The TOC Thinking Processes

Basics Workshop

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Date: 4 June 2013

Focus of this Session

Objectives:

- **Understand the nature of TOC's Thinking Processes**
  - **Quick introduction to the Thinking Processes**
    - **How to read and understand the TP tools**
- **Appreciate the role the TP tools play in managing change**

Coverage

- **Managing change**
  - **Key questions for successful change**
- **TOC's Thinking Process Tools**
  - **Logic basics**
  - **The TP Tools**
  - **Examples**
  - **How they all fit together**
- **Harnessing resistance to change**

Managing change the TOC way

- **TOC is 'common sense' … but not commonly applied**
  - **Solutions often seem obvious in hindsight**
- **Keys to success**
  - **Focus on the constraint!**
  - **Use the right measures …**
  - **Understand relationships in the system**
    - **Re-examine policies, procedures**
    - **involve people, understand behaviours**
    - **Consider wider context**

Capturing the whole, while focusing on the important parts

But how can we do this reliably?

Theory without practice is empty; practice without theory is blind.
Immanuel Kant

Managing Change – 3 Key Questions

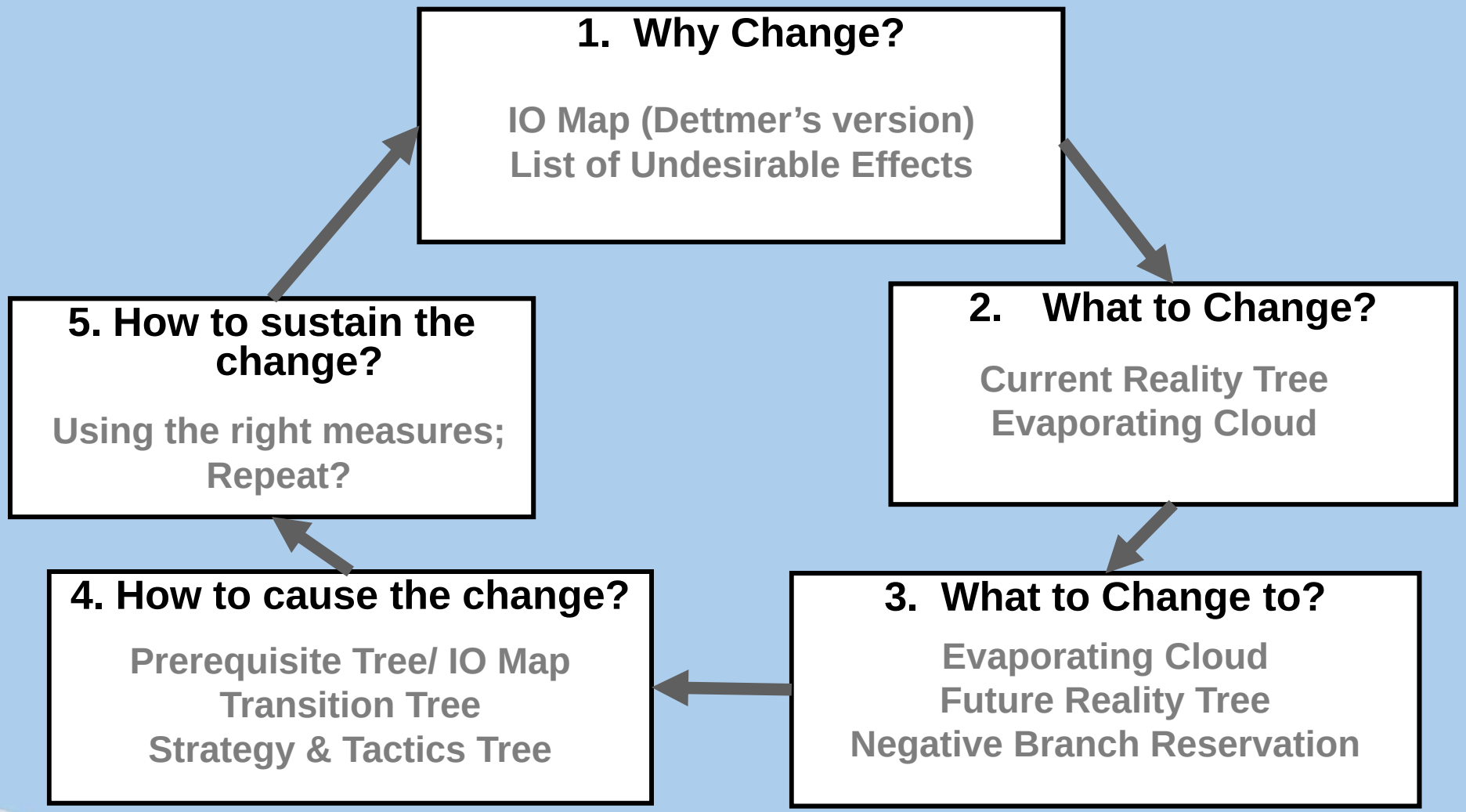
Any improvement is a change, but not every change is an improvement.
Eliyahu M. Goldratt

Three key questions in any improvement process:

1. **What to change?**
2. **What to change to?**
3. **How to cause that change?**

- **Dettmer, 2007. The Logical Thinking Process, ASQ Quality Press.**
- **Goldratt, 1994. It's Not Luck, North River Press.**
- **Kim, Mabin & Davies, 2008. The theory of constraints thinking processes: retrospect and prospect. *International Journal of Operations & Production Management* 28 (2): 155 - 184.**
- **Mabin & Davies, 2010. The TOC Thinking Processes, Theory of Constraints Handbook Chapter 23.**
- **Scheinkopf, 1999. Thinking for a Change, St Lucie Press.**
- **Scheinkopf, 2010. Thinking Processes including S&T Trees, TOC Handbook Chapter 25.**
- **Schragenheim, 1999. Management Dilemmas, St Lucie Press.**

The Expanded Change Questions



Two Types of Logic

Necessity-based logic

"In order to achieve A, B must be true."

In order to reach our goal, certain factors need to be met.

Used in: Evaporating Cloud, Prerequisite Tree and the IO Map

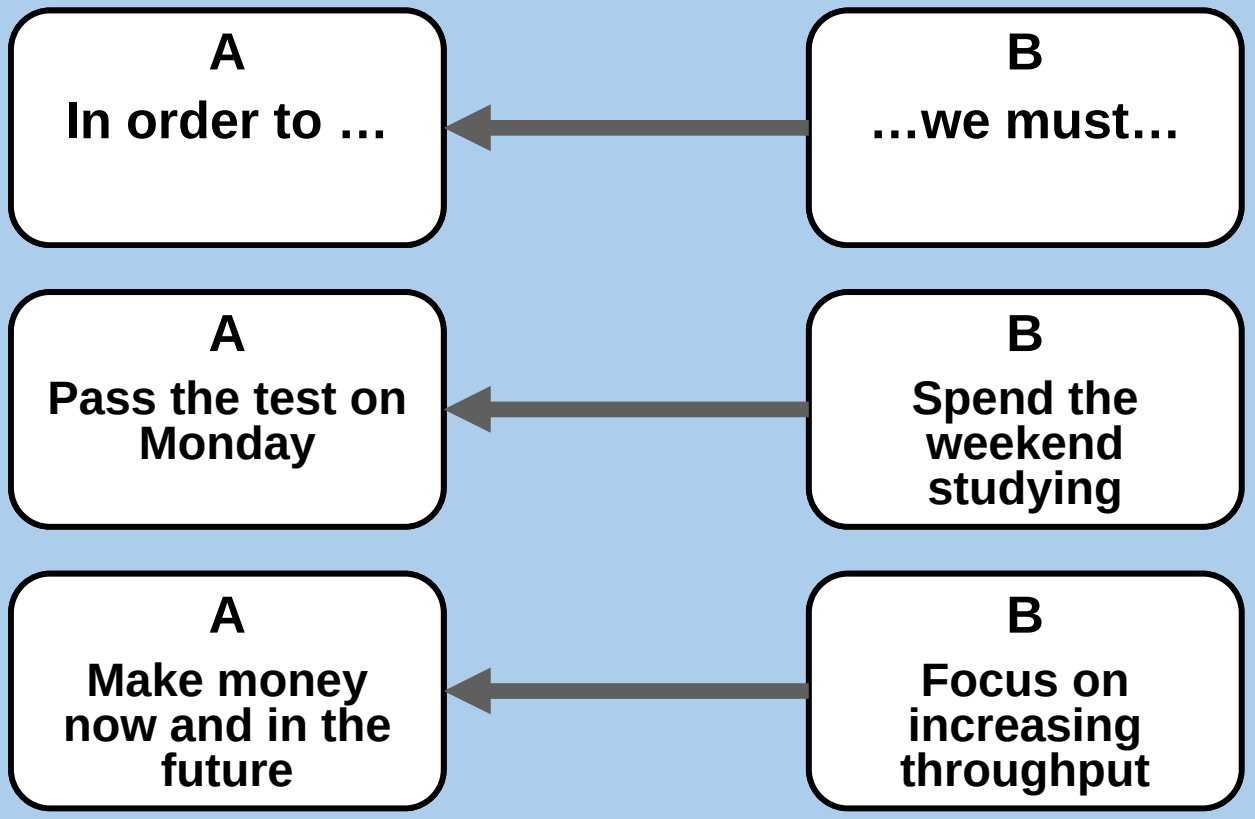
Sufficiency-based logic

"If X and Y, then Z."

X and Y together are sufficient or enough to cause Z.

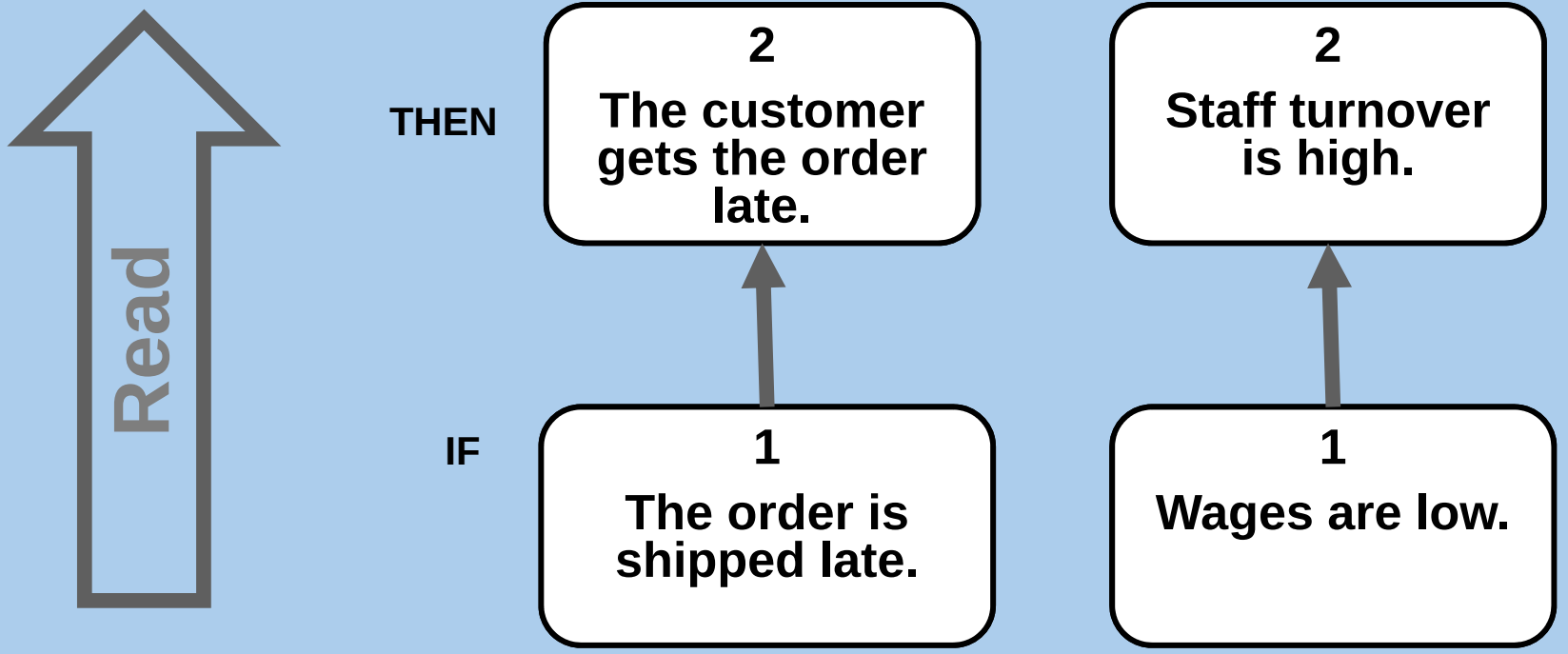
Used in: Current and Future Reality Trees, Negative Branch, and Transition Trees

Necessity Logic



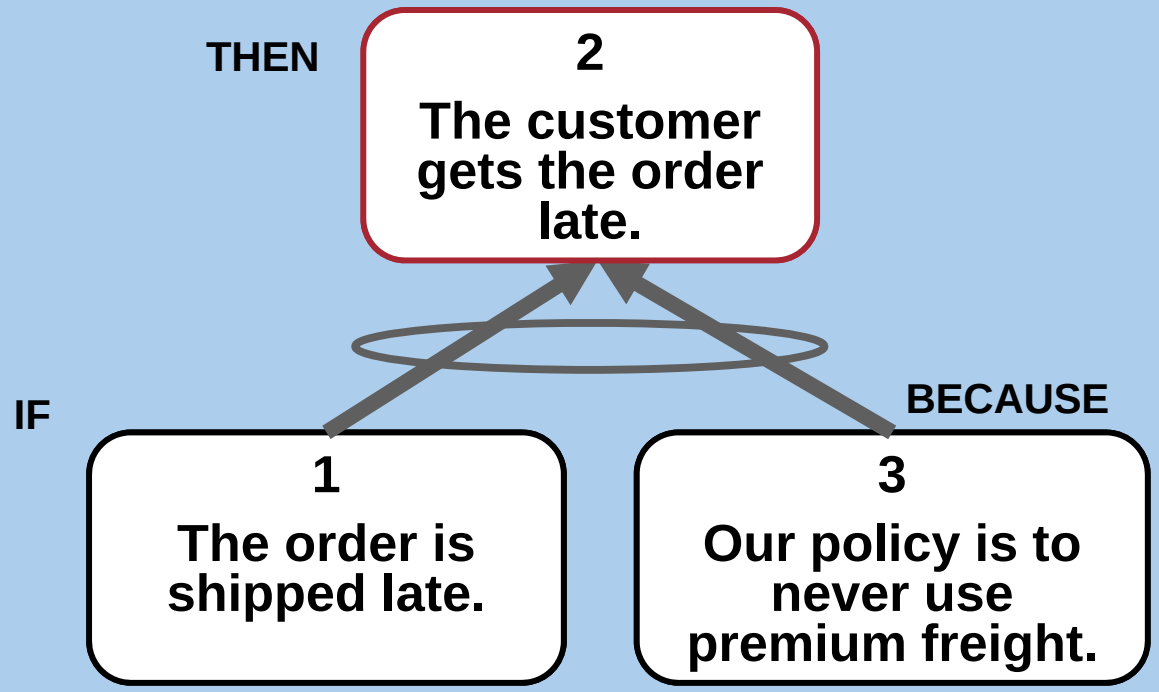
Sufficiency Logic

Read (from bottom up): If [1], **then** [2].

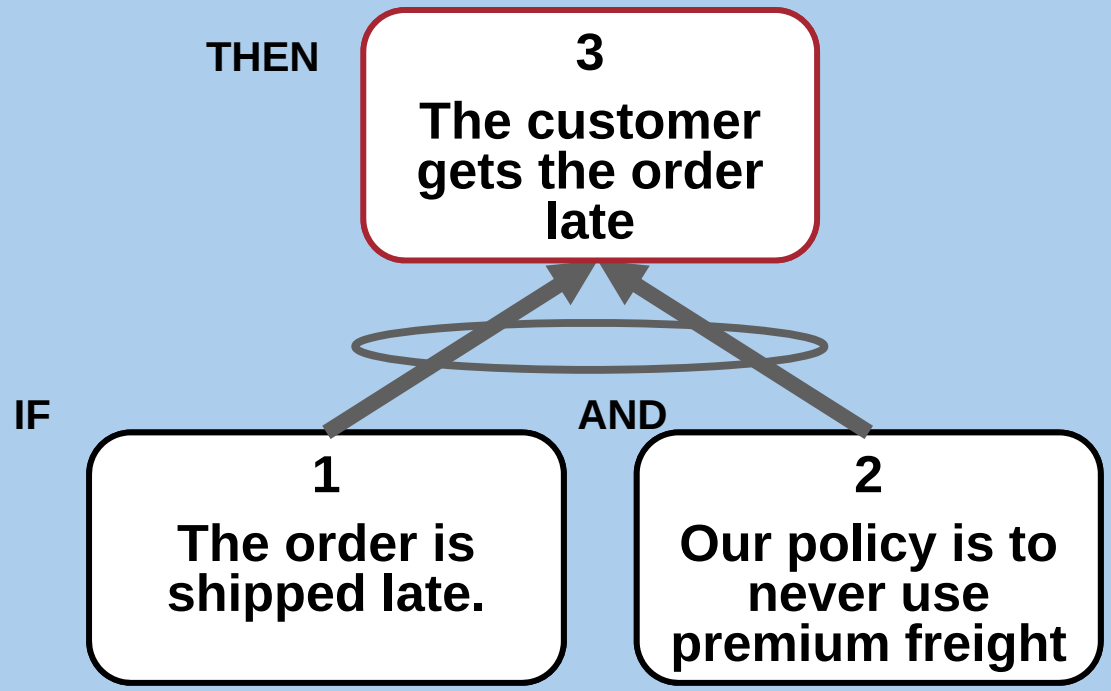


Example adapted from: Cox, Blackstone & Schleier, Managing Operations: A focus on excellence, p82.

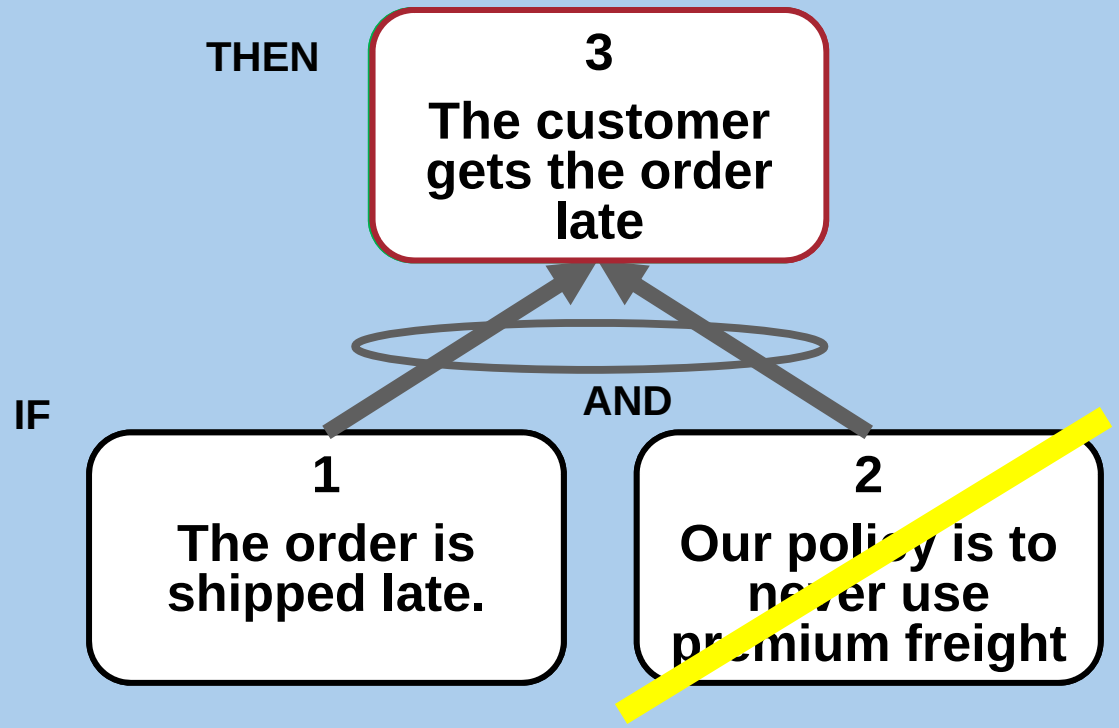
Sufficiency Logic – building the branch



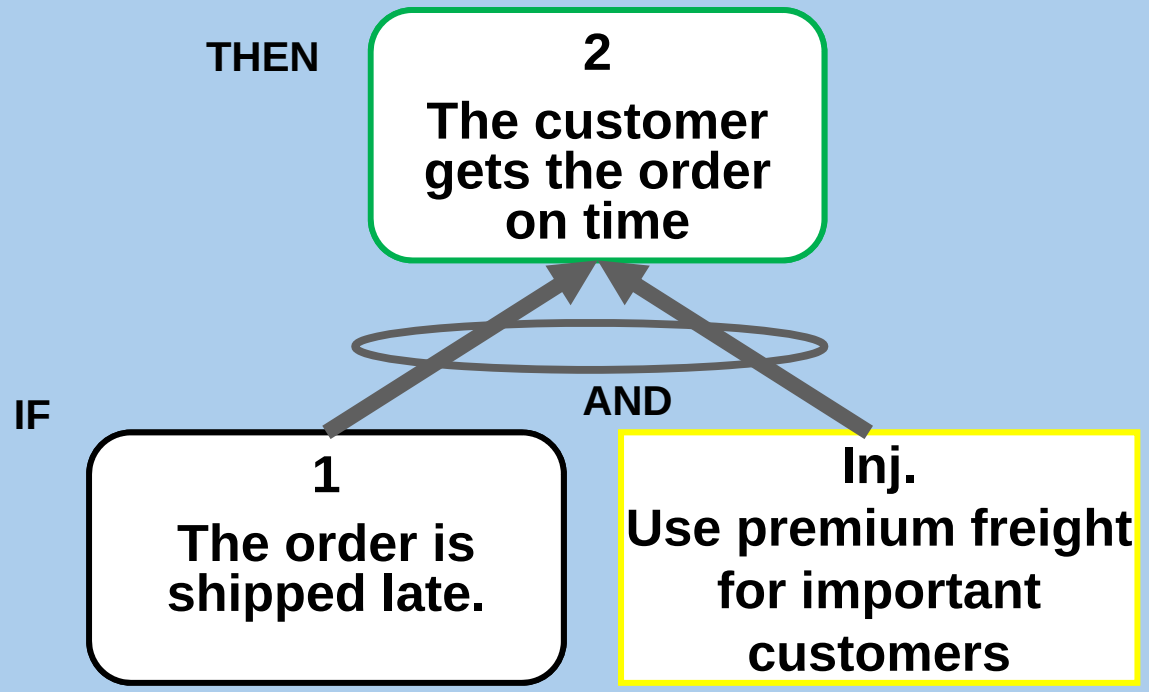
Sufficiency Logic – reading



Sufficiency Logic – challenging



Sufficiency Logic – changing



Categories of Legitimate Reservation (CLR's)

Using the CLR's, objections can be expressed in an effective and constructive way:

Level I: Clarity reservation **Are the statements clear?**

Level II: Entity existence **Do the entities exist?**

Causality existence reservations **Is the cause and effect relationship plausible?**

Level III: Cause insufficiency **Are the causes sufficient to cause the effect?**

Additional cause **Is there some other cause adding to the effect?**

Predicted effect **If the cause is true, then what else would you expect to see?**

Cause-effect reversal **Are the cause and effect the right way around?**

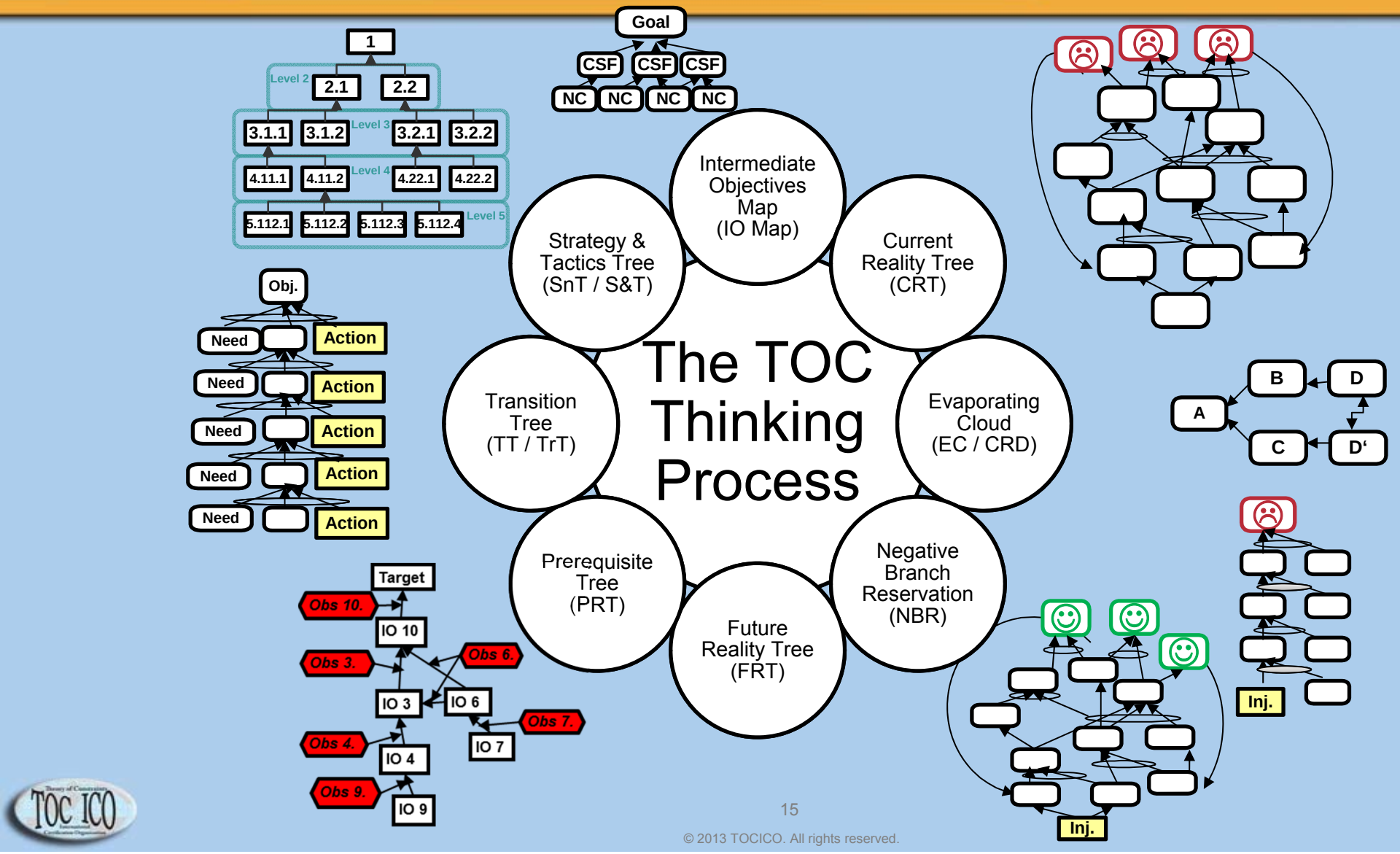
Tautology reservations **Are the cause and effect just stating the same thing?**

Source: Cox, Boyd, Sullivan, Reid, Cartier, 2012. TOCICO Dictionary, 2nd Edn, p27

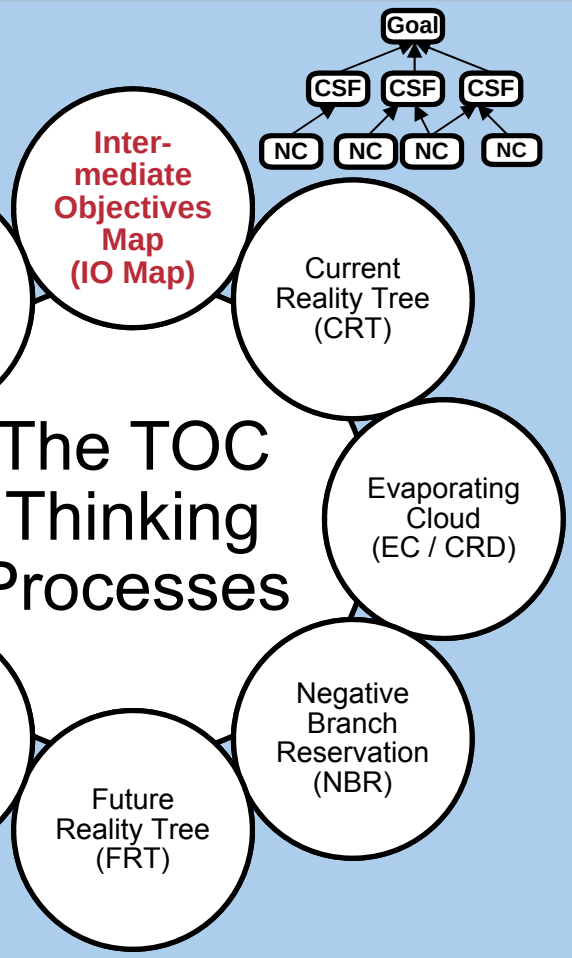
Lastly, check the 'big picture'

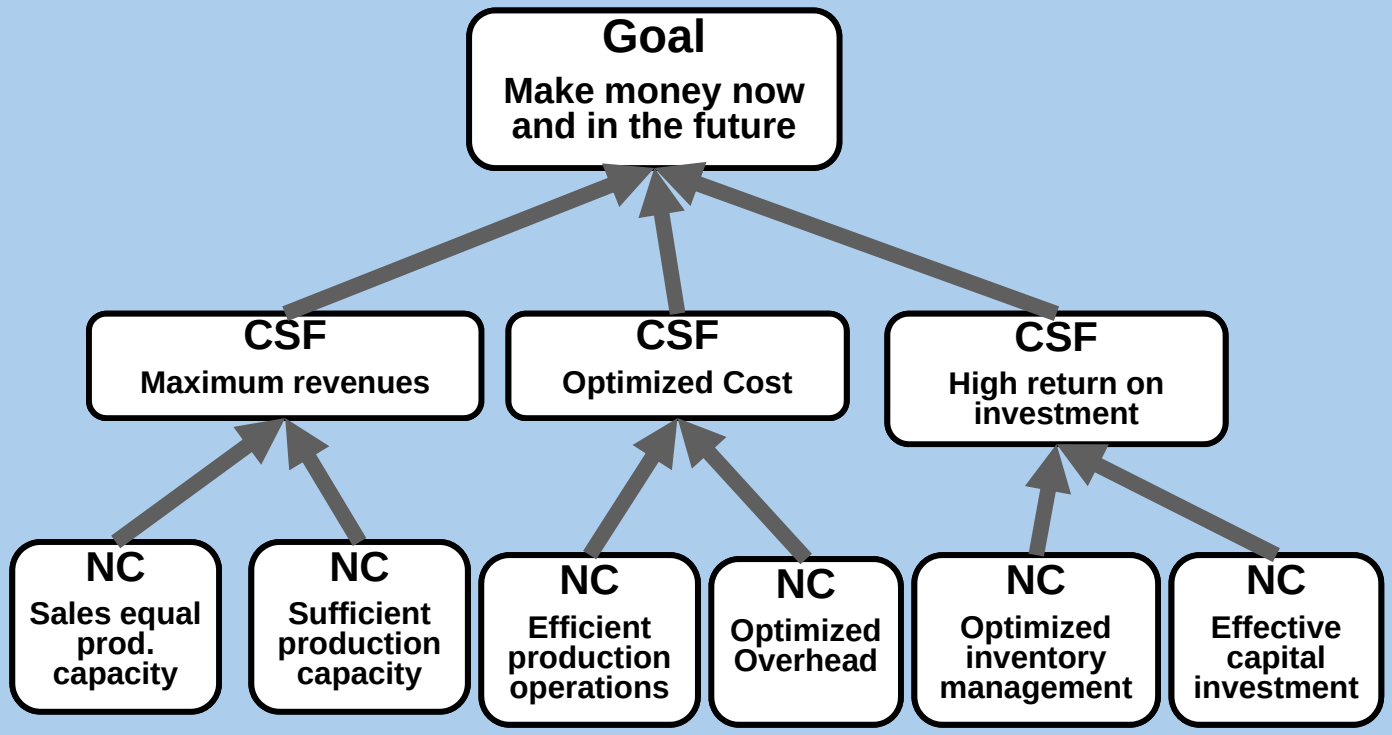
Seek first to understand before seeking to be understood. (Proverbs 18)

The Thinking Process Tools - Overview



The IO-Map (Dettmer's version)

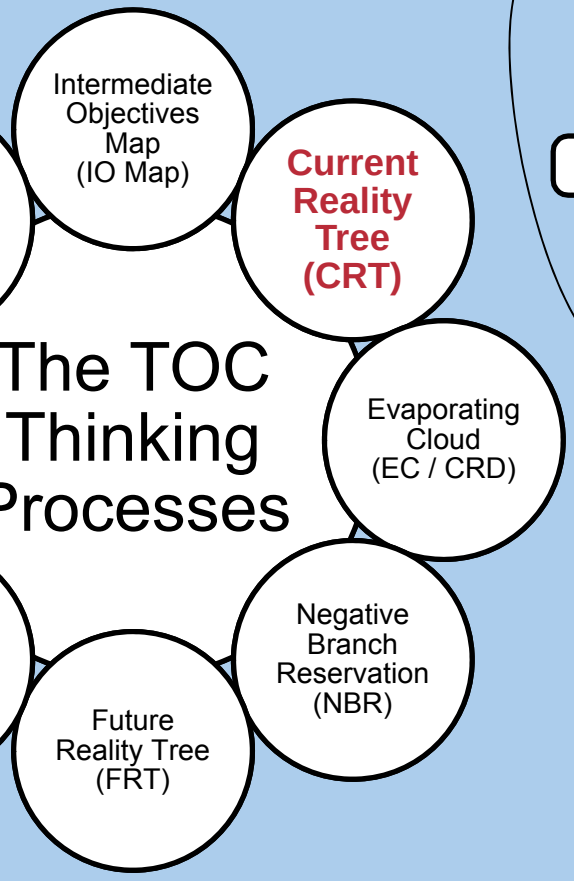


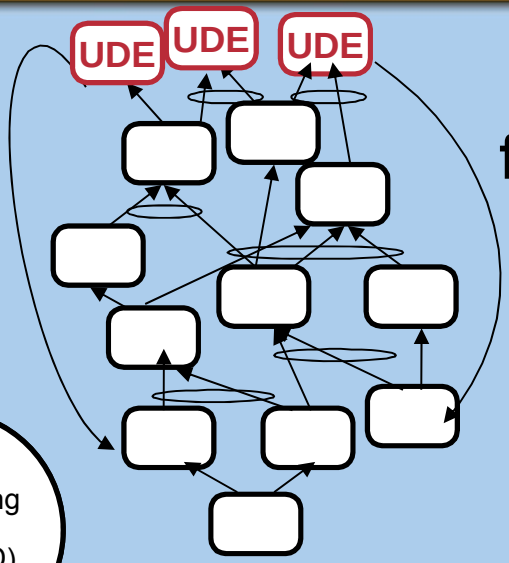


CSF = Critical Success Factor
NC = Necessary Condition

Adapted from: Dettmer, 2007. The Logical Thinking Process, ASQ Quality Press.

The Current Reality Tree





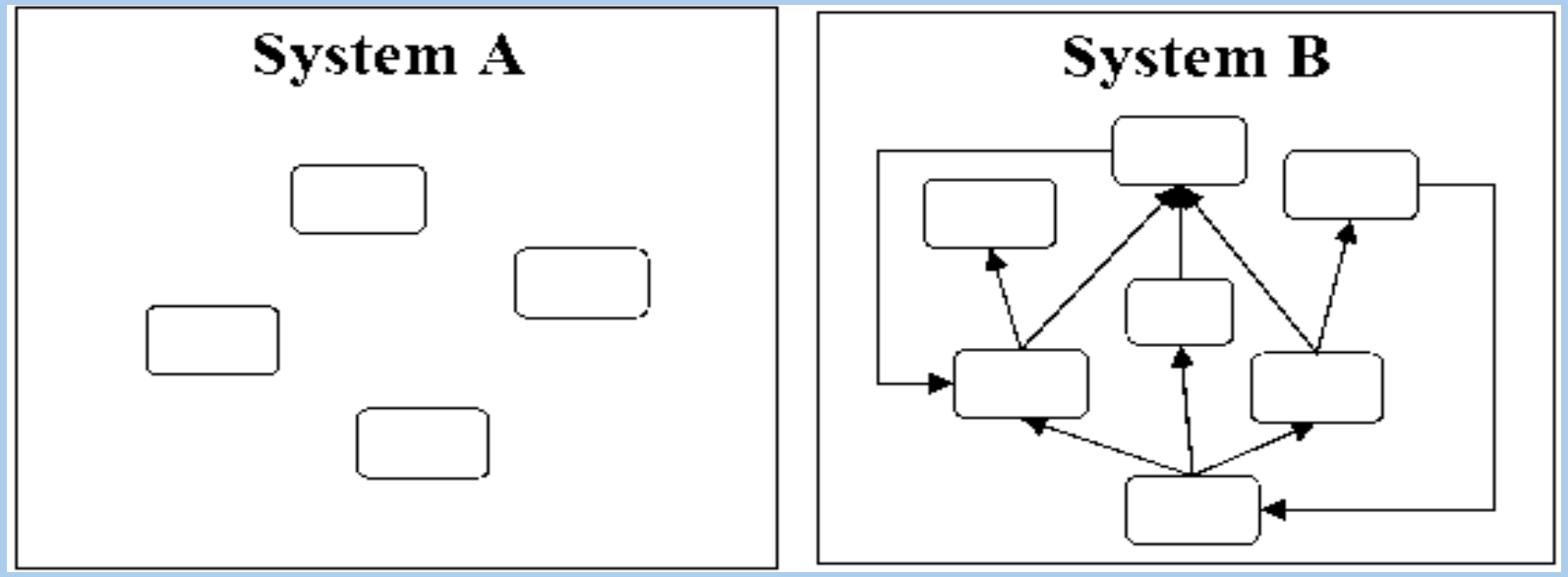
- **Analyse the current situation full of UnDesired Effects (UDE's) using cause and effect (sufficiency logic)**
- **Diagnose the root cause(s)**
- **Explain how the root cause leads to the current undesirable situation**

If we dive deep enough we'll find that there are very few elements at the base, the root causes, which through cause-and-effect connections are governing the whole system. The result of systematically applying the question 'why?' is not enormous complexity, but rather wonderful simplicity.

Eliyahu M. Goldratt, The Choice

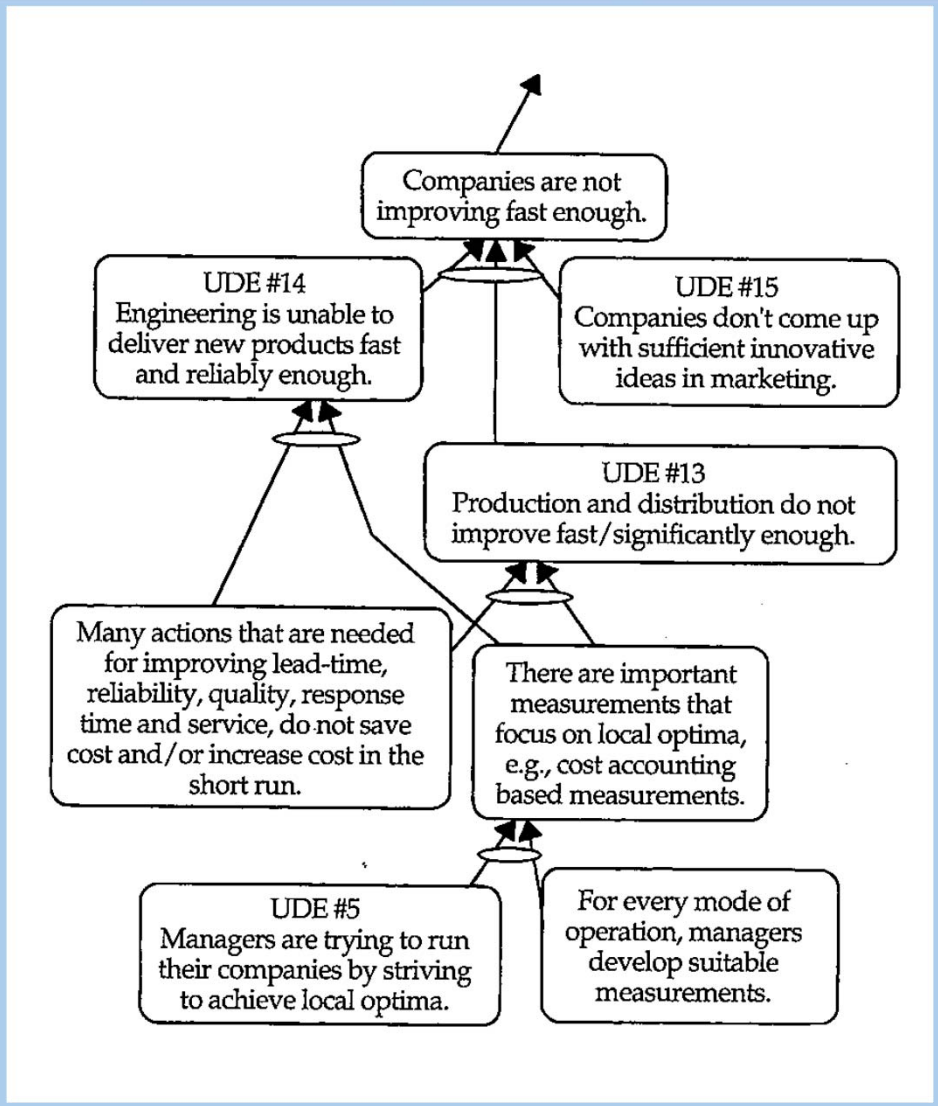
Complexity vs Simplicity

Which system is easier to manage?



Source: Goldratt, The Choice, p 40

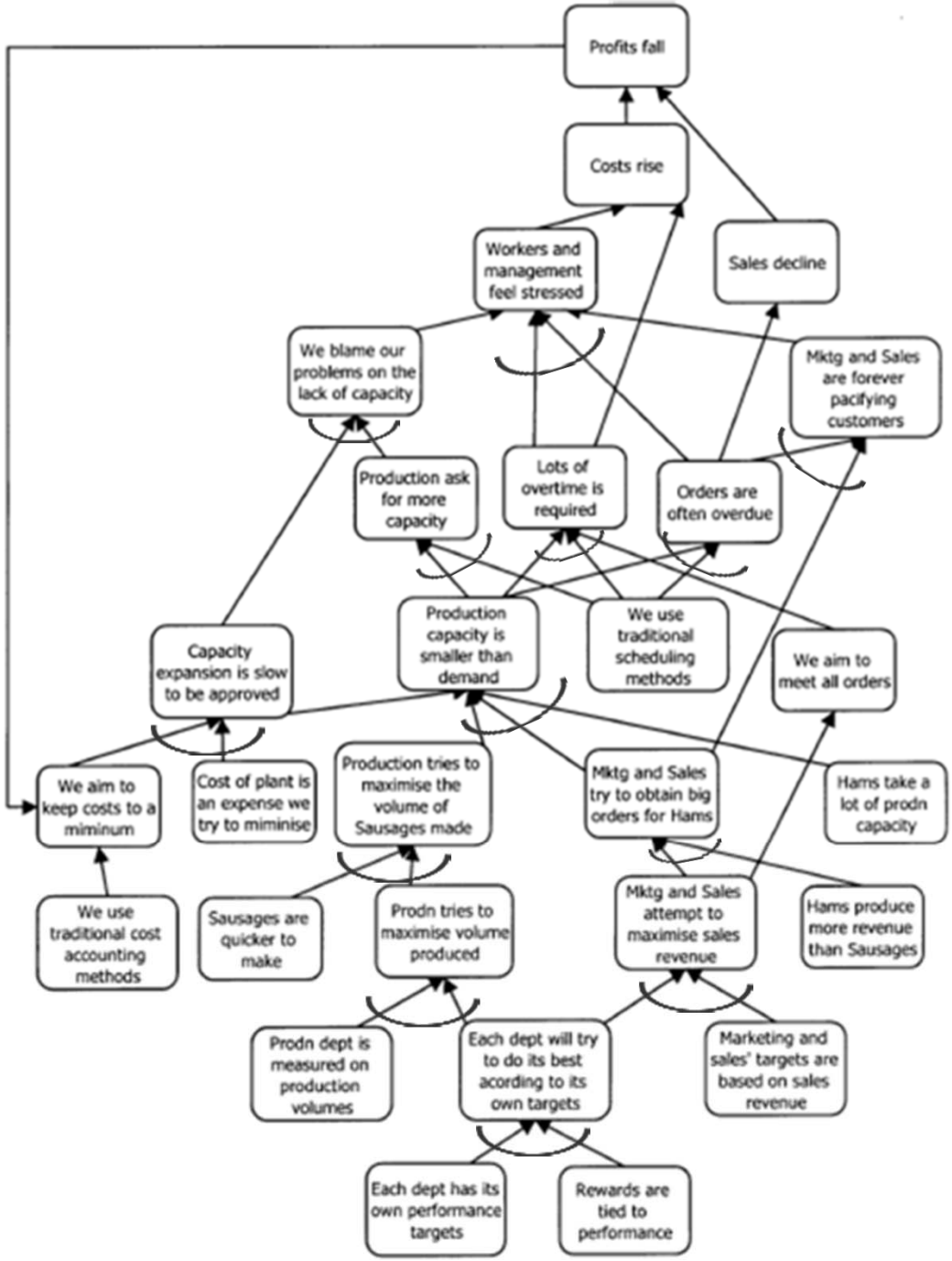
Part of a CRT



- **Connect UDE's using cause-effect relationships until all are connected**
- **Keep building down until you have identified the 'core problem'**
- **Read bottom up, using If … and… then …**
- **Check and correct using CLR's**

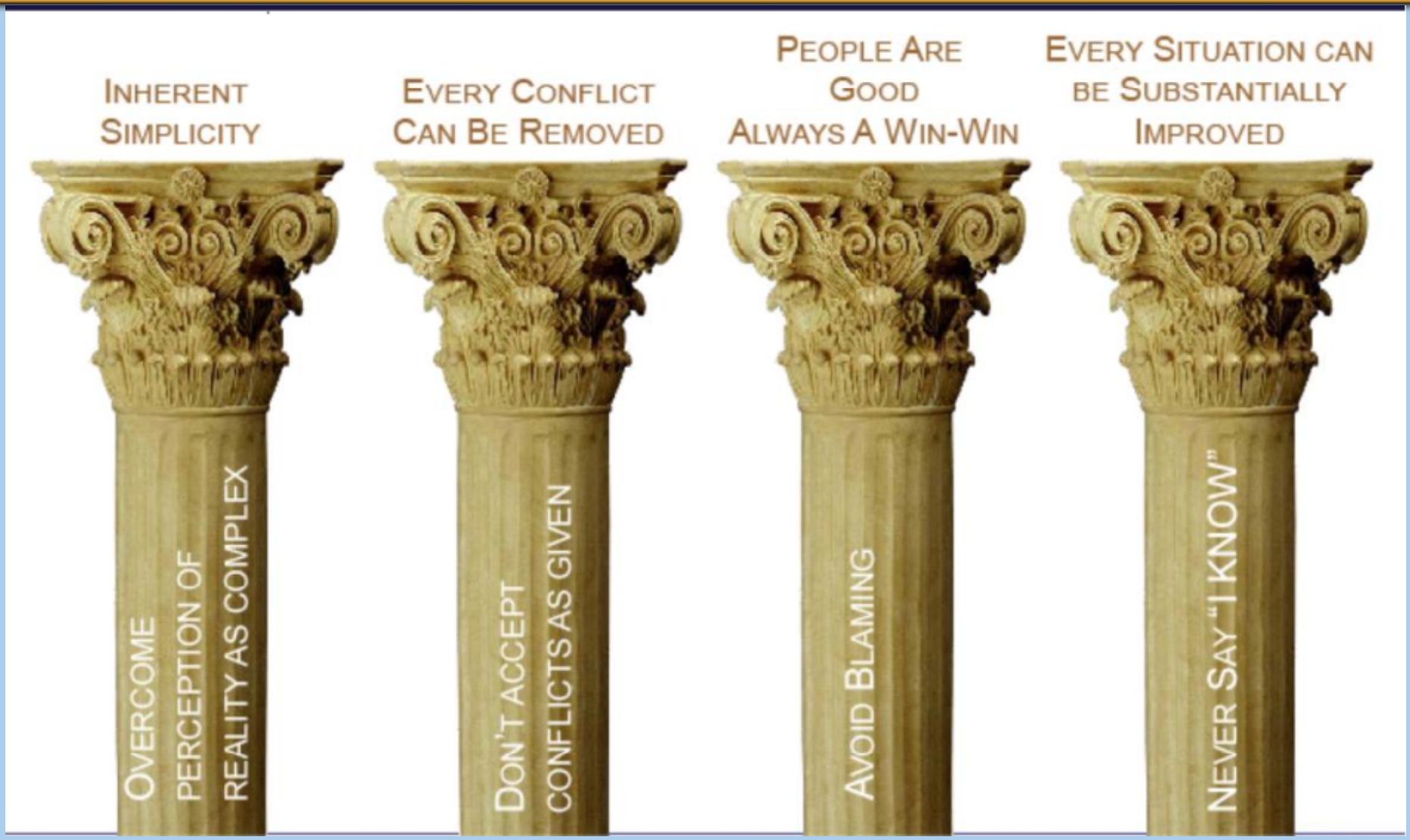
Source: Goldratt, 1994. It's Not Luck, p129.

A small CRT



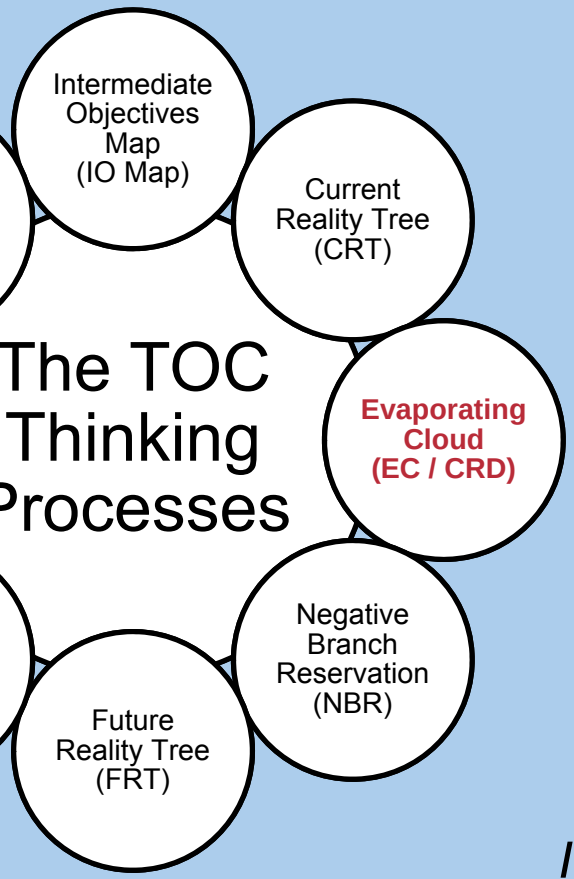
Source: Mabin & Davies, 2003. Understanding the complementary nature of TOC frames, International Journal of Production Research, 41/4, p673.

4 Pillars of TOC



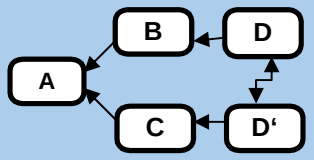
Source: Goldratt Consulting

The Evaporating Cloud (EC)



Note: Some authors use the term **Conflict Resolution Diagram (CRD)**

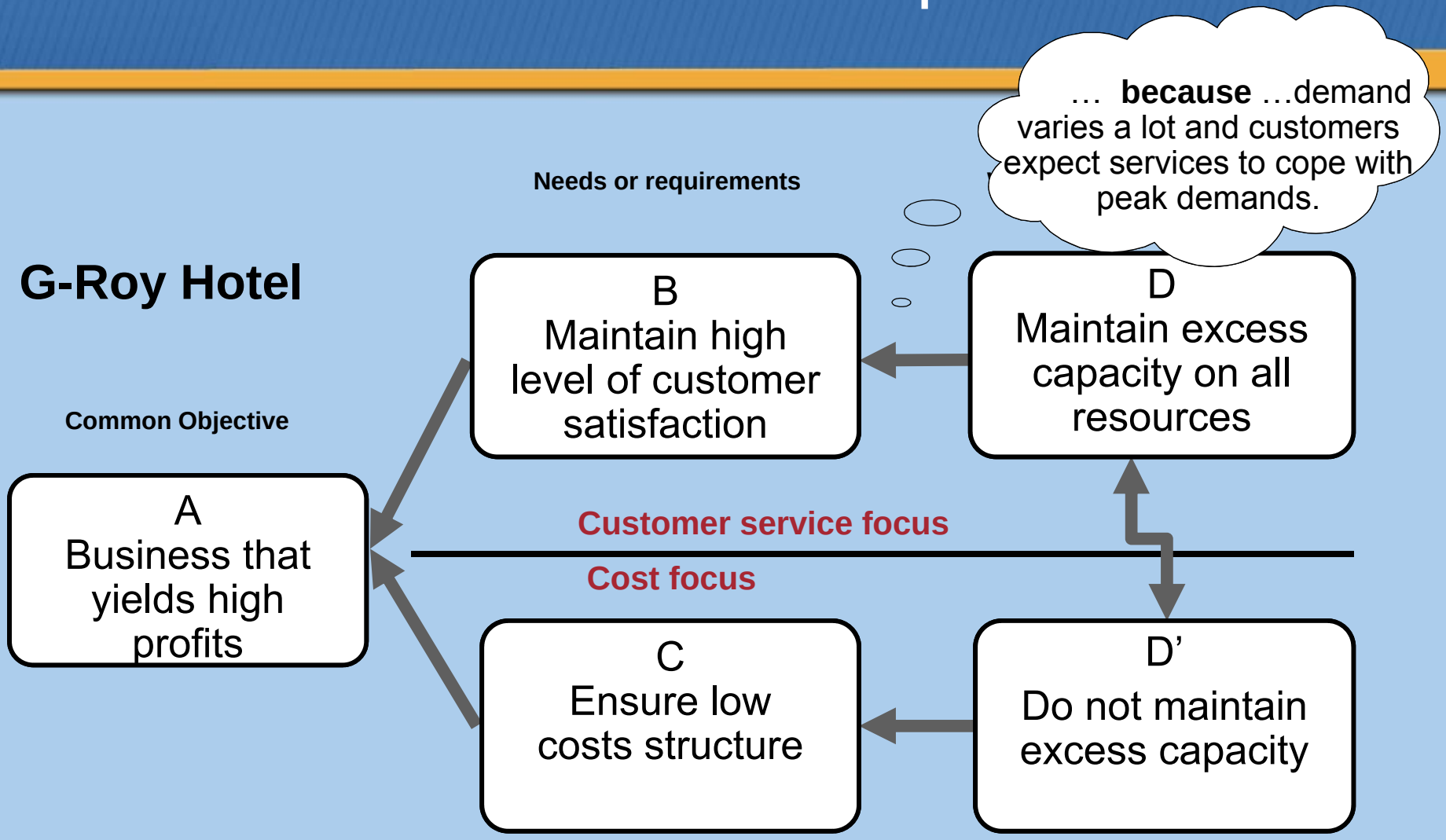
We can't solve problems by using the same kind of thinking we used when we created them. Albert Einstein



1. **Frame the problem taking both sides into account**
2. **Surface assumptions**
3. **Challenge assumptions till win-win solution is found**

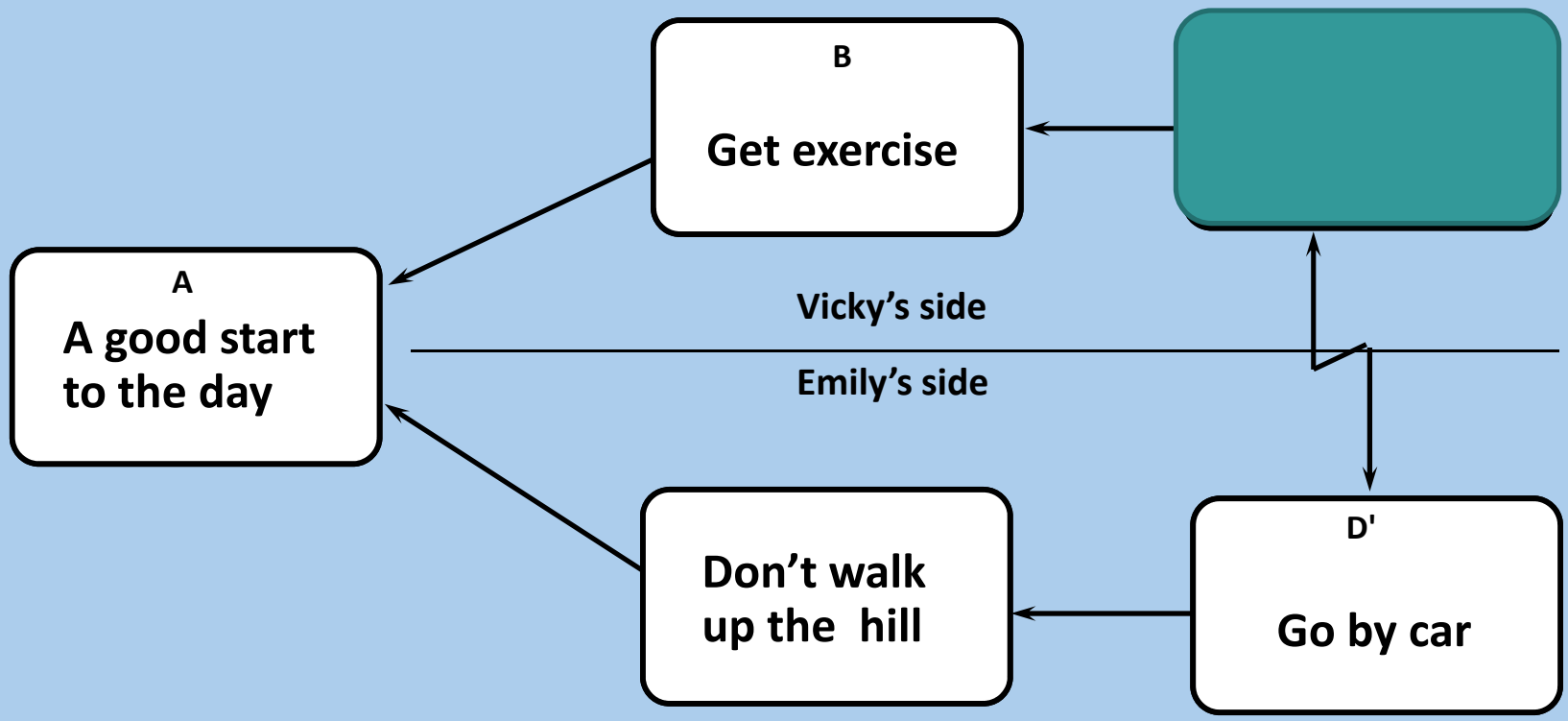
If you can't explain it simply, you don't understand it well enough. Albert Einstein

EC – A Business Example



Source: Schragenheim, 1999. Management Dilemmas, Boca Raton: APICS/St Lucie Press.

EC – A Personal Story

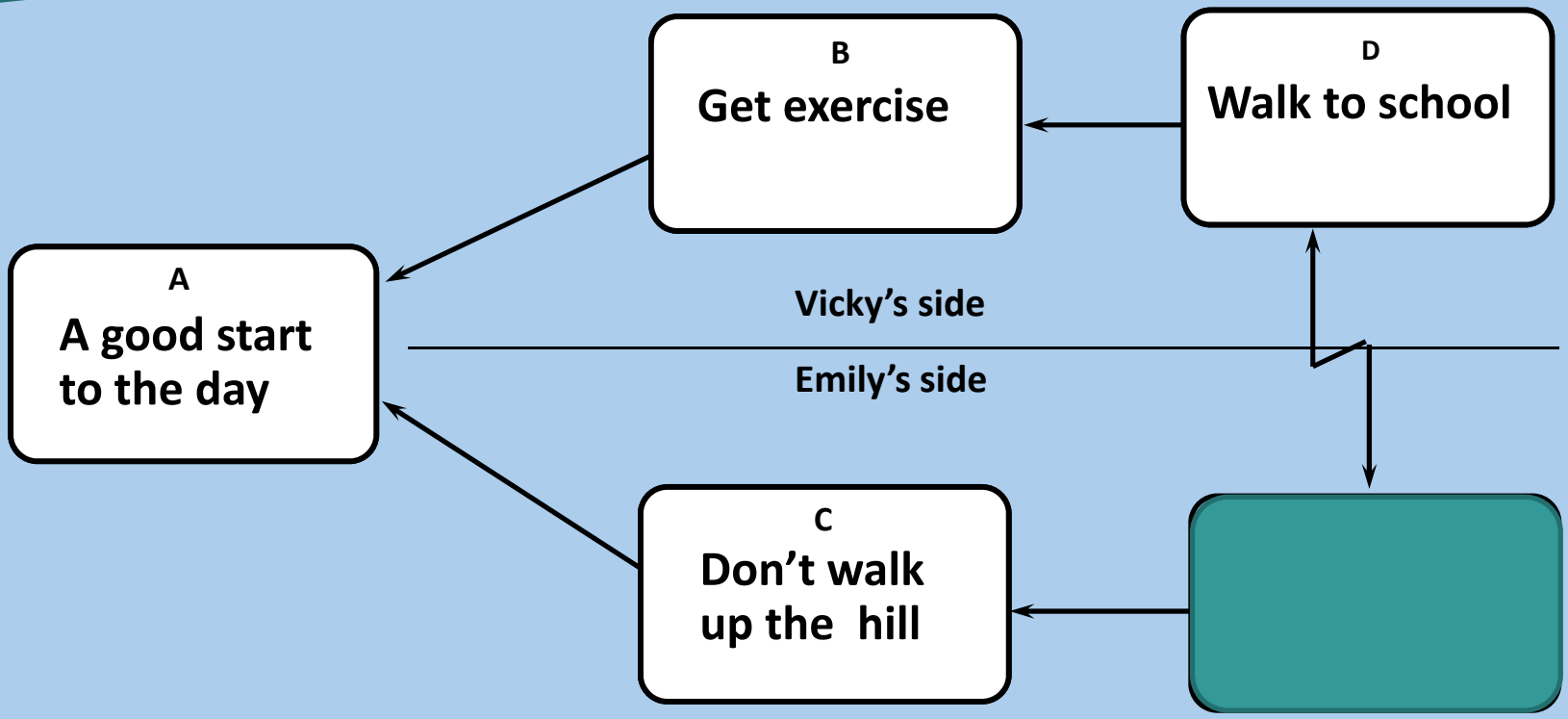


How could we get B and D' at the same time?

_____

_____

Better still… Our way!

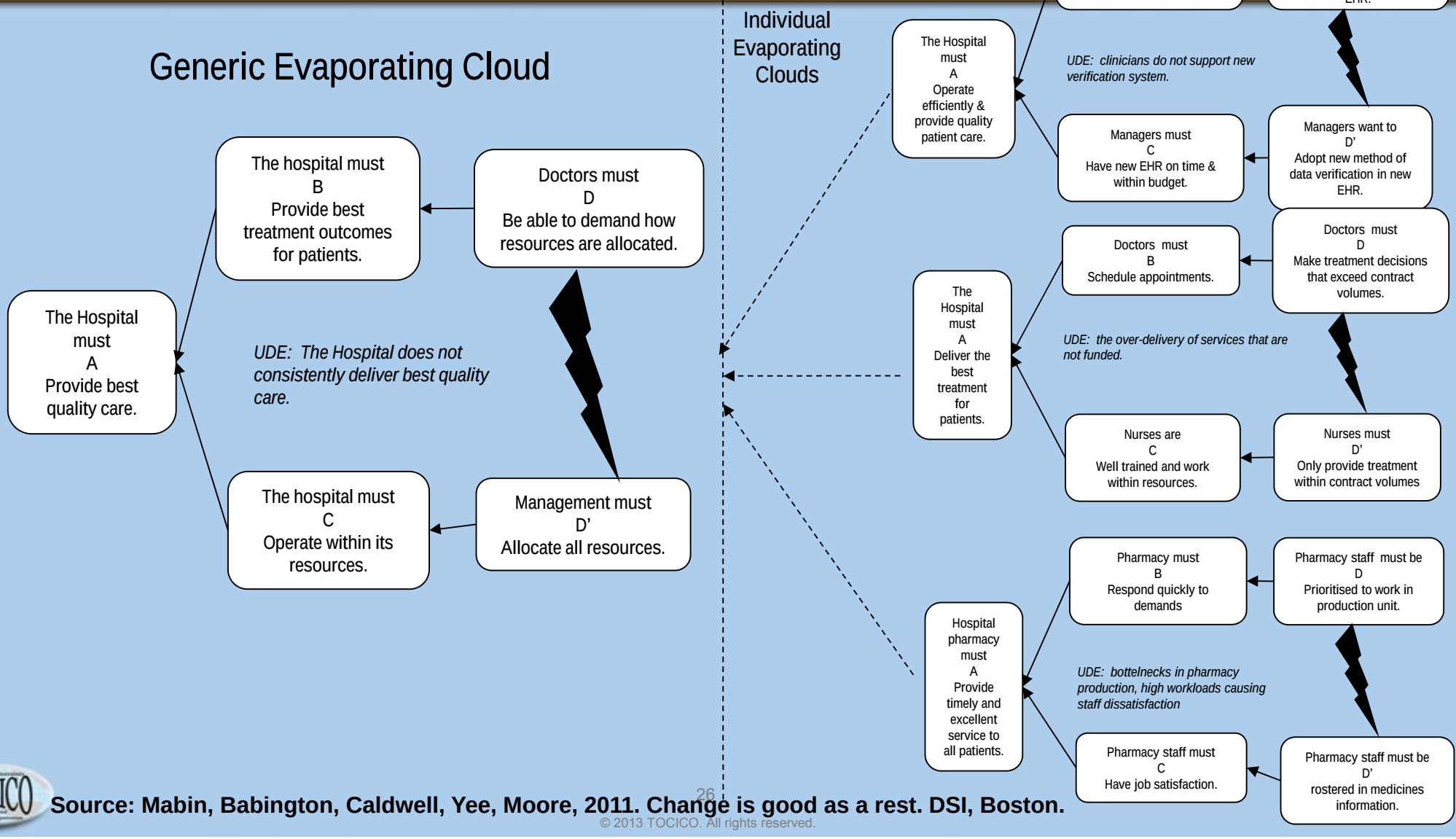


How could we get C and D at the same time?

_____

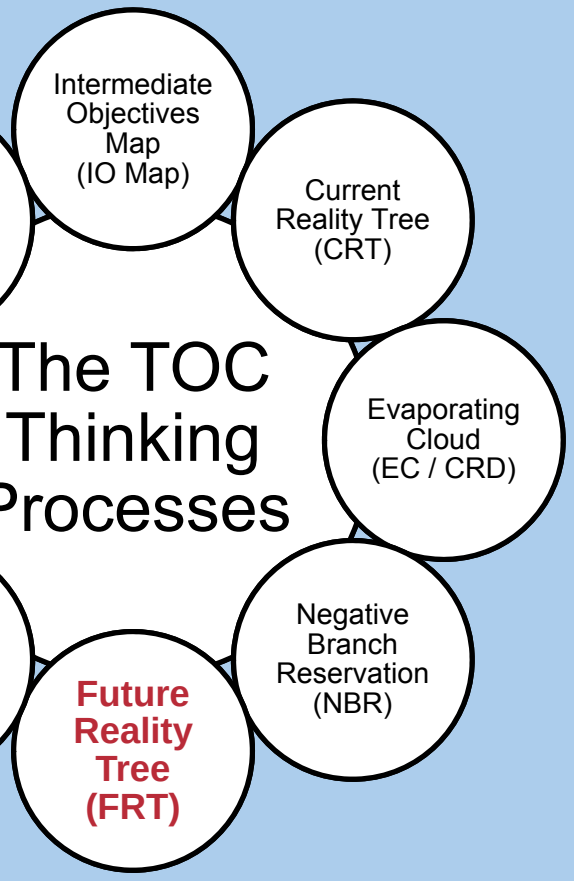
_____

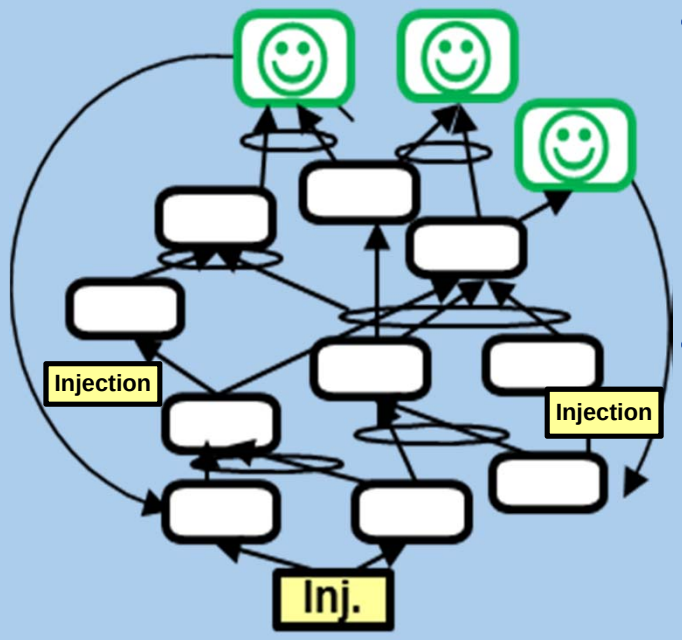
The 3-cloud process



Source: Mabin, Babington, Caldwell, Yee, Moore, 2011. Change is good as a rest. DSI, Boston.

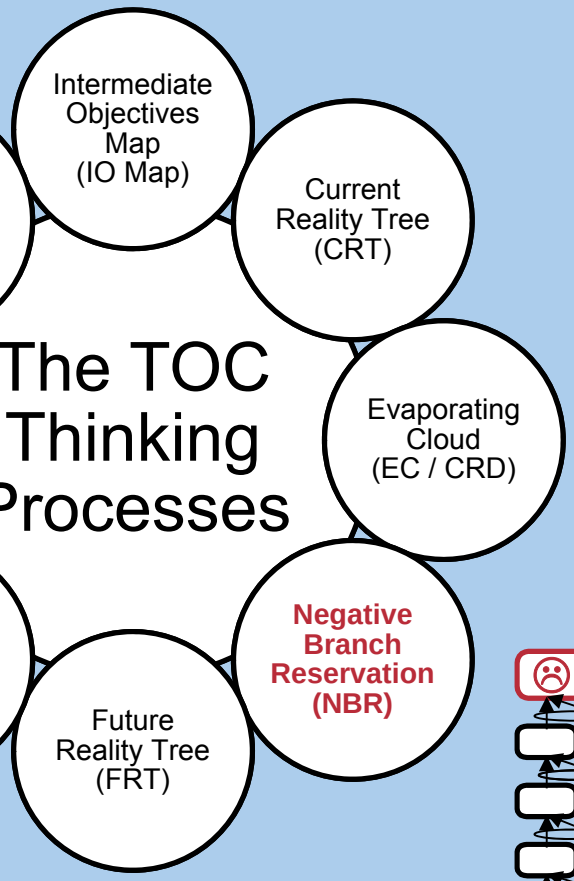
The Future Reality Tree

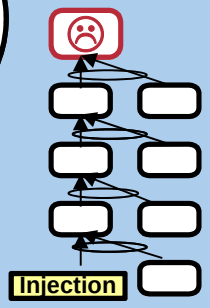




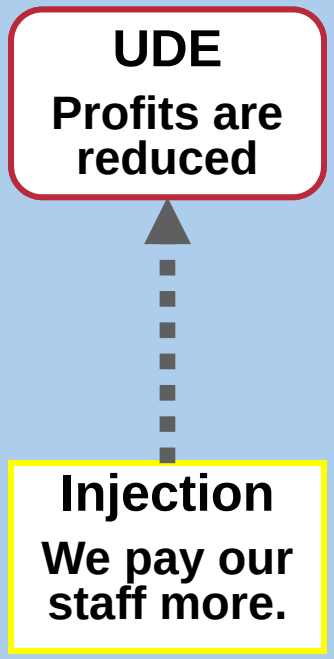
- **Show how the Injection leads to the desired effects (DE's)**
- **Incorporate extra injections as needed to ensure that all effects at top are DE's**
- **Whenever you encounter "Yes, but …", use the Negative Branch Reservation tool to prevent possible negative effects (every NBR improves the FRT!)**

The Negative Branch



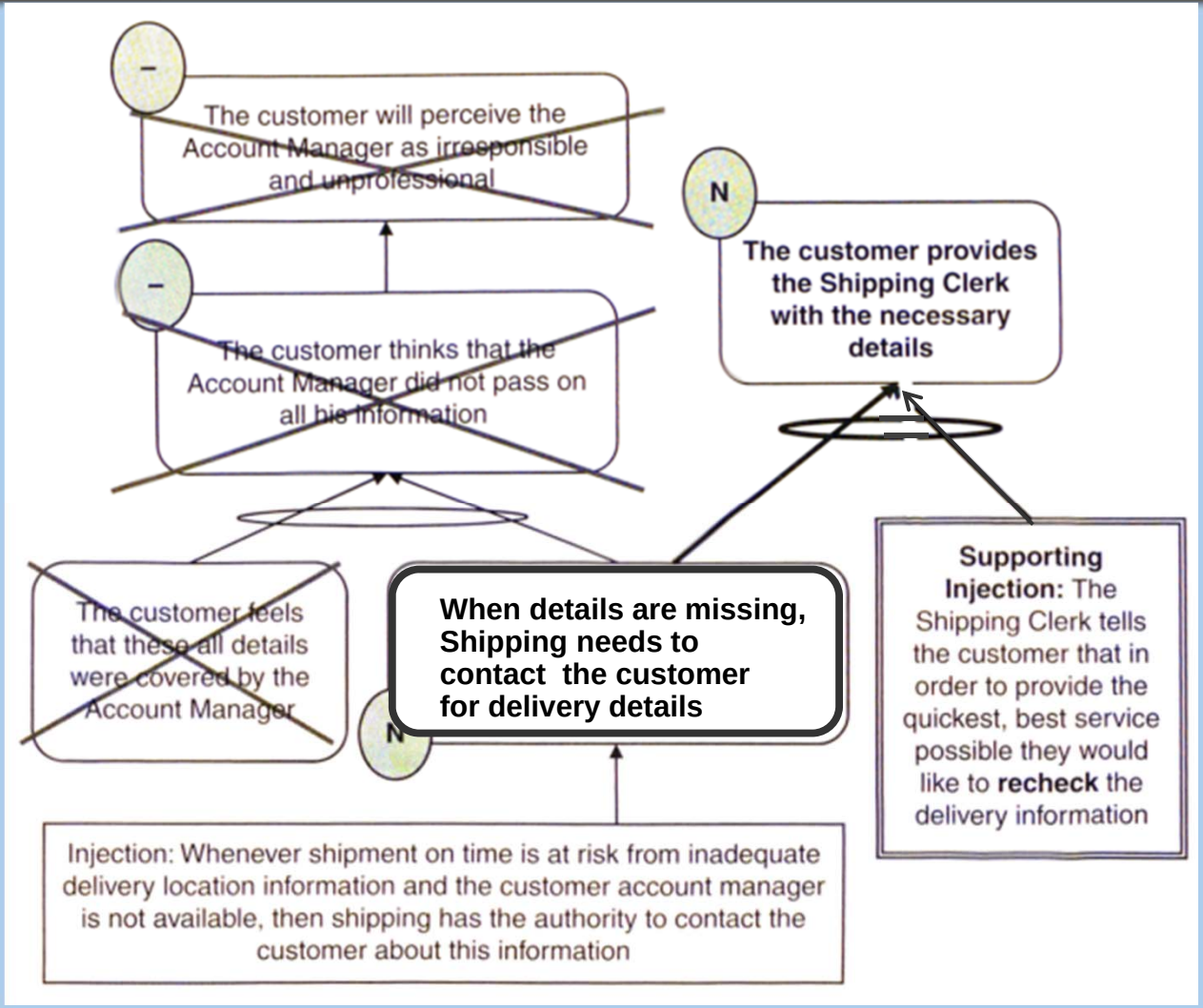


- ***Anticipating and preventing unintended negative consequences of a proposed action:***
- **Example: in response to a problem of low staff morale, we decide to pay our staff more, but we're concerned that our profits will be reduced. ☹**



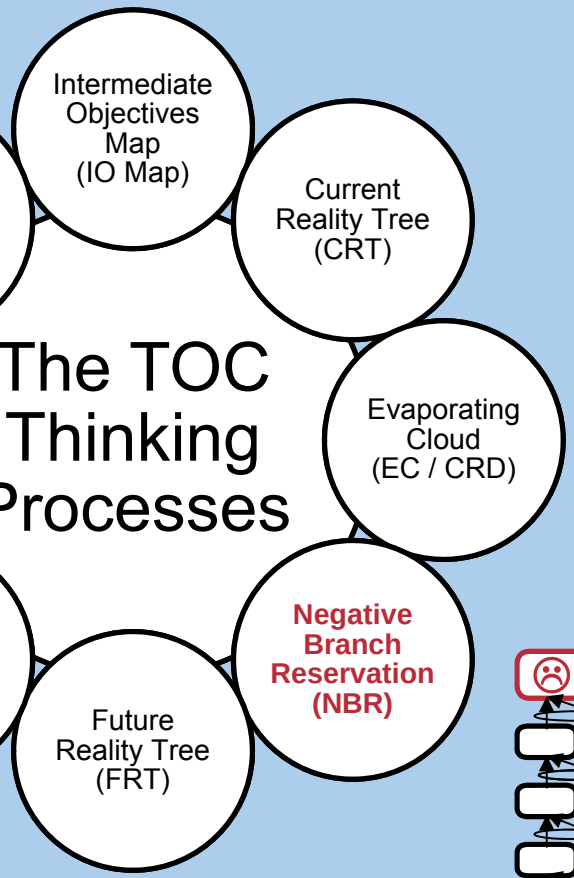
The NBR is used to fill in the missing logic and identify where to stop the negative effects from occurring.

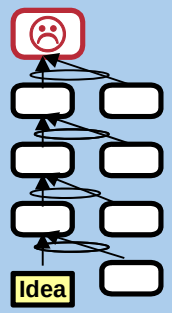
Negative Branch – an example



Adapted from: Cohen, 2010. Daily Management with TOC, Ch 24, TOC Handbook, p718

The Negative Branch - uses





Use the Negative Branch for:

- **Checking and improving injections from the Evaporating Cloud (EC)**
- **Improving half-baked ideas**
- **Giving/receiving criticism creatively and constructively**
- **Dealing with chronic conflict – use in conjunction with the EC.**

The Prerequisite Tree

1. State the target clearly *- something that looks hard to achieve (often an injection)*

***2. List all* Obstacles**

O1

O2

O3

O4

O5

O6

O7

***3. Next list* Intermediate Objectives (IO's)**

IO1

IO2

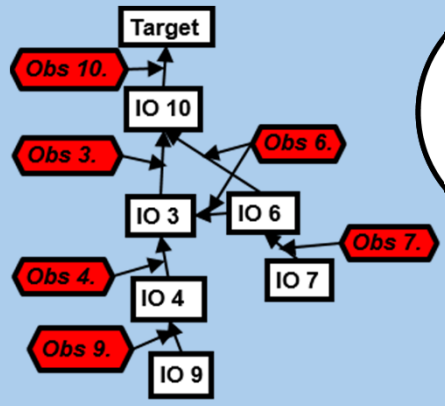
IO3

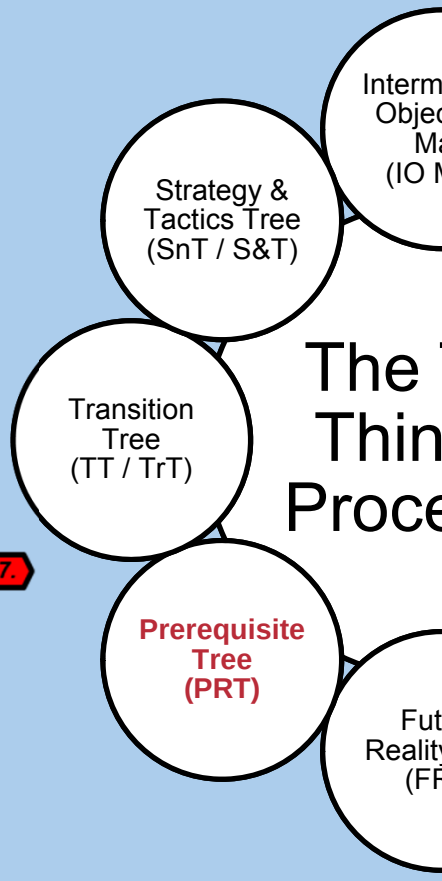
IO4

IO5

IO6

IO7



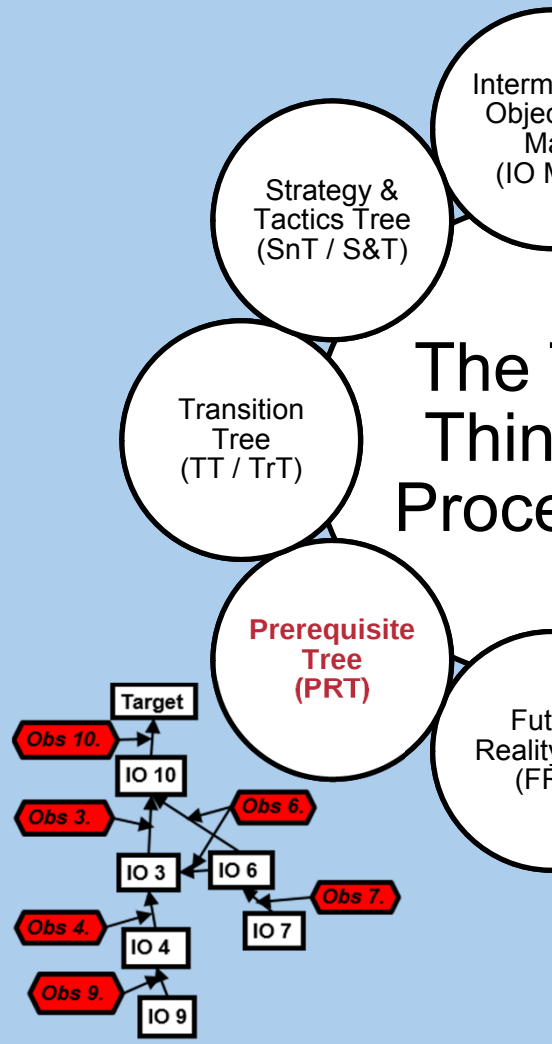


4. Lastly, place all Intermediate Objectives in time/precedence order, starting from the bottom, using "We must do [lower IO X] in order to get over {obstacle X}, before we can achieve [upper IO Y]".

The Prerequisite Tree - Example

Target: Make good use of the TOC TP tools at work

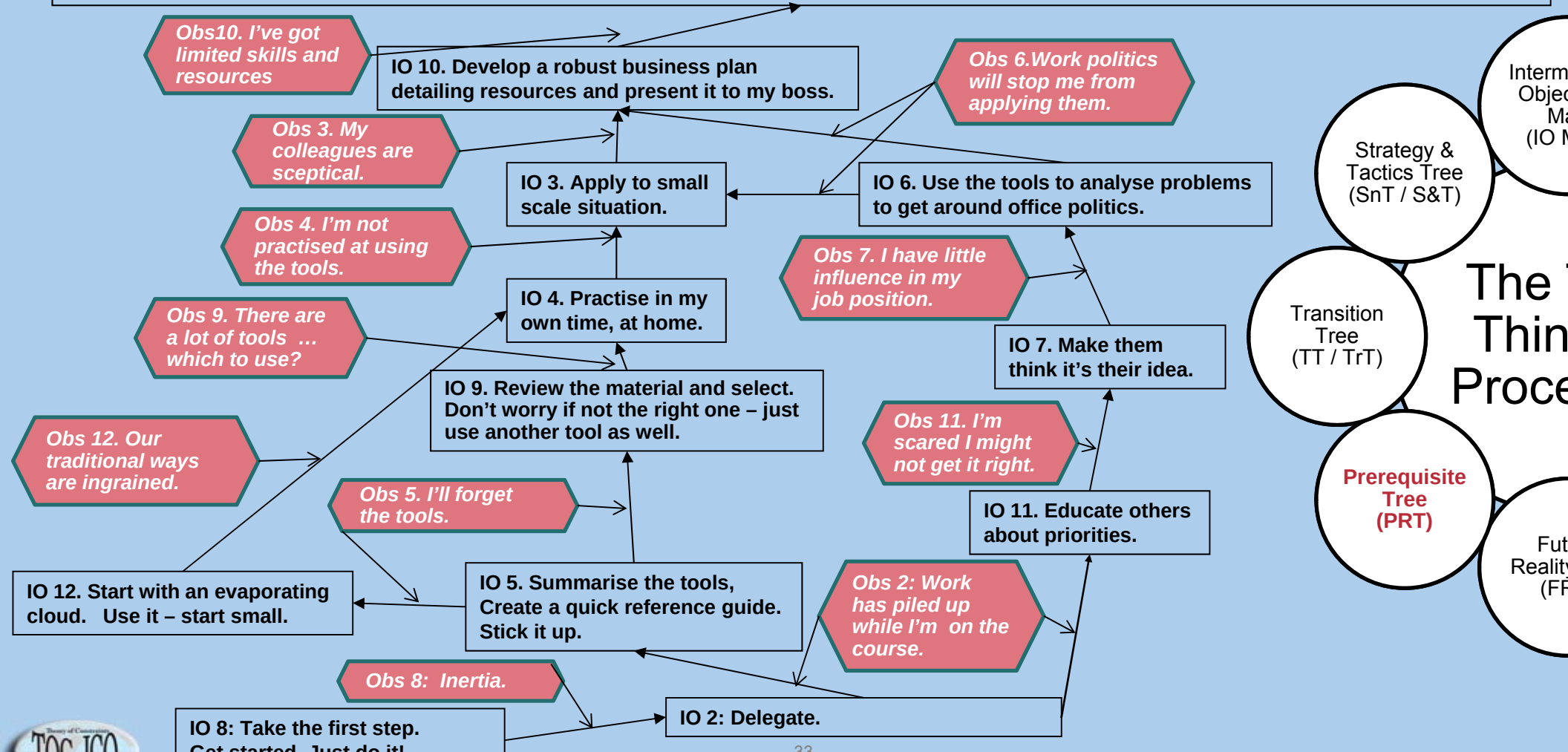
Obstacles	Intermediate Objectives
1. Competing demands for my time	1. Set specific time aside to work on it.
2. Work has piled up while on the course.	2. Delegate.
3. My colleagues are sceptical.	3. Apply to small scale situation.
4. I'm not practised at using the tools.	4. Practise in my own time eg movies.
5. I'll forget the tools.	5. Summarise the tools and stick it up. Quick reference guide.
6. Work politics will stop me from applying them.	6. Use the tools to analyse problems to get around office politics.
7. I have little influence in my job position.	7. Make them think it's their idea.
8. Inertia.	8. Take the first step. Get started. Just do it!
9. There are a lot of tools … which tool do I use when?	9. Review the material and select. Don't worry if not the right one – just use another tool as well.
10. I've got limited skills and resources.	10. Develop a robust business plan detailing resources and present it to my boss.
11. I'm scared I might not get it right.	11. Educate others about priorities.
12. Our traditional ways are ingrained.	12. Start with an Evaporating Cloud. Use it – start small.



Source: Executive Education Course, Victoria University of Wellington, led by V Mabin, 2004.

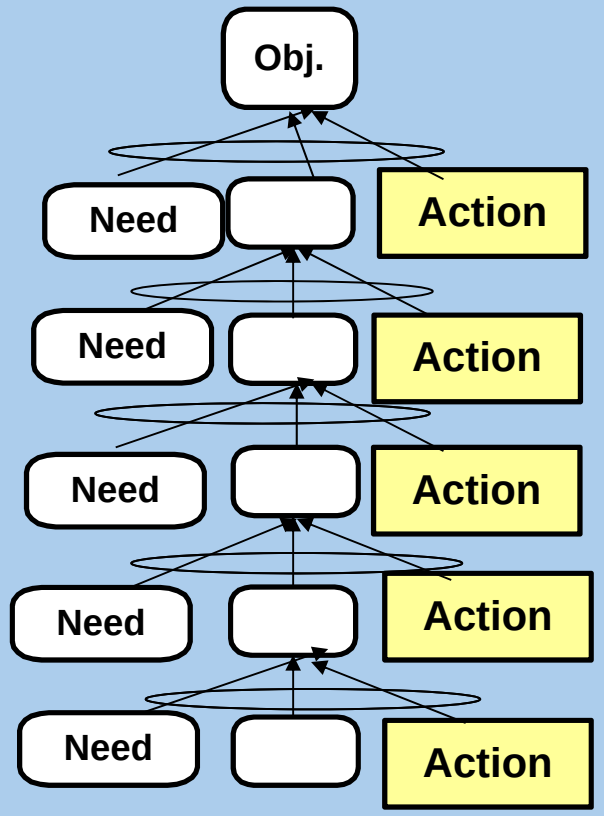
The Prerequisite Tree - Example

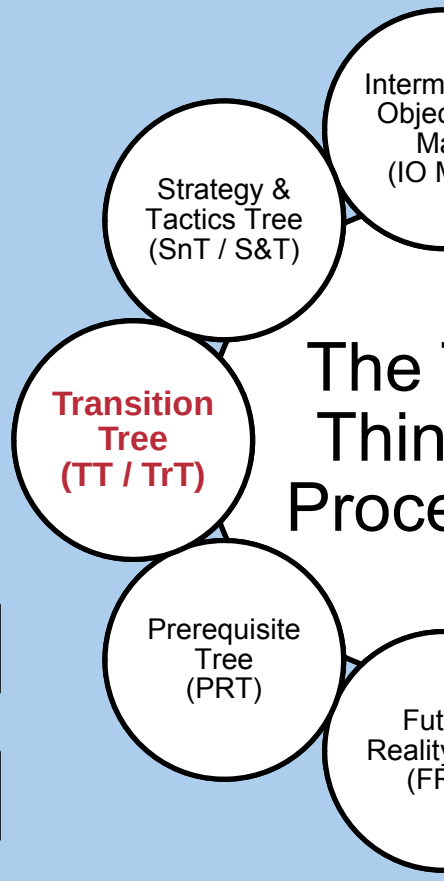
Target: Make good use of the TOC TP tools when I go back to work.



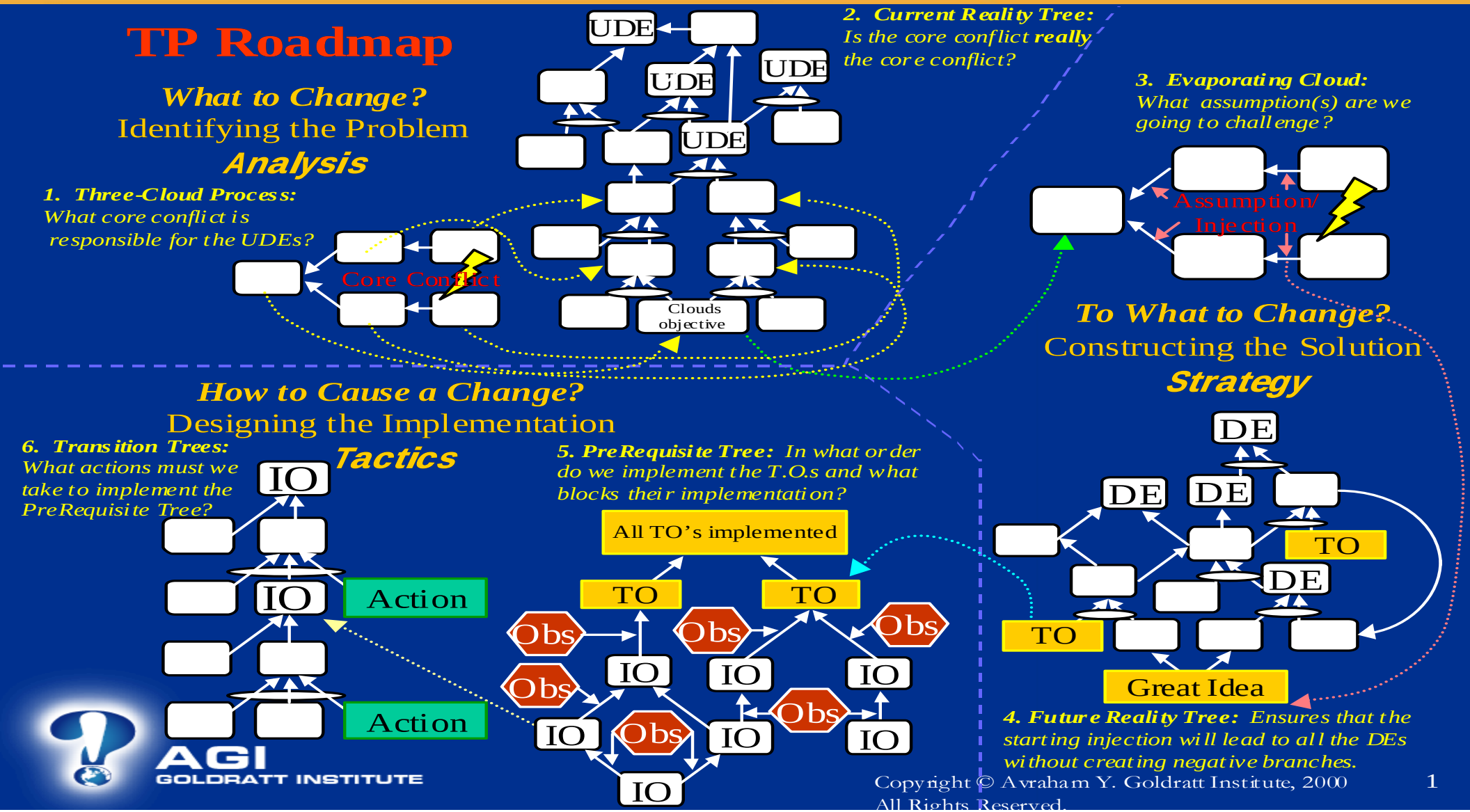
The Transition Tree

- **Uses:**
  - **Planning how to cause the change, by using knowledge of how people are likely to behave.**
  - **Detailed action plan**
  - **Preparing transformational speeches**
  - **In change projects: often omitted in favour of project plan or Strategy & Tactics Tree**





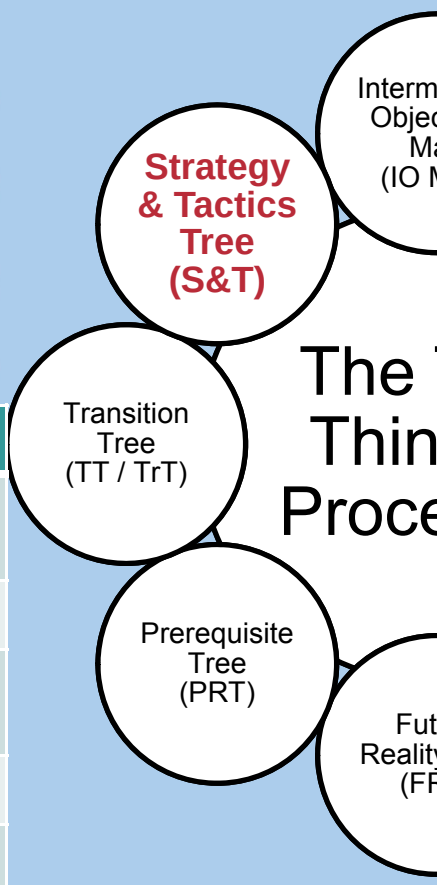
How they all fit together



The Strategy & Tactics Tree

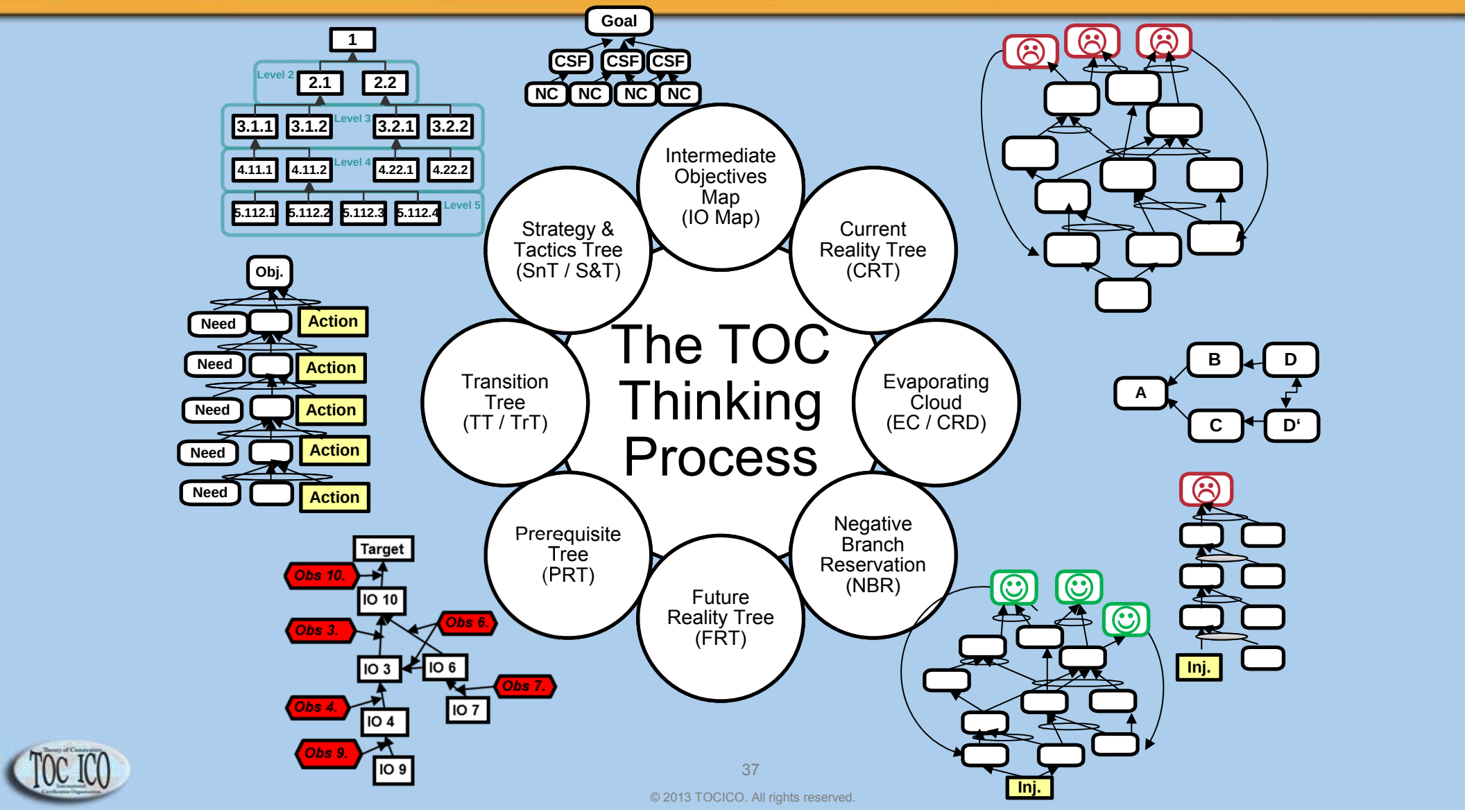
- **S&T Tree sums up TP analysis**
- **Combines both logics**

Step ##	
Necessary Assumptions	"Why" this Strategy/Tactic pair (step) is needed to achieve the step in the level above
Strategy	The purpose of the initiative ("what for")
Parallel Assumption	The "why" of the tactic, the conditions in reality leading us to choose this way to achieve the strategy
Tactic	The "how" – what needs to be done to achieve strategy
Sufficiency Assumption	The "why" of the next level below; explains why a next level is necessary



Source: Scheinkopf (2010). Thinking Processes including S&T Trees, Ch 25 in Cox & Schleier (Eds), TOC Handbook, McGraw-Hill; and Ferguson (2010). Applications of S&T Trees in Organizations, Ch 34 in same volume.

The Thinking Process Tools - Overview



The Logic Sequence

Tool	Nec	Suff	Question
Intermediate Objectives Map	x		Why change?
Current Reality Tree		x	What to
Evaporating Cloud(s)	x		change?
Future Reality Tree		x	What to
Negative Branch Reservation		x	change to?
Prerequisite Tree	x		How to
Transition Tree		x	make the change
Strategy and Tactics Tree	x	x	happen?

Nec = Necessity logic; Suff = Sufficiency logic

Quiz – What do you remember?

1. **Which TP tool is used to resolve a conflict?**
2. **Where do you find and-connectors (bananas)?**
3. **How do you read a Current Reality Tree?**
4. **Where do you start when presenting a cloud?**
5. **How do you read necessity logic?**
6. **How do you recognise necessity logic?**

Managing Change, Harnessing Resistance

- **So many factors are needed when planning and carrying out major strategic change:**
  - **big picture with clarity on goals**
  - **logical and compelling argument …**
  - **communicated well**
  - **develop trust and teamwork**
  - **excellent leadership**
- **But how do you achieve all this?**
- **TOC Thinking Processes provide the roadmap for change in a way that harnesses resistance**

Mabin, Forgeson, & Green, 2001. "Harnessing resistance: using the theory of constraints to assist change management." Journal of European Industrial Training 25(2/3/4): 168.

Layers of Resistance

What to Change?

0. There is no problem (CRT)
1. Disagreement on the problem (CRT)
2. The Problem is out of my control

What to change to?

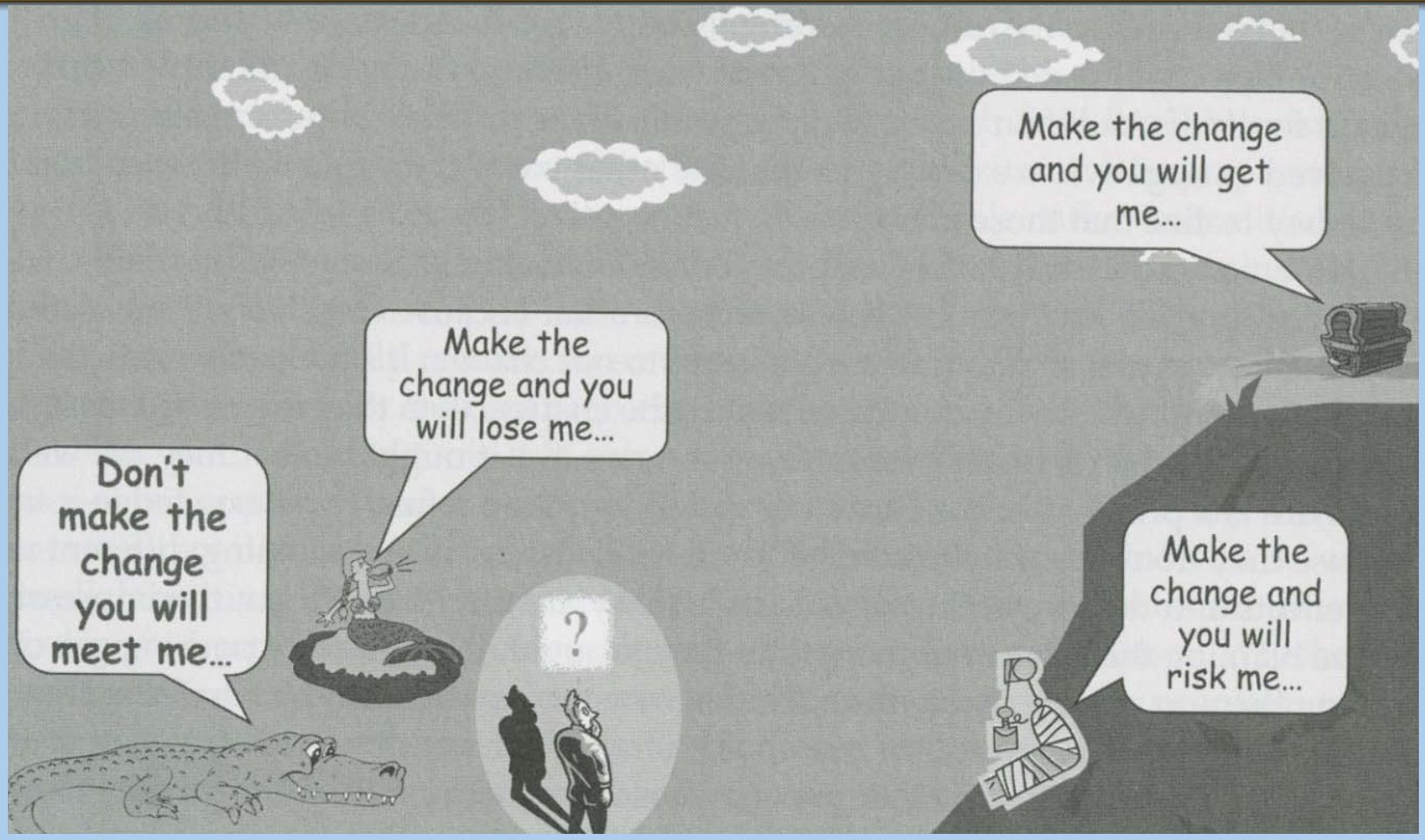
3. Disagreement on the direction of the solution (Core Conflict Cloud)
4. Disagreement on the details of the solution (FRT)
5. Yes but… the solution has negative ramifications (NBR)

How to cause the Change?

6. Yes but… we can't implement the solution (PRT, S&T)
7. Disagreement on the details of the implementation (TRT)
8. You know the solution holds risks
9. "I don't think so" – Social and psychological barriers

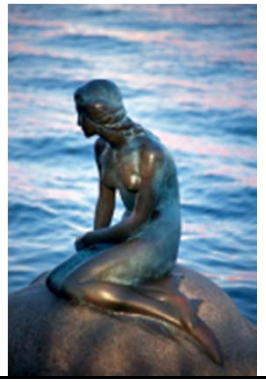
Goldratt-Ashlag, 2010. The Layers of Resistance – The Buy-in Process according to TOC, Ch 20 in TOC Handbook, Cox & Schleier (Eds), McGraw-Hill

Weary Will's Dilemma: To change or not to change?



Source: Efrat Goldratt, 2010. The Layers of Resistance – the buy-in process according to TOC, TOC Handbook, Ch 20, p575; Cox, Boyd, Sullivan, Reid, Cartier, 2012. TOCICO Dictionary 2nd Edn, p 116. For an animated explanation, see http://m.youtube.com/#/watch?v=hcz1aZ60k7w&desktop_uri=%2Fwatch%3Fv%3Dhcz1aZ60k7w

To change or not to change?

	Change	Don't change
Plus	'Pot of gold' 	'Mermaid' 
Minus	'Broken legs' 	'Crocodiles' 

Sources: Efrat Goldratt, 2010. The Layers of Resistance – the buy-in process according to TOC, TOC Handbook, Ch 20, p575; Cox, Boyd, Sullivan, Reid, Cartier, 2012. TOCICO Dictionary 2nd Edn, p 116; Ferguson, 2010. TOC Handbook, Ch 34.
http://m.youtube.com/#/watch?v=hcz1aZ60k7w&desktop_uri=%2Fwatch%3Fv%3Dhcz1aZ60k7w for an animated explanation

Buy-in processes

Minus-Minus

1. Agree on the problem.
2. Agree on the direction for the solution.
3. Agree on the solution details.
4. Agree that the potential negative consequences of the solution can be prevented.
5. Agree that the obstacles to implementing the solution can be overcome.
6. Overcome unverbalized fears.

Plus

1. Agree on the very ambitious objective we desire to reach – a pot of gold.
2. Agree that reaching the pot of gold at the top of the cliff is much more difficult than we originally thought (the cliff is very high and steep).
3. Agree that there is a direction for the solution, an anchor on the cliff against which a ladder can be leaned.
4. Agree on the solution details (the rungs of the ladder).
5. Overcome unverbalized fears, such as the potential NBRs of success (how not to break your legs climbing the ladder).

Conclusions

TOC's Thinking Processes:

Quick introduction to help you read, understand and appreciate the TOC Thinking Process tools to lead change:

- **Key questions for successful change**
- **Logic used in the Thinking Processes**
- **TP Tools Overview**
- **Examples of each tool**
- **How they all fit together**
- **Harnessing resistance to change**

Reading Recommendations

- Cox, Blackstone & Schleier (2003). **Managing Operations: A Focus on Excellence**. North River Press.
- Cox & Schleier (Eds.) (2010). **The Theory of Constraints Handbook**, McGraw-Hill.
- Dettmer (2007). **The Logical Thinking Process**, ASQ Quality Press.
- Ferguson (2010). **Applications of Strategy and Tactics Trees in Organizations,** TOC Handbook Ch. 34.
- Goldratt, E.M. (2008). **The Choice**. Great Barrington, MA, North River Press.
- Kim, Mabin & Davies (2008). **The theory of constraints thinking processes: retrospect and prospect.** *International Journal of Operations & Production Management* 28 (2): 155-184.
- Mabin & Davies (2010). **The TOC Thinking Processes**, TOC Handbook Ch. 23.
- Scheinkopf (1999). **Thinking for a Change: Putting the TOC Thinking Processes to Use**. Boca Raton, FL, St Lucie Press / APICS Series on Constraints Management.
- Scheinkopf (2010). **Thinking Processes including S&T Trees**, TOC Handbook Ch. 25.
- Watson, Blackstone & Gardiner (2007). **The evolution of a management philosophy: The Theory of Constraints**, Journal of Operations Management, 25: 387-402.
- Cox, Boyd, Sullivan, Reid & Cartier (2012). **The Theory of Constraints International Certification Organization Dictionary**, 2nd Ed, URL http://www.tocico.org/i4a/pages/index.cfm?pageid=3331

Some TOC TP Vocabulary

English	German
Categories of Legitimate Reservation (CLR)	Kategorien Legitimer Vorbehalte
Current Reality Tree (CRT)	Gegenwartsbaum
Evaporating Cloud, Conflict Resolution Diagram (EC, CRD)	Wolke, Konfliktlösungsdiagramm
Future Reality Tree (FRT)	Zukunftsbaum
Injection	Injection, Lösungsidee
Intermediate Objectives Map (IO-Map)	IO-Map, Zielebaum
Layers of Resistance	Ebenen des Widerstandes (gegen Veränderung)
Necessary condition / Necessity Logic	Notwendige Bedingung / Voraussetzungslogik
Negative Branch Reservation (NBR)	Negativer Zweig
Prerequisite Tree (PRT)	Voraussetzungsbaum
Root cause	Kernursache, Wurzelursache
Strategy & Tactics Tree (S&T)	Strategie&Taktik-Baum
Sufficient cause / Sufficiency Logic	Hinreichende Ursache / Kausalitätslogik
Thinking Process (TP)	Denkprozesse / Denkwerkzeuge
Transition Tree (TT / TrT)	Umsetzungsbaum
UDE (“oodee“, UnDesirable Effect)	Unerwünschter Effekt, Negativer Effekt

The last word?

I smile and start to count on my fingers.

"One, people are good.

Two, every conflict can be removed.

Three, every situation, no matter how complex it initially looks, is exceedingly simple.

Four, every situation can be substantially improved; even the sky is not the limit.

Five, every person can reach a full life.

Six, there is always a win-win solution.

Shall I continue to count?"

Eliyahu M. Goldratt, 2008. The Choice, p168.

About the Presenter

Dr Vicky Mabin is Professor in Management, Victoria Business School, Victoria University of Wellington, New Zealand, and Associate Dean (Teaching and Learning) since 2008. Prior to 1991, she worked as an OR scientist and consultant for the NZ government and led the first application of OPT (TOC) in NZ with Expozay International in 1986.

She has published widely on TOC including "*The World of the Theory of Constraints: A review of the international literature*" (2000), the lead chapter on the TP in the "*Theory of Constraints Handbook*" (2010), and dozens of journal articles, book chapters, and presentations on TOC.

She holds PhD in Operational Research, University of Lancaster, UK; TOCICO certification in 3 areas, and the academic Jonah qualification in TOC; is a Fellow of the Operational Research Society (UK); past president of the Operational Research Society of New Zealand; and past Chairperson of the Wellington Chapter of the NZPICS. She has served on the examinations board for TOCICO, and as an editor for the *Decision Sciences Journal of Innovative Education,* and *International Transactions in Operational Research.*

Hannah Nowak helped create this presentation, and will present the German version.