



TOCICO 2014 Conference

TOC Thinking Processes – TP Basics

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Date: June 8th, 2014

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- **TP – Mindset and Logic**
- **TP for Current Problems**
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- **Conclusion**



Introduction

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TOC Started with a solution for managing production shop floor (OPT). Nevertheless, OPT used breakthrough ideas that were developed using systematic thinking.

Transferring these ideas to potential users were challenging. With the desire to find ways to communicate the logic of the solutions Eli Goldratt and his team developed the Thinking Processes. (1985+).

The Thinking Processes were developed for a period of nearly ten years. (MSW - 1995). The S&T Trees were developed for the Viable Vision approach from 2008.

The purpose of the TP is to provide a set of logical tools to enable management to analyze problems, to construct solutions and to communicate them to the relevant people that are needed for the implementation of the solution.



TOC TP - Thinking Processes

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Strategy:

Management enhance their ability to improve the performance of the system under their responsibility

Tactics:

Management employ the TOC Management Tools

Mindset & Basics

Commitment to Logic based Management

Current Reality

Understanding the problem
WHAT to Change

Future Reality

Establishing the Solution
What to Change TO

Transition

Implementing the Solution
HOW to Change

POOGI

Continuous Improvement
How to Grow

- U-Shape
- C&E
- CLR
- Logical Branches
- Clouds

- UDEs
- UDE Cloud
- Consolidated Cloud
- Core Cloud
- CRT

- Pivot
- Direction
- Injections
- DE
- NBR
- FRT

- Ambitious Target
- PRT
- TrT
- Detailed plan
- S&T

- Fire-Fighting Cloud

TOC TP Mindset & Basics

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Strategy:

Management enhance their ability to improve the performance of the system under their responsibility

Tactics:

Management employ the TOC Management Tools

**Mindset &
Basics
Commitment
to Logic
based
Management**

Current Reality
Understanding
the problem
WHAT to Change

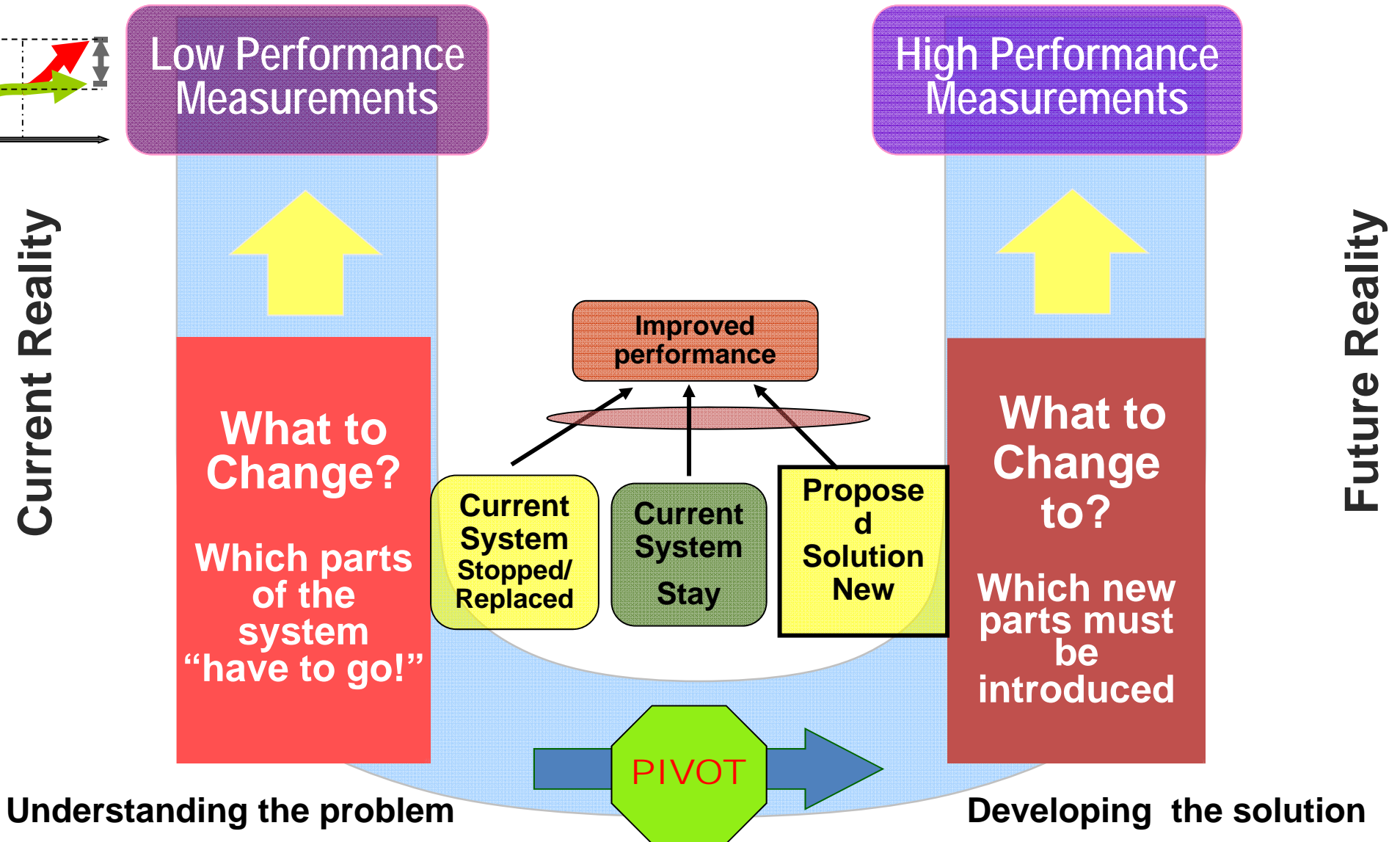
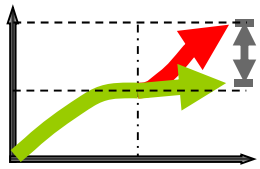
Future Reality
Establishing the
Solution
**What to Change
TO**

Transition
Implementing the
Solution
HOW to Change

POOGI
Continuous
Improvement
How to Grow

- **U-Shape**
- **C&E – Cause & Effect**
- **CLR - Categories of Legitimate Reservations**
- **Logical Branches – positive/negative**
- **Clouds**

Improvement Solution

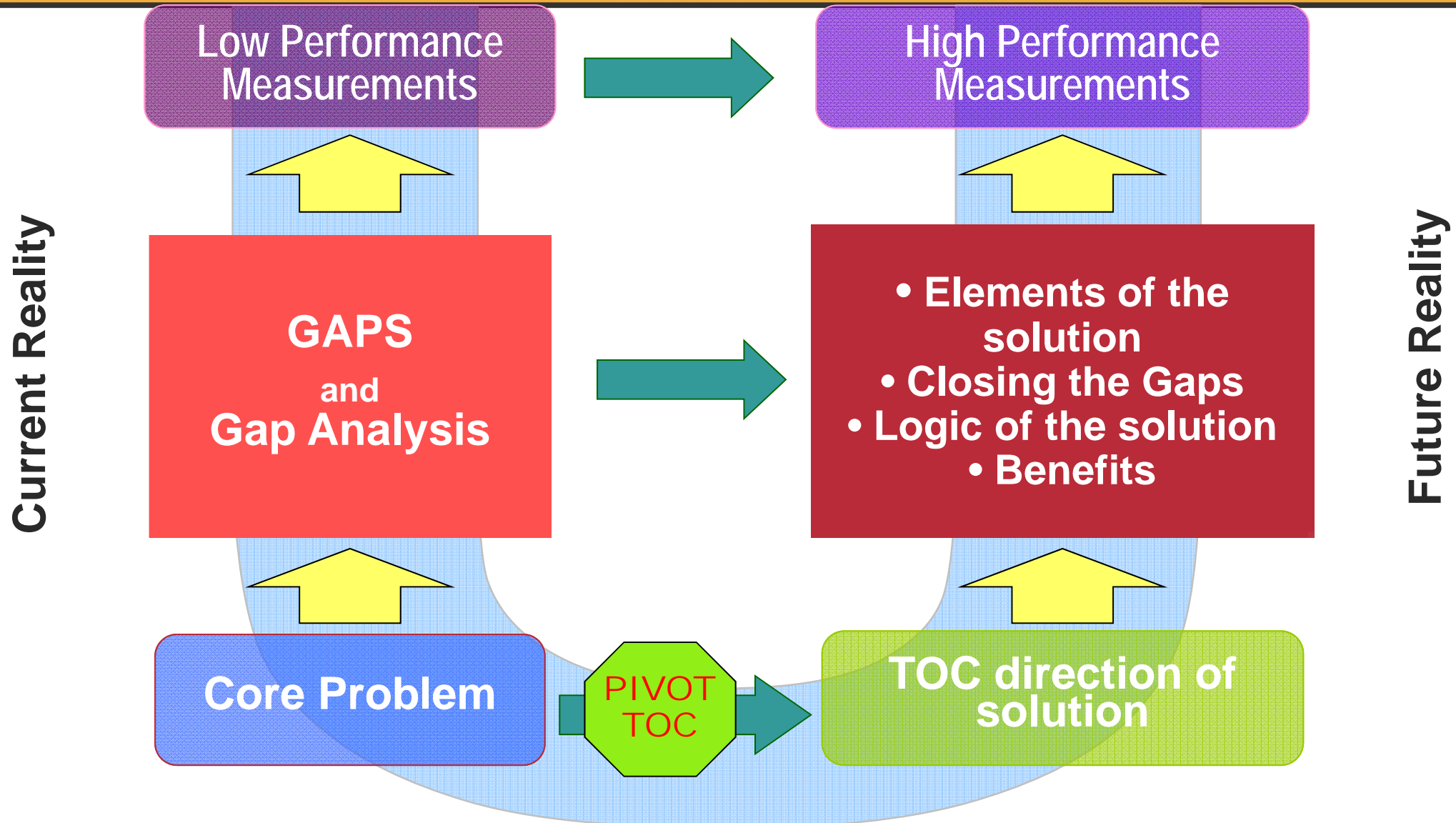


U-Shape for analysis and solution development

What to change?

What to change to?

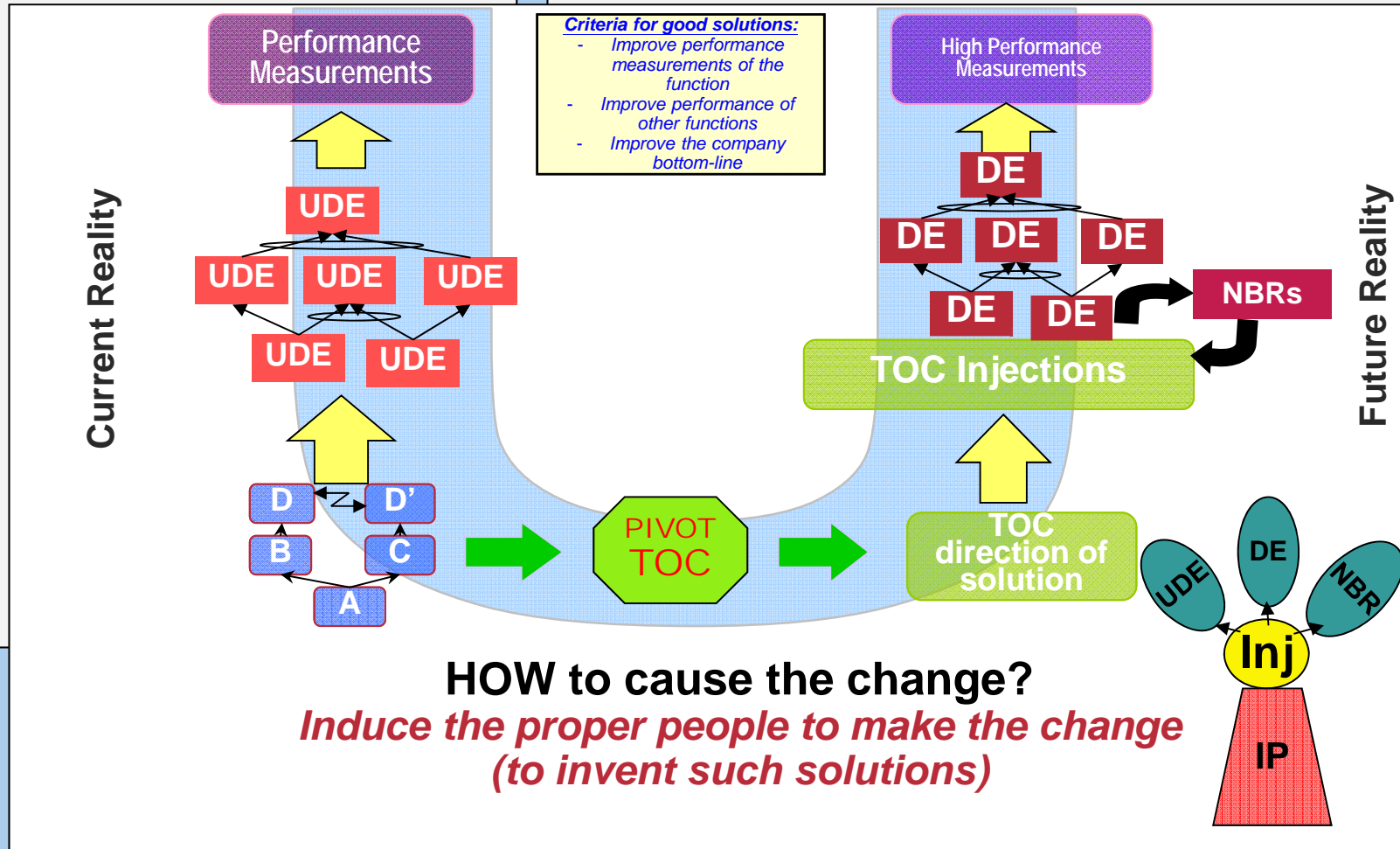
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The U-Shape

WHAT to change?
Pinpoint the core problem

WHAT to change TO?
Construct simple practical solutions



Logical Relationships

Cause & Effect

Sufficiency

Necessity

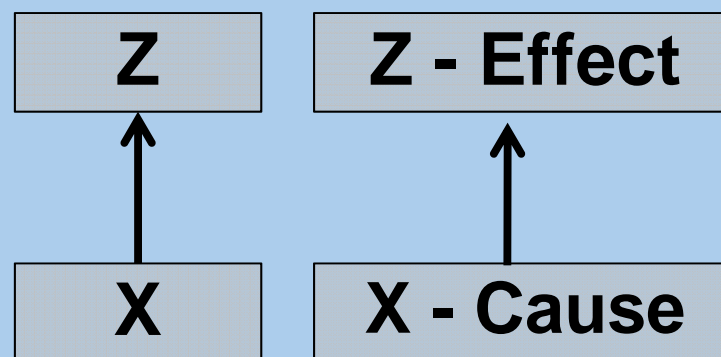
Cause & Effect Relationship

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Understanding is based on making logical connections between entities.

Cause & Effect relationship connects two entities while one is the cause for the existence of the other.

“X” is the cause for the “Z”



Necessity and Sufficiency Statements

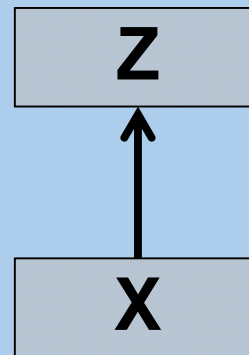
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The **STRAIGHT ARROW** between the entities states that they are connected through Cause & Effect (C&E) relationship. There are two ways how C&E is expressed in statements:

Necessity

In order to have “Z” we
MUST have “X”

If “X” is absent
“Z” cannot happen



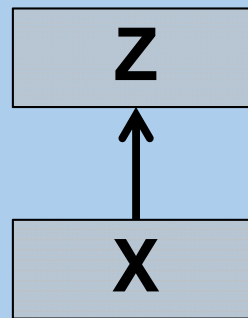
Sufficiency

Presence of “X”
guarantees presence of “Z”

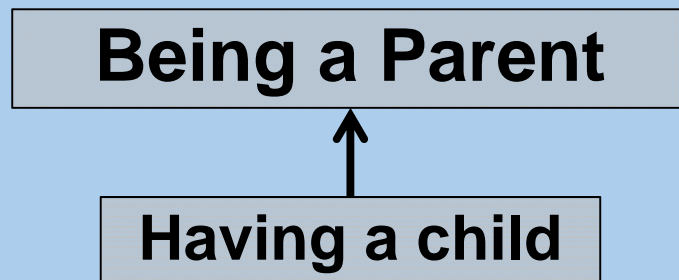
Necessity Statements

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In order for “Z” to exist “X” MUST be there



This means that if “X” is absent, “Z” cannot happen.
It also means that if “X” is removed “Z” will cease to exist.

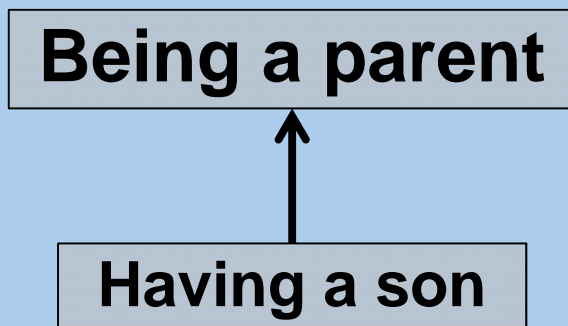
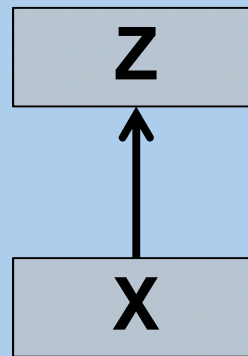


Having a child is a NECESSARY condition for being a parent.

Sufficiency Statements

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Presence of “X” guarantees presence of “Z”



Having a son is sufficient for being a parent but NOT necessary, as one may have a daughter and it will also mean that this person is a parent.

Necessity and Sufficiency

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Example of Necessity with several entities in one statement

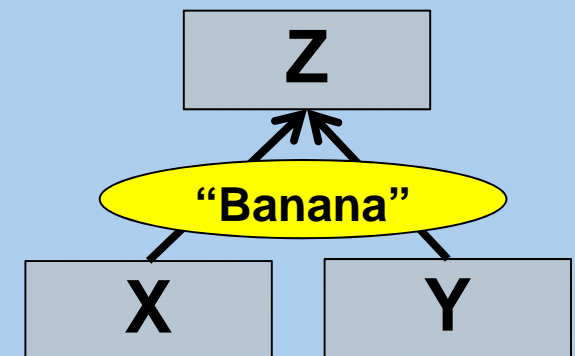
When there are several entities that **TOGETHER** cause Effect to exist – **EACH ONE** of the causing entities is a **NECESSARY** condition.

Example of Sufficiency with several entities in one statement:

The existence of Effect always takes place **ONLY** as a **COMBINATION** of several causes existing at the same time.

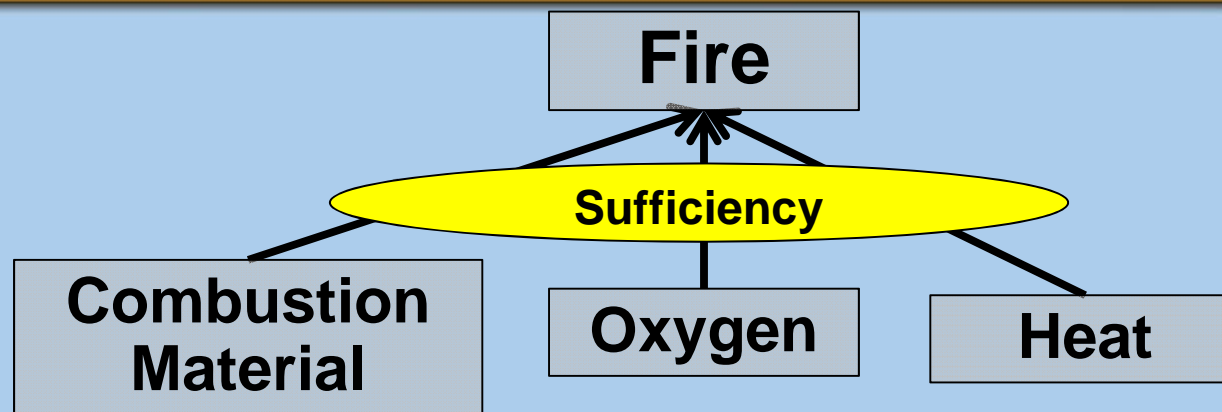
For majority of the cases - the Sufficiency Statement will look like:

If “X” **AND** “Y” exist at the same time **THEN** “Z” takes place. **ONLY WHEN TOGETHER**, “X” and “Y” **ALWAYS** cause “Z” to exist



Necessity and Sufficiency - example

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There are three Necessary Conditions for Fire:

- **Combustion Material**
 - **Oxygen**
 - **Heat**

While EACH of them is a **NECESSARY** condition for the fire, the fire always happens only if **ALL OF THEM** occur at the same time.

Each one of them on itself is **NOT SUFFICIENT**,
ONLY the three of them **TOGETHER ARE SUFFICIENT** to cause fire.

***Checking
Cause-Effect Relationship
Categories of Legitimate
Reservations (CLR)***

Categories of Legitimate Reservations

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In logical reasoning it is important to check each causality connection between two entities to ensure that it is clear and irrefutable.

There are times when what is stated “Does not make sense” to the receiver of the communication.

TOC suggests a protocol how to discuss such situation in a productive and respectful way.

The process of checking logic is called scrutinizing that has its own terminology and sequence

We check for:

- 1. Clarity**
- 2. Entity Existence**
- 3. Causality Existence**
- 4. Cause Insufficiency**
- 5. Additional Cause**
- 6. “House on Fire”**
- 7. Predicted Effect Existence**

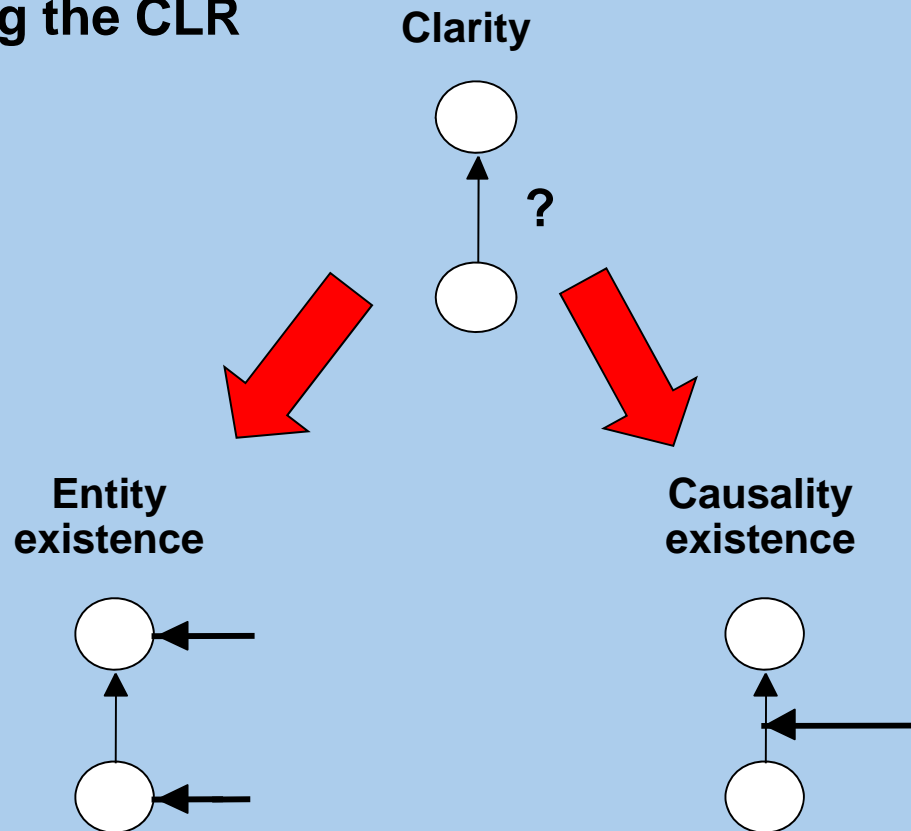


Categories of Legitimate Reservations

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The protocol of using the CLR

“Round One”

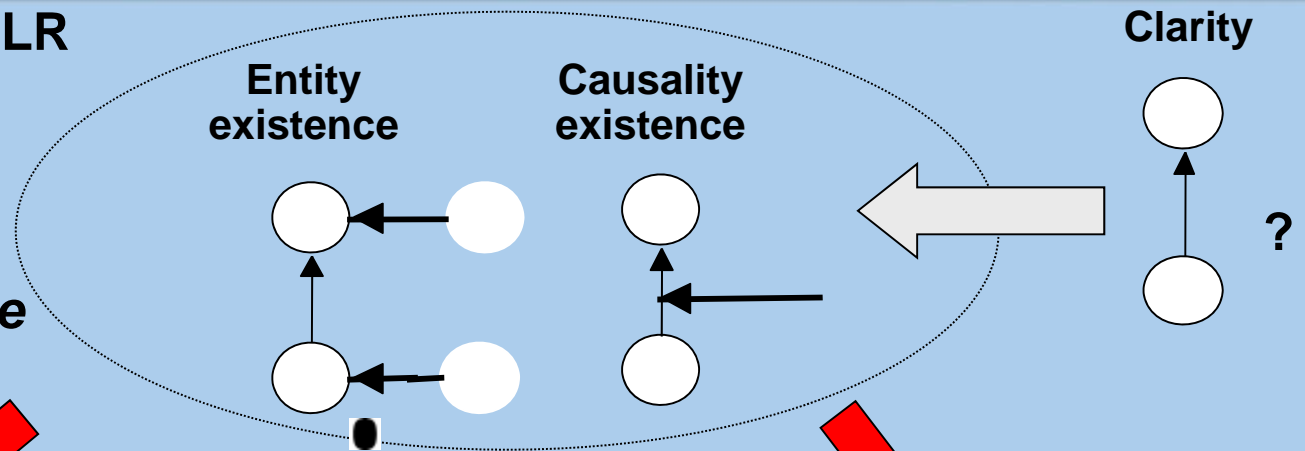


Categories of Legitimate Reservations

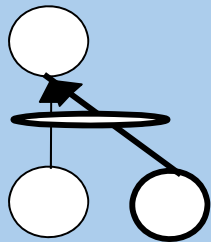
The protocol of using the CLR

“Round Two”

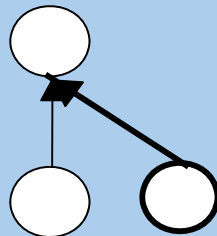
State what is your disagreement regarding the causality



Cause insufficiency



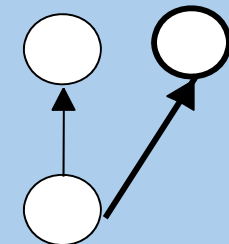
Additional cause



House on Fire



Predicted effect existence



Logical Branches

A series of C&E clusters when the Effect of one cluster becomes the cause for the higher cluster

Example of recording Cause-Effect relationship from Dr. Eli Goldratt's article – The Power of Cause & Effect

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“The answer is that retailers also read newspapers. The alarming headlines created the impression of an economic crisis, and retailers are especially sensitive to such developments.

Typically, a significant part of the inventory they hold has a finite market life and the nightmare of a retailer is to get stuck with yesterday's merchandise.

For this reason, the recession warnings brought retailers to almost instinctively take immediate precautions to reduce their inventories.

To lower inventories, many retailers gave substantial price reductions in December to encourage sales, while cutting down on incoming inventories; ordering less from their suppliers.”

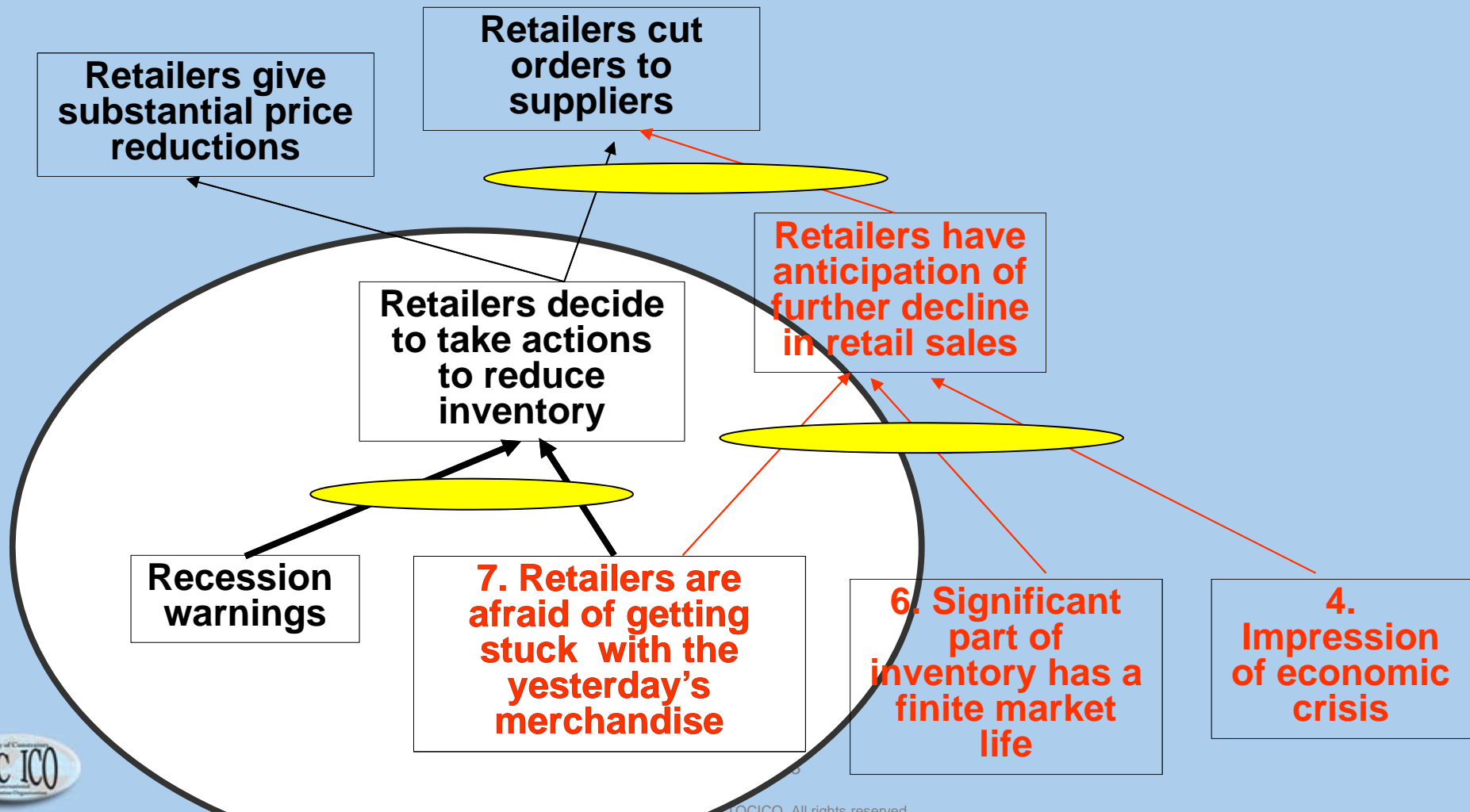
Example of recording Cause-Effect relationship (Cont.)

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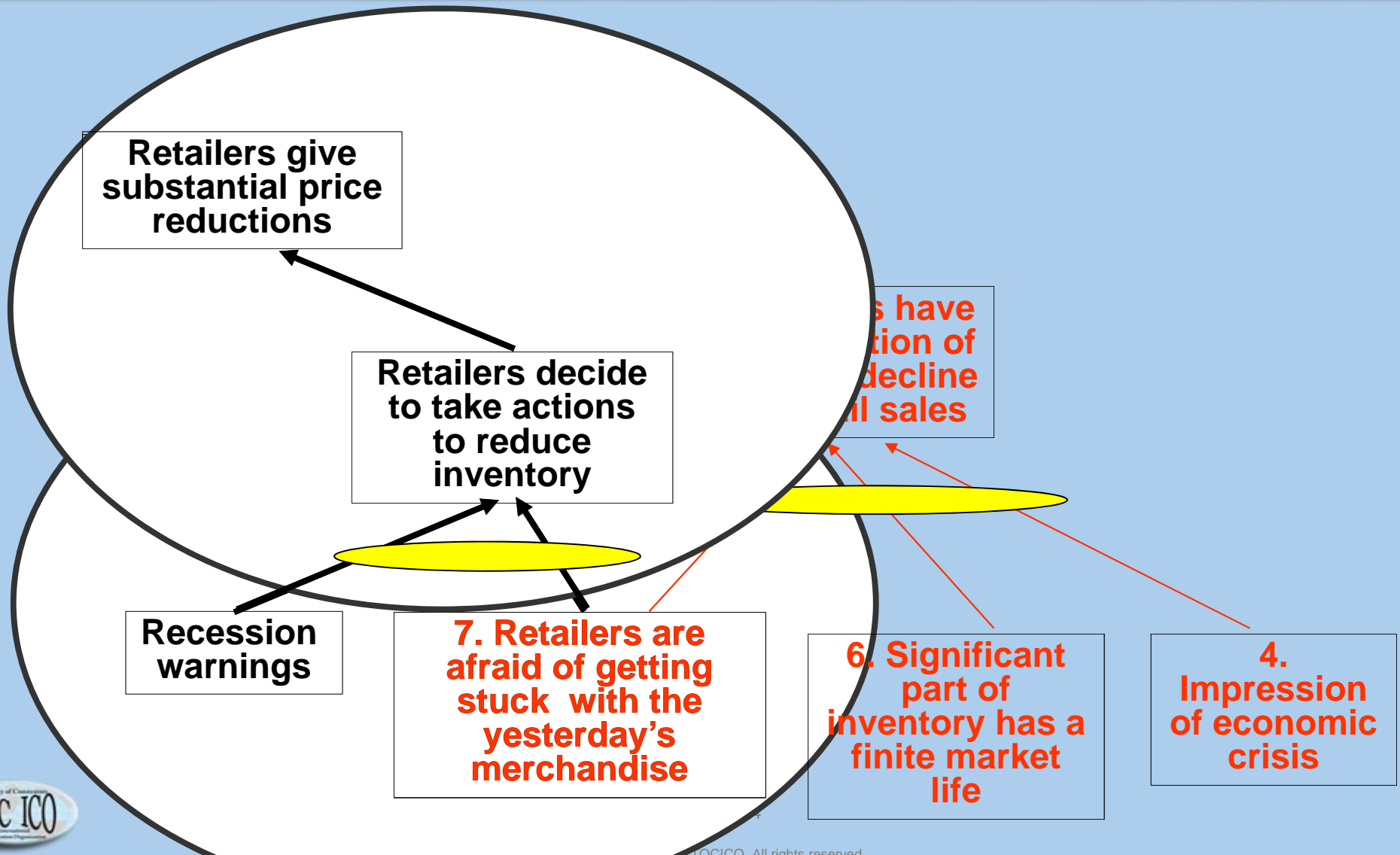
Facts of reality as stated in the article:

- 1. Actual sales are down 10% in the retail**
- 2. Retailers read newspapers**
- 3. Alarming headlines**
- 4. Impression of economic crisis (3 leads to 4)**
- 5. Retailers are sensitive about economic situation**
- 6. Significant part of inventory has a finite market life**
- 7. Retailers are afraid of getting stuck with the yesterday's merchandise**

Example of recording Cause-Effect relationship (Cont.)



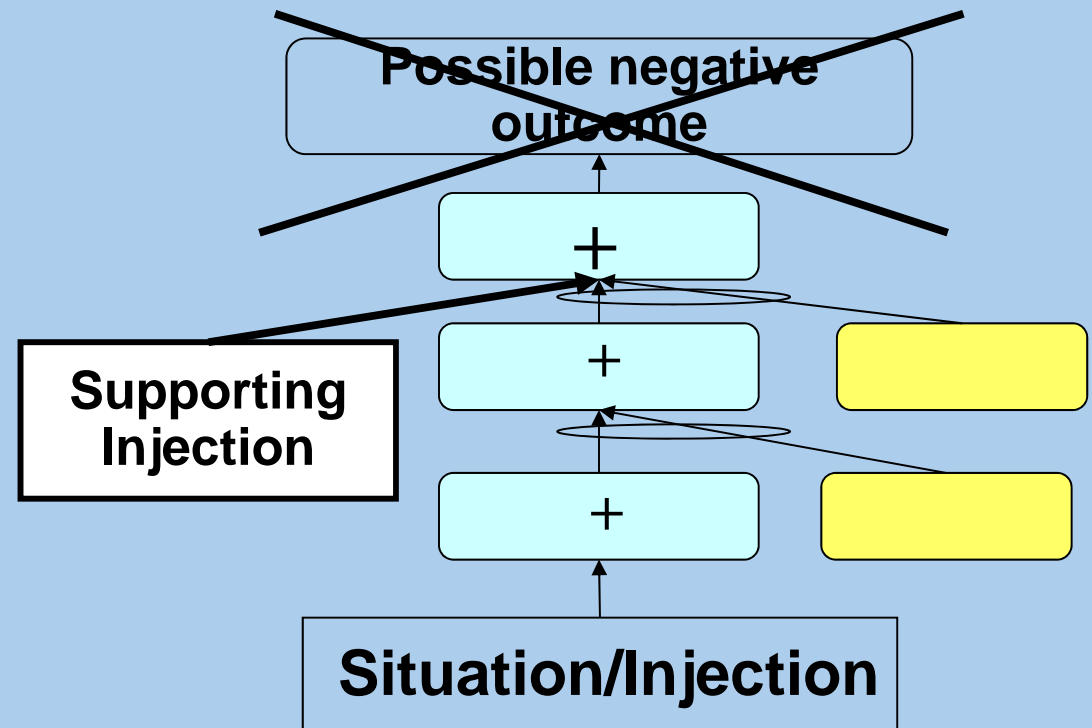
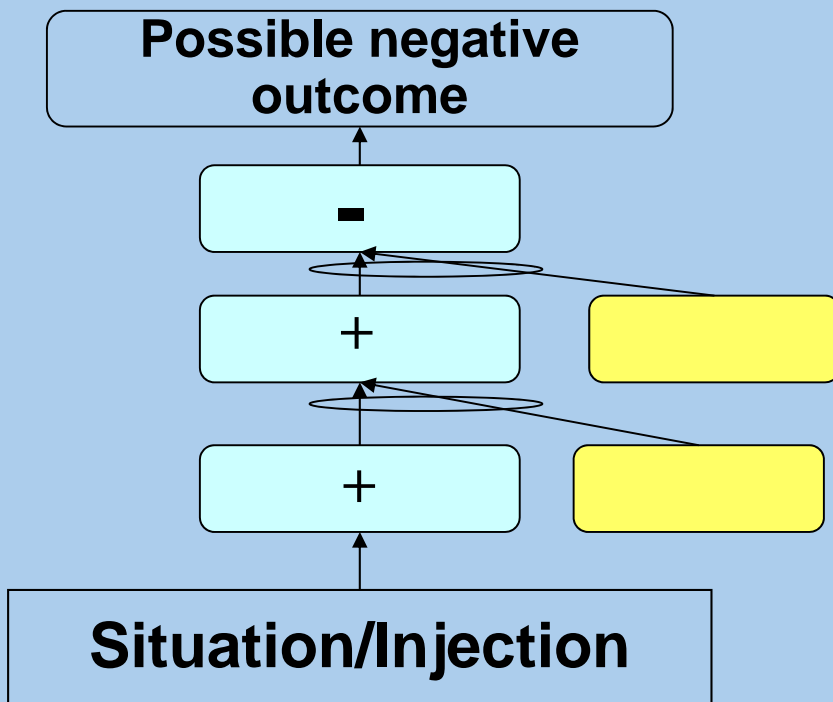
Example of recording Cause-Effect relationship (Cont.)



Negative Branch Reservations - NBRs

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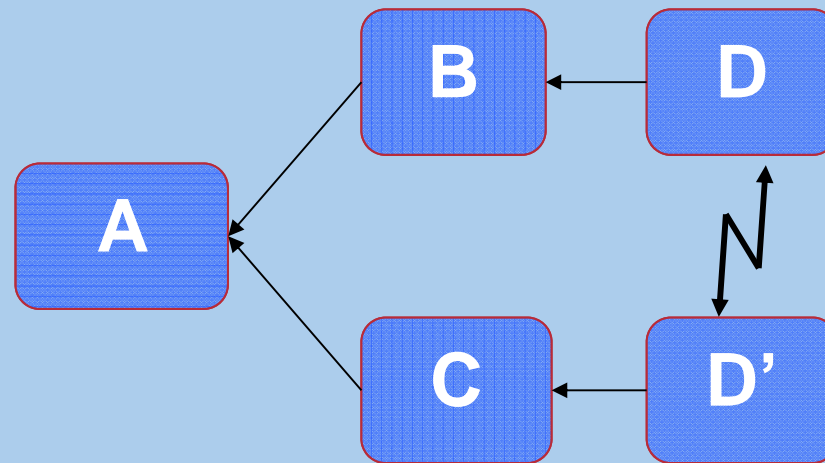
Presenting potential negative outcome of a situation or an proposed solution and finding an injection to trim it



Clouds

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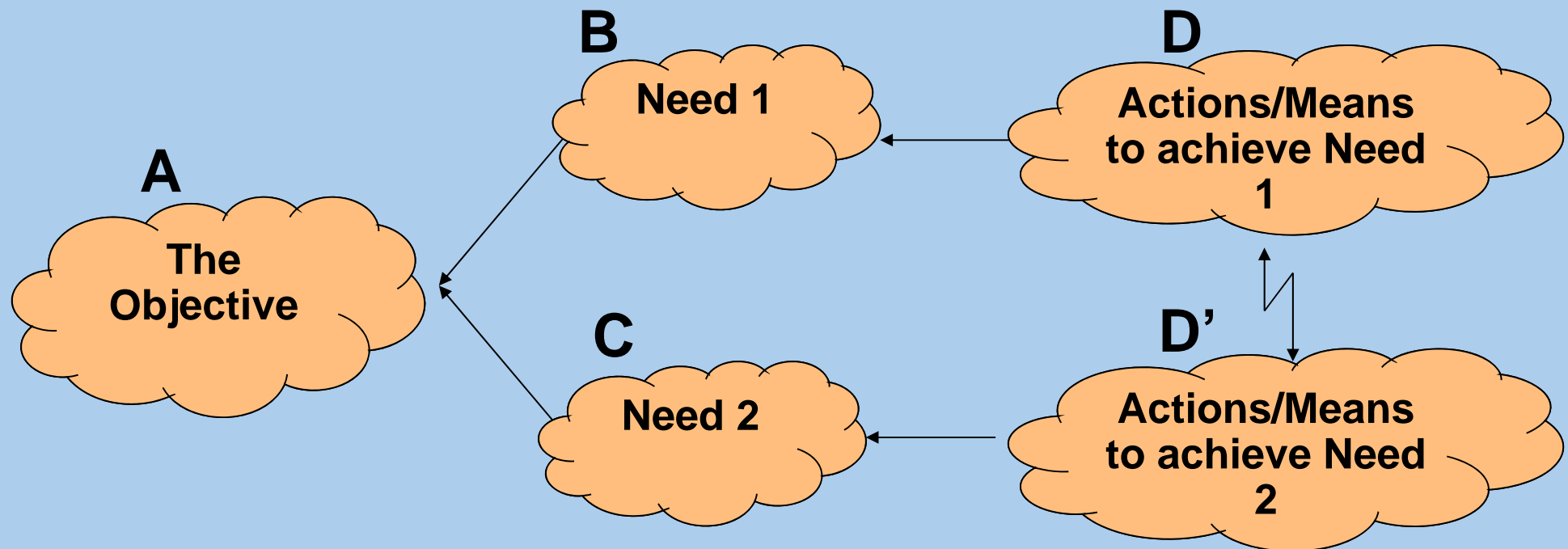
Problem Investigation and Solution Development



The Cloud

All clouds have the same basic structure:

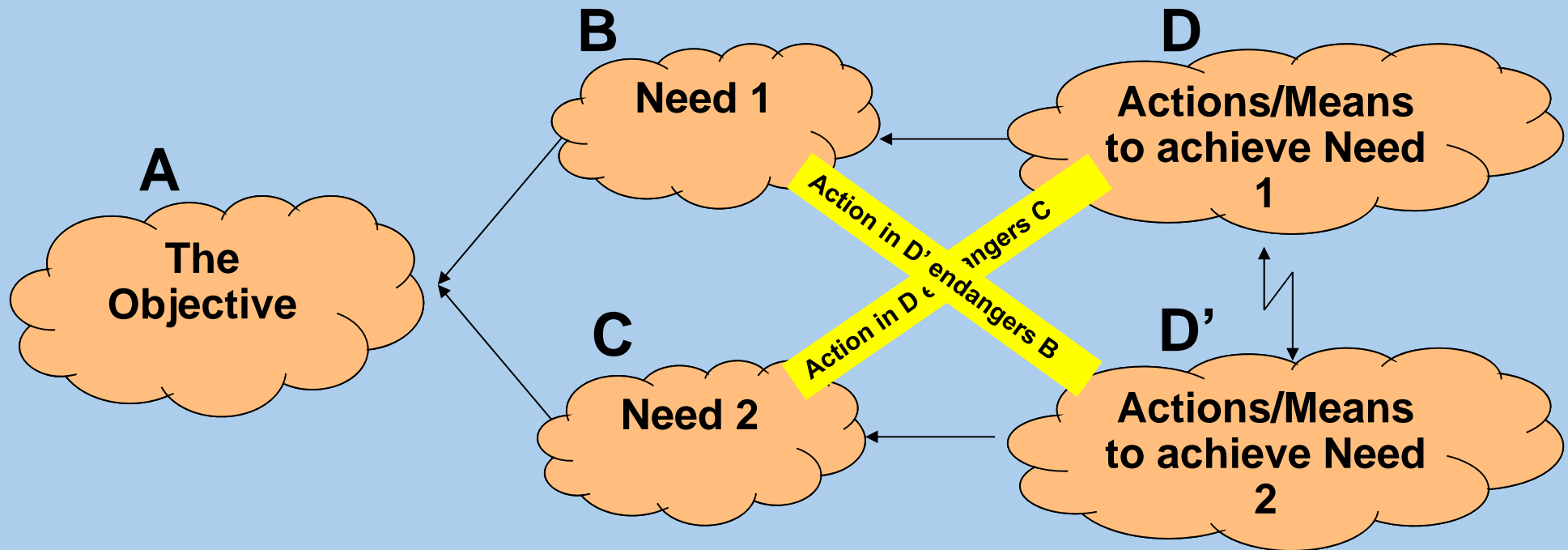
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The Cloud

Logical Checks

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- In order to have desired objective A We/I must have need B
- In order to have desired objective A We/I must have need C
 - In order to satisfy need B, action D must be taken
 - In order to satisfy need C, action D' must be taken
- D and D' are in direct conflict

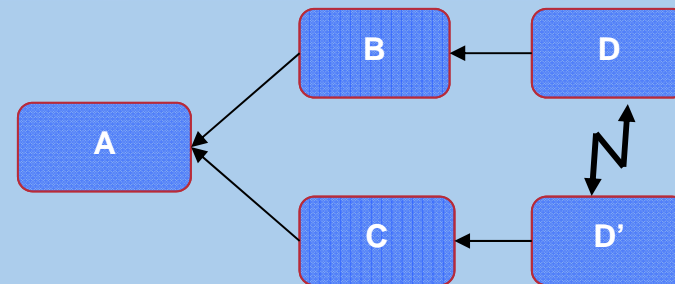
• Action in D endangers C

• Action in D' endangers B

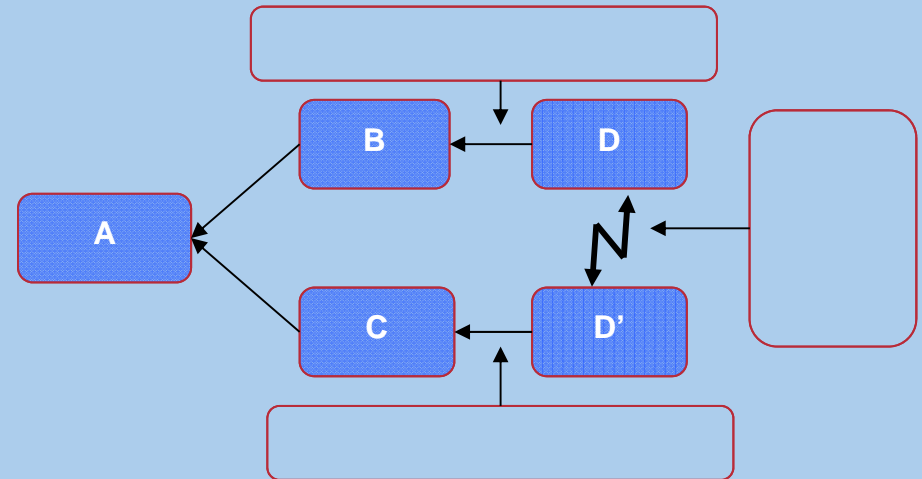
3 Stages of working with the Cloud

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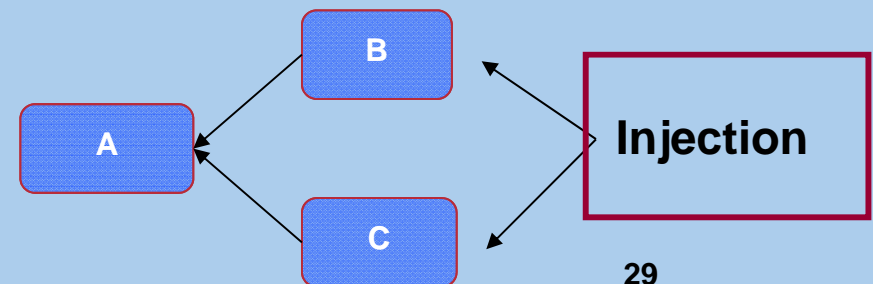
➤ Understanding the problem



➤ Surfacing assumptions



➤ Finding Injections



Different types of Clouds

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- **Dilemma Cloud (Internal)**
- **Conflict Cloud**
- **UDE Cloud**
- **Consolidated Cloud**
- **Core Cloud**
- **Firefighting (Lieutenant) Cloud**

TP Work – Levels

- ***Single problem***
- ***Several problems – shortcut
(consolidated view)***
- ***Full TP – multi UDE with the
elaborated logic***

TOC TP – What to Change Understanding the Problem

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Strategy:

Management enhance their ability to improve the performance of the system under their responsibility

Tactics:

Management employ the TOC Management Tools

Mindset & Basics

Commitment to Logic based Management

**Current Reality
Understanding
the problem -
WHAT to
Change**

Future Reality
Establishing the
Solution
What to Change
TO

Transition
Implementing the
Solution
HOW to Change

POOGI
Continuous
Improvement
How to Grow

- UDEs – Undesirable Effects
- UDE Cloud
- Consolidated Cloud
- Core Cloud
- CRT – Current Reality Tree

Understanding the Problem

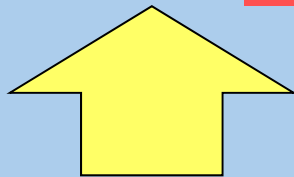
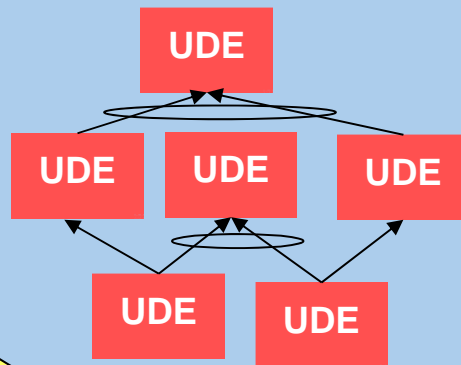
Current Reality

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Low Performance Measurements



GAPS
and
Gap Analysis



Core Problem

Gaps – facts and entities from reality that explain why it is so difficult to achieve the higher level of performance measurements

**They are called – UDEs
Un-Desirable Effects**

The Gap Analysis connects the UDEs to each other and explains the current level of the performance measurements

Understanding the Problem

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Current Reality

Low Performance
Measurements

Unsatisfactory On-Time Delivery



GAPS
and
Gap Analysis

Typical UDEs in a business environment (severe problems):

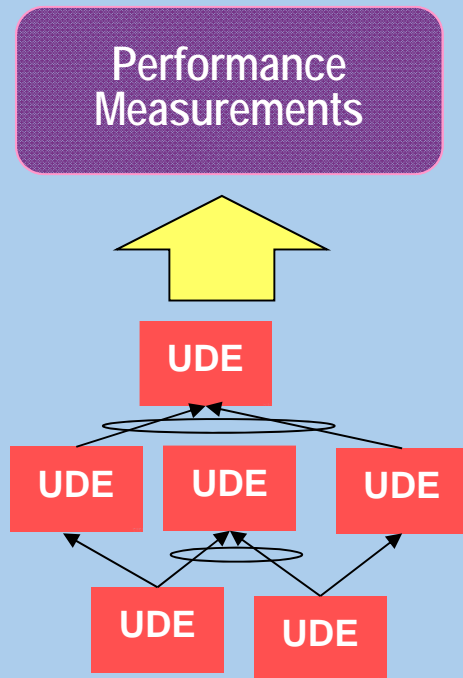
Often resources are not available when needed
Priorities constantly shift
Input is not always available when needed
Too much expediting
Too much over time
Too much rework

- **UDE - A complaint about an ongoing problem that exists in your reality**
- **UDEs are subject to severe validity checks**

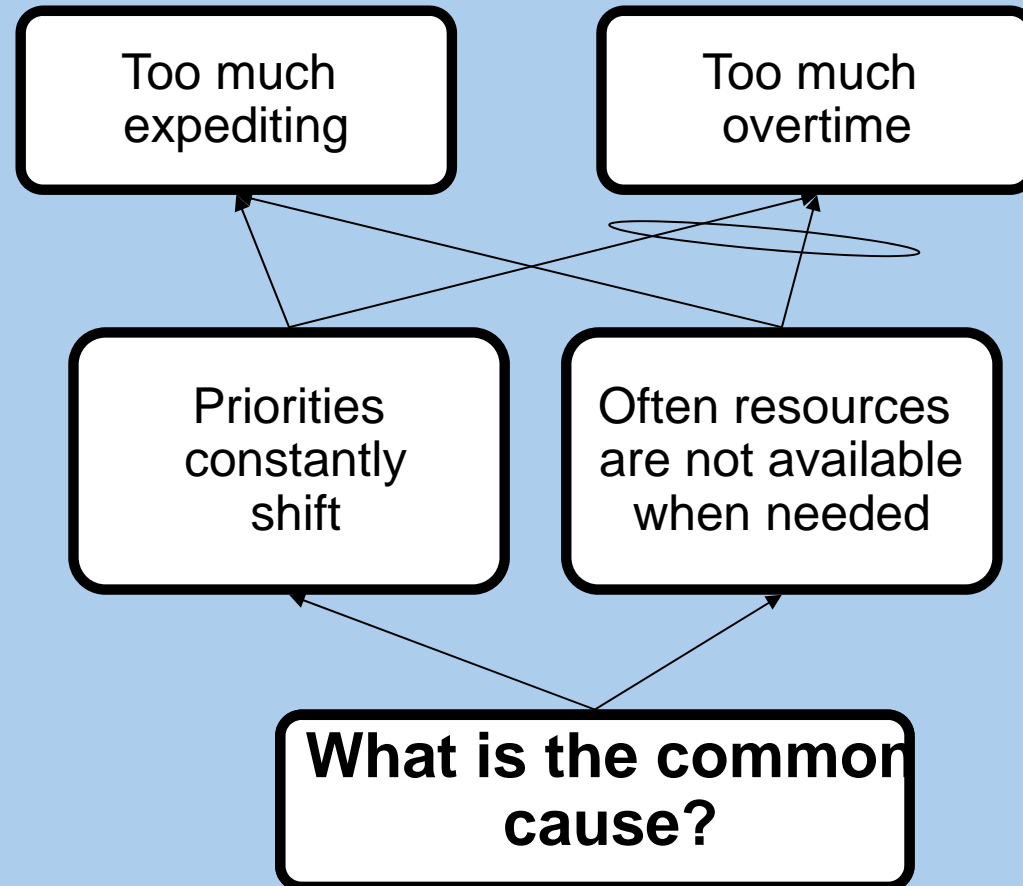
Understanding the Problem

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Current Reality



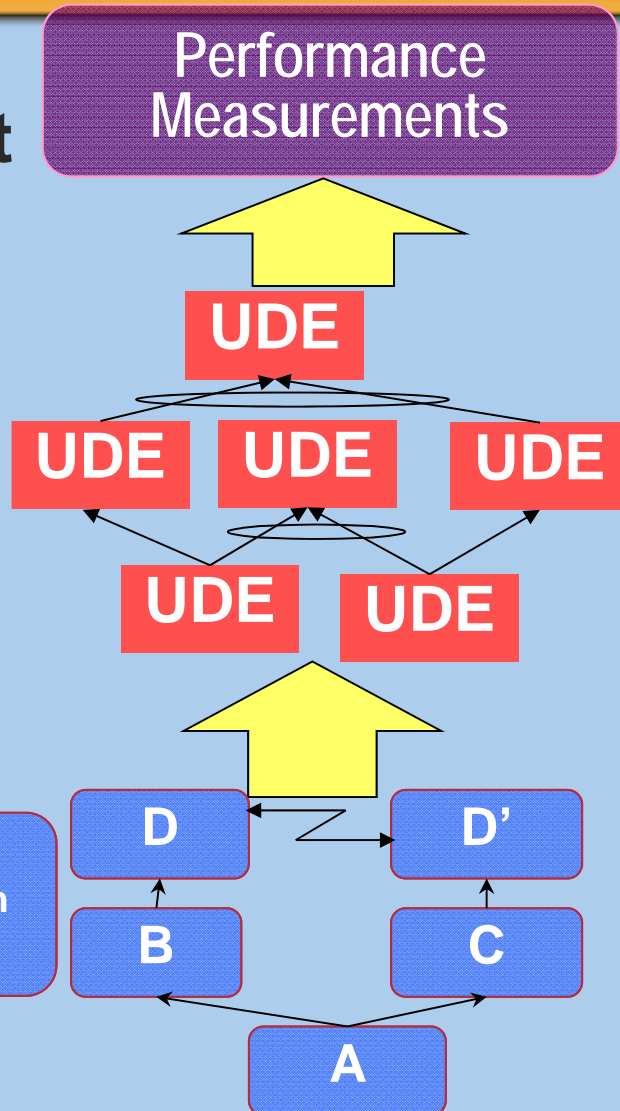
GAP and Gap Analysis



Understanding the Problem

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Current Reality



Core Problem

reveals the logical reason for the existence of all the Gaps/UDEs

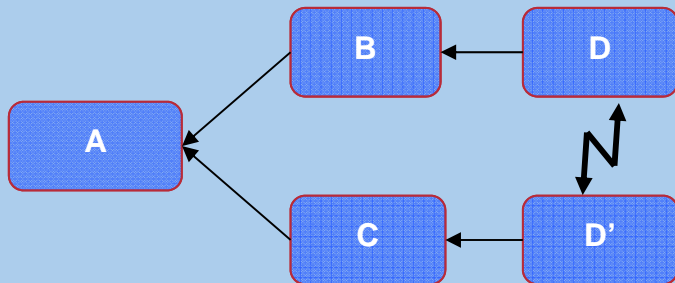
It can be expressed through a Core Cloud -

a diagram of a conflict between two major ways of handling an issue (in a business environment - two major ways of managing)

Understanding the Problem

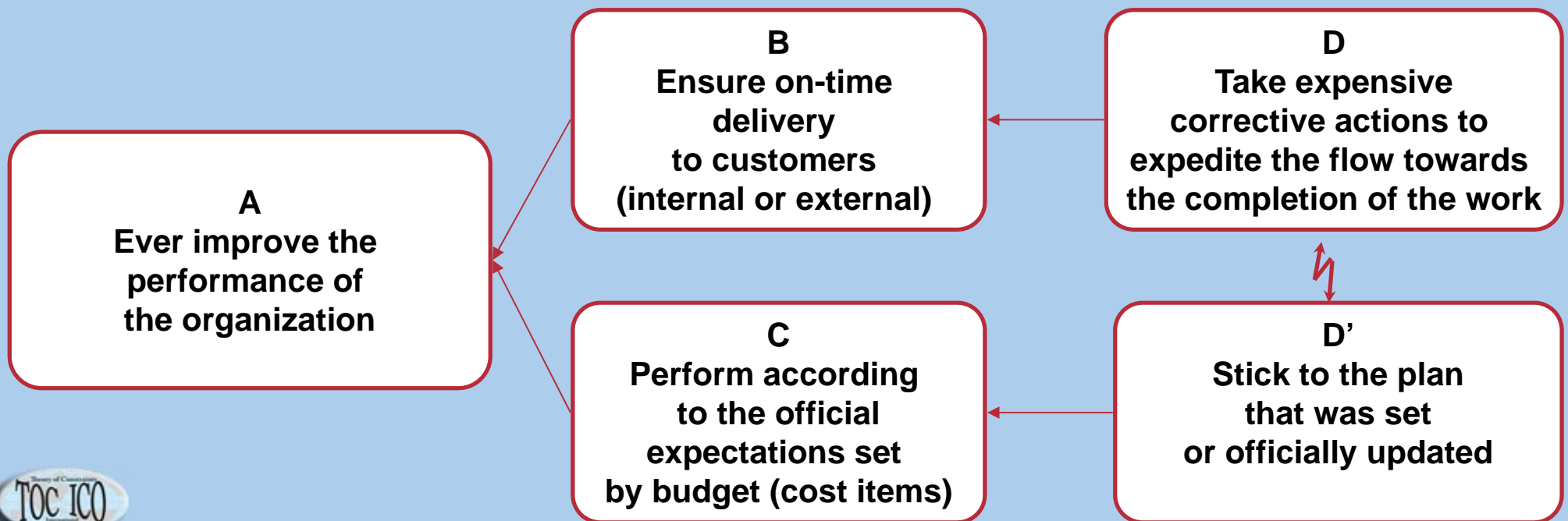
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Current Reality



Core Problem

- A conflict diagram - Core Cloud



Constructing UDE Clouds

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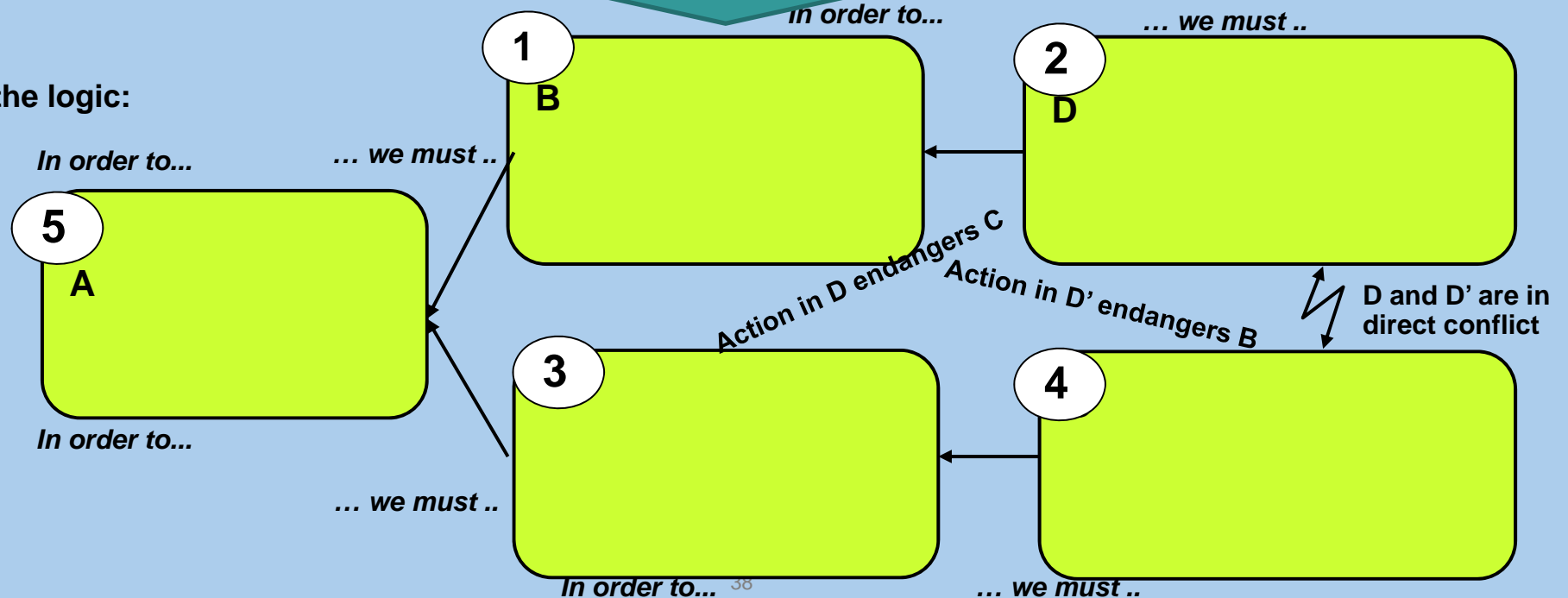
Starting Point:

Why is this UDE undesirable?

What important need [B] of the system does it jeopardise?

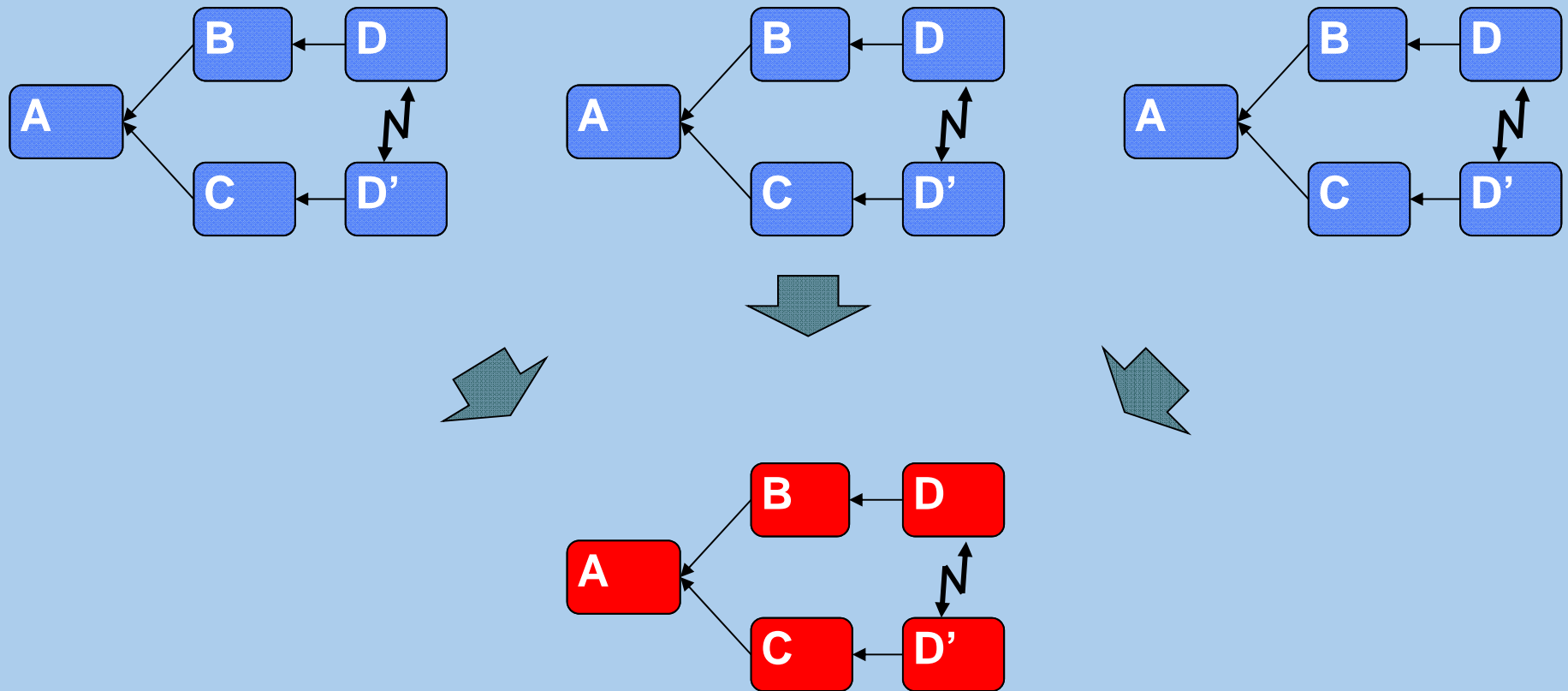


Check the logic:



Consolidating 3 UDE Clouds

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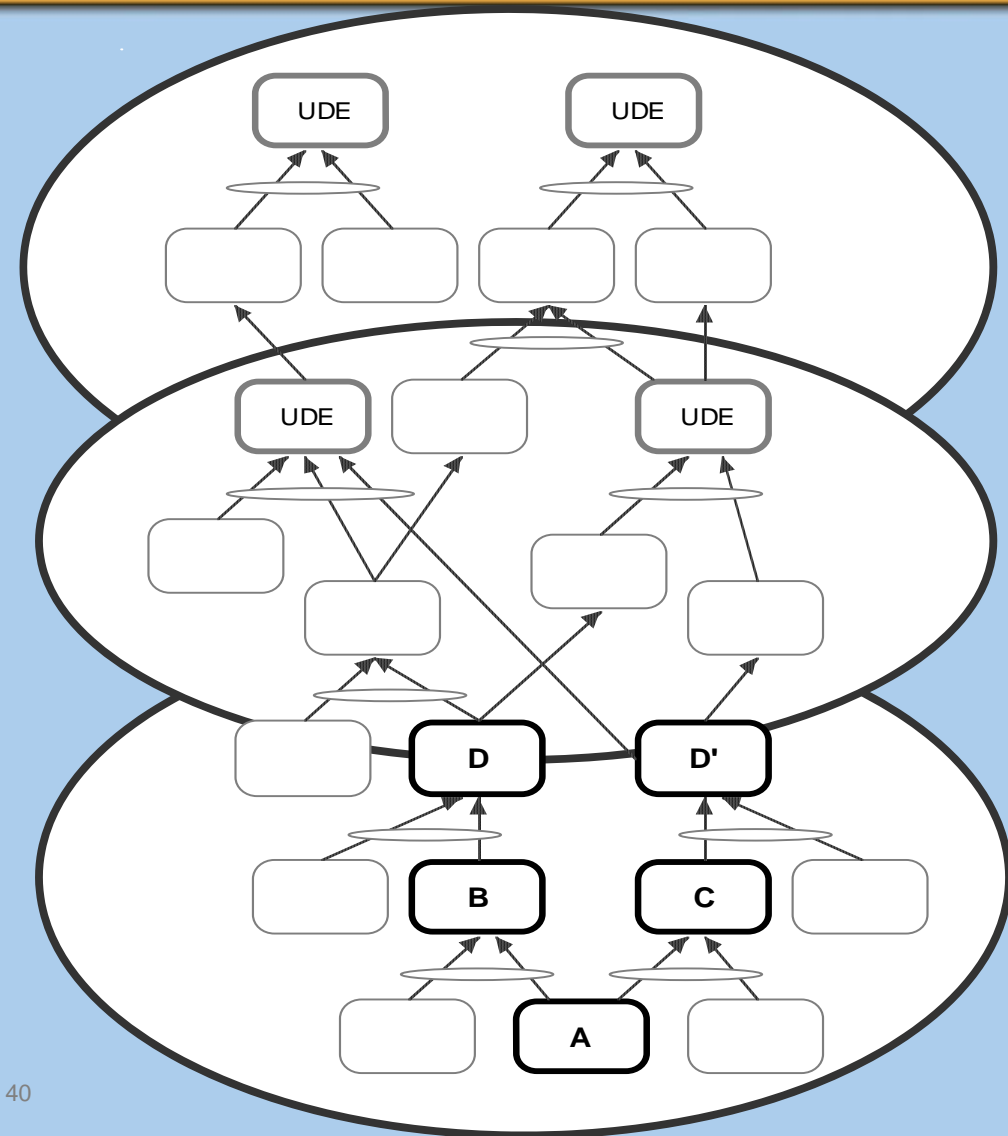
CRT – Current Reality Tree

The general structure of the CRT

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Current Reality Tree consists of 3 major structural parts:

- **Core Current Reality Tree (CCRT) – the base of the full CRT. This base is the Core (Consolidated) Cloud with main assumptions.**
- **The UDE map**
- **Logical connections and entities within the combined structure.**



CRT – Current Reality Tree

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The CRT assists in validating the logical connections that support the claim that the core problem causes the existence of the UDEs that are perceived to be the reasons for the low and unacceptable performance of the system.

The objective of this work is to ensure that in the process of developing a solution we focus on the right problem and that our efforts are not futile.

TOC TP – What to Change to – The Solution

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Strategy:

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What to change to?

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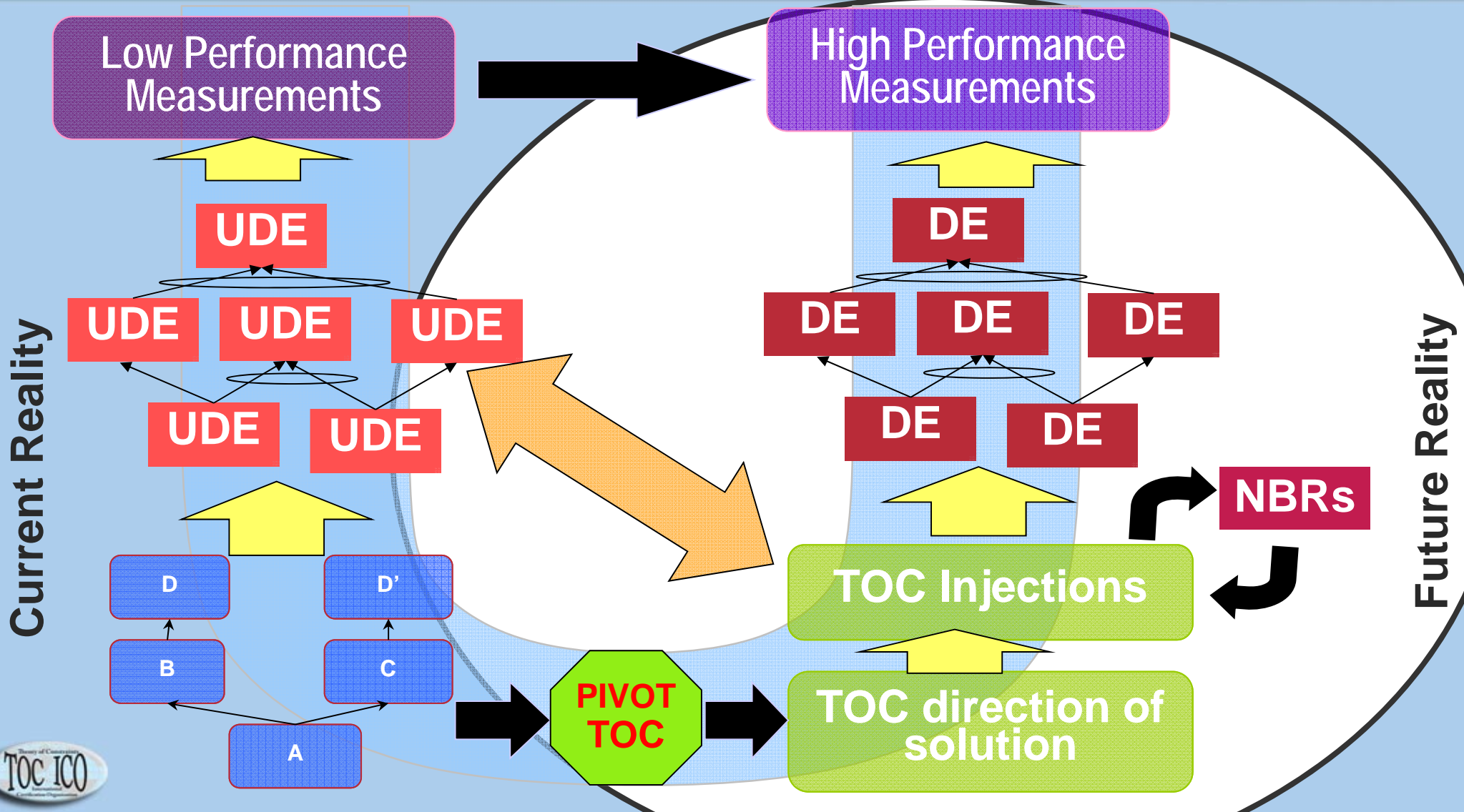
Construct Simple Practical Solutions

We need:

- Replace the core problem with a new Driver
- Construct new features of the system
- Close the Gaps using Cause and Effect relationships
- Get the benefits (Desired Effects – DE) as the result of implementing the solution
- Improve levels of the system's performance measurements

TOC Detailed Solution Design

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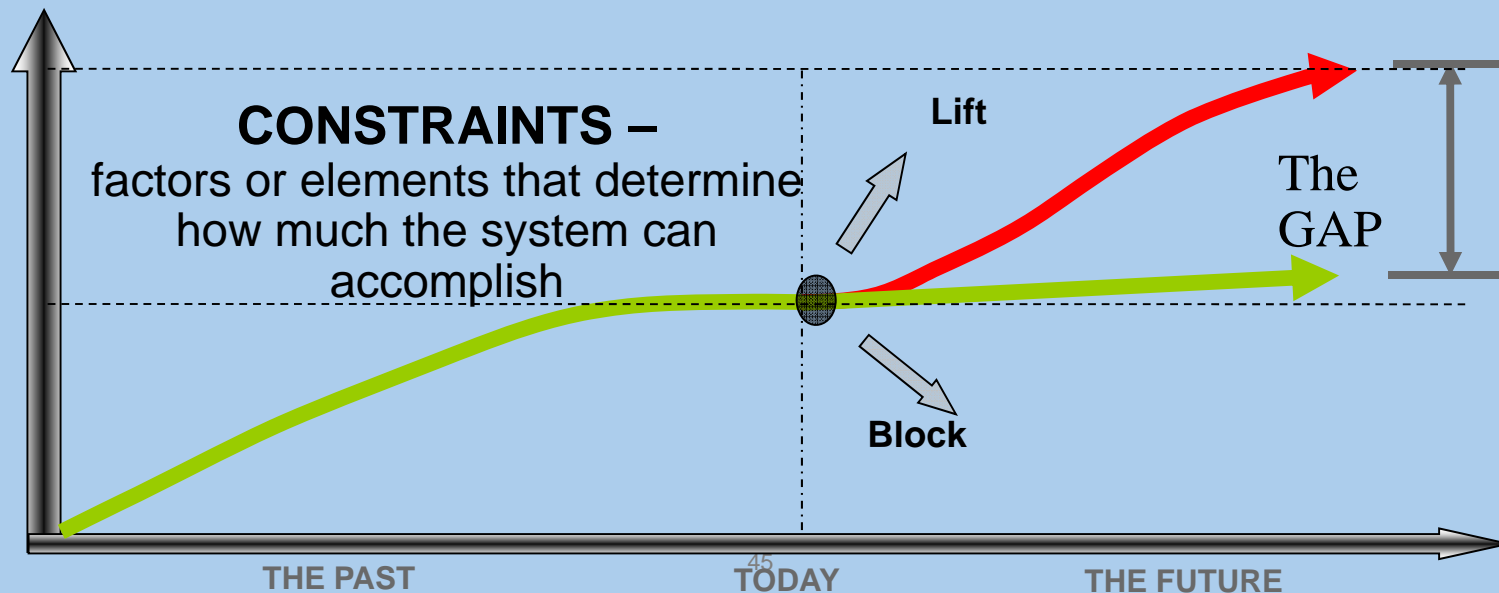


The TOC Pivot

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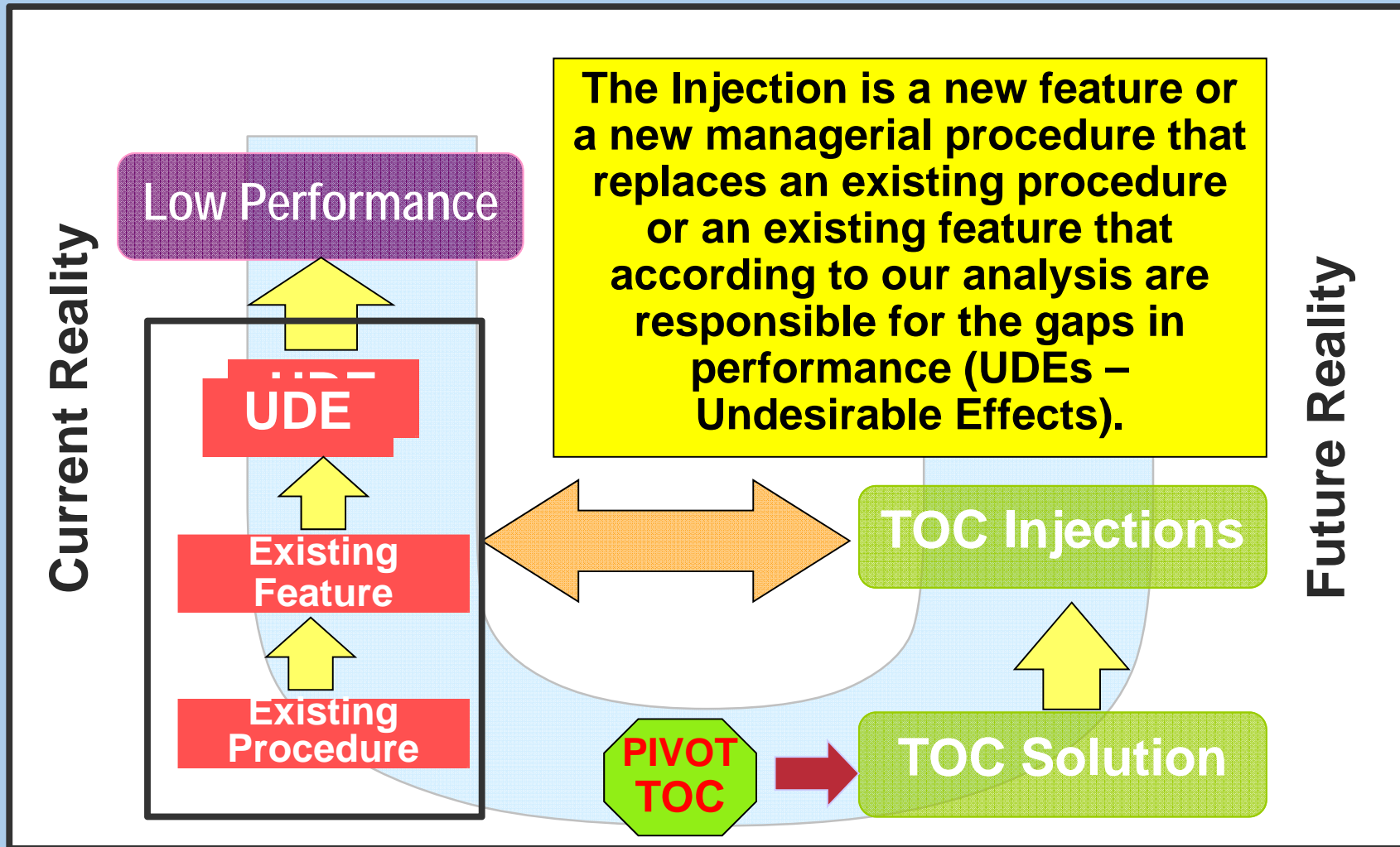


- The Basic Assumptions
- The Flows within the system
- The Constraint
- Types of Constraints
- Managing through the Constraint
- The Five steps of Focusing



The Injection

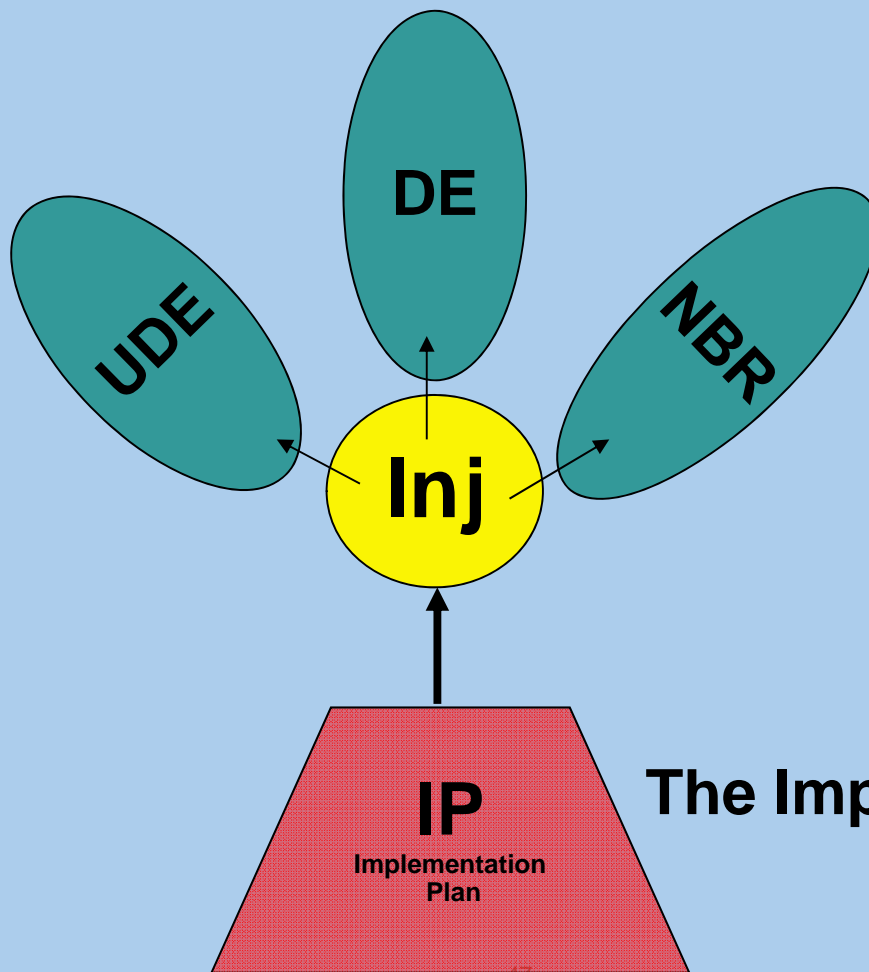
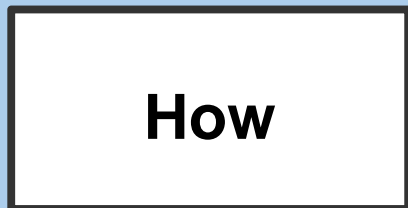
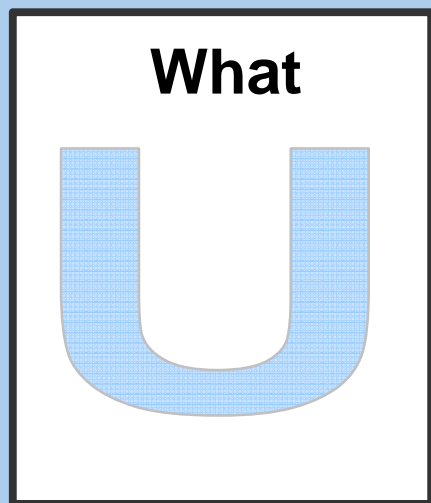
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All about the Injection Injection Flower

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The Solution Design



**The Implementation
Plan**

FRT – Future Reality Tree

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The FRT assists in validating the proposed solution that has been developed to break the Core Cloud.

Validation means that there is a strong Cause & Effect logic to state that proposed solution actually brings the desired benefits.

The FRT demonstrates how the proposed solution brings to the achievement of the two important needs of the Core Cloud (B and C) and eventually to the achievement of the objective A.

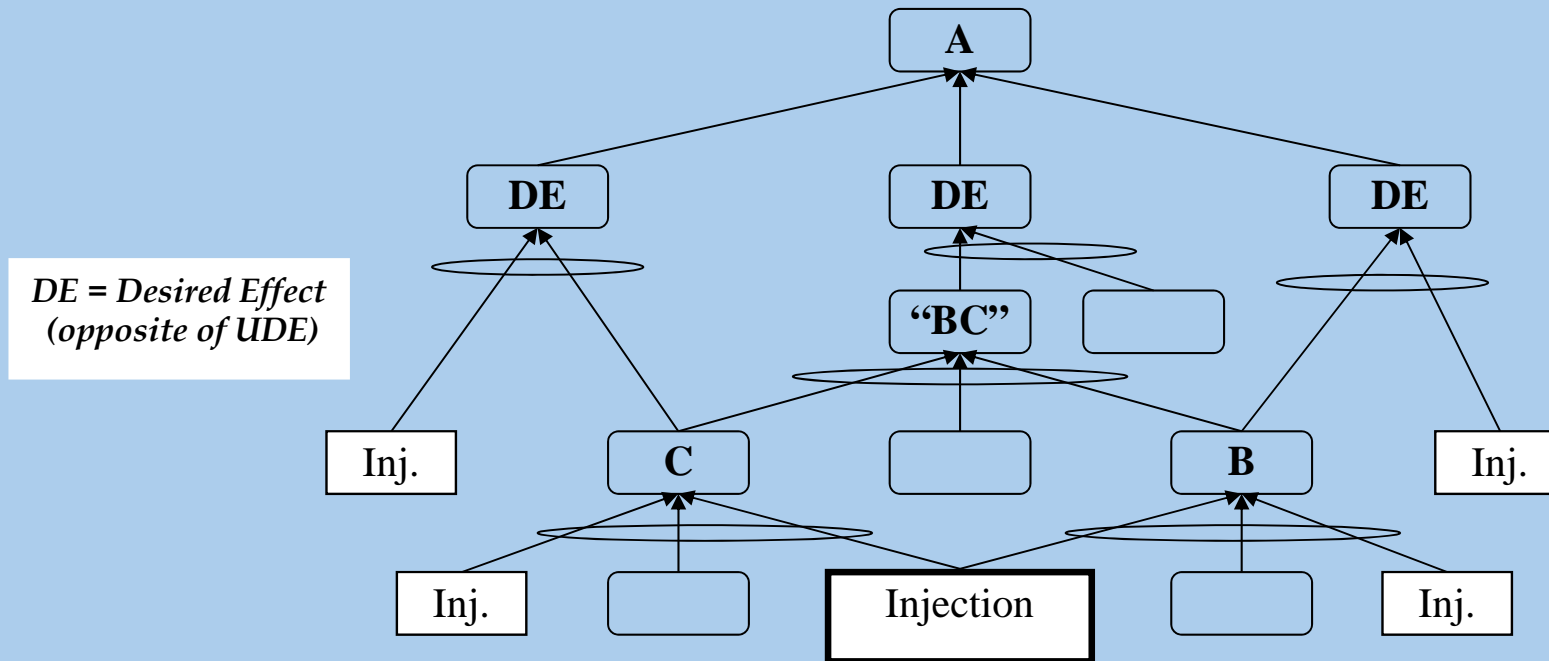
The FRT shows exactly how solution will eliminate the UDEs and will bring the Desired Effects (DEs).

The objective of this work is to ensure that we focus on the right solution and that our efforts are not futile.

FRT - Future Reality Tree - General Structure

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The Full Solution with Benefits



Future Reality Tree (FRT) –

the thinking process that enables a person to construct a solution which, when implemented, replaces the existing UnDesirable Effects (UDEs) by Desired Effects (DEs) without creating devastating new ones.

TOC TP - Transition - Implementing

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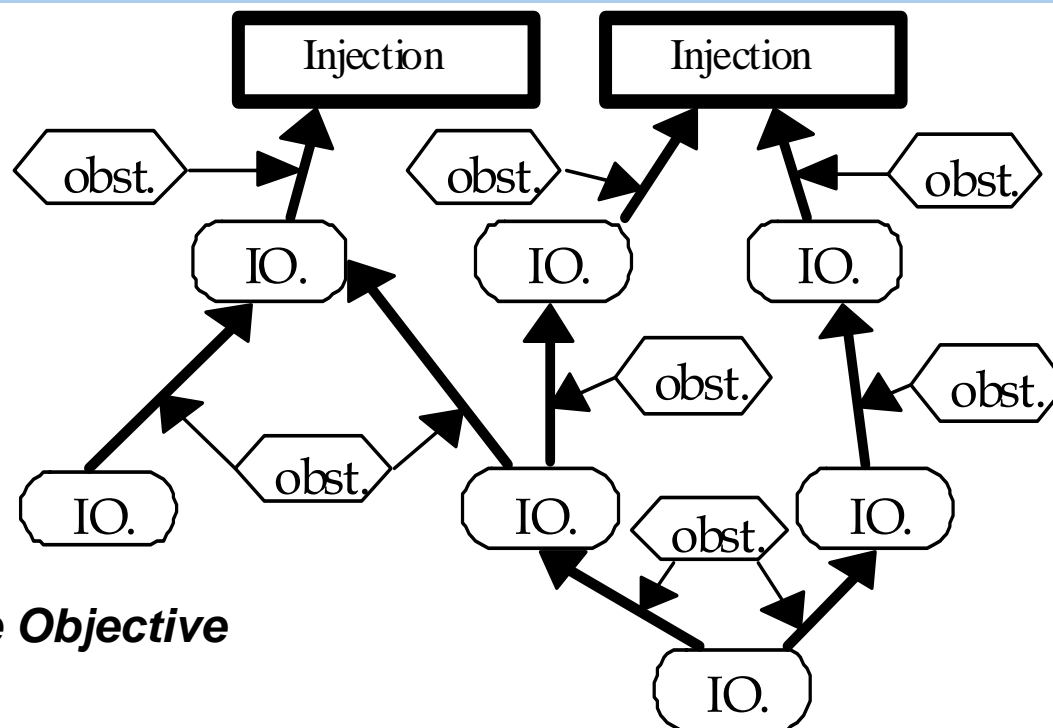
POOGI

Continuous
Improvement
How to Grow

- Ambitious Target - I.O. Map
- PRT – Prerequisite Tree
- TrT – Transition Tree
- Detailed plan
- S&T

PRT - Prerequisite Tree

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Pre-Requisite Tree (PRT)

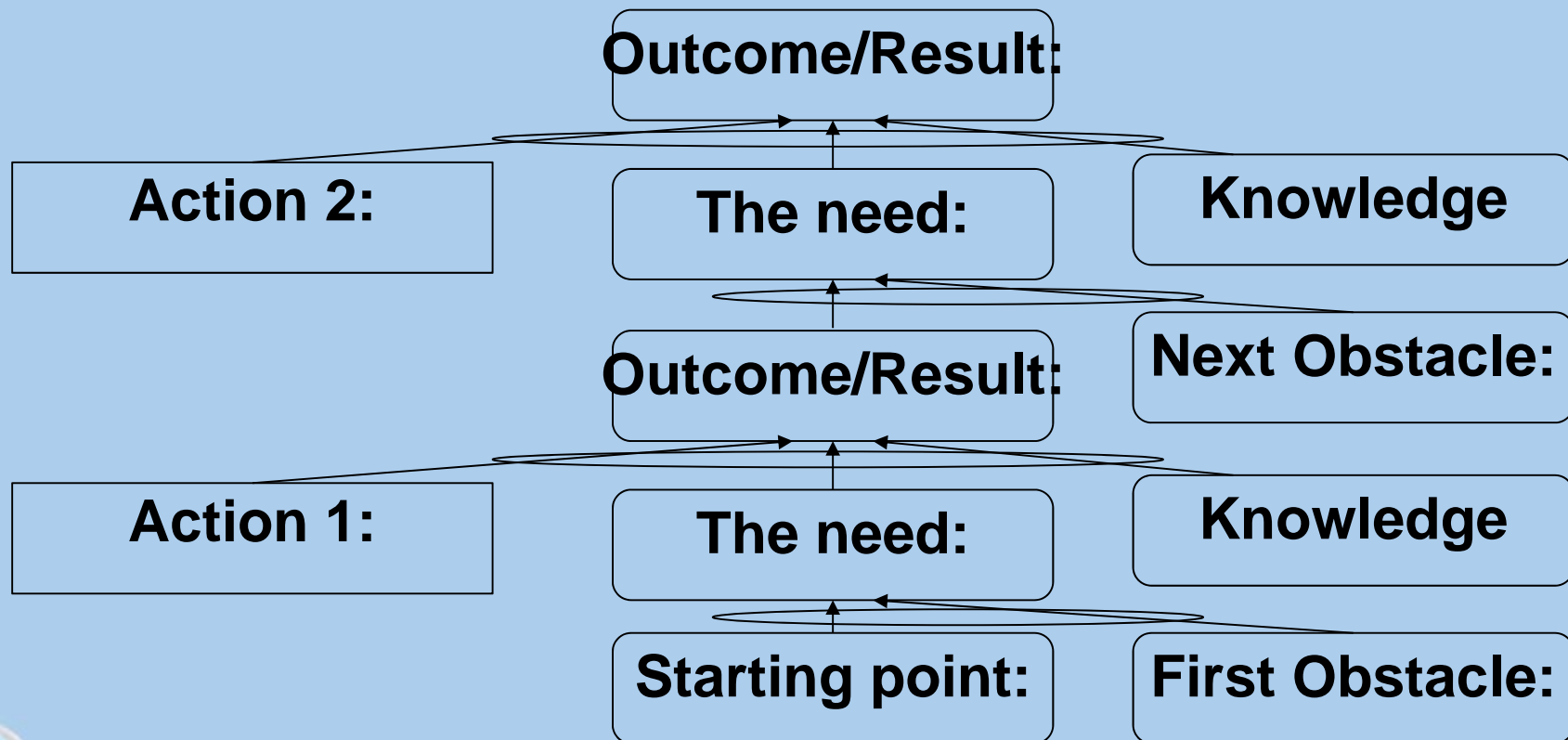
By relying on everybody's "expertise" at pointing out obstacles, this Thinking Process enables dissection of the implementation tasks into an array of interrelated, well-defined, Intermediate Objectives.

Transition Tree - TrT

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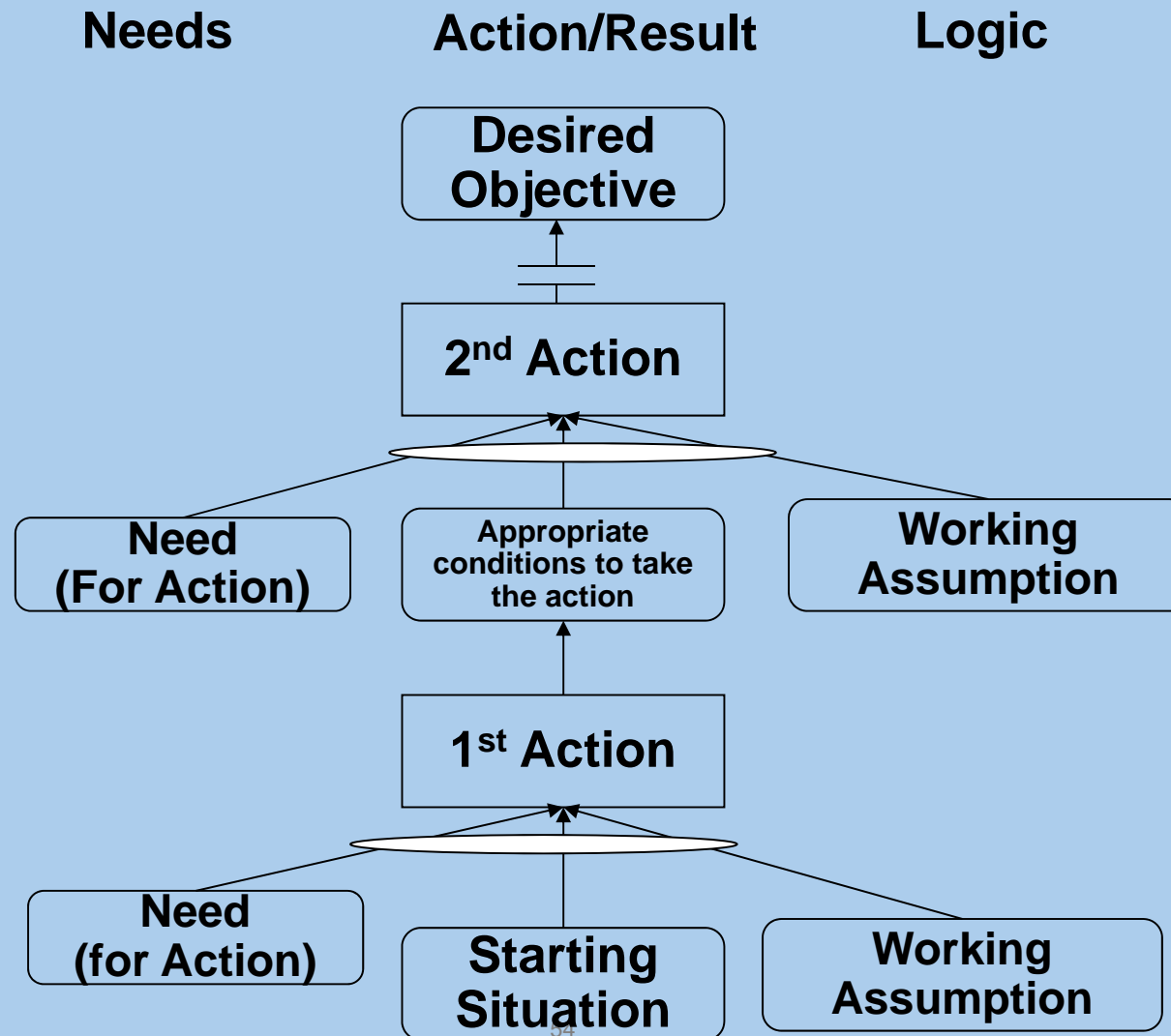
Transition Tree (TrT)

The Thinking Process used to construct a detailed implementation plan, based entirely on the initiator's actions (other actions appear as reaction).



Alternative Structure for TrT

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S&T – Strategy & Tactics Tree

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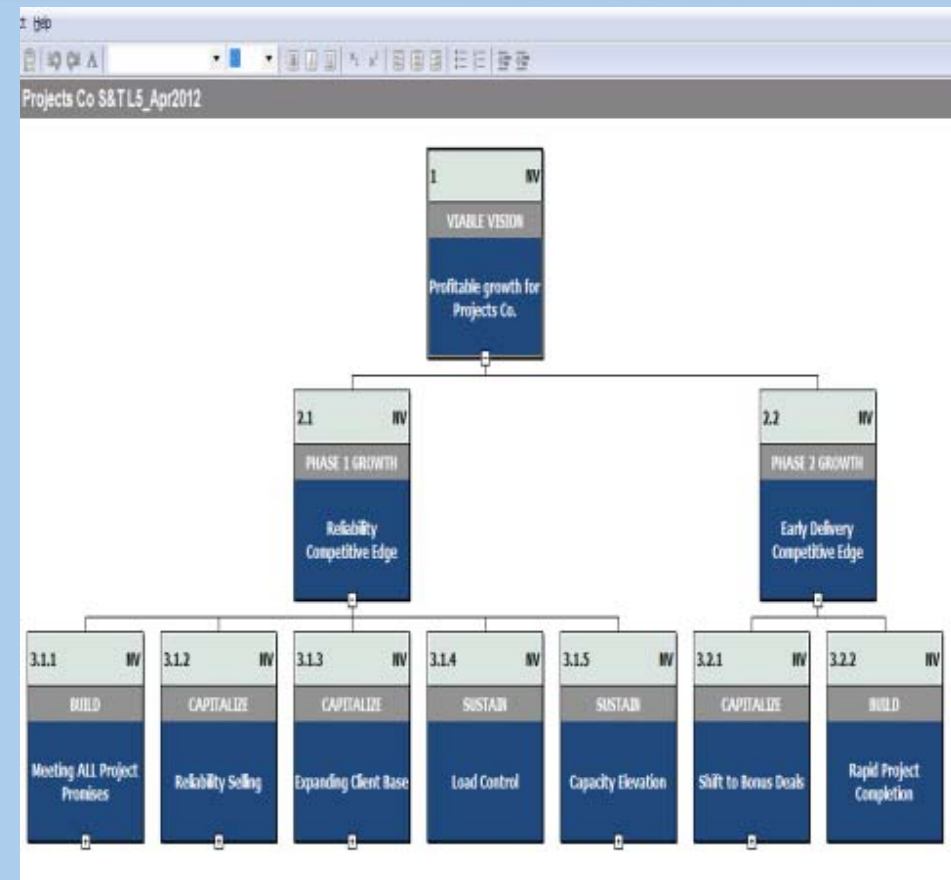
The essence of an S&T Tree is to assist the management of a system to create understanding and synchronization by explaining the logical connections, within a level and between levels.

As such an holistic tree should have content related to performance measurement, improvement and POOGI.

Logical connections under TOC means – necessity and sufficiency and recording the (sometimes hidden) relevant assumptions.

Currently three types of different applications have been identified:

- Transformation
- Project content (e.g. product development)
- Organization



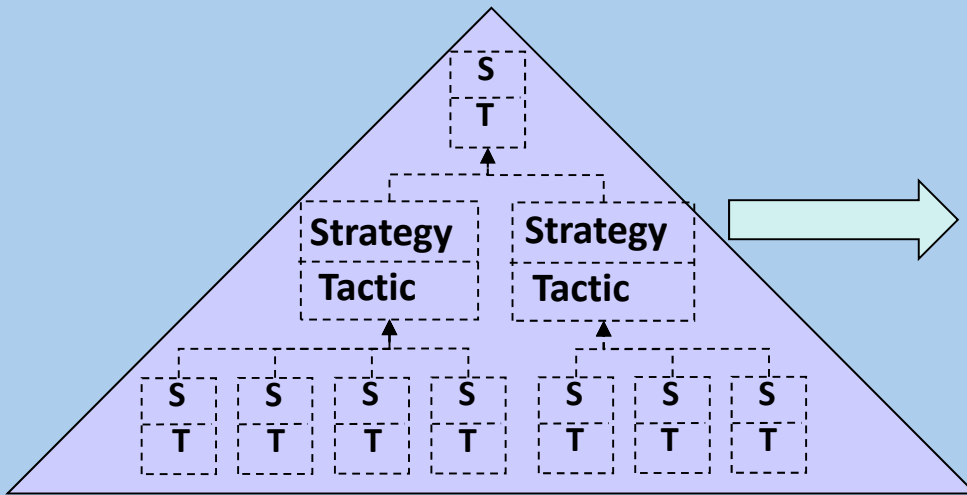
Strategy

Tactic

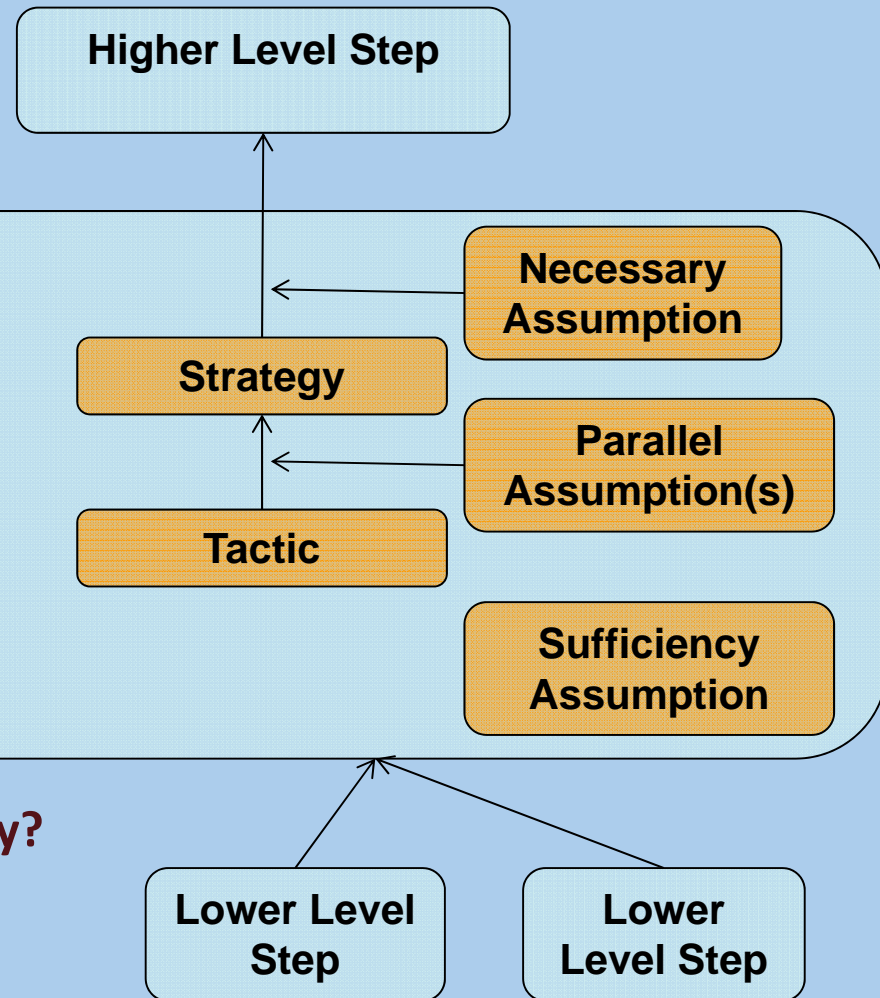
What has to be achieved?
How do we accomplish this
element of the strategy?

The Assumptions in an S&T Tree

A TOC View



Step



- **Necessary assumption – Why do we need this element of the strategy to be achieved?**
- **Parallel assumption(s) – Why will the tactic / action / activity achieve this element of the strategy?**
- **Sufficiency assumption (warning) – Why is accomplishing this strategy/tactic at risk without providing another level of details?**

S&T Tree

2.1	Reliability Competitive Edge	
Necessary Assumptions	<p>The way to have a decisive competitive edge is to satisfy a client's significant need to an extent that no significant competitor can.</p> <p>When the due-dates of the suppliers are notoriously bad and late delivery has major consequences for the client, reliability is a clients' significant need</p>	
Strategy	<p>A decisive competitive edge is gained by the market knowing that the Company's promises are remarkably reliable, when all other parameters remain the same.</p> <p><i>In the Multi-projects arena, remarkably reliable (very high due date performance without compromising on the content) is defined as delivering well over 95% on (or before) promised due-date, while in cases of late delivery the delay is much smaller than the prevailing delays in the industry</i></p>	
Parallel Assumptions	<p>Promises are cheap. Putting money to back up promises (especially when no-one else dares to do the same) is convincing.</p>	
Tactic	<p>The Company is remarkably good at meeting its promises and offers hefty penalties for each time interval of delay.</p> <p><i>Hefty penalties means enough to deter a competitor from offering (or even from yielding to pressure to do) the same.</i></p>	
Sufficiency Assumptions	<p>Building a decisive competitive edge is not easy; building the capabilities to capitalize on it is not less difficult. But, sustaining these two elements is the real challenge.</p>	

POOGI

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Tools: Fire fighting Cloud

Processes:

Buffer Management Analysis

(TP work on its on:

Single/multiple problems or Full TP)

Oded Cohen

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Oded has over 35 years of experience in developing, teaching and implementing TOC methodology, solutions and implementation processes working directly with Dr. Goldratt all over the world. Among the countries to which Oded brings his expertise are the USA, Canada, Japan, India, China, the UK, Poland, Russia, Ukraine, Colombia, Chile, Peru, Turkey and many others.

Oded has authored multiple TOC articles and contributed to numerous TOC books.

Oded is the author of *Ever Improve – A Guide to Managing Production the TOC Way*, published in June 2010. Oded co-authored the book *Deming & Goldratt: The Theory of Constraints and the System of Profound Knowledge – The Decalogue*.

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