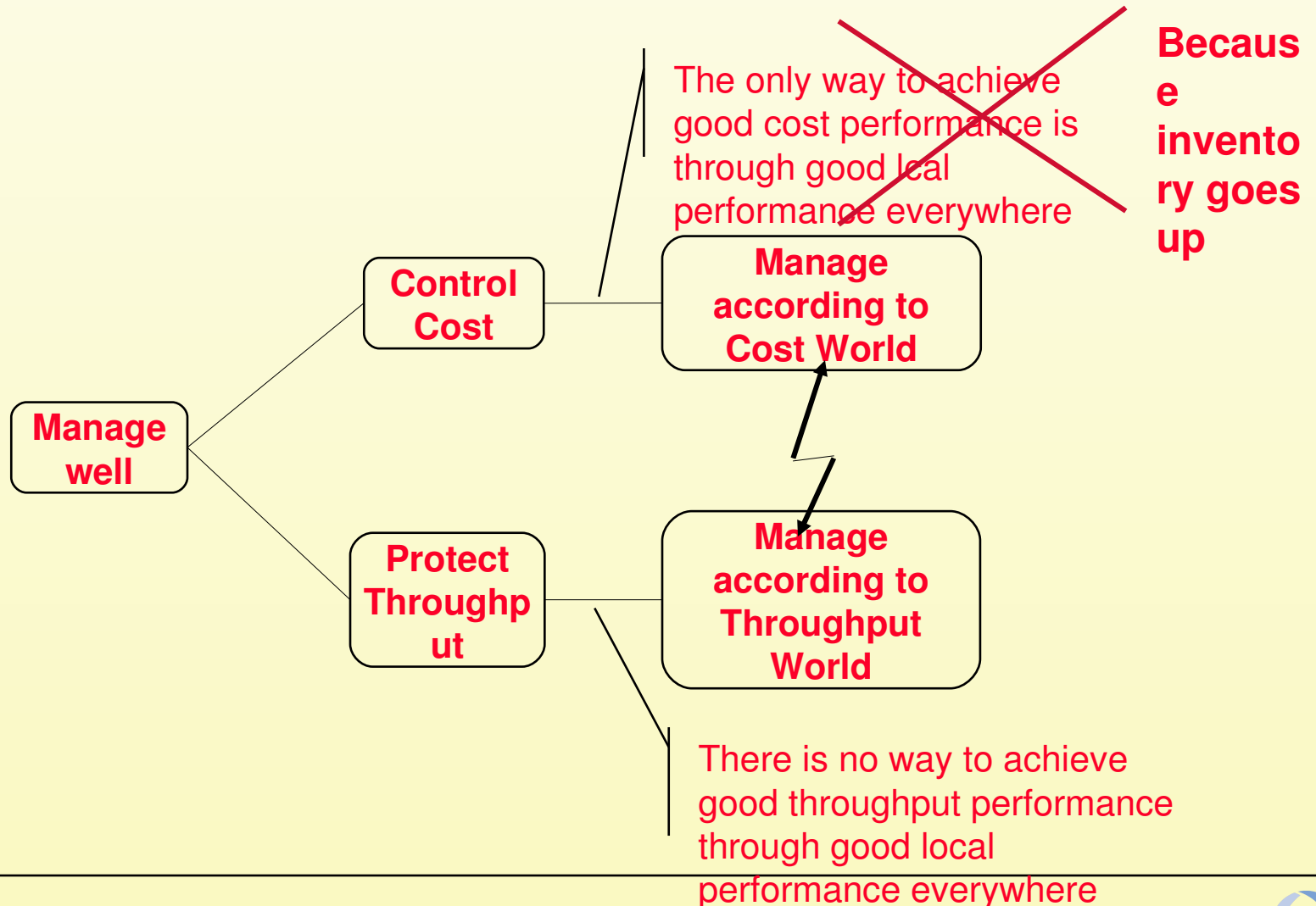
## Inventory (I)

- All the money the system invests in things it intends to sell, or the money tied up within the system (includes investment)

## Operating Expenses (OE)

- All the money the system need spends turining Inventory in Throughput (direct labor, utilities, consumables...)

# Throughput World vs Cost World



# TOC Principles

Systems as « Chains »

The weakest link can be found and strengthened

Local vs System optima

The system performance is not the same as the sum of local optimas

Cause and Effects

May be complex in complex systems

Undesirable effects and core problems

Eliminate core problems vs treating UDEs

Solution deterioration

Inertia is the worst ennemy of POOGI

Physical vs Policy Constraints

Most of the Constraints originate from policies, not physiscal things

Ideas are not Solutions

Most great ideas fail in the implementation stage

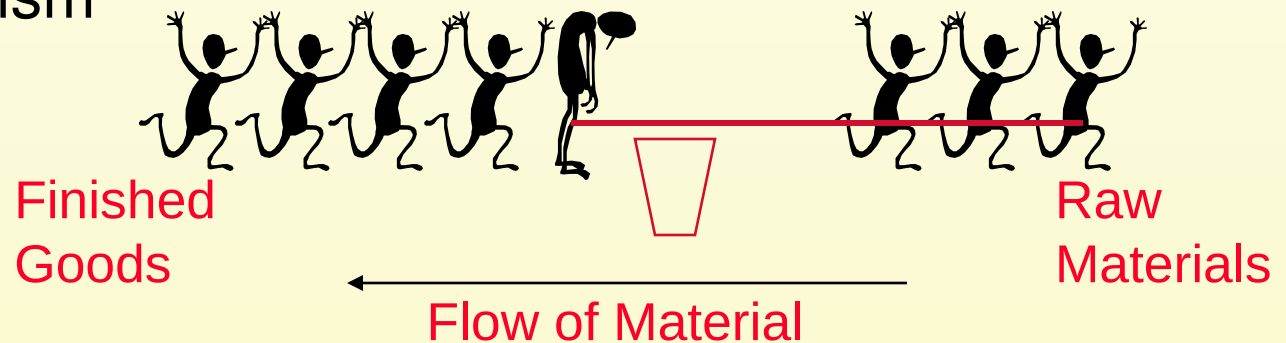


# TOC Prescriptions : 5 Focusing steps

1. Identify the System Constraint What to change?  
What part of the system constitutes the weakest link?
1. Decide How to Exploit the Constraint What to change to?  
Get the most out of the constraint without expensive changes or upgrades
1. Subordinate Everything Else How to cause the change?  
Adjust the system in order to get the most of the constraint
1. Elevate the Constraint  
If step 2-3 are not sufficient, major changes may be needed. The constraint is broken
1. Go Back to Step One, But Beware Inertia

# TOC : Applications

Production Scheduling : The Drum-Buffer-Rope mechanism



Throughput Accounting

Absence of allocated fixed costs => very different management decision for pricing and marketing

Project Management : Critical Chain

Inspired from DBR

Provide buffers on critical path steps

# TOC : Tools

CRT : Current Reality Tree

Describe the present situation

CRD : Conflict Resolution Diagram

Resolve hidden conflicts

FRT : Future Reality Tree

Verify the action produces what is expected

Identify negative outcomes of the intended action

PRT : Prerequisite Tree

Identify obstacles and the best way to overcome them

Build the sequence we need to complete the major milestones

TT : Transition Tree

Detailed step-by-step instruction for implementing a course of actions

CLR : Categories of Legitimate Reservations

Rules that govern the construction and review of trees

# Tools overview

*WHAT to change*

**Current Reality Tree**

Undesirable Effects  
↑  
Intermediate Effects  
↑  
Root Causes,  
Core Problem



**Conflict Resolution Diagram**

Objective  
↑  
Requirements  
↑  
Prerequisites



**Future Reality Tree**

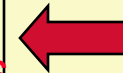
Desired Effects  
↑  
Intermediate Effects  
↑  
Injections



*How to CAUSE the change*

**Transition Tree**

Objective  
↑  
Intermediate Effects  
↑  
Specific Action

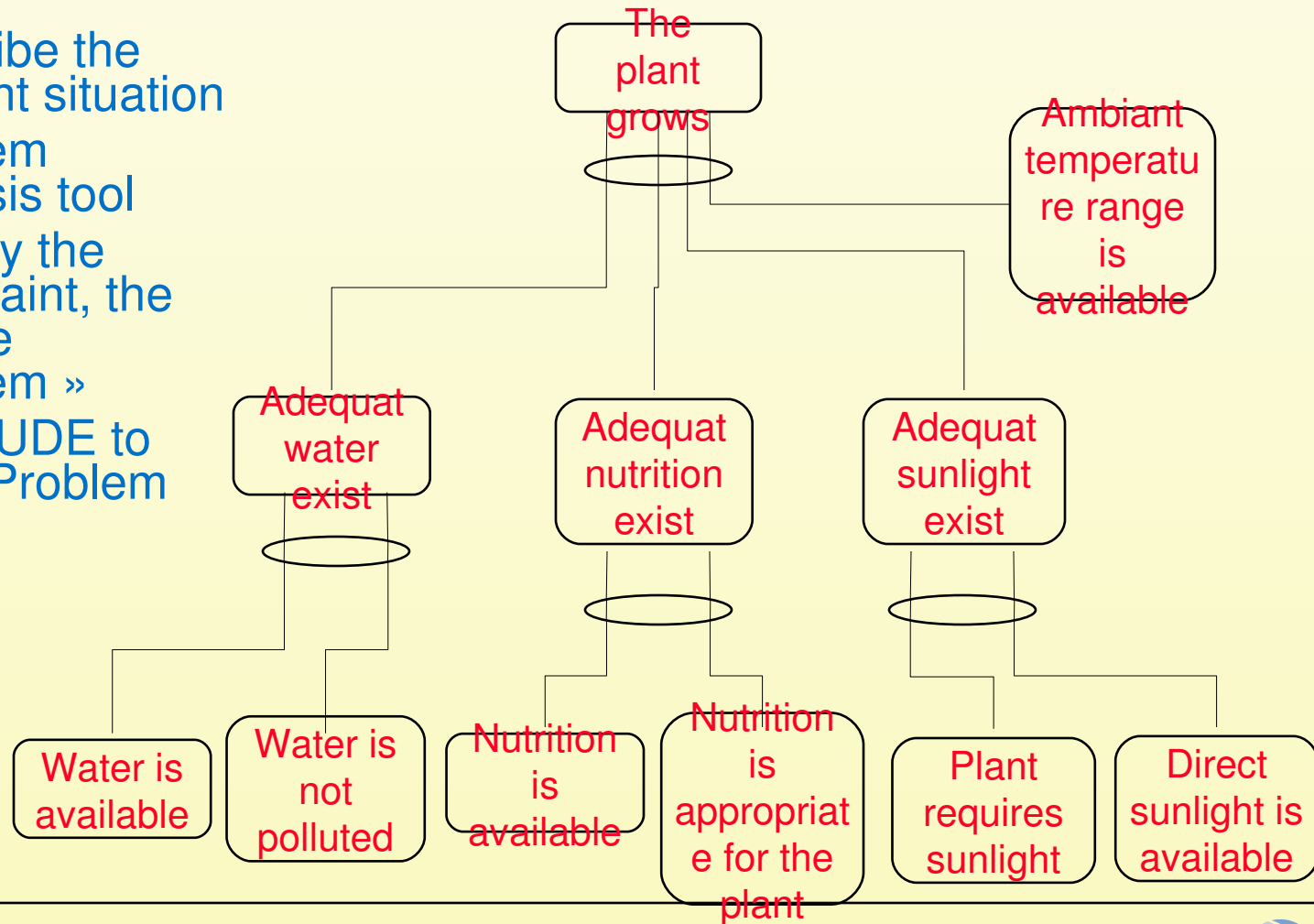


**Prerequisite Tree**

Objective  
↑  
Obstacles,  
Intermediate Objectives

# CRT : Current Reality Tree

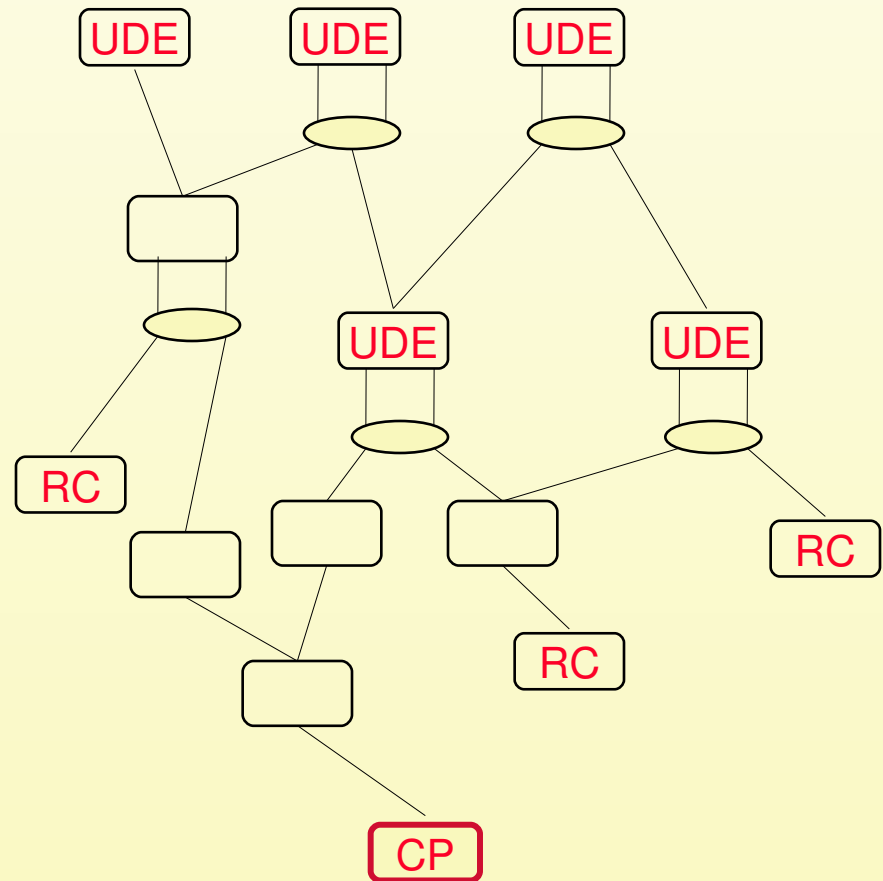
Describe the  
present situation  
Problem  
analysis tool  
Identify the  
constraint, the  
« Core  
Problem »  
From UDE to  
Core Problem



# CRT : Identify the Core Problem

The Core problem is responsible for 70 % or more for the majority of UDEs

- UDE = Undesirable Effect
- RC = Root Cause
- CP = Core Problem



# CRD : Conflict Resolution Diagram

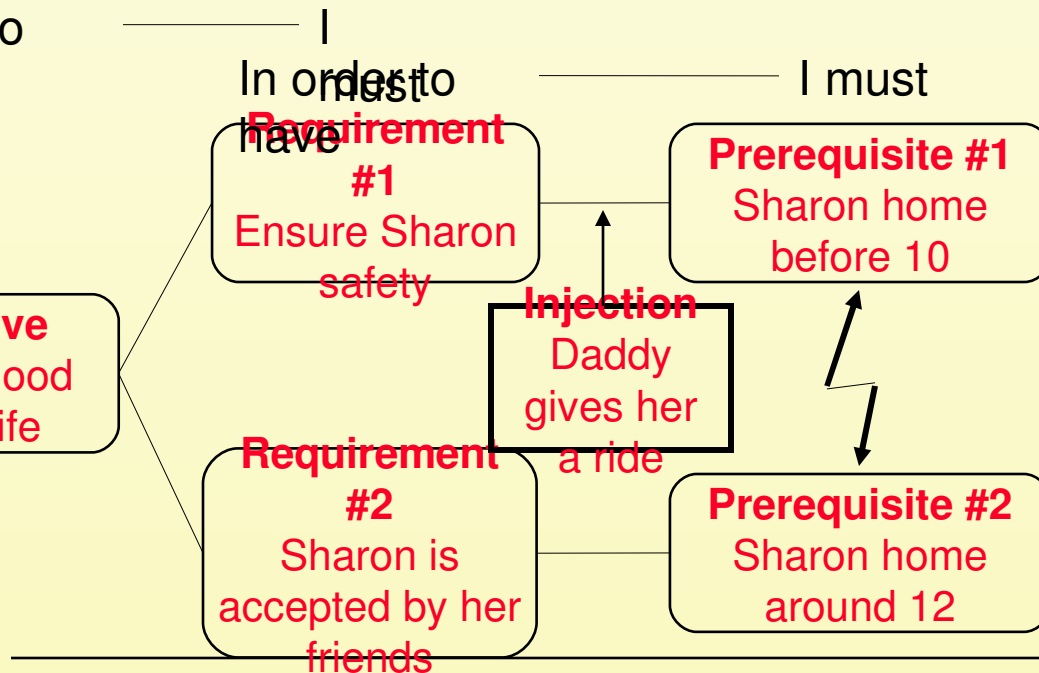
Most core problems exist because of some underlying conflicts

Resolve hidden conflicts

« Creative Engine » or « Idea Generator »

No compromise, win-win solutions

In order to have



Check Assumptions

**R1->PR1**

Anxious about the return  
travel

Bad boys may be there

**R2->P2**

Do not leave before the party ends

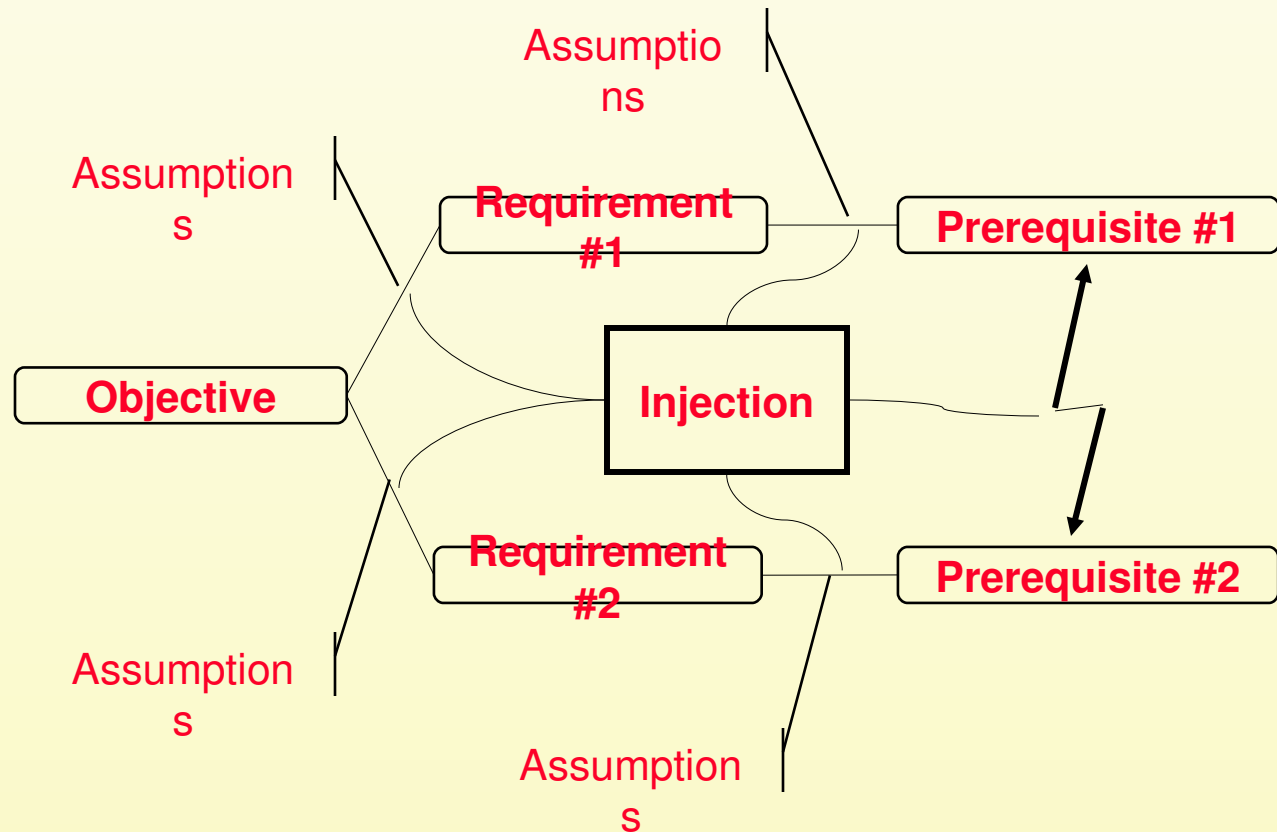
Create injection

**R1->PR1**

Daddy gives her a ride

**=> The conflict is broken**

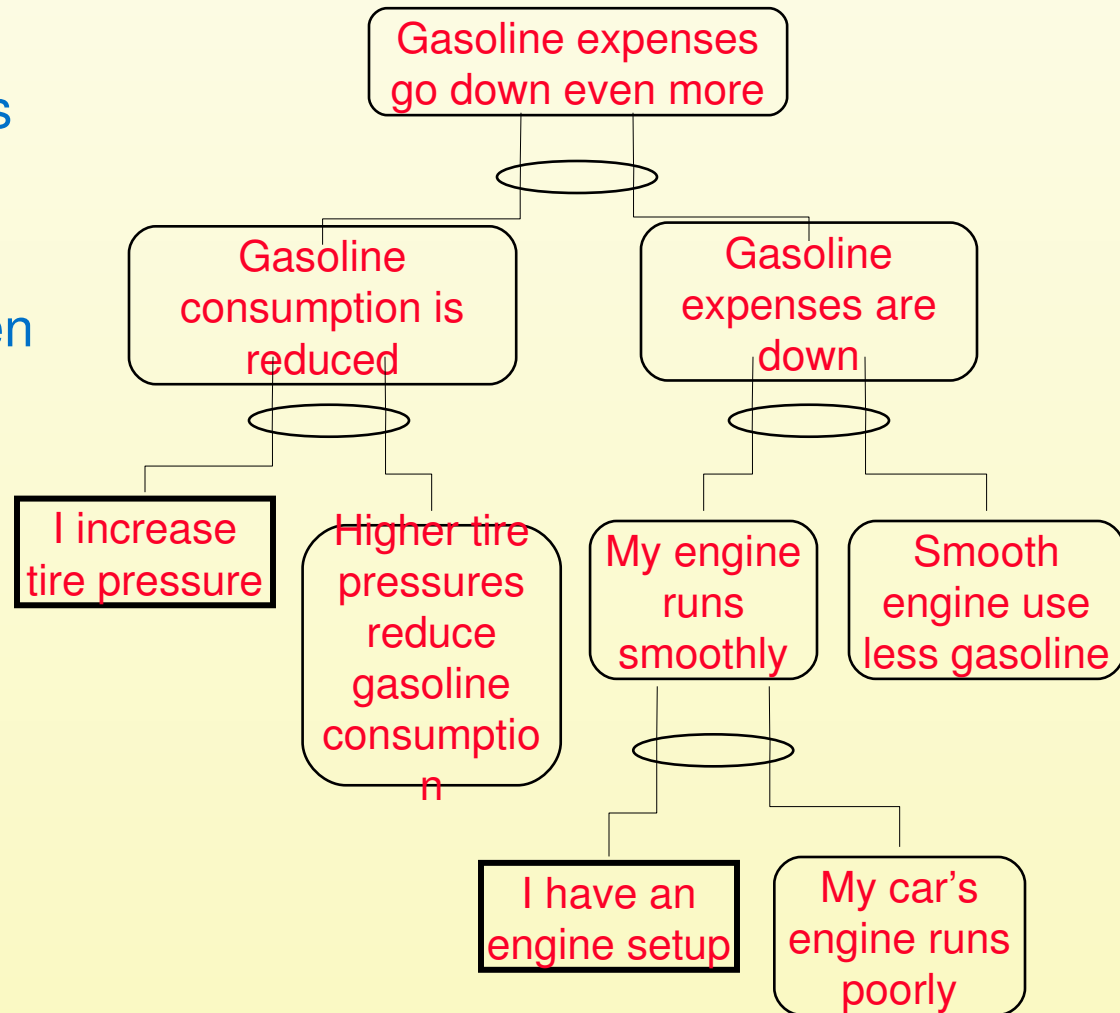
# CRD notation





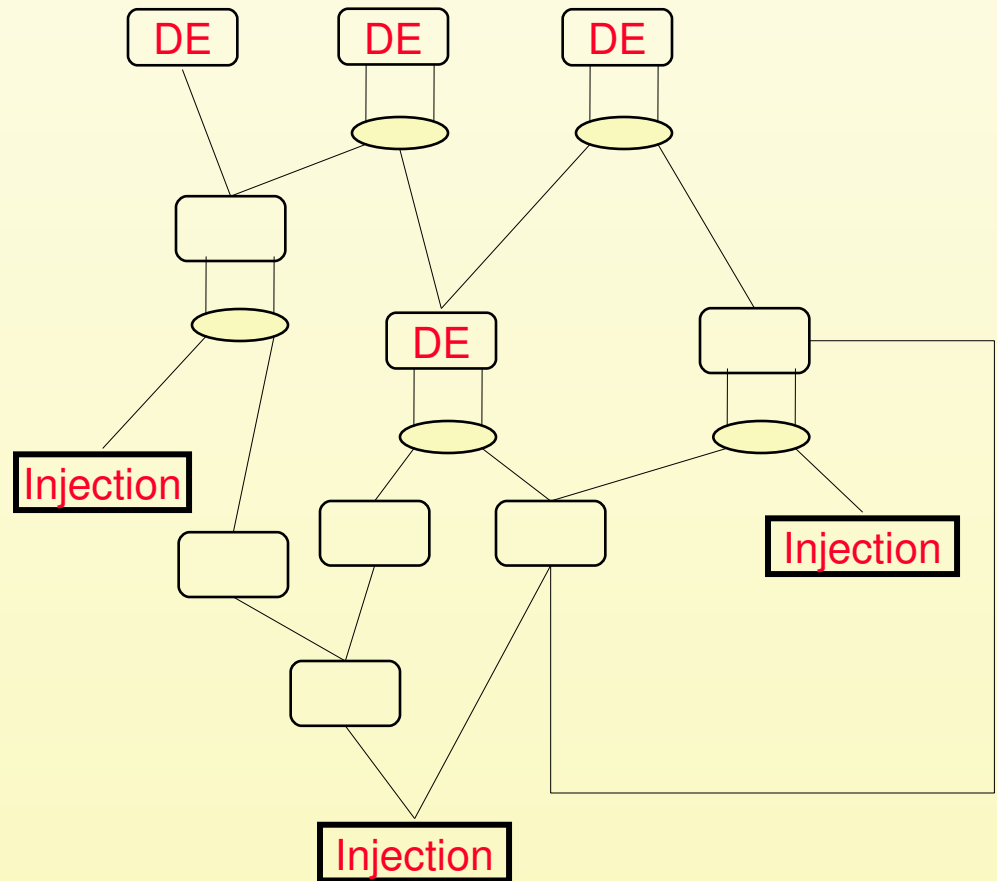
# FRT : Future Reality Tree

Testing of new ideas  
Reveals potential devastating effects  
Reveals negative branches that worsen problems  
Elaboration of positive reinforcing loops  
Persuading tool to convince decision makers  
Initial planning tool



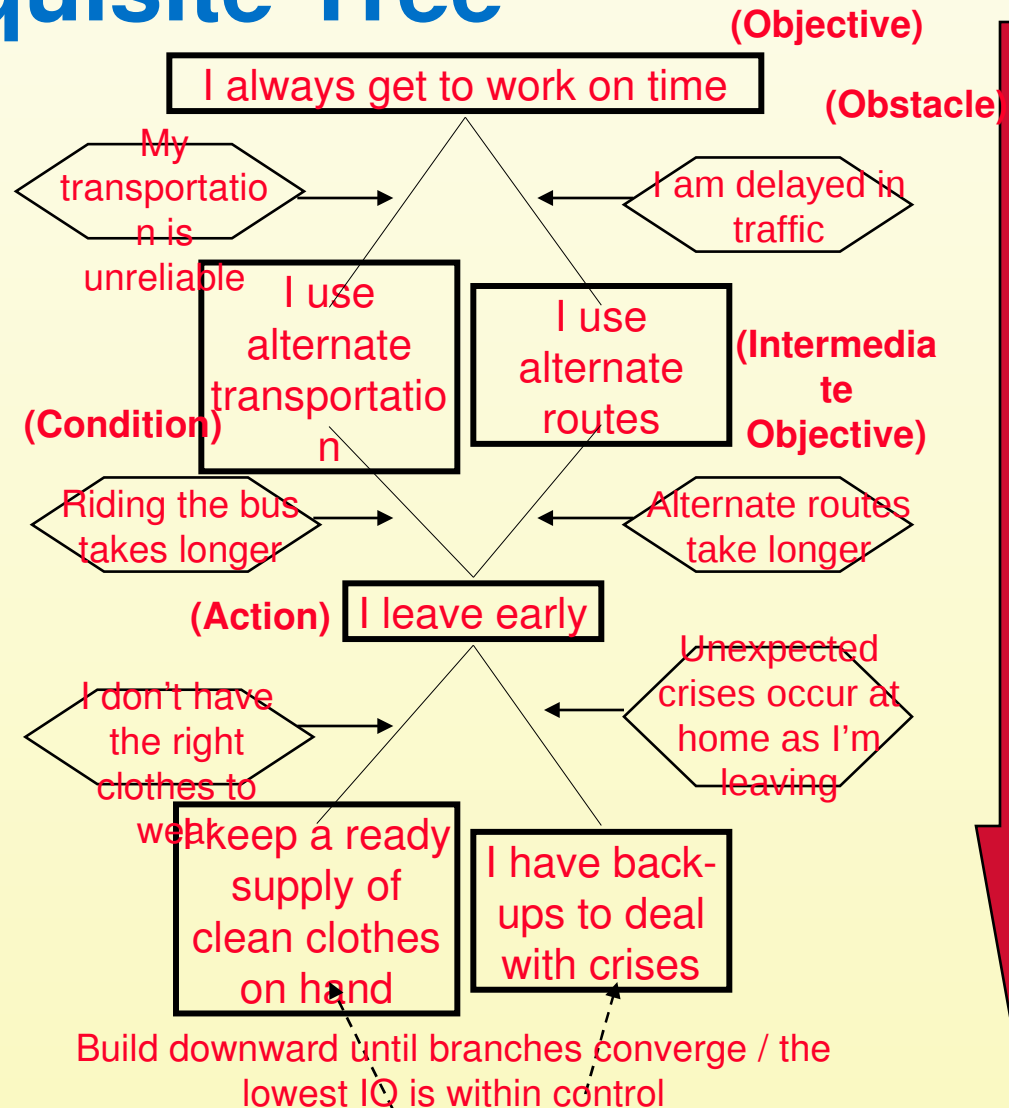
# FRT Notation

DE = Desirable  
Effect  
Injections =  
Proposed actions



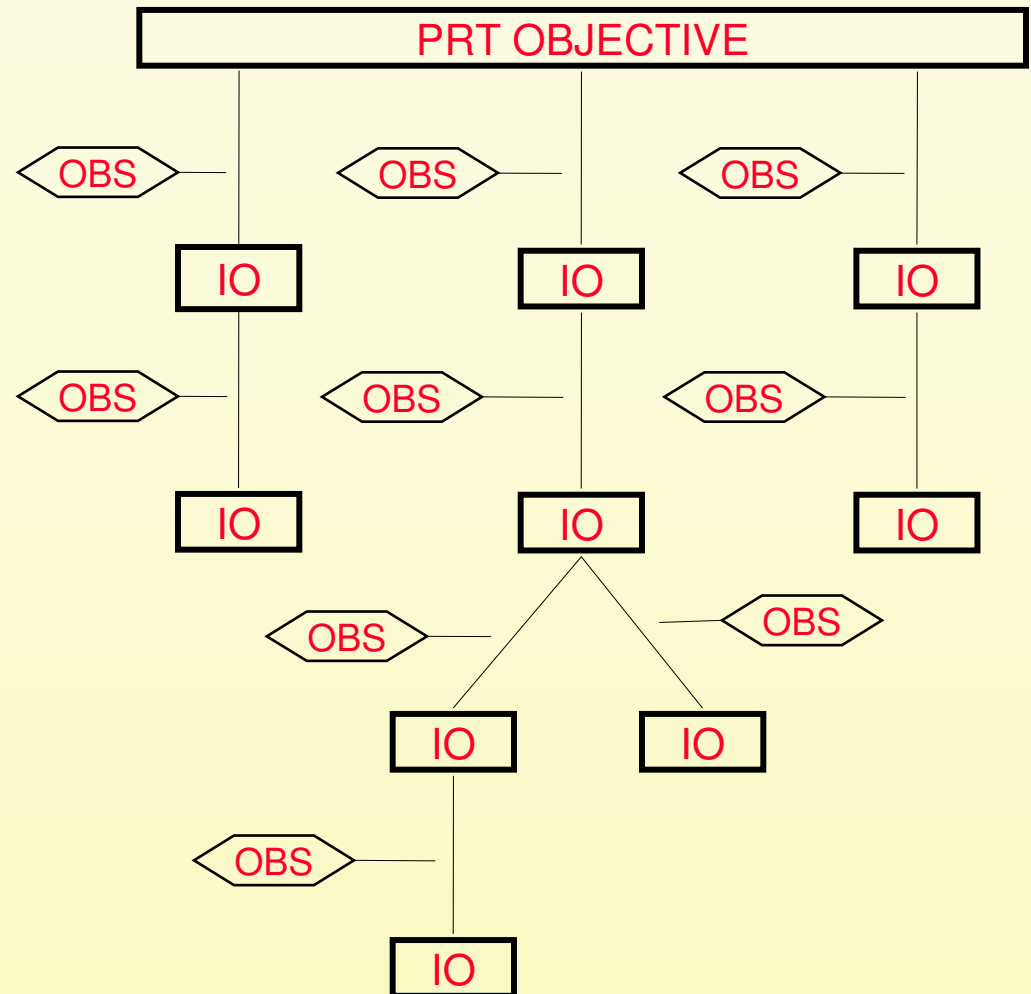
# PRT : Prerequisite Tree

Identify obstacles in realizing an objective  
Identifies remedies to obstacles  
Identify required sequence of actions  
Identify unknown steps  
Bridge the gap between FRT (major milestones) and TT (step-by-step implementation plan)



# PRT Notation

OBS = Obstacles  
IO = Intermediate  
objectives

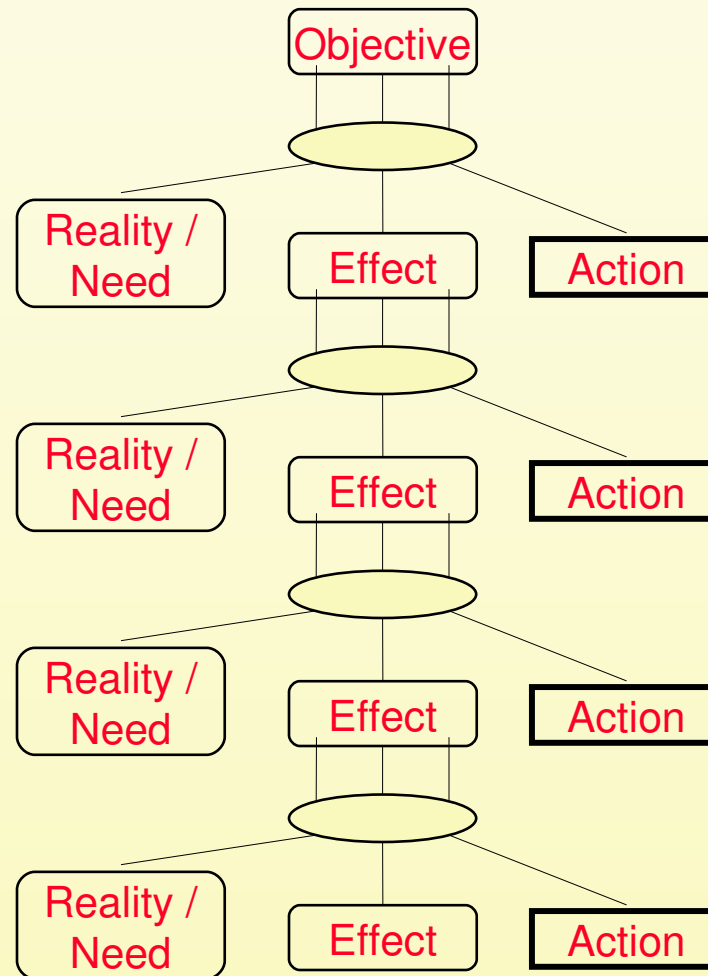


# TT : Transition Tree

Provide step-by-step method for action/implementation  
Enable effective navigation through a change process  
Detect deviation in progress toward a limited objective  
Adapt or redirect effort, should plans change  
Communicate reasons for action to others  
Execute the injections developed in CRD/FRT  
Attain intermediate objectives identified in PRT  
Develop tactical from conceptual / strategic plans  
Preclude UDE from arising out of implementation action



# TT Notation



# CLR : Categories of Legitimate Reservations

## Clarity

Meaning concern, no reasonable cause-effect connection

## Entity Existence

Completeness, Structure (compound), Validity (The sky is falling)

## Causality Existence

Does the cause really result in effect

## Cause insufficiency

The stated cause for the considered effect seems not enough

## Additional Cause

Other causes may result in the same effect

## Cause-Effect Reversal

If many fishermen are fishing and their stringers are full of fish then fishing is good

## Predicted Effect Existence

Most causes result in more than one effect

## Tautology

Circular logic : France football team lost the game because they played poorly

# Summary

TOC is a management philosophy

Common sense based  
Apply in all domains of life

TOC is a prescriptive theory

That provides effective tools to support and apply concepts

TOC Thinking processes

Applying to all situations (what to change, what to change to,  
how to cause the change)

TOC applications

Proven results in many areas

Relatively slow spread

Often chokes common practices



# Glossary

PRT : Prerequisite Tree

CLR : Categories of Legitimate Reservations

CP : Core Problem

CRT : Current Reality Tree

CRD : Conflict Resolution Diagram = Evaporating Cloud

DBR : Drum-Buffer-Rope

DE : Desired effect

FRT : Future Reality Tree

IO : Intermediate objective

OBS : Obstacles

POOGI : Process Of OnGoing Improvement

PRT : Prerequisite Tree

RC : Root Cause

UDE : Undesirable effect

# Useful infos / links

This presentation is based on H. Dettmer's book « Goldratt's Theory of Constraints – A system Approach to Continuous Improvement » ISBN 0-87389-370-0. Also, some examples are taken from Goldratt's books « It's not Luck » and « Critical Chain »

<http://www.goldratt.com/>

<http://www.eligoldratt.com>

<http://sytsma.com/htm/theoryonline.htm>

<http://www.pdinstitute.com>

<http://www.rogo.com/>

<http://www.goalsys.com/>

<http://www.mfgexcellence.com/>

# THANK YOU!

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