38th TOCPA International Conference

28-30 March 2018, Paris, France

What is TOC?

The

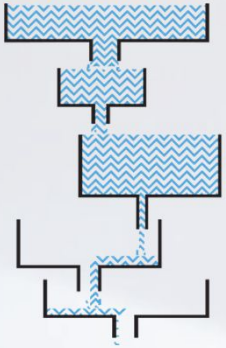
Theory of Constraints

Oded Cohen

tocExpert

Israel, Estonia

Marris Consulting



Oded Cohen

Oded has over 40 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 in the is the author of *Ever Improve – A Guide to Managing Production the TOC Way*, published in June 2010, translated to Chinese in 2015. Oded co-authored the book *Deming & Goldratt: The Theory of Constraints and the System of Profound Knowledge – The Decalogue.*

Together with Jelena Fedurko Oded has co-authored the book *Theory of Constraints Fundamentals.*

Oded is International Director of tocExpert Ltd, TOC Strategic Solutions Ltd and Founder and Co-President of TOCPA.

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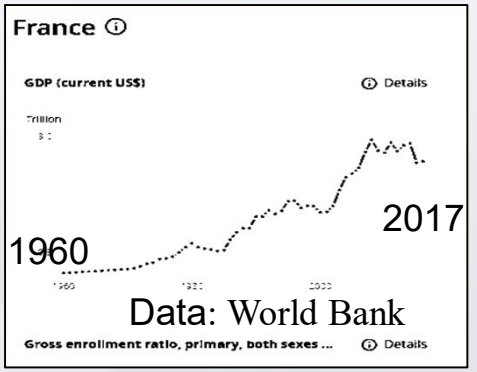
TOC – The Theory of Constraints

WHY TOC?



GDP of the world and of France is growing.

Demand for products and services increases.

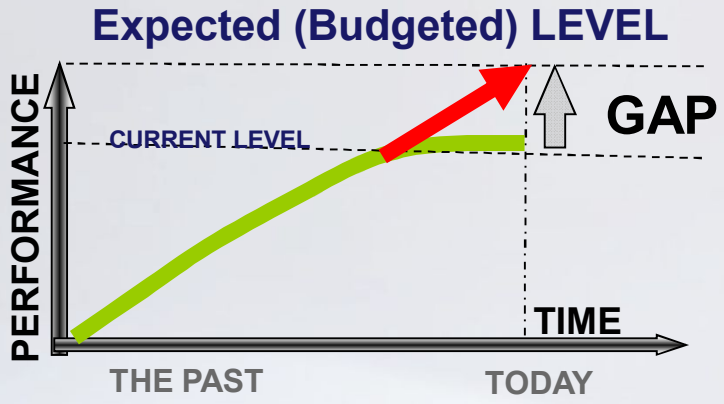
The demand is supplied by companies.

Management is put in charge of commercial enterprises (better paid) in order to deliver financial results.

Hence ➔ The world cannot do without Management.

When results are not achieved management must take corrective actions.

Most changes are in systems and in managerial decision making.



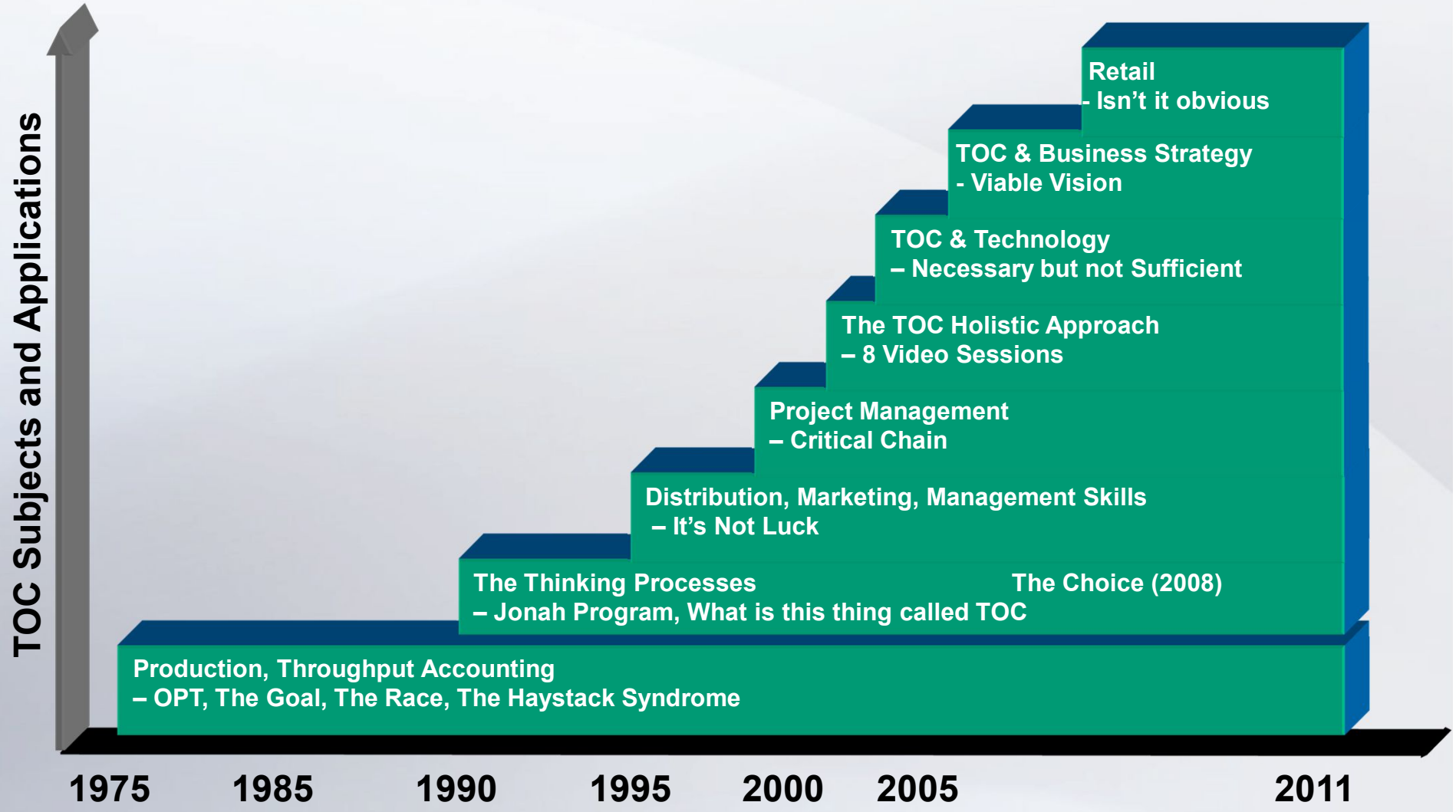
TOC – The Theory of Constraints

TOC is a knowledge based approach assisting managers in running organizations and systems in a better and more effective way.

It contains:

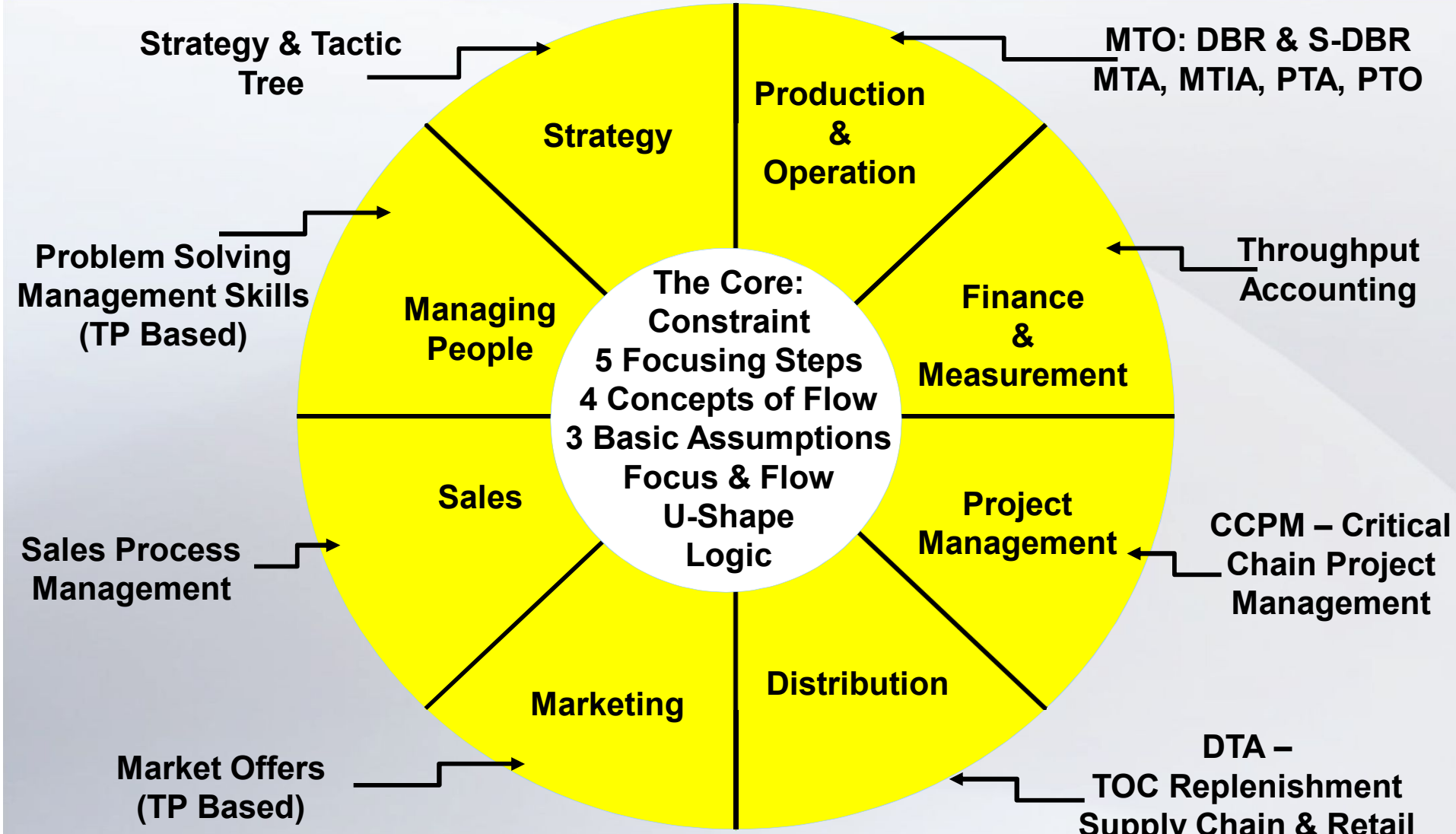
- **The Core – Constraint, Basic principles and Key Managerial Processes**
- **Logistical Solutions for managing flow systems: Production, Supply Chains, Projects and Sales**
- **Decision Support System – Throughput Accounting**
- **A set of comprehensive Logical tools – TOC Thinking Processes (TP) for problem solving and developing new solutions**
- **Special applications for unique environments – Health, Education. Government, Startups and more.**

The Evolution of TOC as recorded by Goldratt



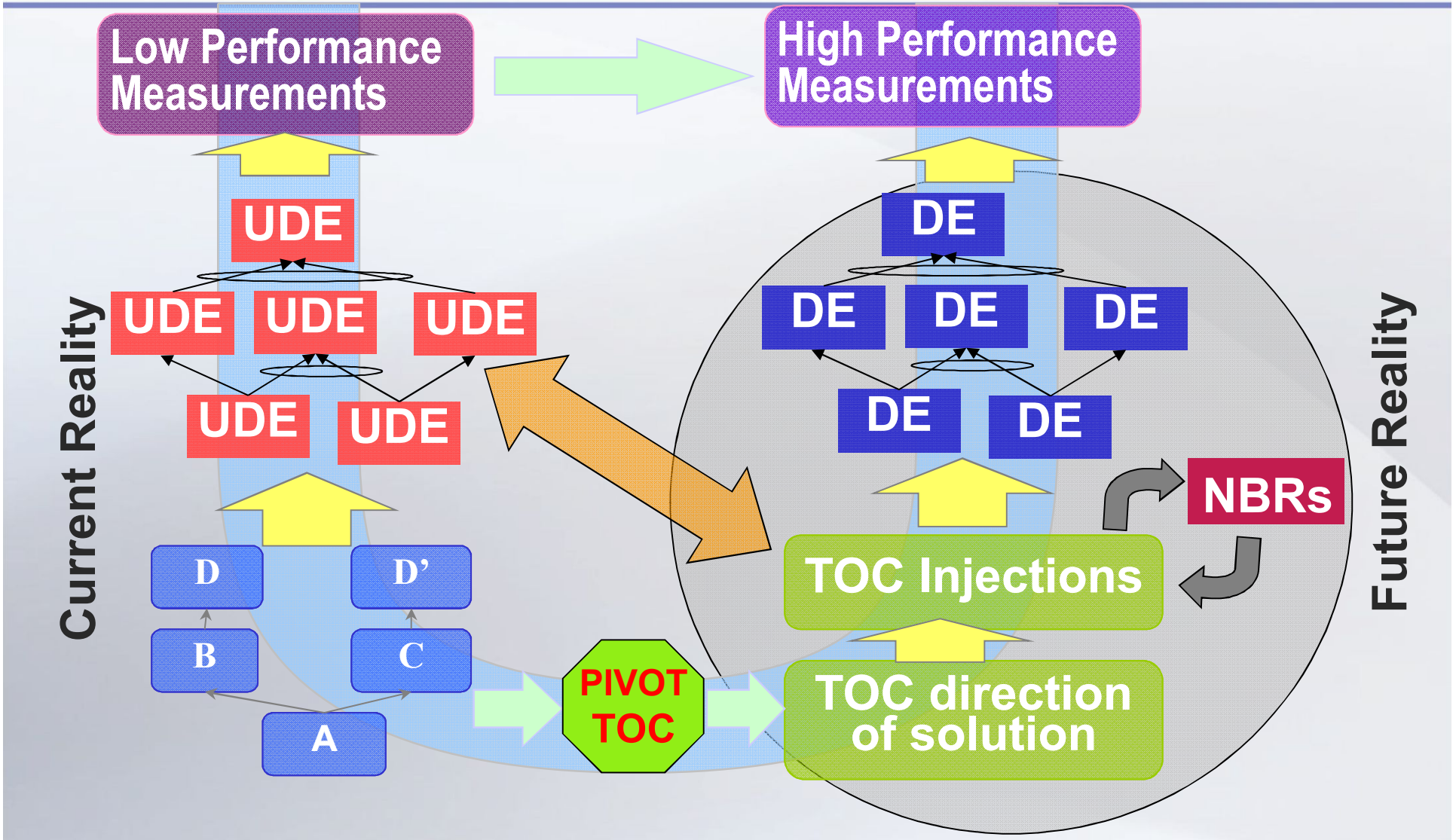
TOC – Subject Map

Based on GSP 1999



TOC Detailed Solution Design

The U-Shape



Maintenance Center, Albany, GA

The Honorable Diane K. Morales
Deputy Under Secretary of Defense
(Logistics and Materiel Readiness)

Goals

- **Increase Throughput**
- **Decrease costs**
- **Decrease Work In Process WIP**
- **Reduce Repair Cycle Time**
- **Make schedule 90+% of the time**

Accomplishments

- Ahead of or on schedule for all production lines
- Reduced Repair Cycle Time by at least 50%
- Reduced Quantity of Assets in Maintenance by up to 50%

Comments [OC]:

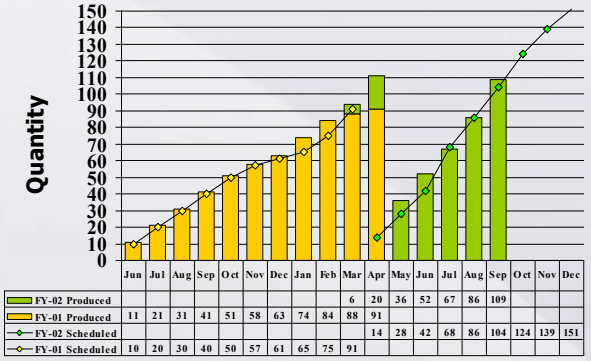
- **TOC Applications used: Critical Chain (projects) and S-DBR (production)**
- **Implementation rollout - 22 product families**
- **Implementation duration – 3 to 6 months**

TOC implementation began with the MK-48 product line

MATCOM

MK-48

Output Per Month, Cumulative

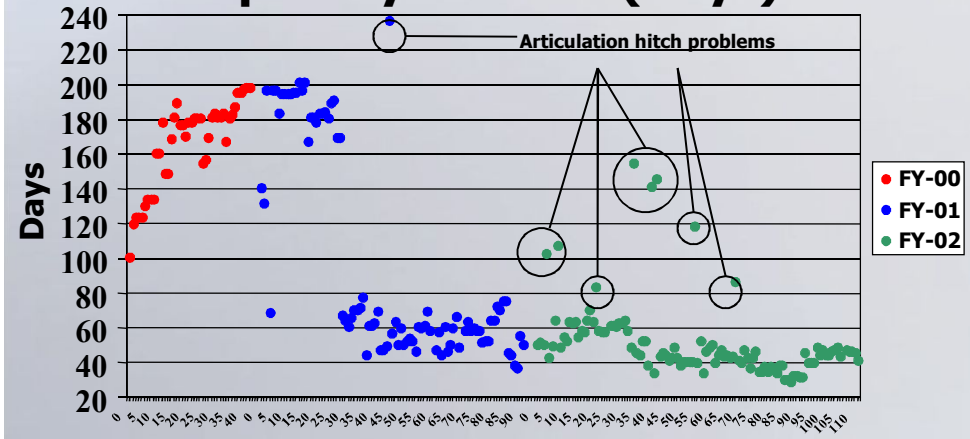


	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
FY-02 Produced										6	20	36	52	67	86	109			
FY-01 Produced	11	21	31	41	51	58	63	74	84	88	91								
FY-02 Scheduled											14	28	42	68	86	104	124	139	151
FY-01 Scheduled	10	20	30	40	50	57	61	65	75	91									

Data Source: Master Work Schedule vs. Completions

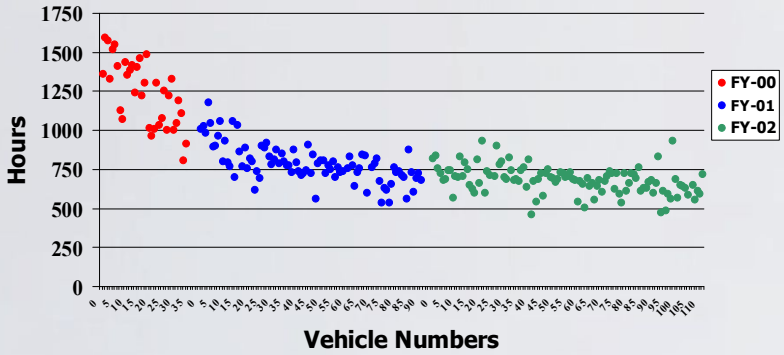
*On 20 Jul 02, July's requirements changed from 14 to 26.
**On 04 Sep 02, 10 vehicles were added to the schedule for Nov and Dec.

Repair Cycle Time (Days)



Data Source: Concerto
Activity By Project Records

Labor Hours - MK-48



Data Source: Essex Replacement Program (ERP)

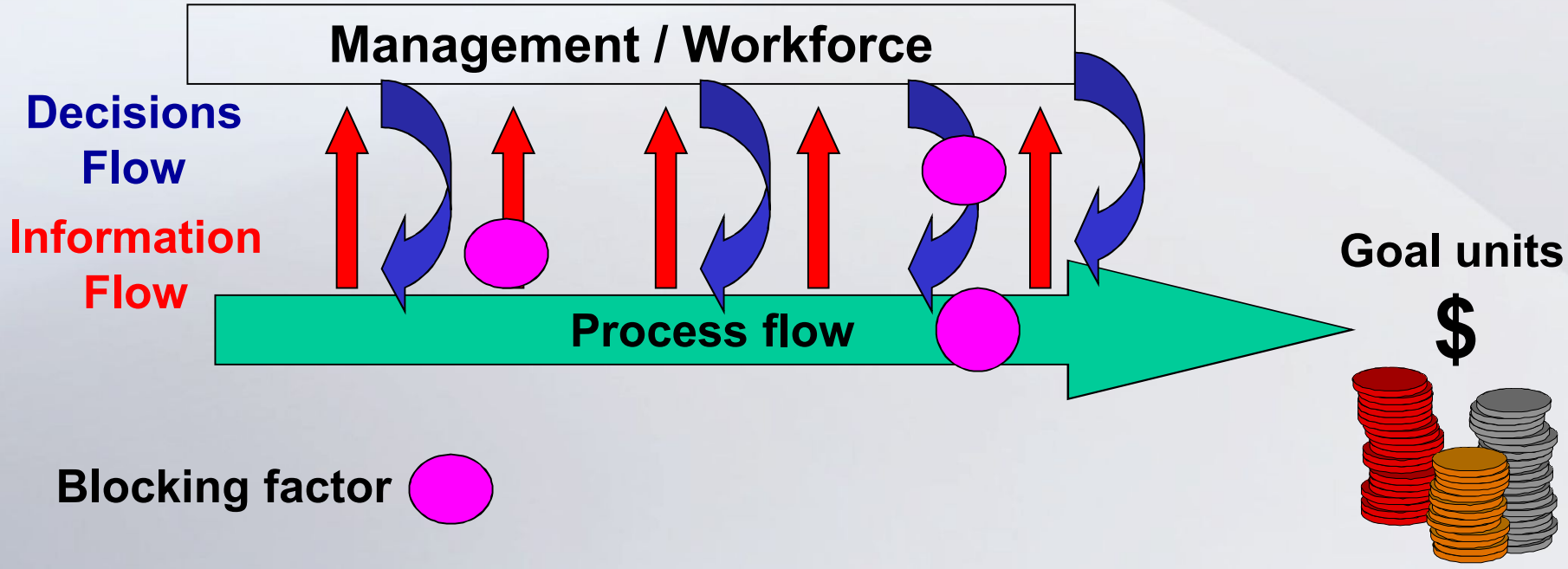
Starting with vehicle #161981, includes installation of the Antilock Braking System (ABS) Modification.
Starting with vehicle #2MK115, includes 100% replacement of Articulation Hitch. No additional funds required.

Before TOC, the repair cycle time average was 167 days.
After TOC, the average is 51 days.

TOC is Focus and Flow

Focus The Goal: To make money now and in the future

Flow



Focus & Flow determine the Constraint(s)

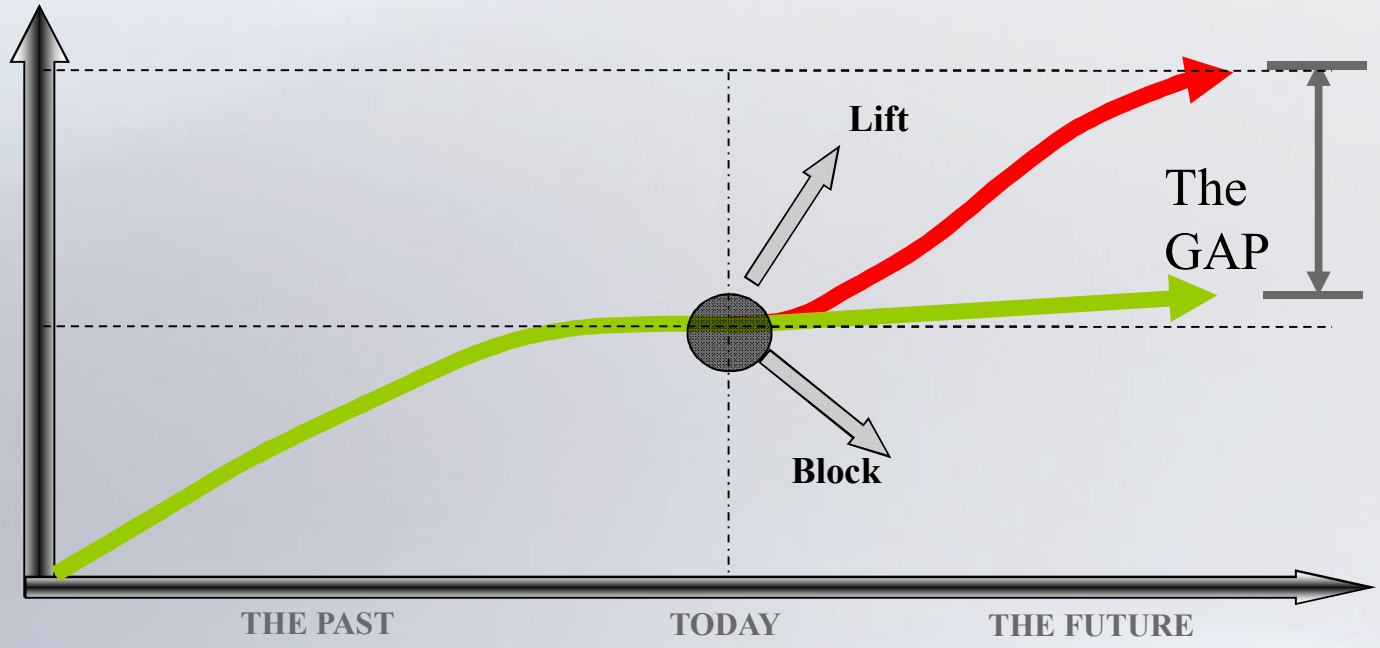
Not every obstacle is a constraint!

Managing System the TOC Way – the Constraint

CONSTRAINTS –
factors or elements that determine how much the system can accomplish

Main Types:

- **Capacity Constraint**
- **Market Constraint**
- **Time Constraint**



Managing System the TOC Way

The Five Focusing Steps

1. **Identify** (choose) the system's constraint
2. Decide how to **exploit** the system's constraint
3. **Subordinate** everything else to the above decision
4. **Elevate** the system's constraint
5. **If** the constraint is broken go back to step one but do not allow **Inertia** to cause the system's constraint

The General Structure of the TOC Solutions

Four elements for managing systems:

Planning

- *Plan should provide explicit Financial Outcome,*
- *Should be realistic and protected against "Murphy"*

Execution

- *Performing activities according to the plan*

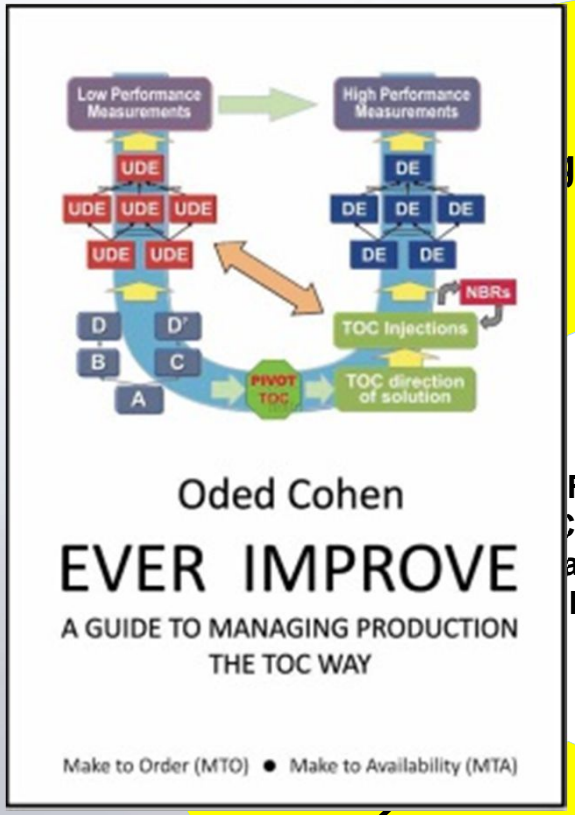
Control

- *The system should provide early warning to prompt recovery actions when plan is under danger*

Continuous Improvement

- *Based on analyzing repeating significant incidents during execution and control*

Production & Operations

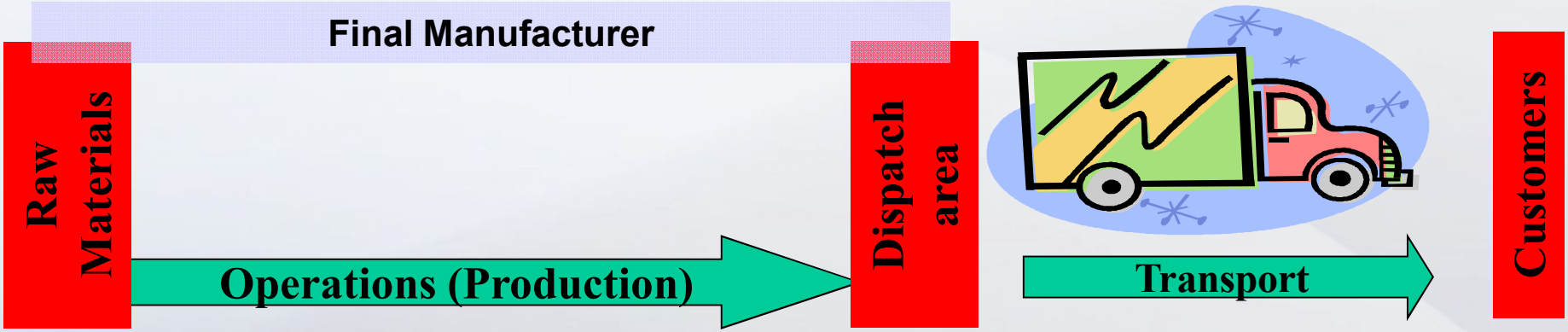


MTO:
DBR & S-DBR

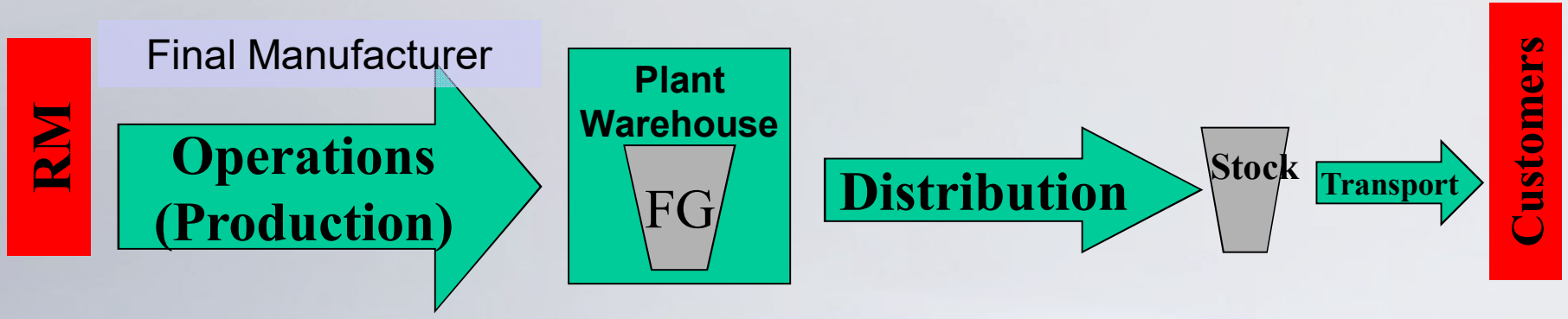
MTA, MTIA,
PTA, PTO

Solutions for Production

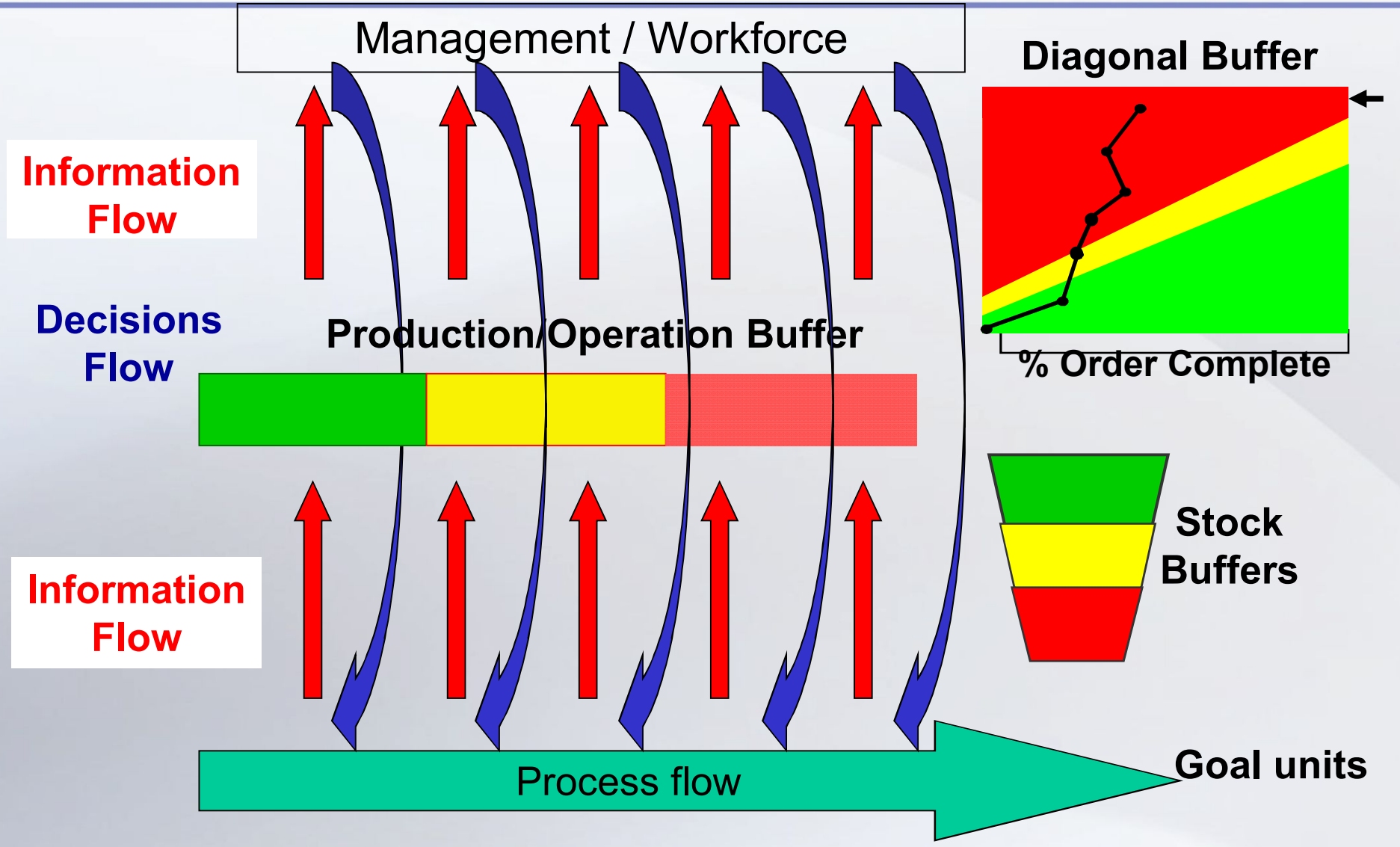
MTO – Make To Order



MTA – Make To Availability (replenishment)

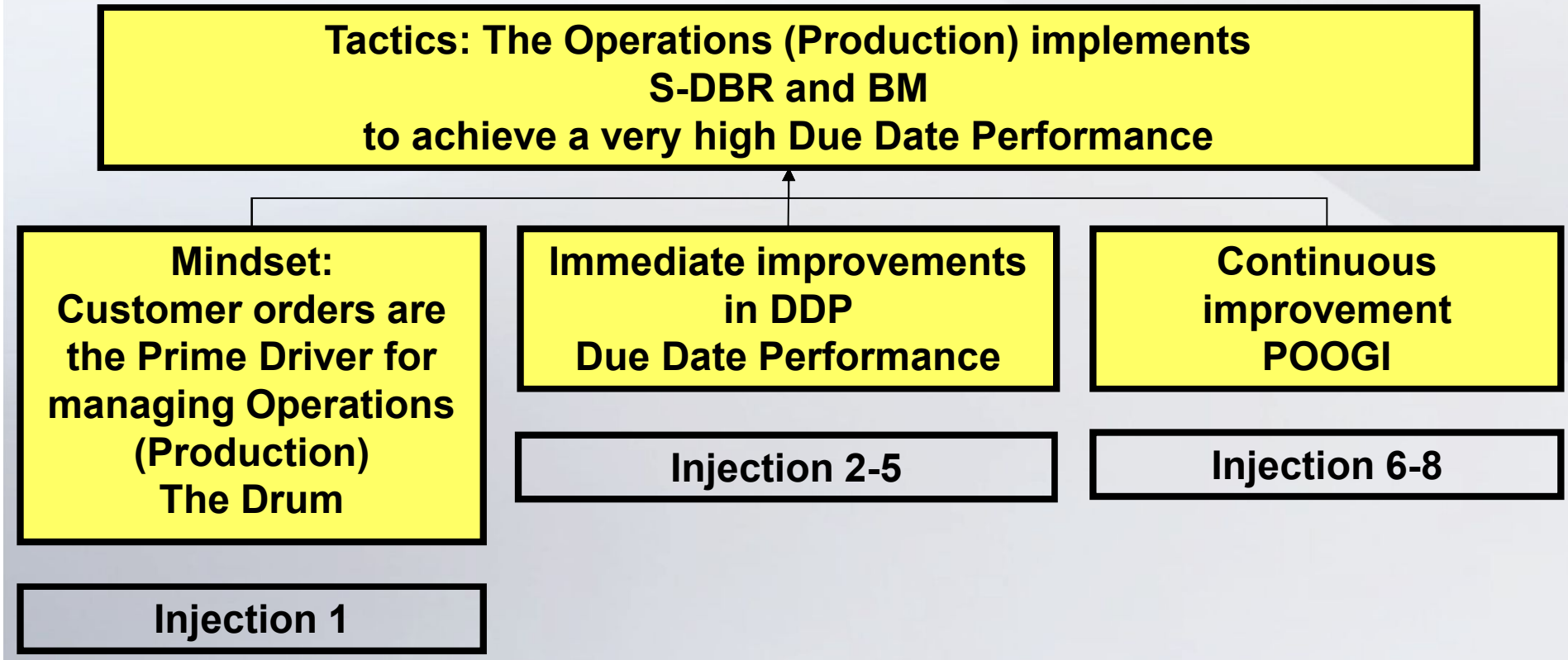


Planning, Execution, Control and POOGI are based on Buffers

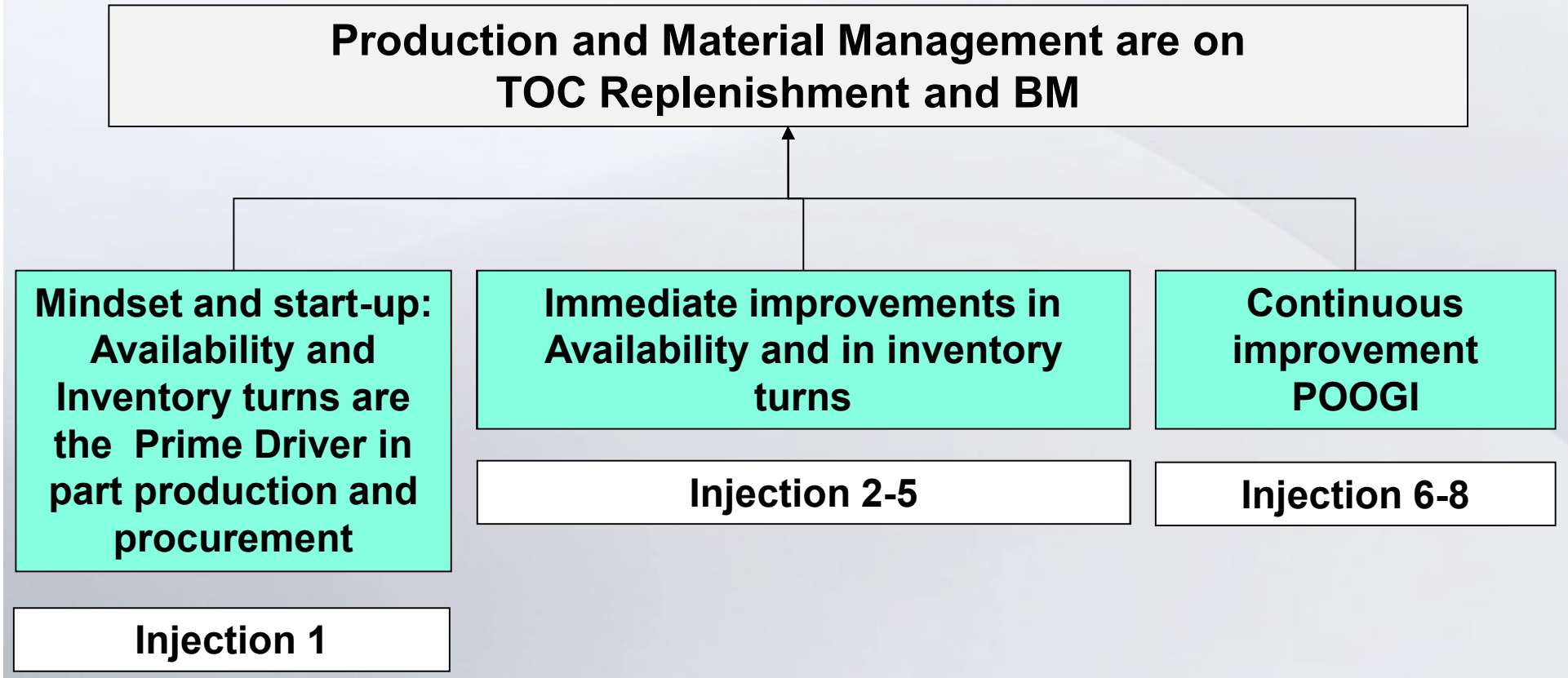


TOC Solution for MTO

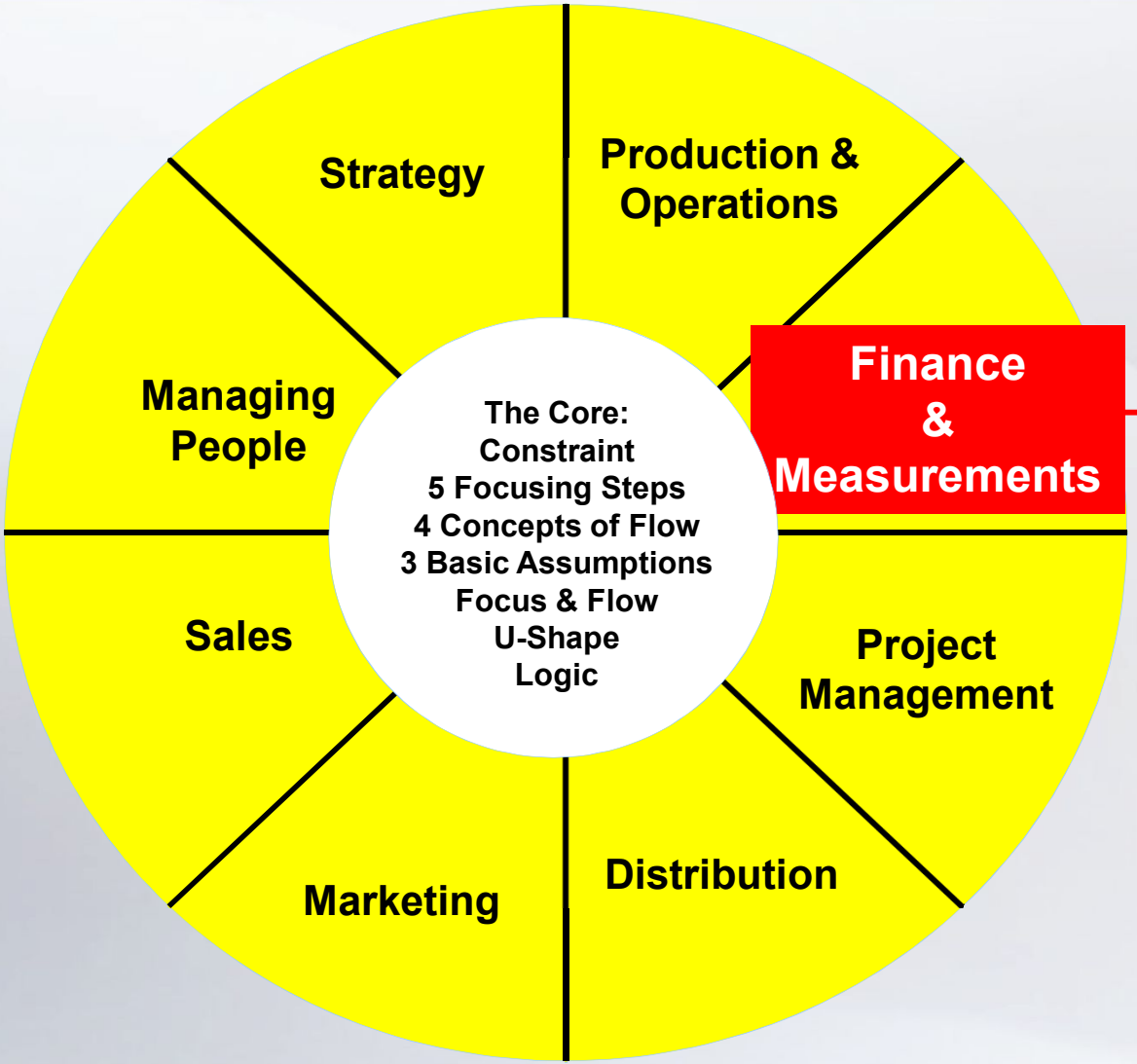
S-DBR Simplified Drum-Buffer-Rope And Buffer Management



TOC Solution for MTA
to achieve Availability
at the Plant (Central) Warehouse

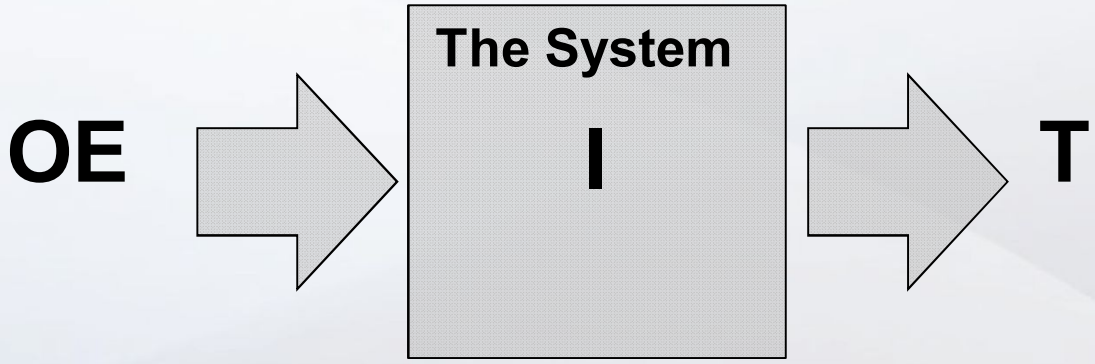


Finance & Measurements



Throughput Accounting

Throughput Accounting



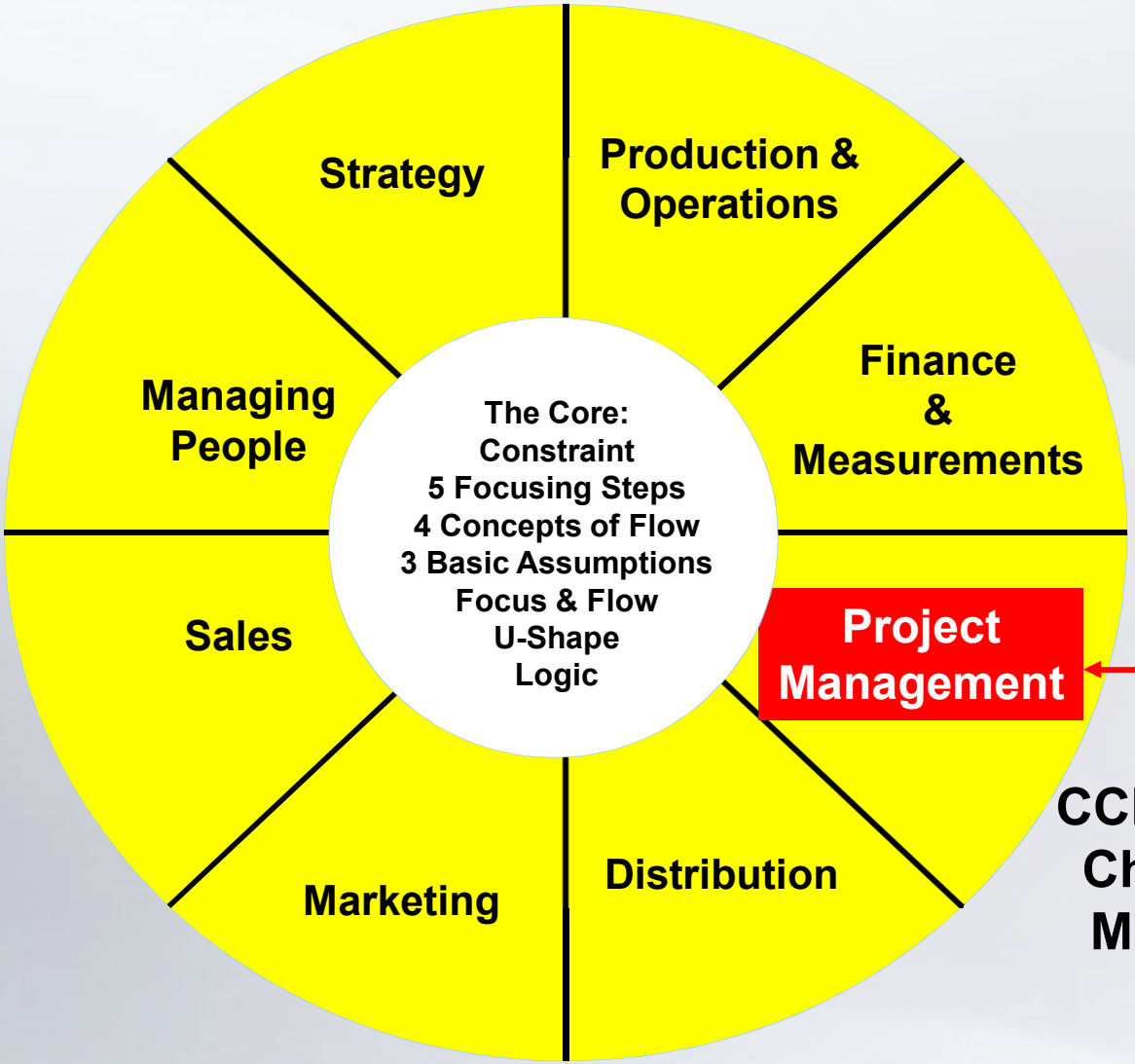
For profit: **NP ROI**
The bridge is: **T I OE**

- NP = T – OE
- ROI = (T-OE)/I

"To become an Ever Flourishing Company, its T must grow (and continue to grow) much faster than OE"

Dr. Eli Goldratt

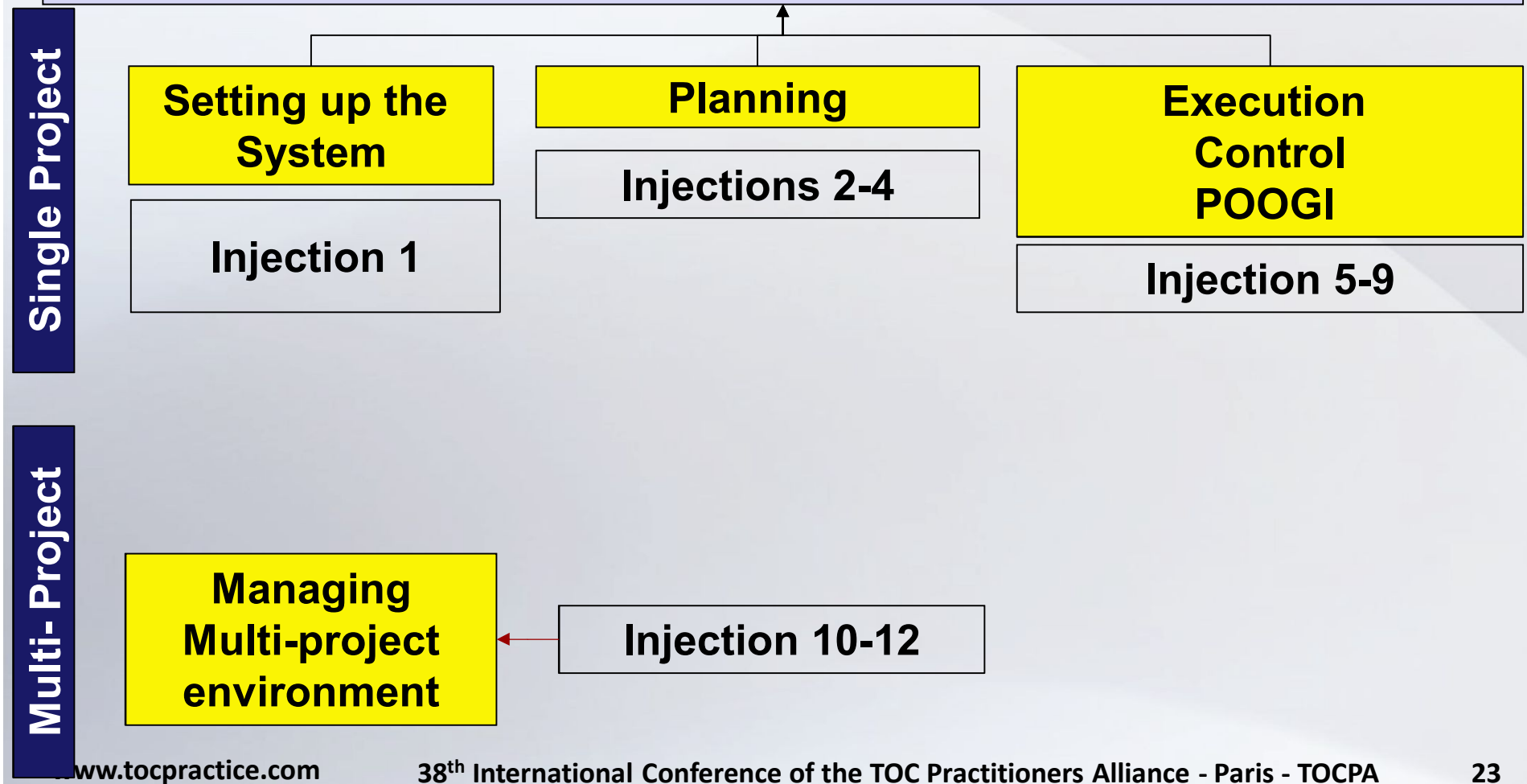
Project Management



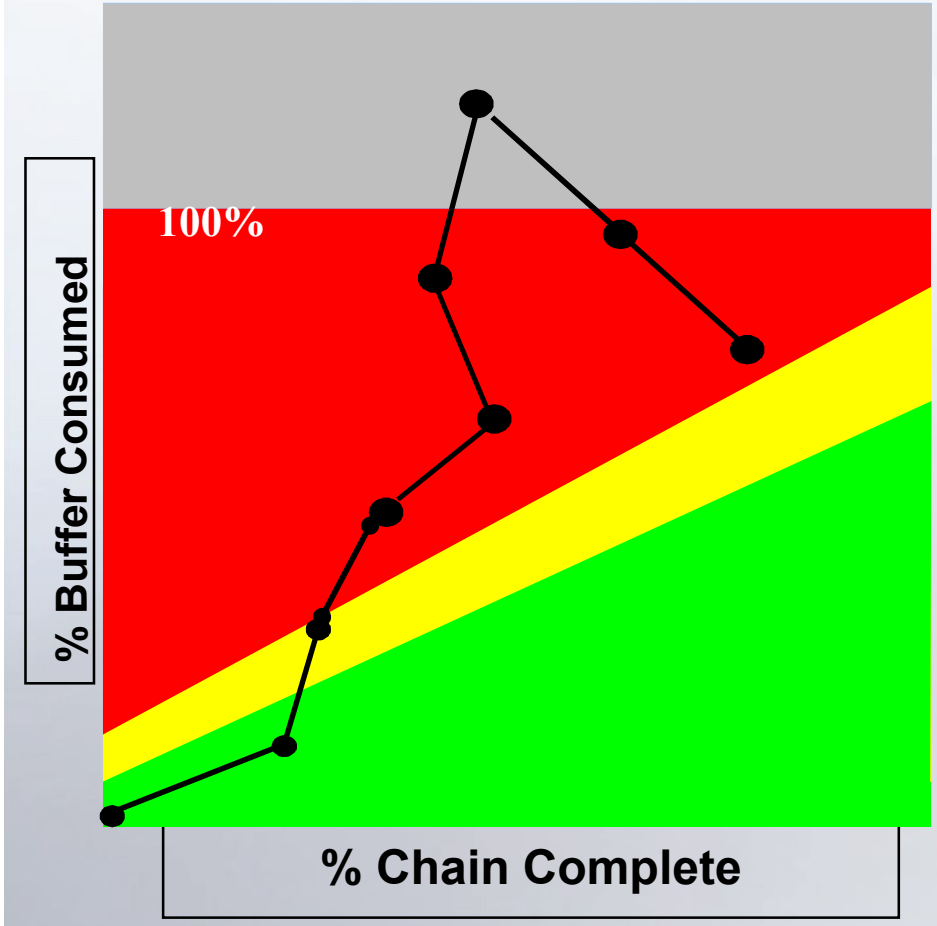
CCPM – Critical Chain Project Management

CCPM
Critical Chain Project Management

Strategy: The Project is On Time, In Full & Within Budget
Tactics: Project Organization is on CCPM

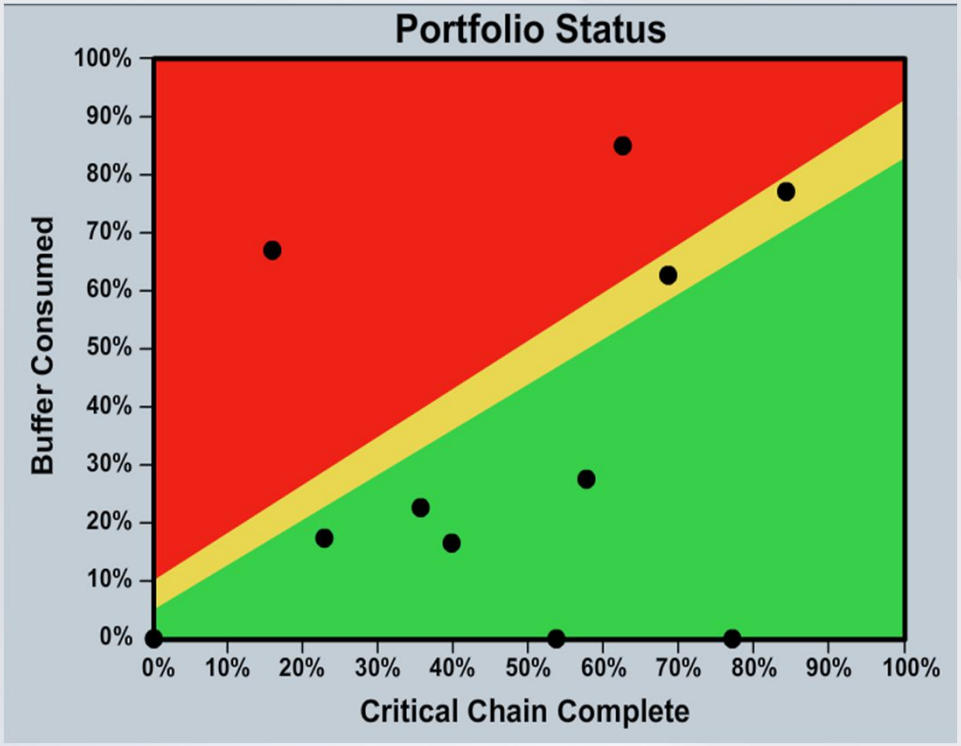


CCPM
Project Buffer Status

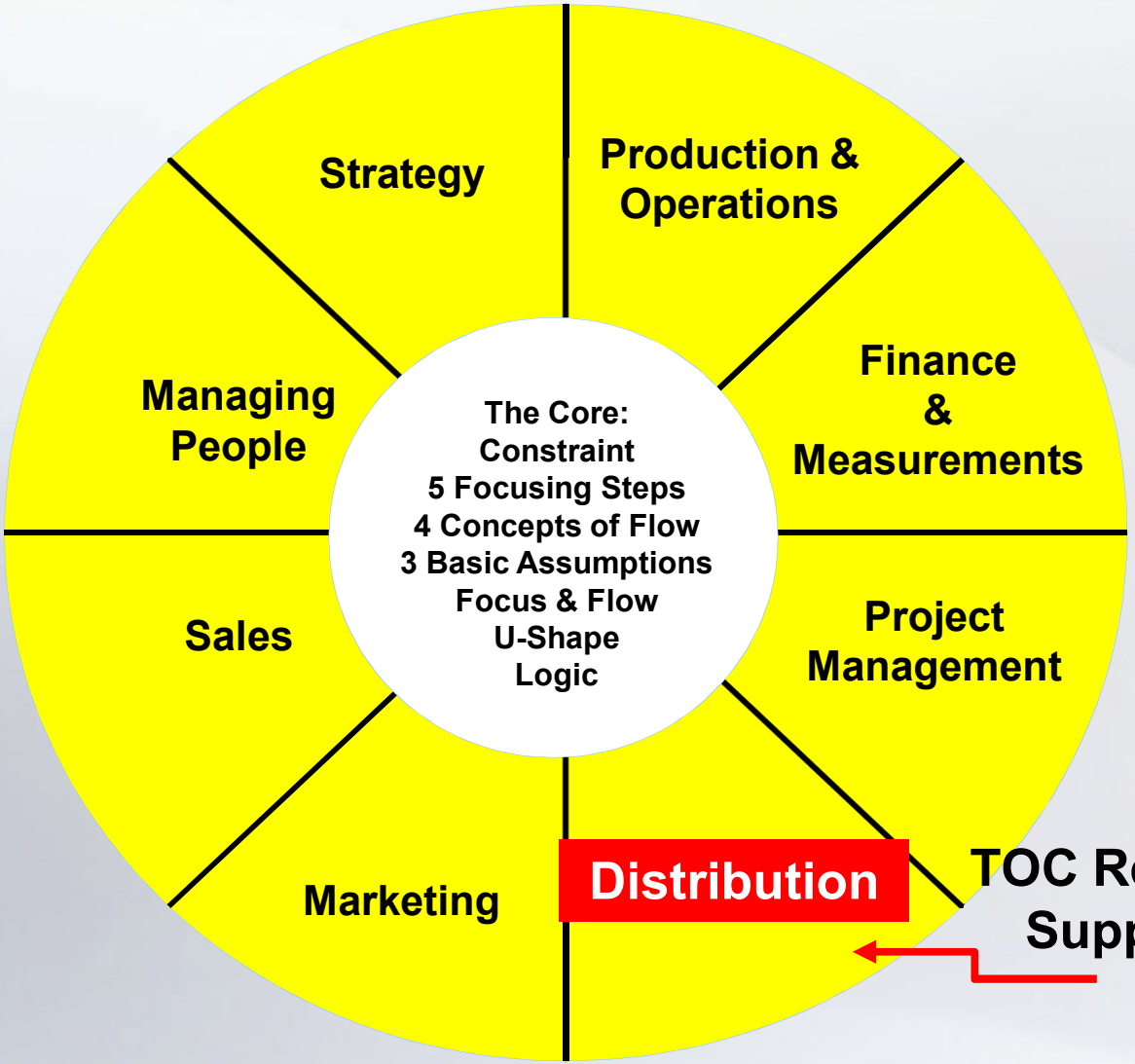


Single Project

Project Portfolio

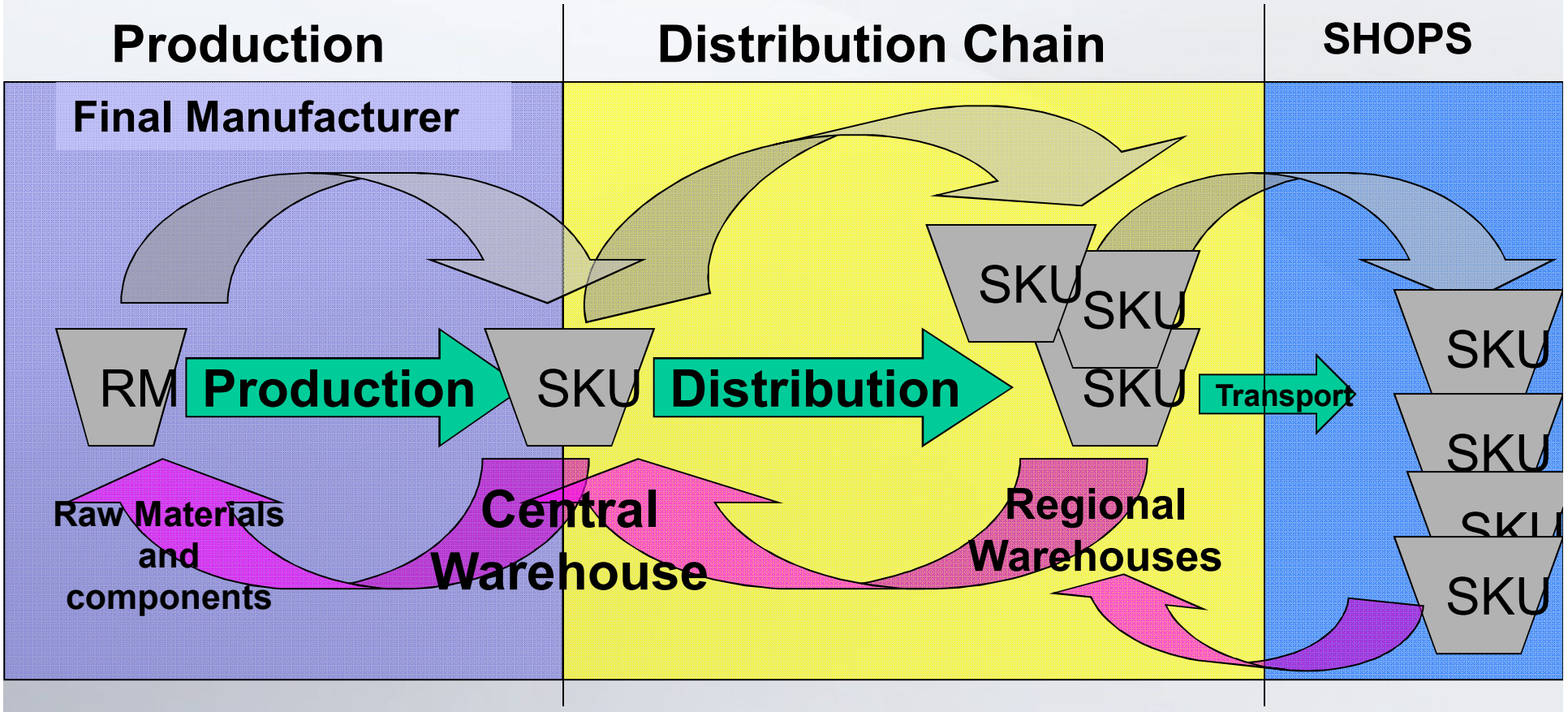


Distribution & Retail



DTA – TOC Replenishment Supply Chain & Retail

Supply Chain Including Manufacturers



DTA – Distribute to Availability

Strategy: The company maintains very high Availability while significantly improving Inventory Stock-turns

Tactics: Stocks are on TOC Replenishment system

Mindset & Start-up	Immediate improvement in availability	Continuous Improvement POOGI
Injection 1	Injection 2-6	Injection 7-10

Marketing

Standard Offering Templates

Market Offers (TP Based)

Handling Market Constraint
Through 5 Focusing Steps

Step 1. Identify

Step 2.
Decide how to exploit
Do not lose any of the existing customers.

Step 3. Subordinate everything else to the above decision

Gained Logistical Excellence

Reliability

The market starts to appreciate the Company's level of service and reliability

Step 4. Elevate the system's constraint – Value Offers

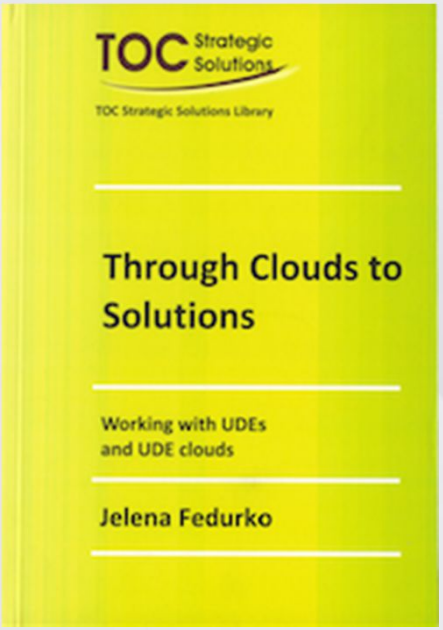
STANDARD TOC MARKET OFFERS

The offer must satisfy a significant need of enough clients

- Reliable Rapid Response
- Inventory Turns
- Projects Company
- Pay-per -Click
- Vendor Managed Inventory

Building Value Offers

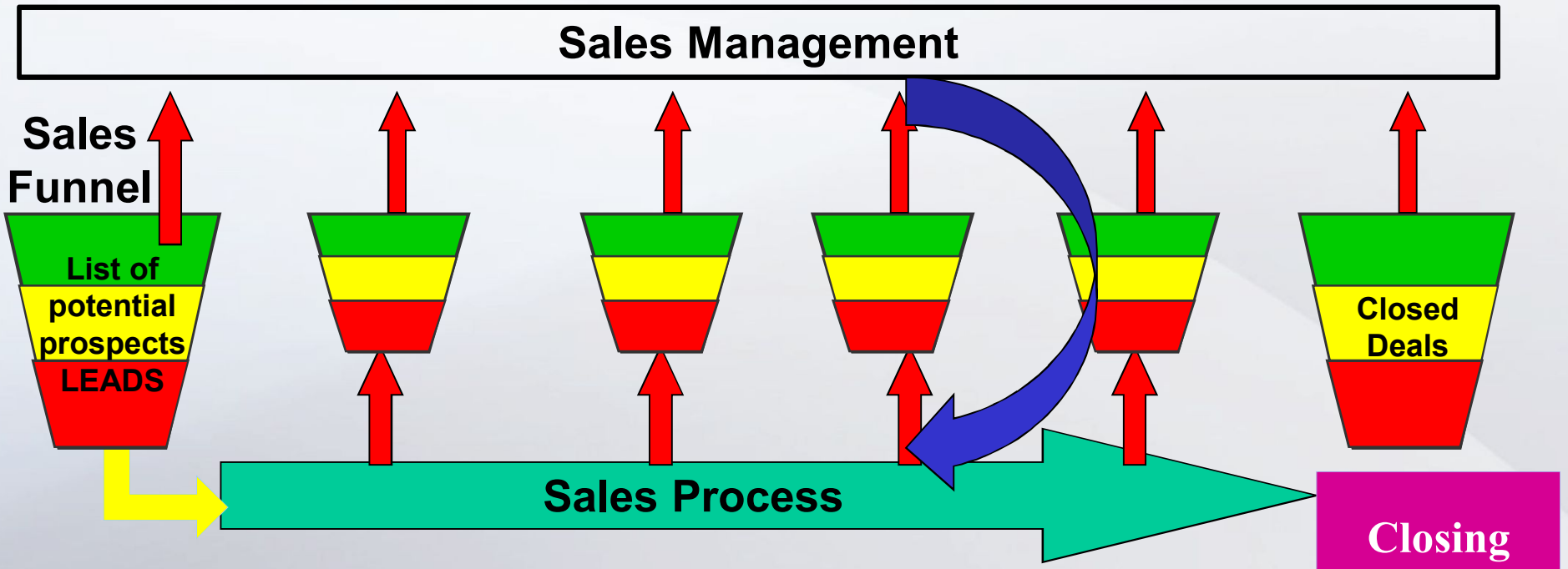
1. Develop the Prospects' profile based on their significant problem
2. Identify typical UDEs that Prospects have
3. Build individual UDE Clouds.
4. Consolidate UDE clouds and surface assumptions (if needed)
5. Identify Prospects' competitiveness elements per profile (for example, Price, Delivery times, Engineering).
6. Develop detailed Value Offer (to the level of specific Injections)
7. Validate that Value Offer will remove the UDEs
8. Develop sales process and content



Sales


Strategy
Production & Operations
Finance & Measurements
Project Management
Distribution
Marketing
Sales
Managing People
The Core:
Constraint
5 Focusing Steps
4 Concepts of Flow
3 Basic Assumptions
Focus & Flow
U-Shape
Logic
Sales Process Management

Managing the Sales Pipe-line As a Production Flow



Example:

List of potential prospects	Initial Call	Meeting 1 Visiting the Prospect to validate UDEs and present conceptual solution	Meeting 2 Presenting the Prospect the detailed offer	Prospect agrees – contract signing
Average Length of stage	1 week	2 week	2 week	3 week	Total: 12 weeks*

Managing the System

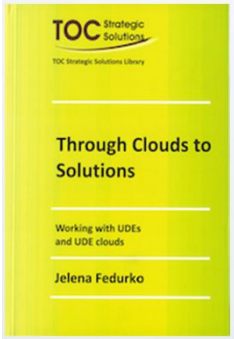
Every Lead is monitored ("Card")

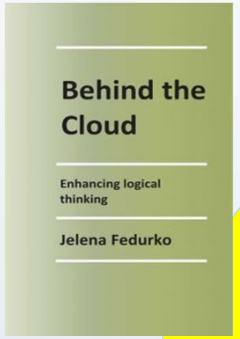
The Buffer Status shows for every salesperson how many leads they have in each stage

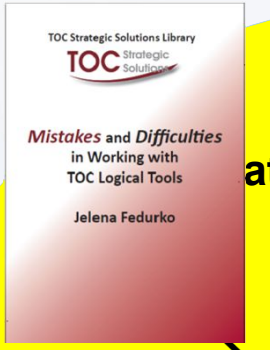
As well as the "age" of the lead in the stage

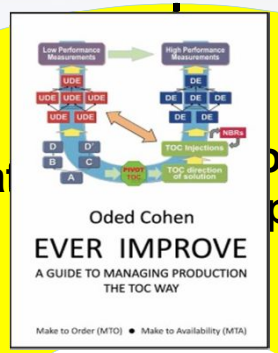
Salesperson	Stage 1			Stage 2			Stage 3			Stage 4			Total
	G	Y	R	G	Y	R	G	Y	R	G	Y	R	
A							3			4		1	8
B	1	1											2
C					1		4		1			1	7
D	1	1											2
E	1			3		4	2		9	1		2	22
F			1		1	4		1	6				13
G				3			11		1				15
H	1	1											2
I	1	1											2
J				4			3	1	1	2		3	14
K	1	1											2
L			1	2		2			6			6	17
M				1					1	1	1		4
N	1	1											2
O	1	1											2
Subtotal	8	7	2	13	2	10	23	2	25	8	1	13	
Total	**17**			**25**			**50**			**22**			**114**

Managing People









Problem Solving

Management Skills

(TP Based)

TOC Thinking Processes –TP
for Managing Systems and People

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 • Inner Dilemma/ Conflict Cloud	• UDEs • UDE Cloud • Consolidated Cloud • Core Cloud • CRT	• Pivot • Direction • Injections • DE • NBR • FRT	• Ambitious Target • PRT • Detailed plan • S&T	• Fire-Fighting Cloud • Inner Dilemma/ Conflict Cloud

6 Layers of Resistance to Change

1. Disagreement on what the problem is
2. Disagreement with the direction of solutions
3. Disagreement that the solution will bring the desired benefits

Yes, but…

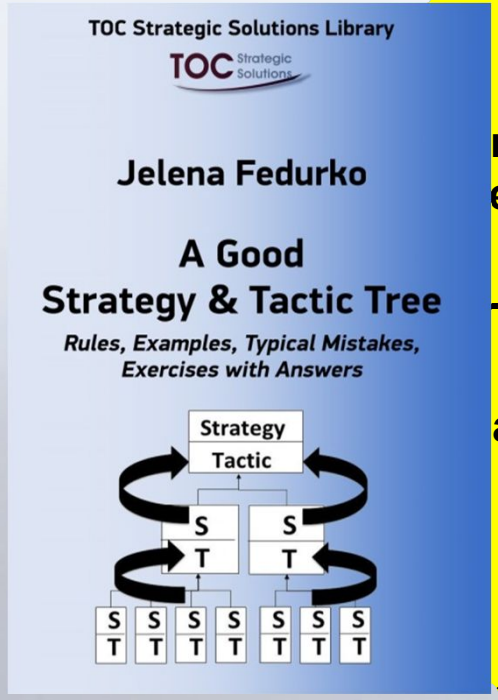
4. Fear that the solution will result in negative consequences (Risks)
5. Obstacles to implementation seem to be impossible to overcome

6. Say “Yes” and do nothing

Application of the TOC Thinking Processes

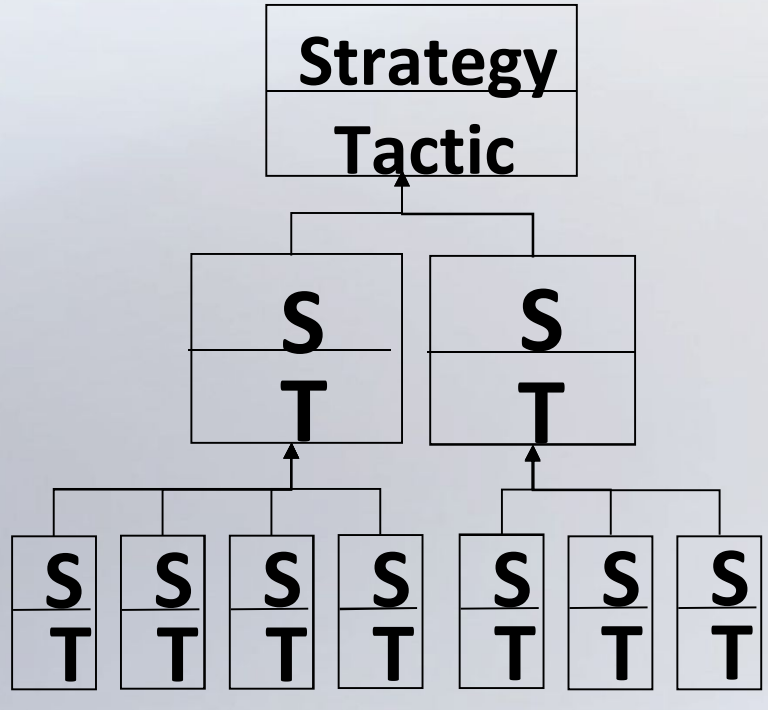
Strategy

Strategy & Tactic Tree



The Strategy & Tactic Tree

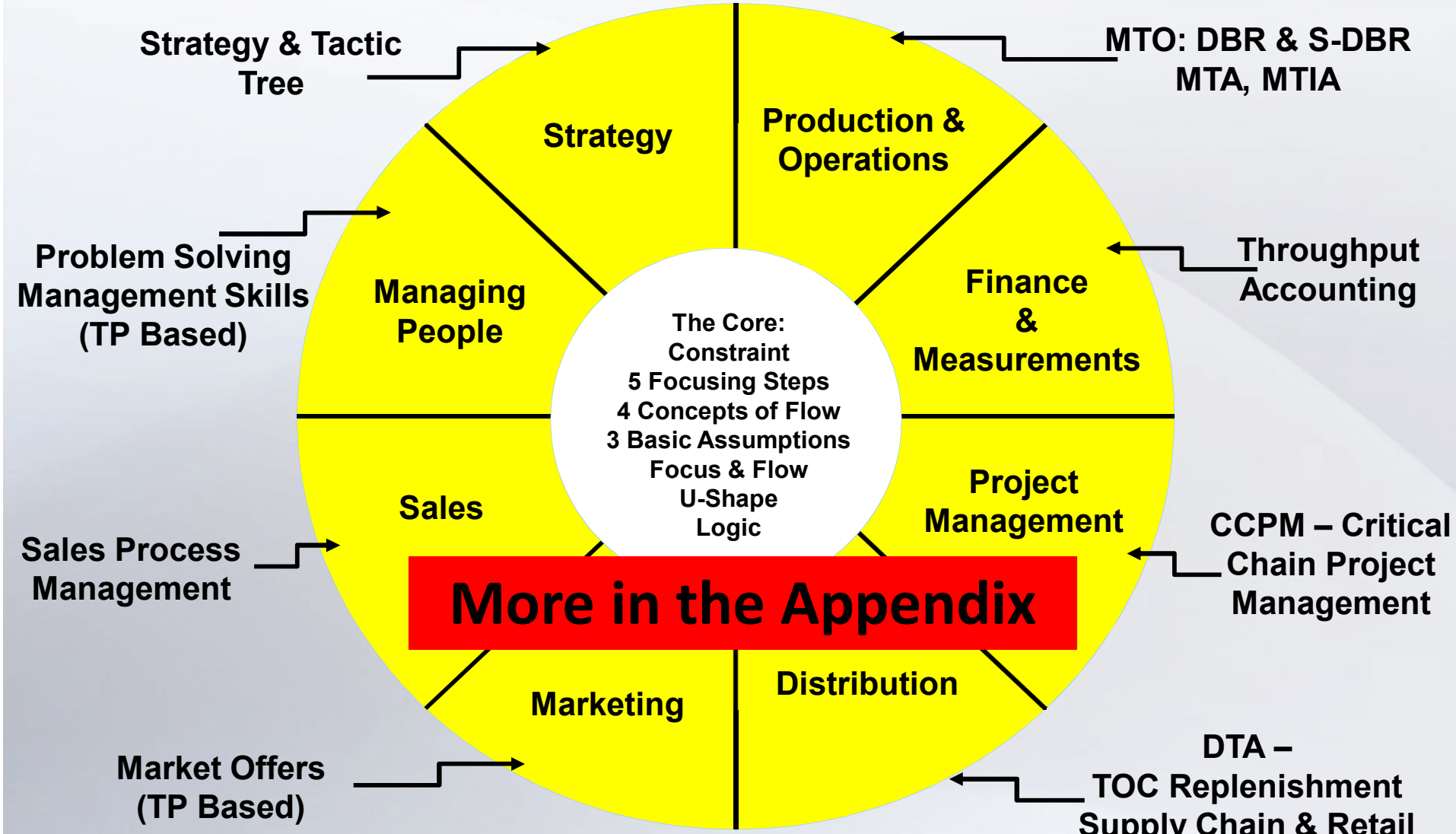
A comprehensive tool to cover the whole system in the **process of transition** from the current reality to the future reality.



The S&T Tree provides a **framework for the structured recording** of the steps needed to be taken in transition and gives their **logical justification**.

- **Five different entities in each S&T box:**
  - **Necessary Assumptions**
  - **Strategy**
  - **Parallel Assumptions**
  - **Tactic**
  - **Sufficiency Assumption**

Summary


Strategy & Tactic Tree
Strategy
Production & Operations
MTO: DBR & S-DBR
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Problem Solving
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The Core:
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Sales
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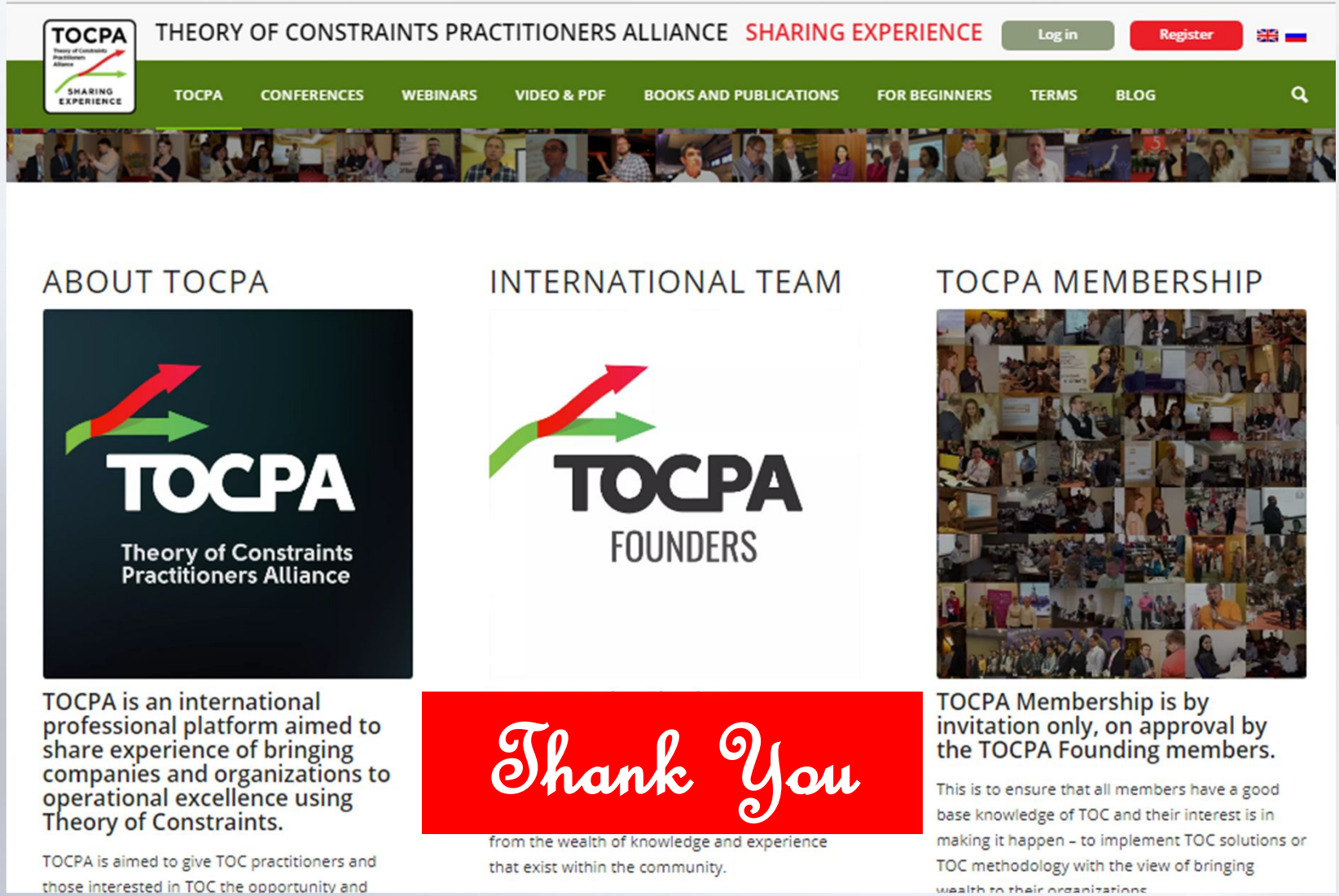
CCPM – Critical Chain Project Management
More in the Appendix
Marketing
Distribution
Market Offers
(TP Based)
DTA –
TOC Replenishment
Supply Chain & Retail

TOCPA – Sharing Experience



Thank You

What is TOC?

The

Theory of Constraints

Appendix

Oded Cohen

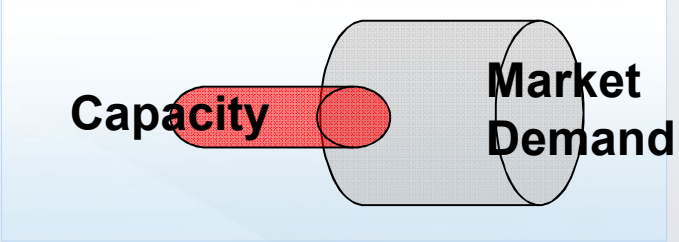
tocExpert

Israel, Estonia

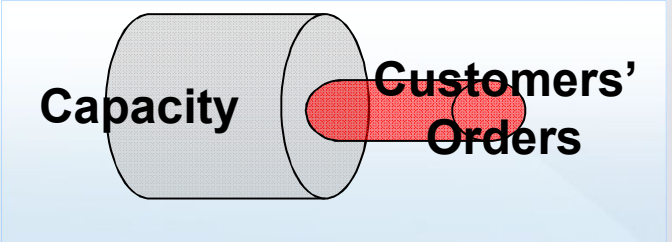
The Core of TOC System Thinking

System Constraints – Main Types:

Capacity Constraint – a resource which cannot provide timely capacity the systems demands for it



Market Constraint – the amount of customers orders is not sufficient to sustain the required growth of the system



Time Constraint – The response time of the system to the requirement of the market is too long to the extent that it jeopardizes the system's ability to meet its current commitment to its customers as well as the ability of winning new business

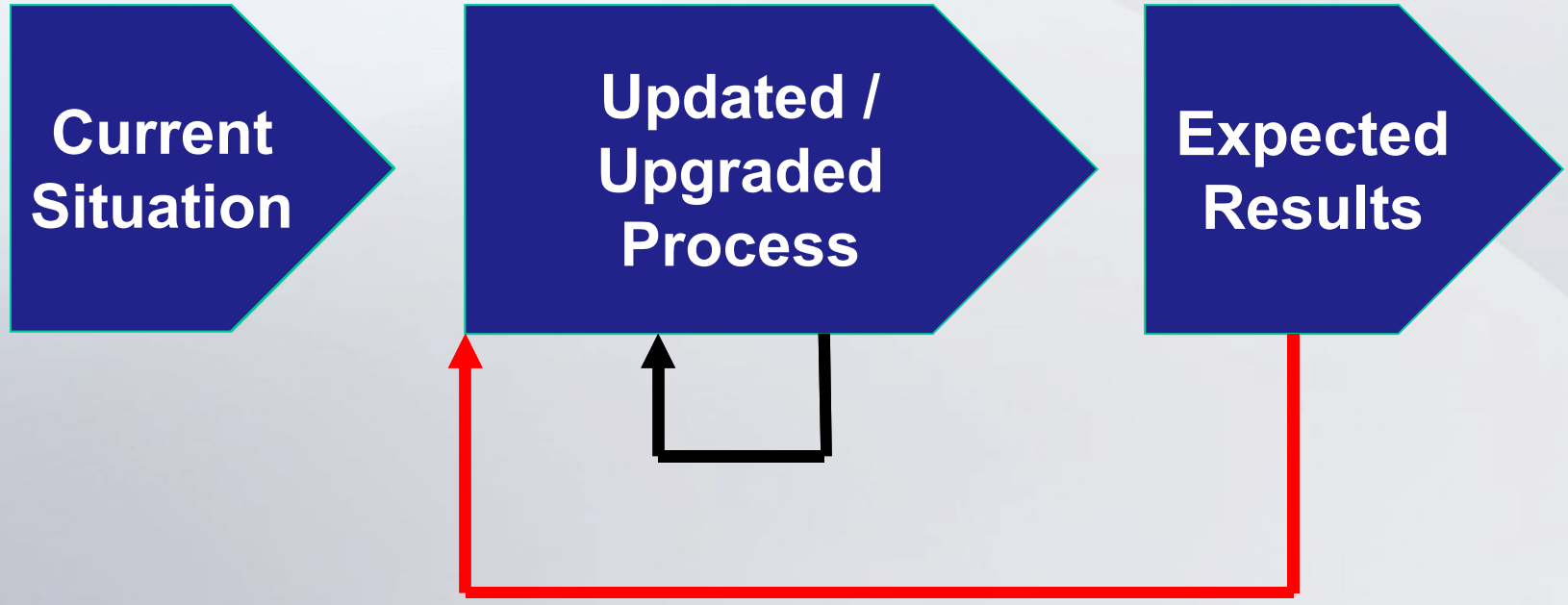
The TOC way for Improvement Processes

A systematic approach for developing plans in the pursuit of a significant improvement of systems

Problem	**WHAT to change?** ***Pinpoint the core problem***
Solution	**WHAT to change TO?** ***Construct simple practical solutions***
Implementation	**HOW to cause the change?** ***Induce the proper people to make the change (to invent such solutions)***
POOGI	**What creates the process of ongoing improvement?** ***Create a mechanism to determine what to improve next***

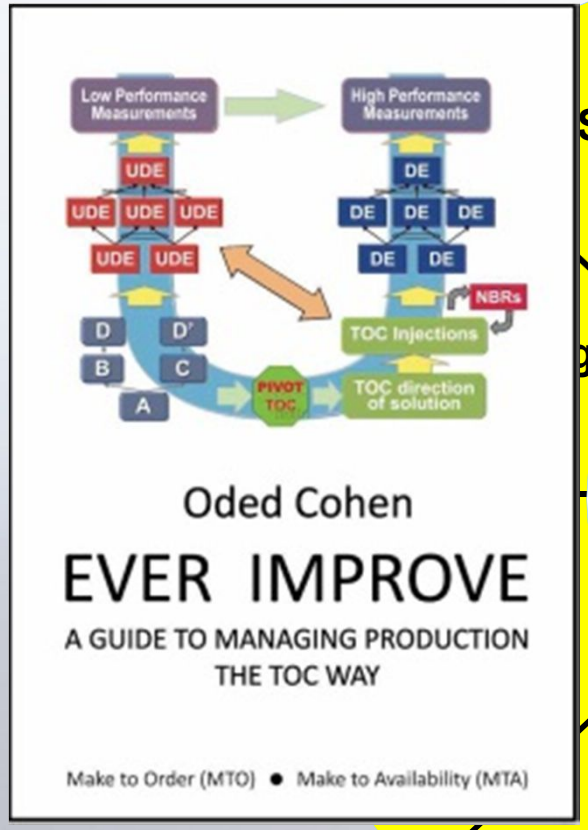
Focus & Flow

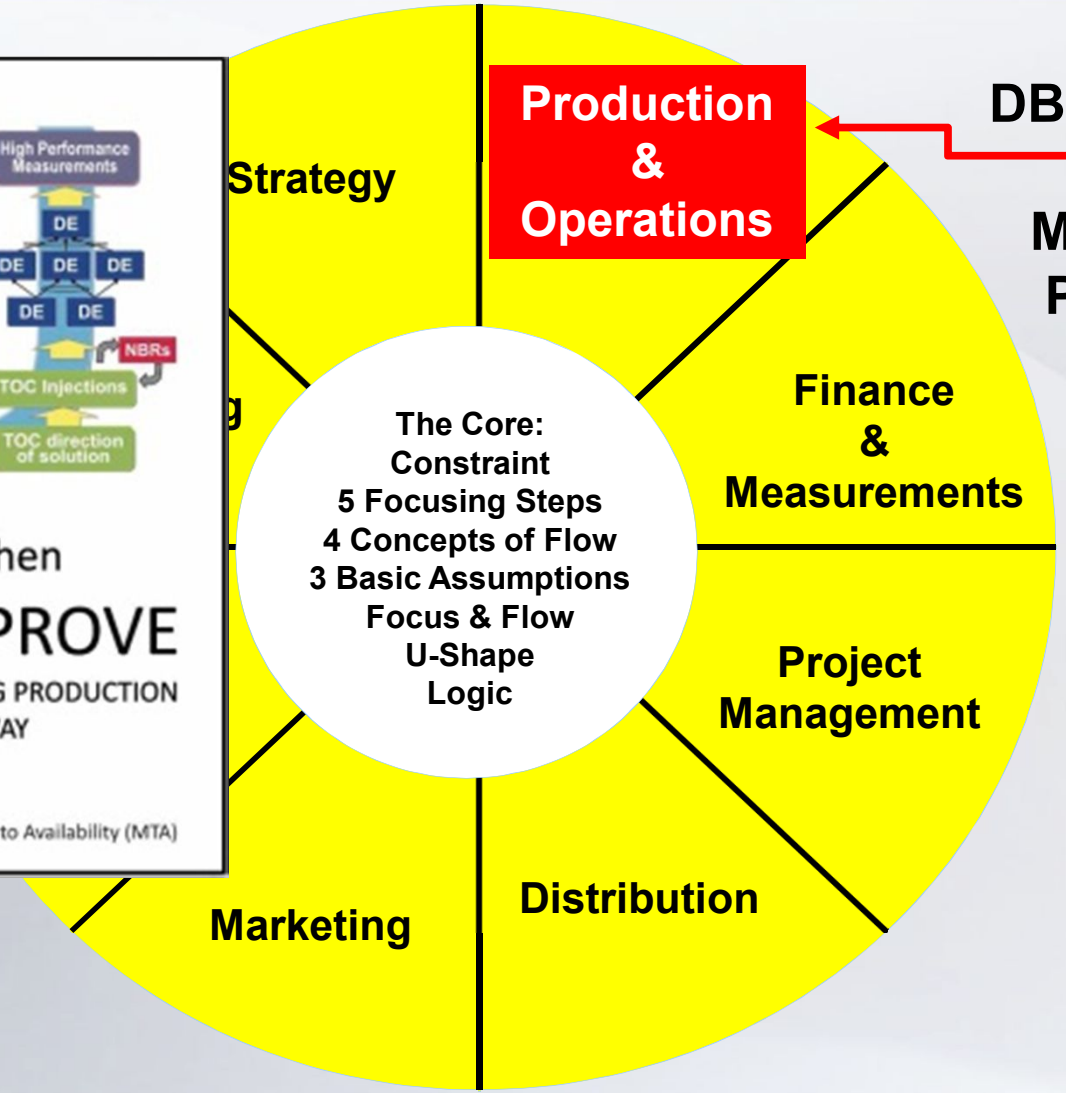
Plan, Execute, Correct (Recover) and Improve:



Continuous (Ongoing) Improvement = POOGI

Production & Operations





MTO:
DBR & S-DBR

MTA, MTIA
PTA, PTO

TOC Solution for MTO

S-DBR Simplified Drum-Buffer-Rope And Buffer Management

Tactics: The Operations (Production) implements S-DBR and BM to achieve a very high Due Date Performance

Mindset: Customer orders are the Prime Driver for managing Operations (Production) The Drum

1. Delivery is Prime Measurement for the production area

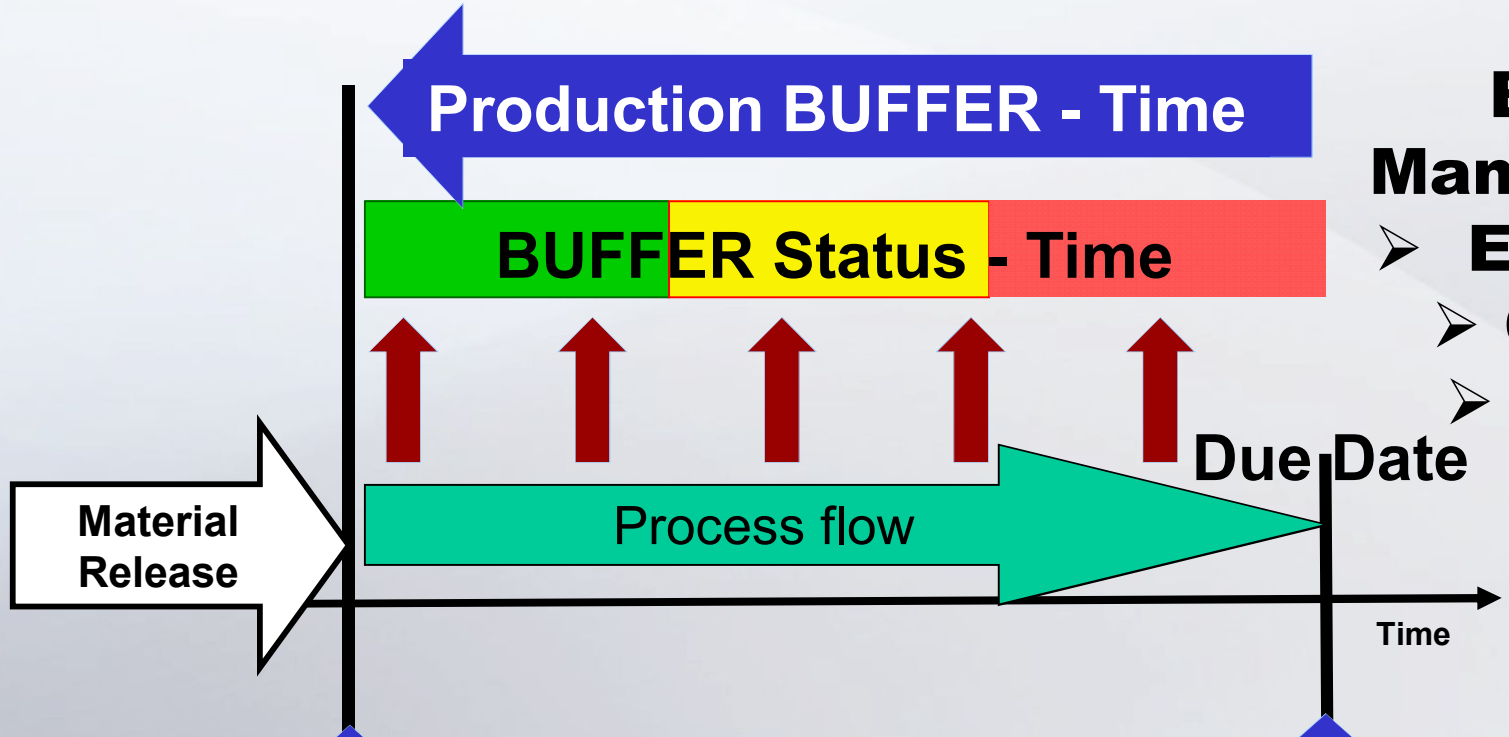
Immediate improvements in DDP Due Date Performance

2. Production Buffer & Material Release
3. Production Work Orders priority based on Buffer Status
4. Buffer Management for Recovery Actions
5. Availability of Raw Materials and components

Continuous improvement POOGI

6. Buffer Penetration Analysis for initiating improvement projects
7. Monitoring CCRs – Capacity Constraints Resources
8. Transfer Batches sized to support flow

MTO
S-DBR & Buffer Management (BM)



Buffer Management

- Execution
- Control
- POOGI

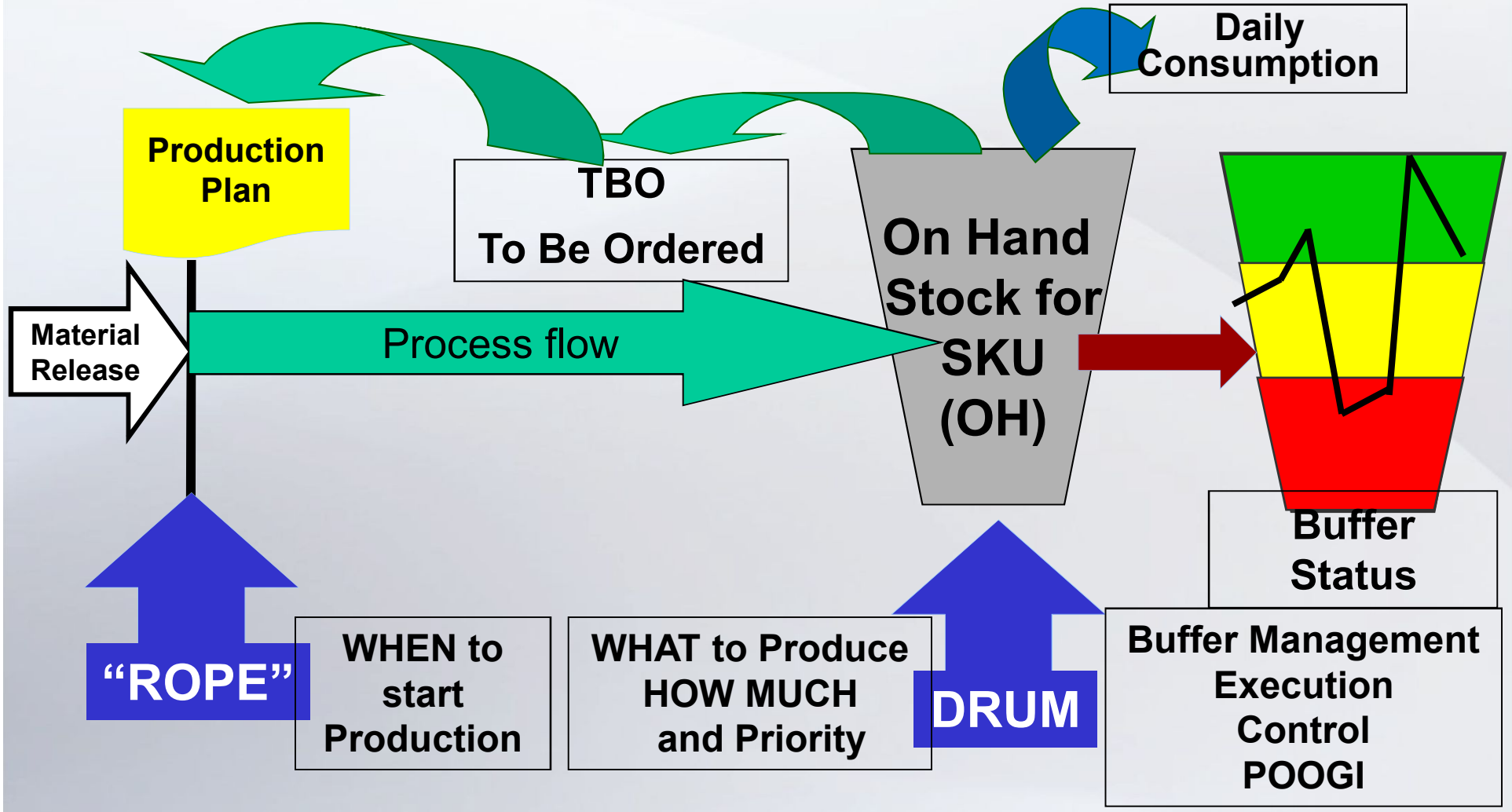
S-DBR for Planning

ROPE

DRUM

Simplified means no Bottlenecks

MTA – Make to Availability
The replenishment solution



TOC Solution for MTA
to achieve Availability at the Plant (Central) Warehouse

Production and Material Management are on TOC Replenishment and BM

Mindset and start-up: Availability and Inventory turns are the Prime Driver in part production and procurement

1. Commitment to Availability with no excess inventory at the Plant (Central) Warehouse

Immediate improvements in Availability and in inventory turns

2. Stock Buffers are established and maintained. Work Orders are released as per consumption from stocks

3. Production Work Orders priority based on Buffer Status

4. Buffer Management for Recovery Actions

5. Availability of Raw Materials and components

Continuous improvement POOGI

6. Buffer Penetration Analysis for IP

7. Monitoring CCRs – Capacity Constraints Resources

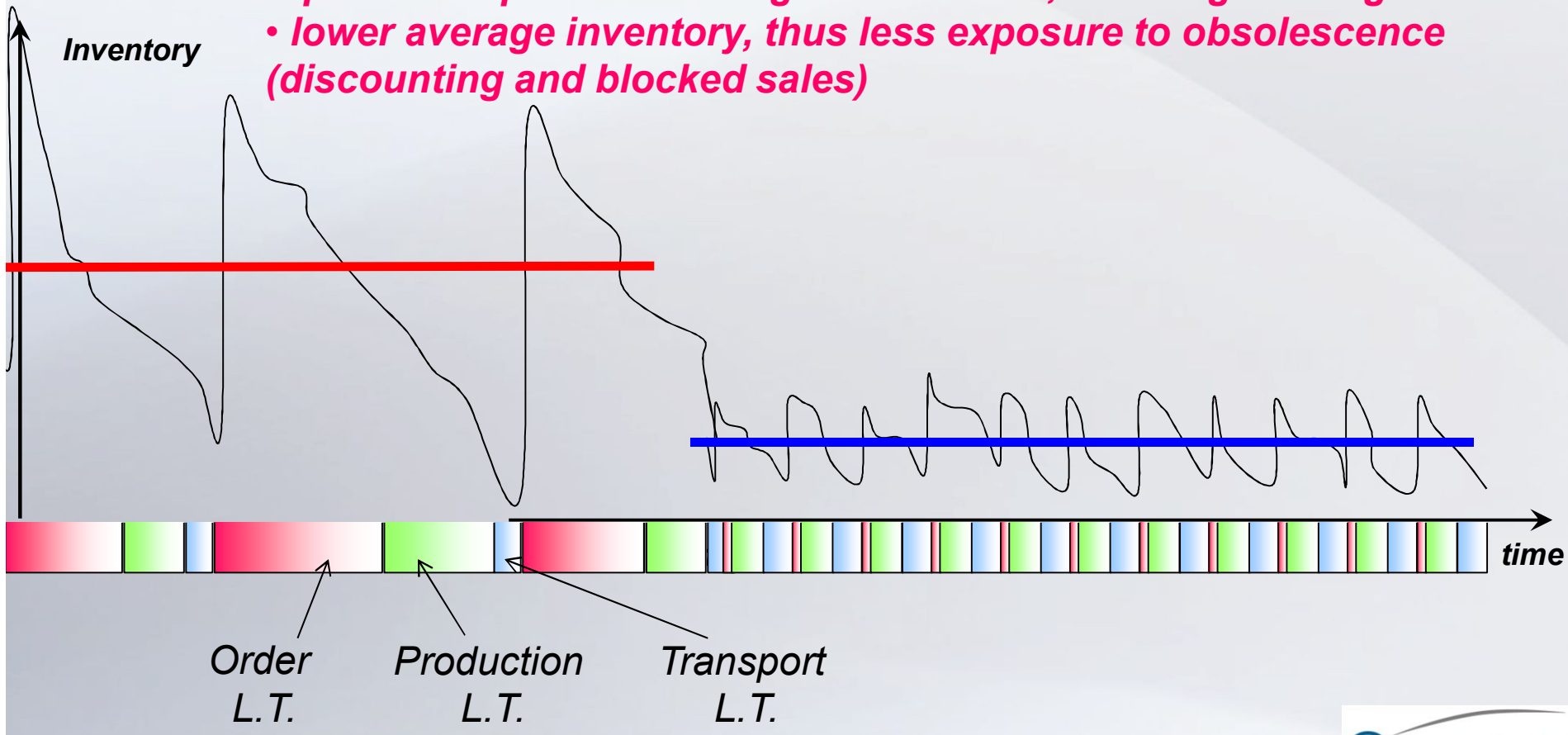
8. Transfer Batches sized to support flow

TOC Replenishment
to achieve High Availability

Shortening the replenishment period – increasing shipping frequency

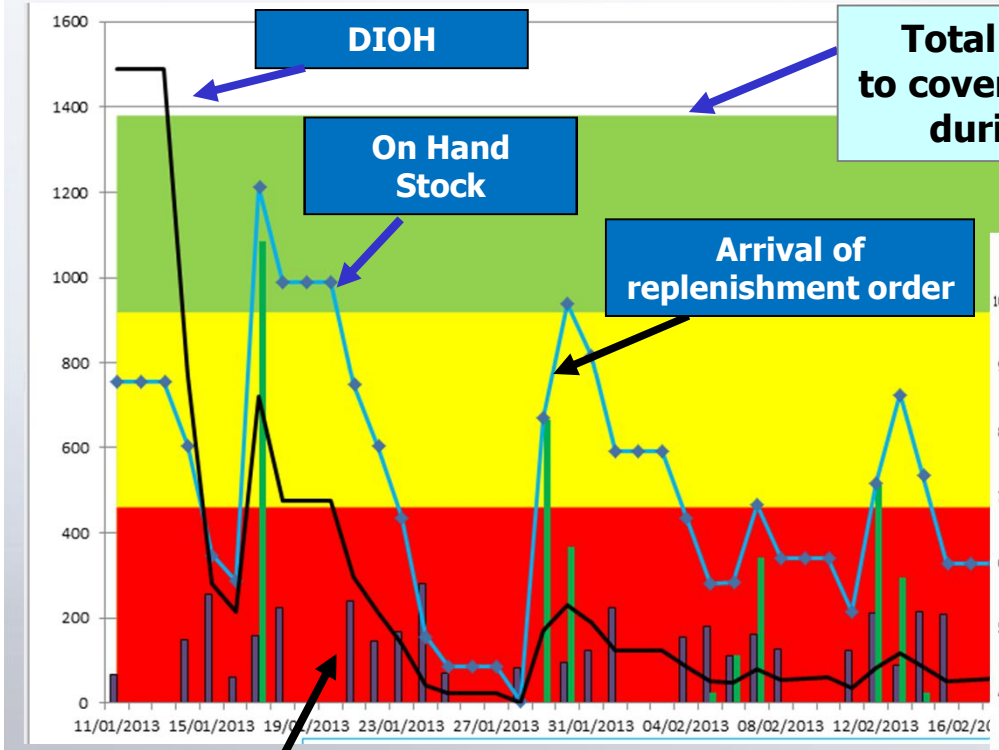
Frequent replenishment with daily orders means:

- ***quicker response to changes in demand, avoiding shortages***
- ***lower average inventory, thus less exposure to obsolescence (discounting and blocked sales)***

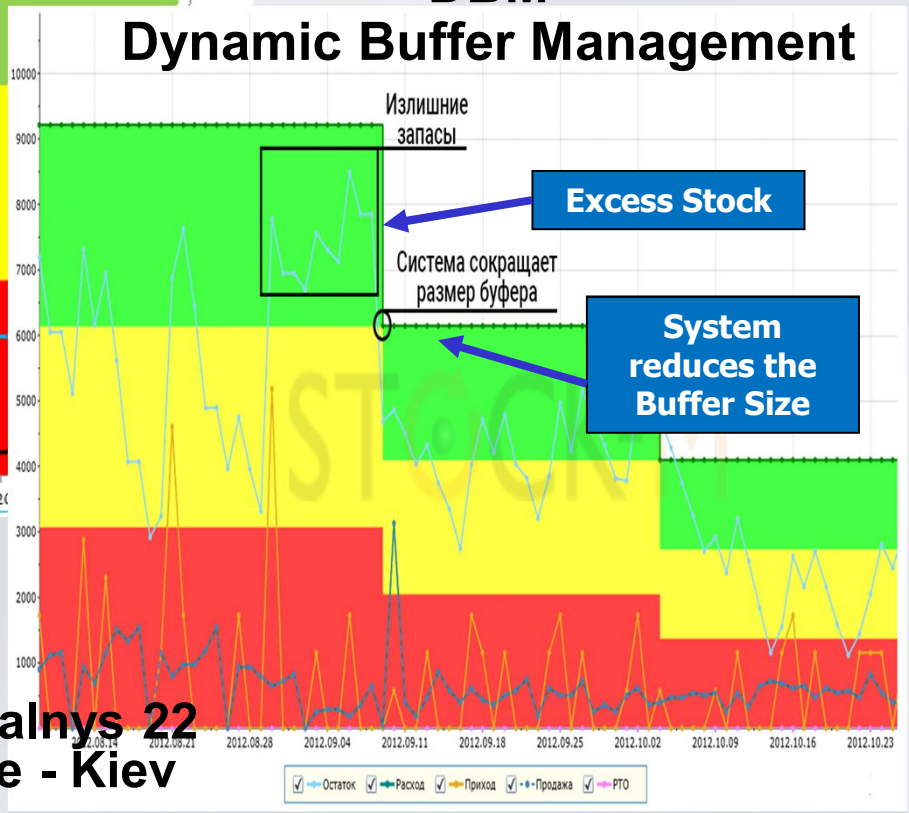


Inventory Management the TOC Way For MTA, MTIA, DTA and Retail

BM Diagram – Inventory Profile per SKU

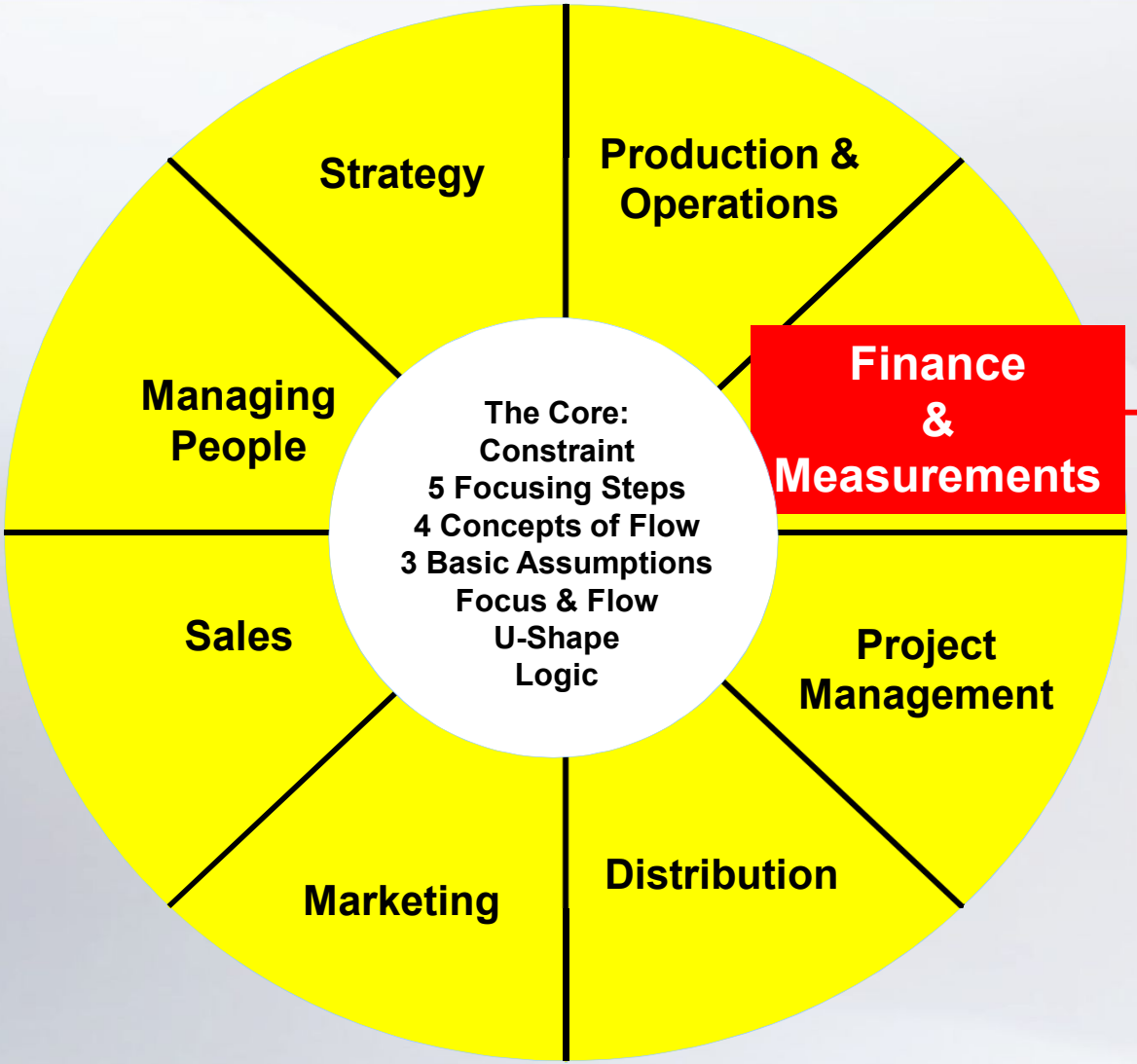


DBM Dynamic Buffer Management



Source: Giedrius Balnys 22 TOCPA Conference - Kiev

Finance & Measurements



Throughput Accounting

T – I – OE
For Decision Making

Throughput, T – is the revenue from the sales for a certain period minus Totally Variable Costs (TVC).

TVC is the cost of purchased raw materials, components, assemblies etc. and direct external services for producing and shipping sold products.

TVC for reselling is the cost of products bought for reselling.

TVC is the cost that grows directly proportionally to the sales of every additional unit of the product:

In calculation of Throughput per product or order we DO **NOT** ALLOCATE direct labor or overhead costs per product/order!

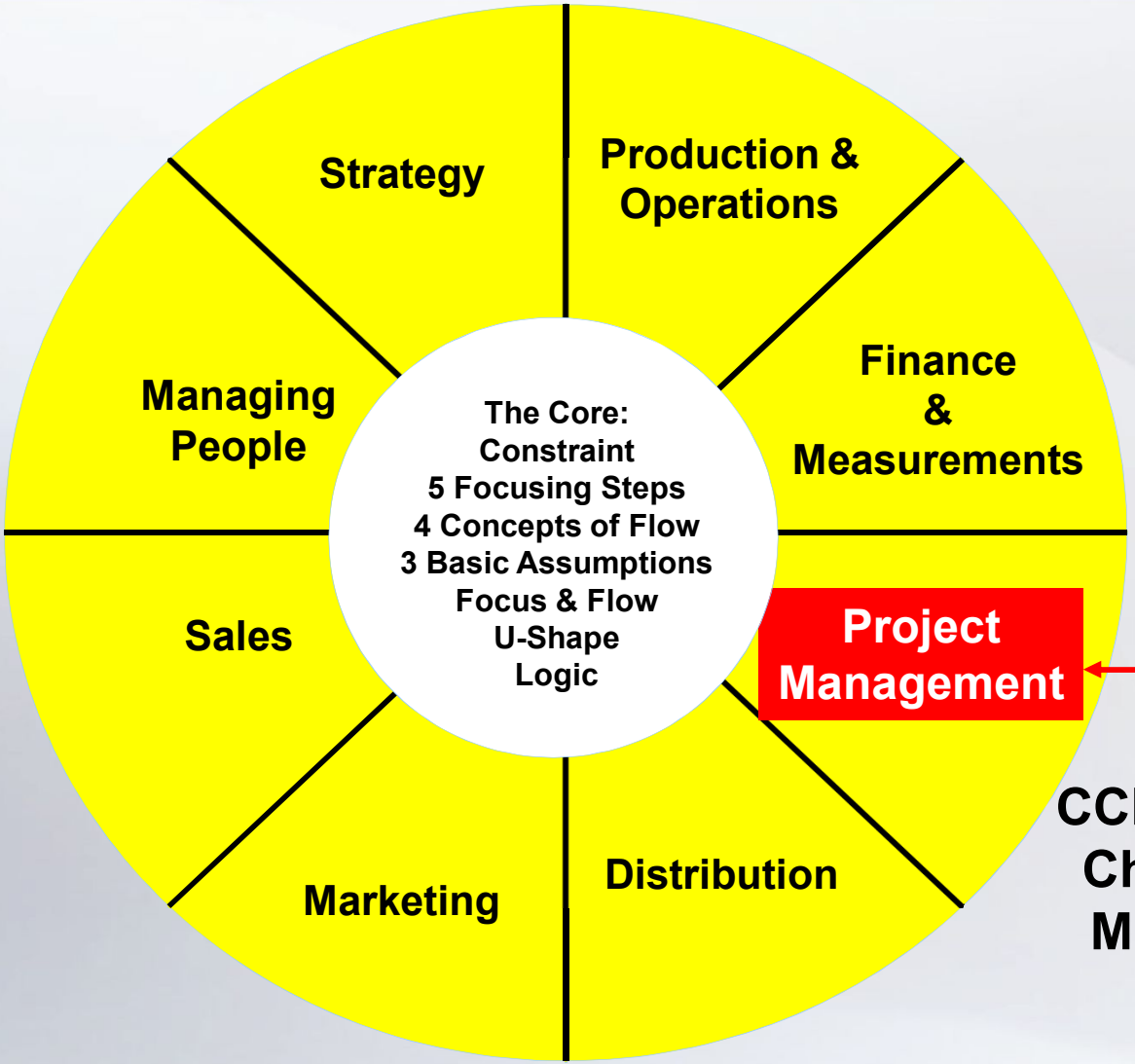
Investment (I): The money that is held within the organization

Usually measured by the assets purchased value minus the depreciation

Investment includes also the Inventory – the money that was invested in purchasing things to be sold

Operating Expenses (OE): The periodical amount of expenses spent by the organization – these are the expenses that do not vary with a single sale.

Project Management



CCPM – Critical Chain Project Management

CCPM
Critical Chain Project Management

Strategy: The Project is On Time, In Full & Within Budget
Tactics: Project Organization is on CCPM

Single Project

Setting up the System

1. Delivery Commitment & Measurements

Planning

2. Project Plan
3. Critical Chain
4. Buffers
Project, Feeding and Milestones Buffers

Execution Control POOGI

5. Report & priority
6. Look ahead
7. Recovery
8. POOGI
9. Critical Resources

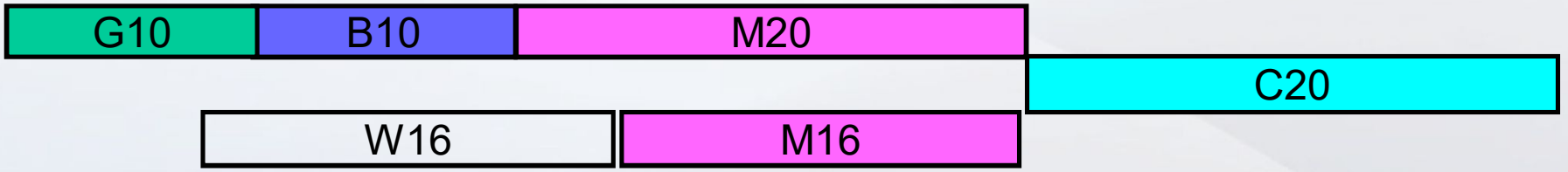
Multi- Project

Managing Multi-project environment

10. Freeze
11. Virtual Drum
12. Managing Portfolio

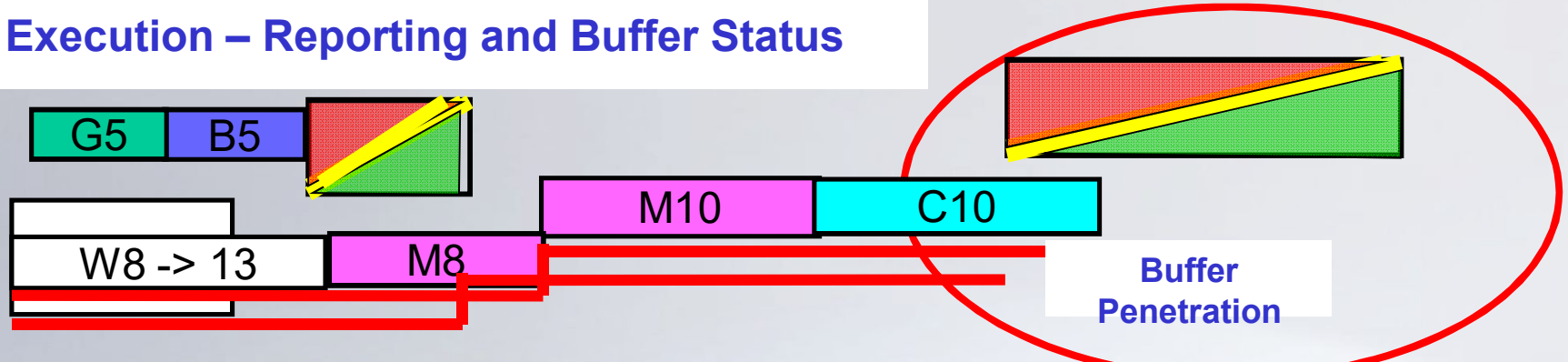
CCPM
Critical Chain Project Management

Project Plan



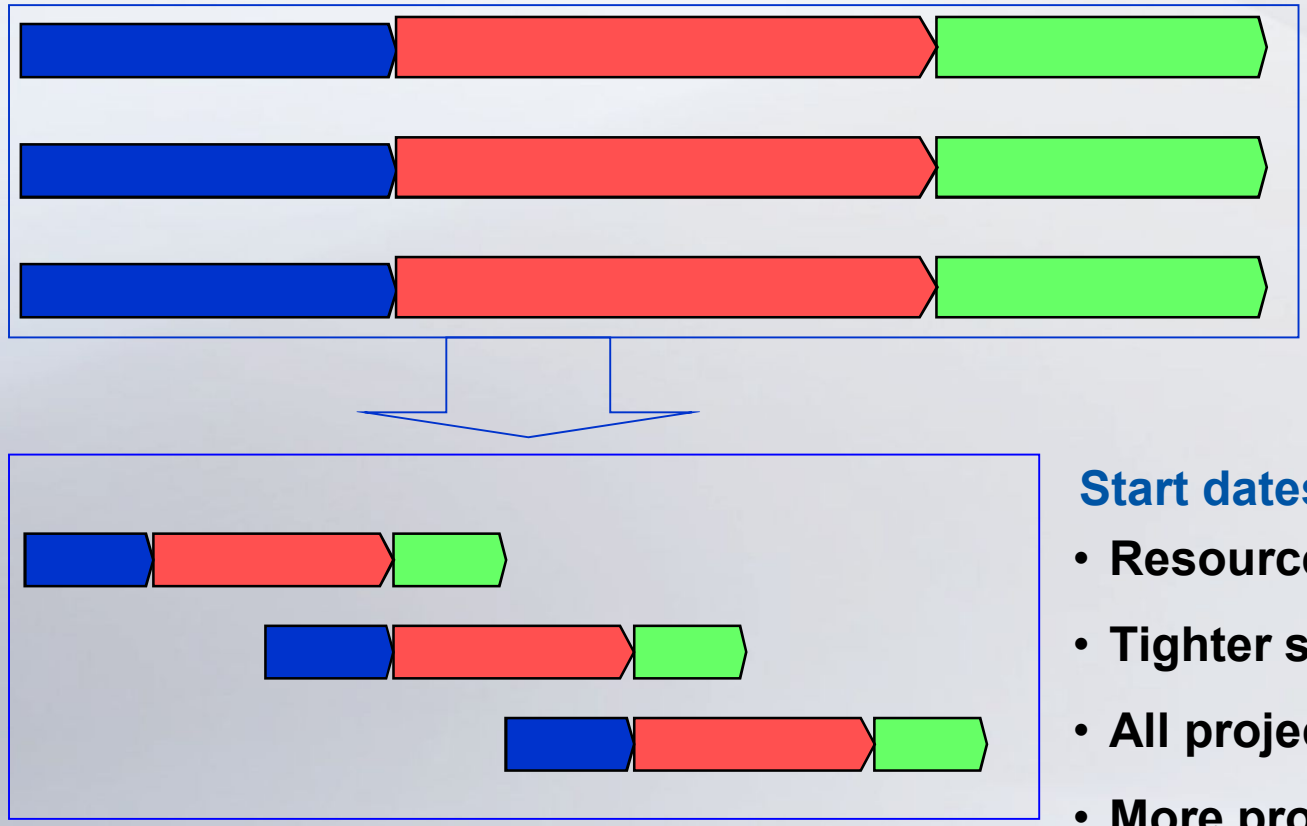
CCPM Project Plan

Execution – Reporting and Buffer Status



CCPM for Multi-Project Environments

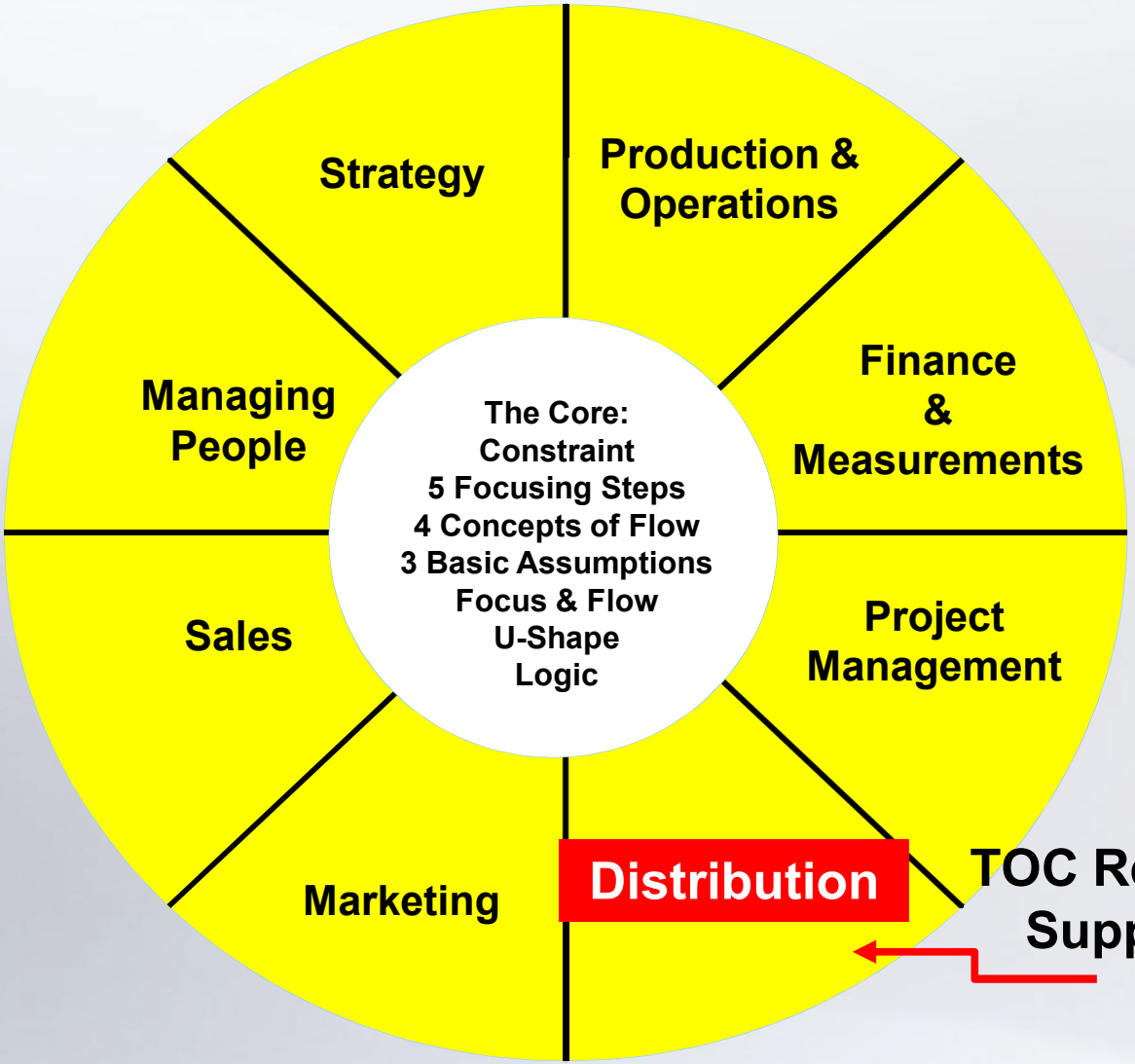
When top management realizes the potential of improved projects performances – the time is right to move to TOC Multi-Project Solution - STAGGERING



Start dates are staggered

- **Resources stay focused**
- **Tighter synchronization**
- **All projects finish faster**
- **More projects can be done**

Distribution & Retail

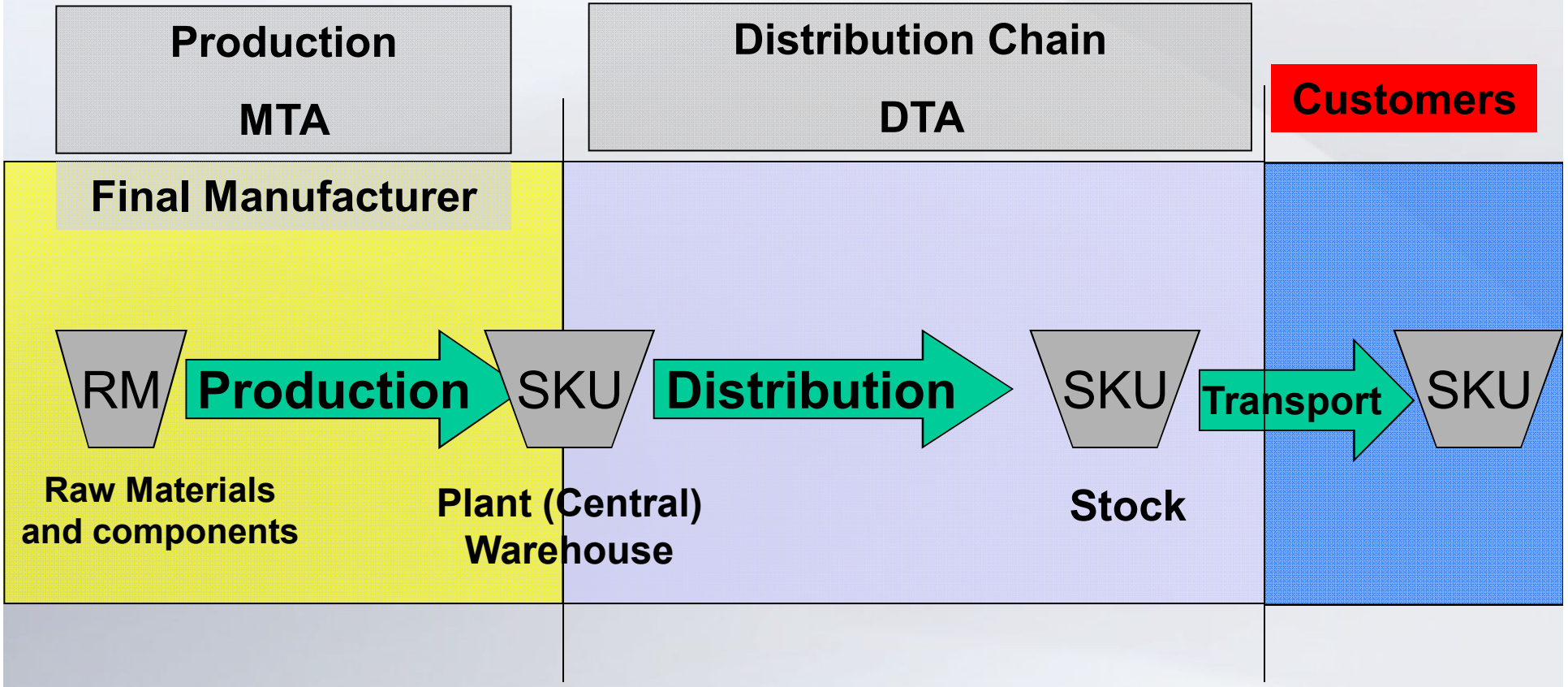


DTA – TOC Replenishment Supply Chain & Retail

Supply Chain Management (SCM)

Mindset & Start-up : Supply to ensure Availability.

The role of every link in the chain is to ensure that the Stock Buffer of the next link is properly maintained.



Supply Chains are overstocked

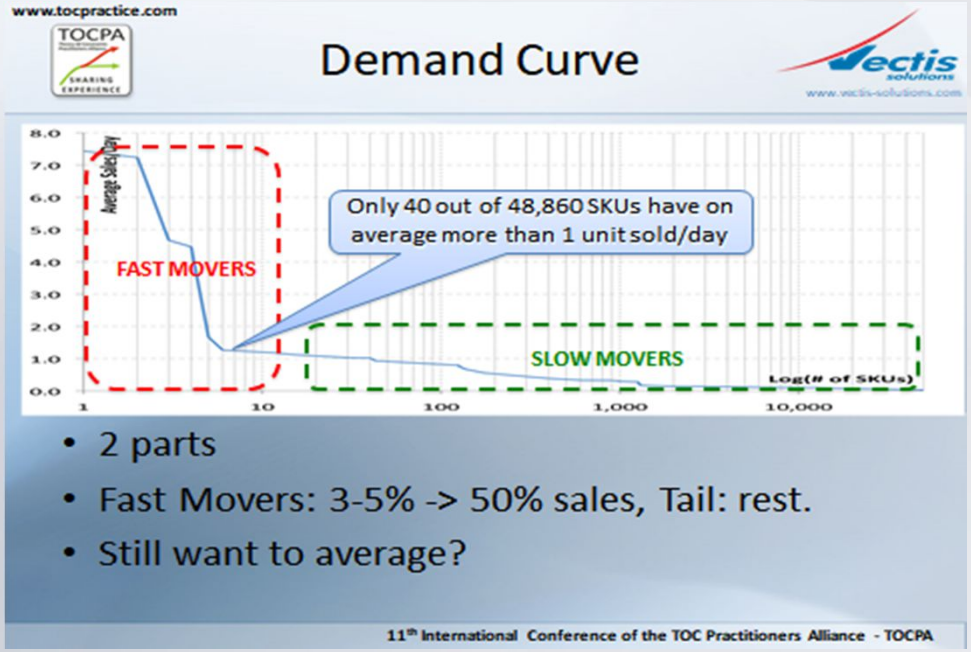
Retailers have to hold in stock tens and sometimes hundreds of thousands of SKUs with very few fast movers and vast majority of slow movers:

From

Humberto Baptista's presentation

11th TOCPA Conference

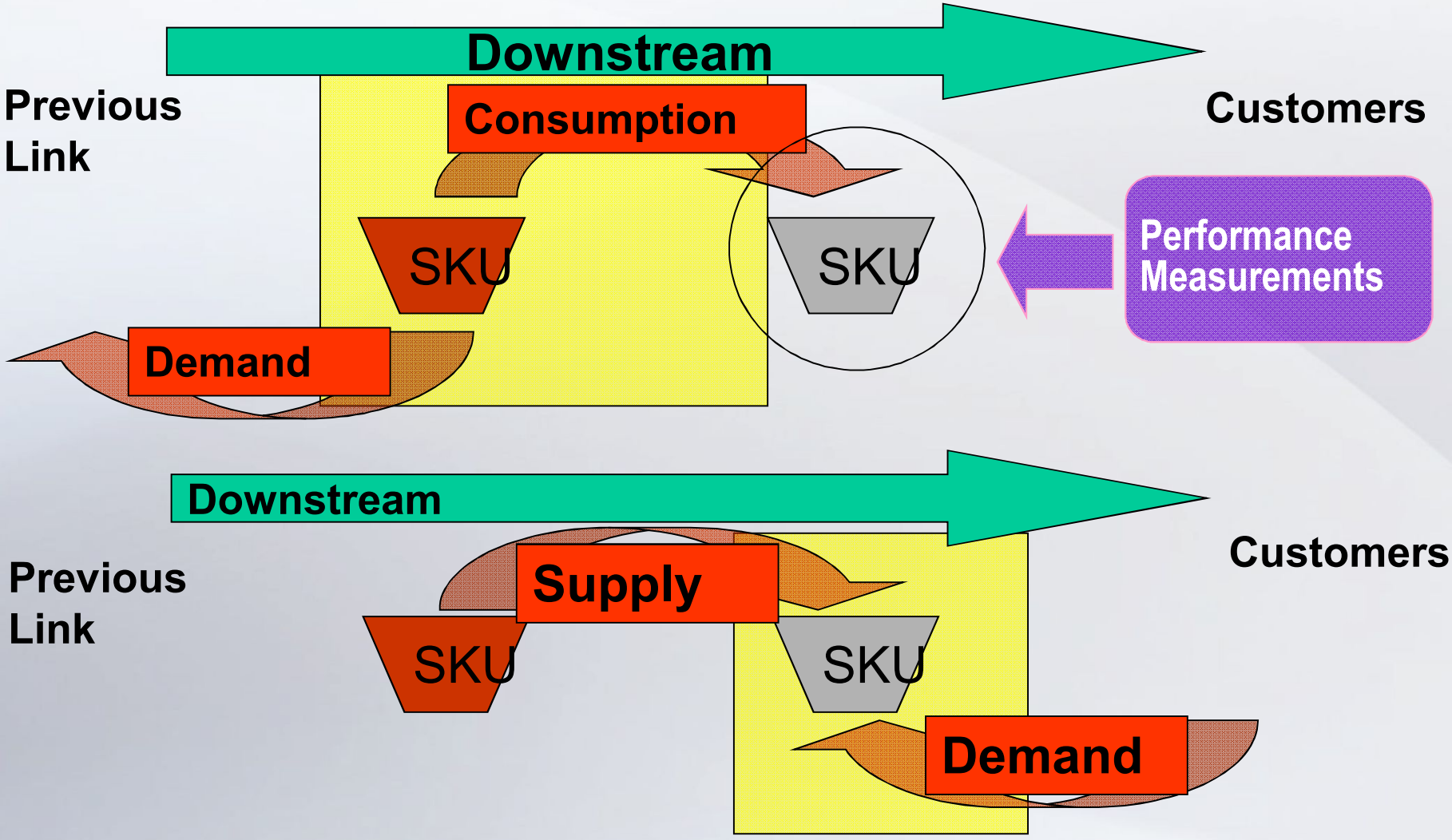
http://tocpractice.com/conferences/2014/02/15/11th-tocpa-conference-14-15-march-2014-brazil/



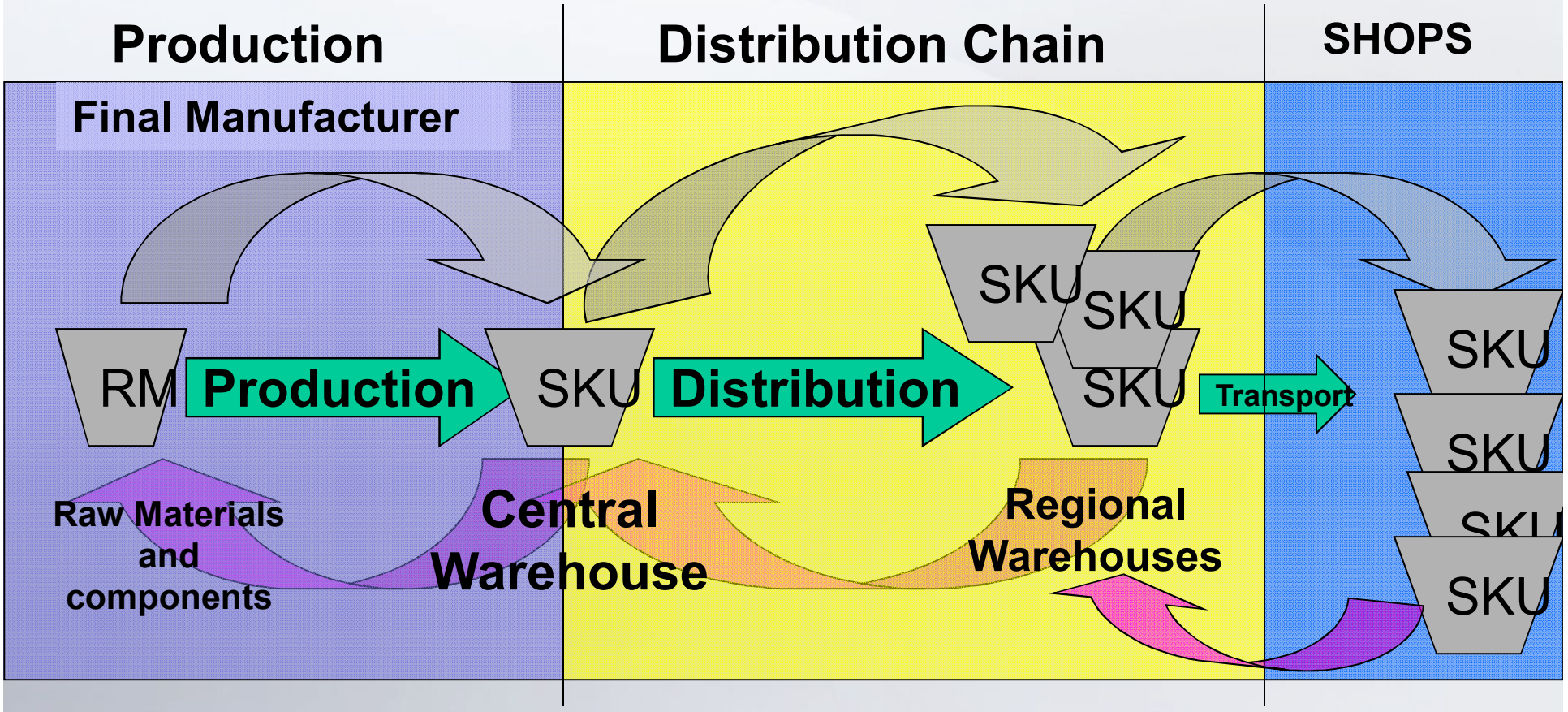
There is too much inventory in the supply chain

From John Darlington's presentation

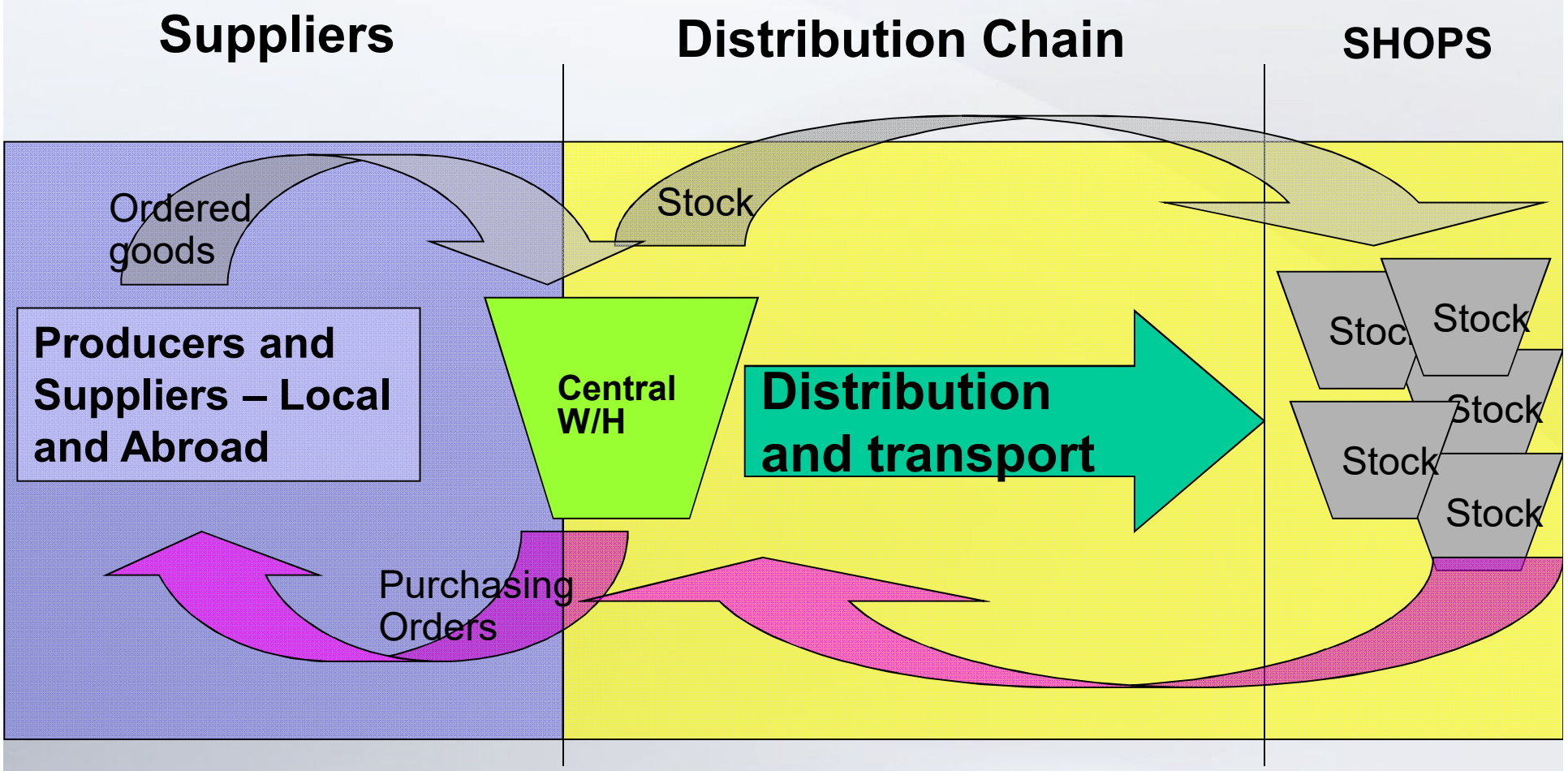
Supply Chain Management
Consumption and Replenishment



Supply Chain Including Manufacturers



Supply Chain Of Retails



DTA – Distribute to Availability

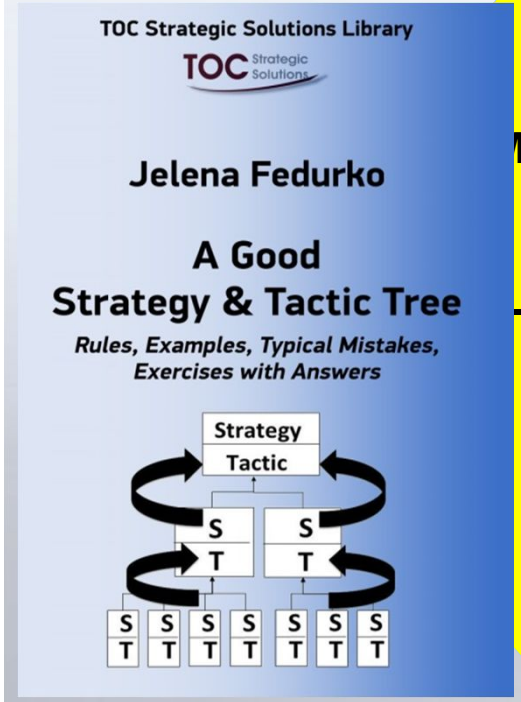
Strategy: The company maintains very high Availability while significantly improving Inventory Stock-turns

Tactics: Stocks are on TOC Replenishment system

Mindset & Start-up	Immediate improvement in availability	Continuous Improvement POOGI
1. Commitment to ensure availability and Central Warehouse	2. Setting up Stock Buffers	7. Assortment Management
	3. Receiving consumption data (daily)	8. POOGI for IP
	4. Frequent replenishment Priority is per Buffer Status	9. Internal CCRs
	5. Dynamic Buffer Management for resizing Buffers	10. Value Offers for the market
	6. Recovery Actions	

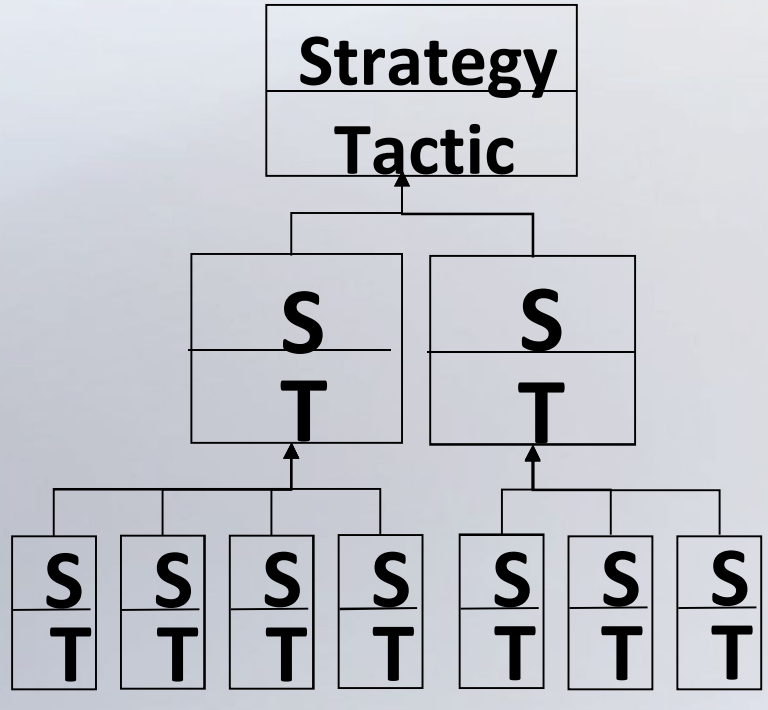
Strategy

Strategy & Tactic Tree



The Strategy & Tactics Tree

A comprehensive tool to cover the whole system in the **process of transition** from the current reality to the future reality.

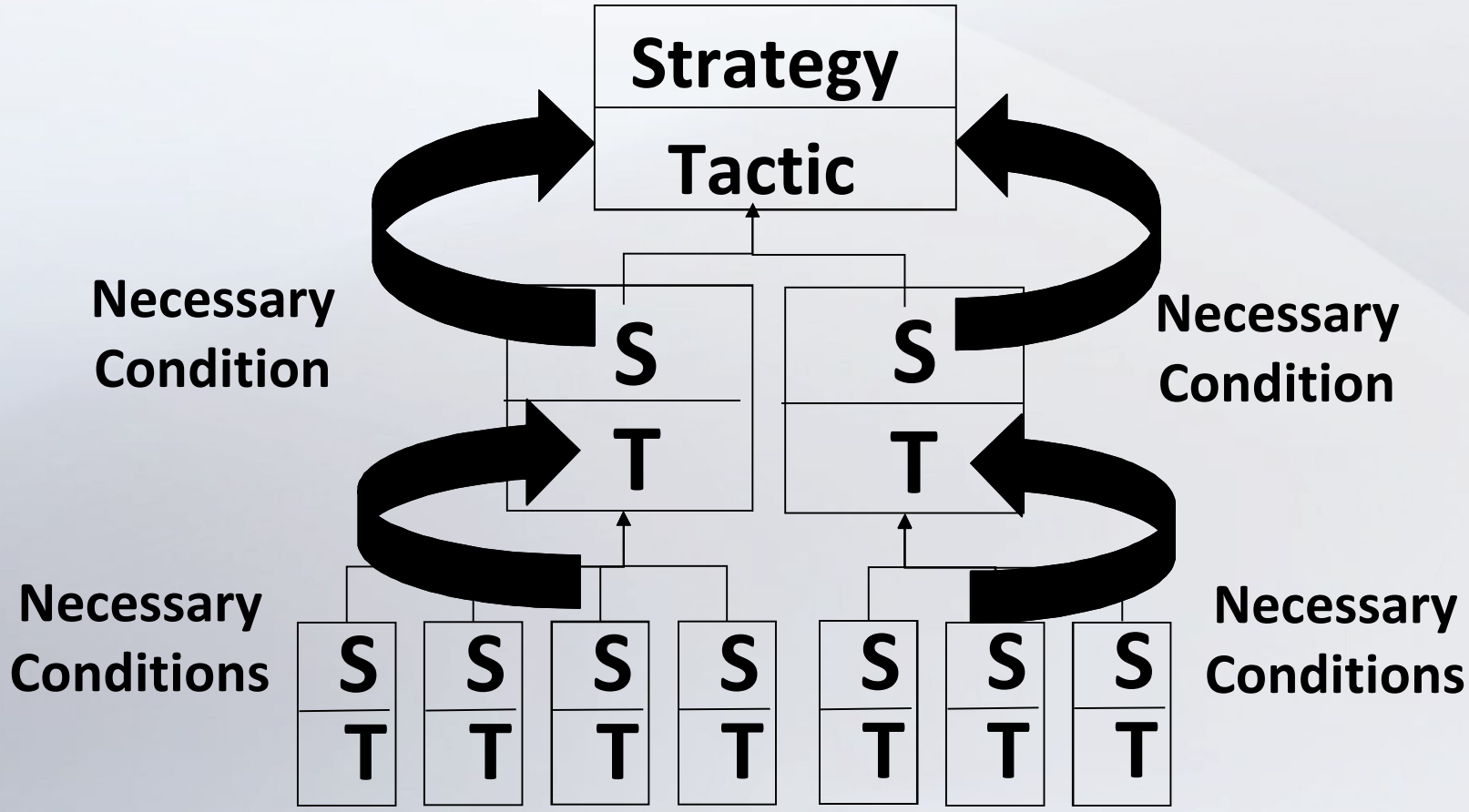


The S&T Tree provides a **framework for the structured recording** of the steps needed to be taken in transition and gives their **logical justification**.

- **Five different entities in each S&T box:**
  - **Necessary Assumptions**
  - **Strategy**
  - **Parallel Assumptions**
  - **Tactic**
  - **Sufficiency Assumption**

The S&T structure

Strategies on the lower level are Necessary Conditions and inputs for the Tactic on the upper level



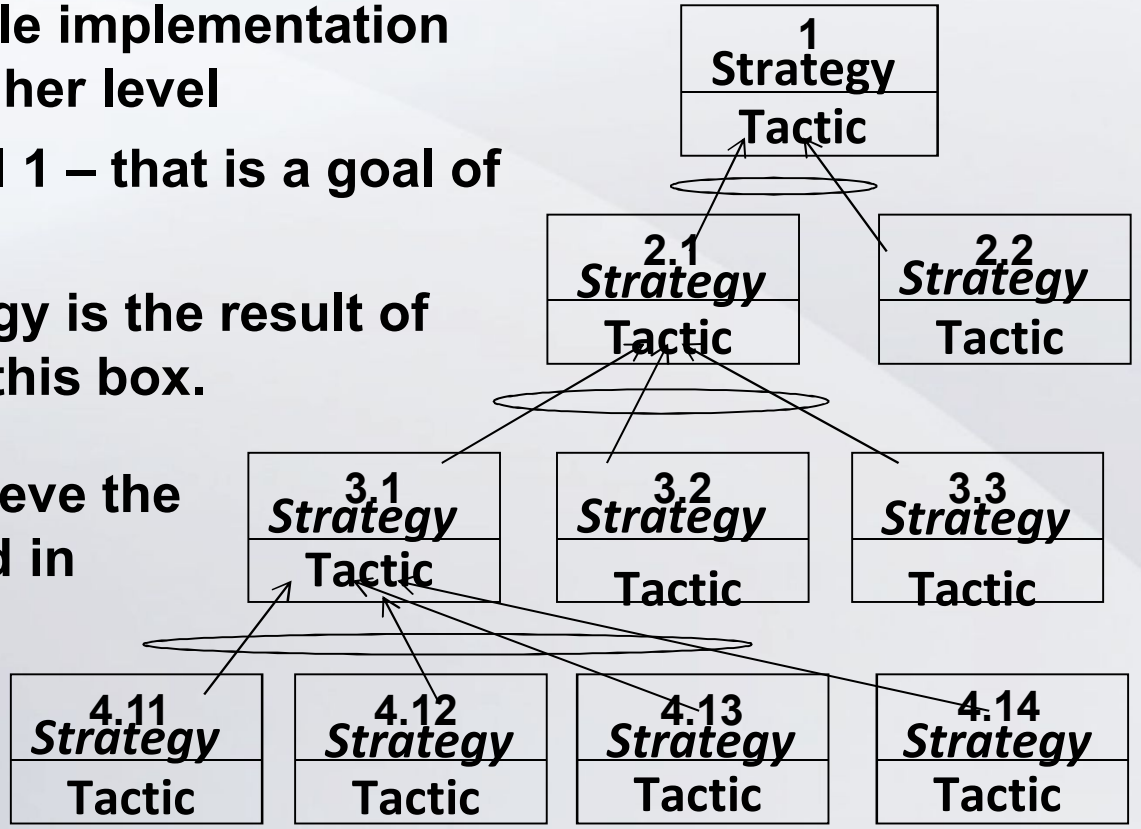
Vertical relationship between boxes

Strategy specifies WHAT WE WANT TO ACHIEVE in this box to enable implementation of the 'parent' box on the higher level

(except for Strategy on Level 1 – that is a goal of itself.)

The deliverable of the Strategy is the result of implementing the Tactics in this box.

Tactic specifies HOW to achieve the tangible deliverable recorded in Strategy – what actions the company will take.



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