Operation Management (OM) Introduction

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Coordinates (it is a part of OM Intro presentation as well)

- **Lecturer :** Ing.Jaromír Skorkovský, CSc.
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- **Study material :** will be updated regularly after every lesson (is.muni.cz)
- So far there is lot of material there but mind you that nearly every part will be slightly or more heavily modified this year. So the correct material will have at the end of its name specification …2018mmdd e.g. 20180917 if not specified otherwise in advance
- **Attendance :** seminar and lectures are obligatory – see subject specification (is.muni.cz) – first important condition to be admitted to exam)
- **Excuses :** if serious reason emerges- **only written from is accepted**
- **Seminar work** : will assigned after some theory will be presented. Accepted seminar work is the second condition to be admitted to exam. Assign time :1.11.2018
- **Tuition plan :** at the **end** of this slide show
- Name of the tuition plan file : Tuition plan for both groups AOMA and AOPR_20180808
- Locations : AOPR : P104 and VT206, AOMA :VT206 if not specified otherwise
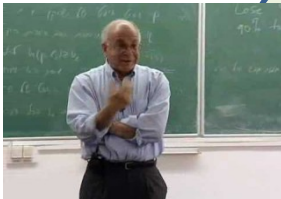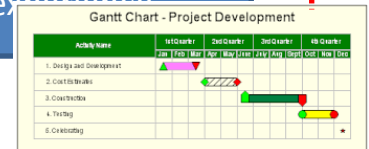
What is going on ?
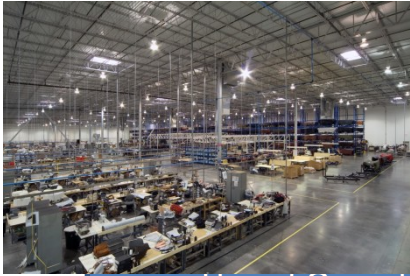
Use of Operations Management (OM) in external environment **(main target)**

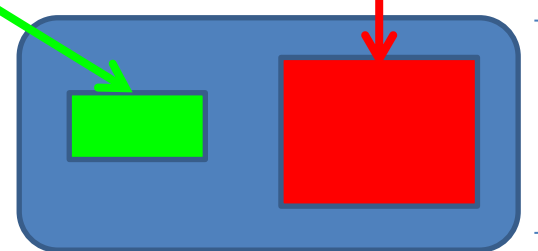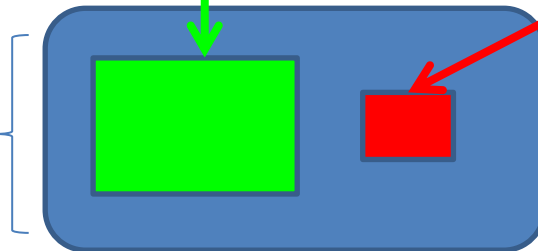General knowledge of OM methods acquired at university and long-standing experience

Knowledge of methods and experience from research and literature - **teachers**

Knowledge of methods and experience from outside world – **consultants, managers**, …

Extent of knowledge

Extent of knowledge

Synergy and put OM into practice

OM all around us

OM is the management of all processes used to design, supply, produce, and deliver valuable goods and services to customers

IN

Processing-transformation

Out

TQM = Total Quality Management

ERP: Logistics, Transportation

MRP, JIT, APS, Lean Manufacturing, Little´s law

ERP: Marketing, Selling, Invoicing, Payment,....

Selected OM methods, which will be kicked around as time will move on

- **Theory of Constraints** -(AOMA-AOPR)
- Balanced Scorecard -(AOMA-AOPR)
- Project Management methods (Critical Chain) -(AOMA-AOPR)
- Material Requirement Planning (MRP) and Just-in-Time principles -(AOMA only basics-AOPR more in detail)
- Advanced Planning and Scheduling (APS) (AOPR only basics)
- Six Sigma – quality management -(AOMA-AOPR)
- Boston, SWOT and Magic Quadrant Matrices -(AOMA-AOPR)
- Little´s Law (relations between WIP, Throughput and Cycle time) -(AOPR)
- Linear programming – optimisation -(AOPR)
- Yield Management -(AOPR)
- Kepner-Tregoe (support of decision making) -(AOMA-AOPR)
- Decision trees -(AOPR)
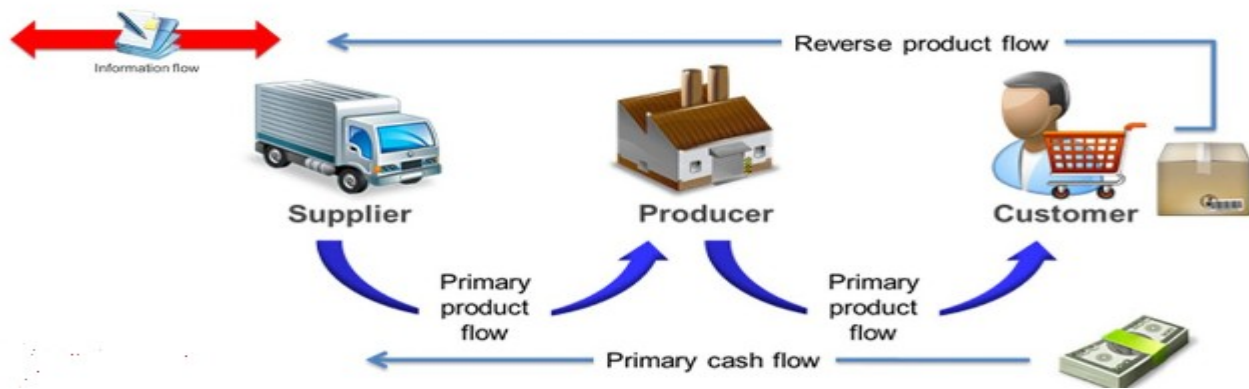
Some tools which have to be used

- **ERP**-Enterprise Resource Planning (MS Dynamics NAV)
  - Basic installation, handling and setup
  - Inventory – Items – Transports –Availability of components
  - Purchase –dealing with Suppliers (**SCM**)
  - Selling – dealing with Customers
  - Payment – bank operations
  - Accounting basics
  - **CRM**- **C**ustomer **R**elationship **M**anagement
  - Manufacturing – Planning and Shop Floor Control
  - Cost management

Serves as the magnifying glass to processes…

# Controlling processes in Supply Chain Management (SCM)

Planning levels		Supply	Production	Orders	Demand Planning
	Strategic		Operation Strategies and Innovations , **R&D**		
	Tactical	Forecasts, Blank Orders	Long term planning	Marketing	
	Operational	Logistic operations	Routing control, **TQM**	Packaging , Transportation	
	Operational	MRP, Replenishment	MRP_II ; JIT, Capacities	Cash flow	

Information flow

Reverse product flow

Supplier   Producer   Customer

Primary product flow   Primary product flow

Primary cash flow

Used abbreviations : **R&D** –Research and Development; **TQM**-Total Quality Management; **JIT**- Just –In-Time; **MRP_II**-Manufacturing and Resource Planning

Used abbreviations (slide number 3): : **ERP** - Enterprise Resource Planning **; APS –** Advanced Planning and Scheduling , **MRP**-Material Requirement Planning

Deming cycle (based on periodicity)
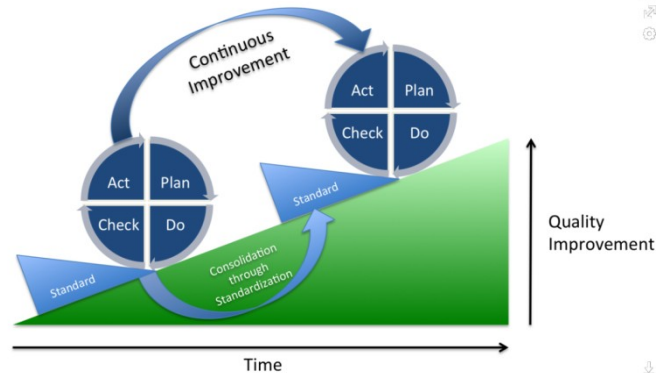
Plan*:* Define the problem to be addressed, collect relevant data, and ascertain the **problem's root cause** (e.g. by use of TOC=**Theory of Constraint**)

Do: Develop and implement a solution; decide upon a measurement to gauge (assess) its effectiveness.
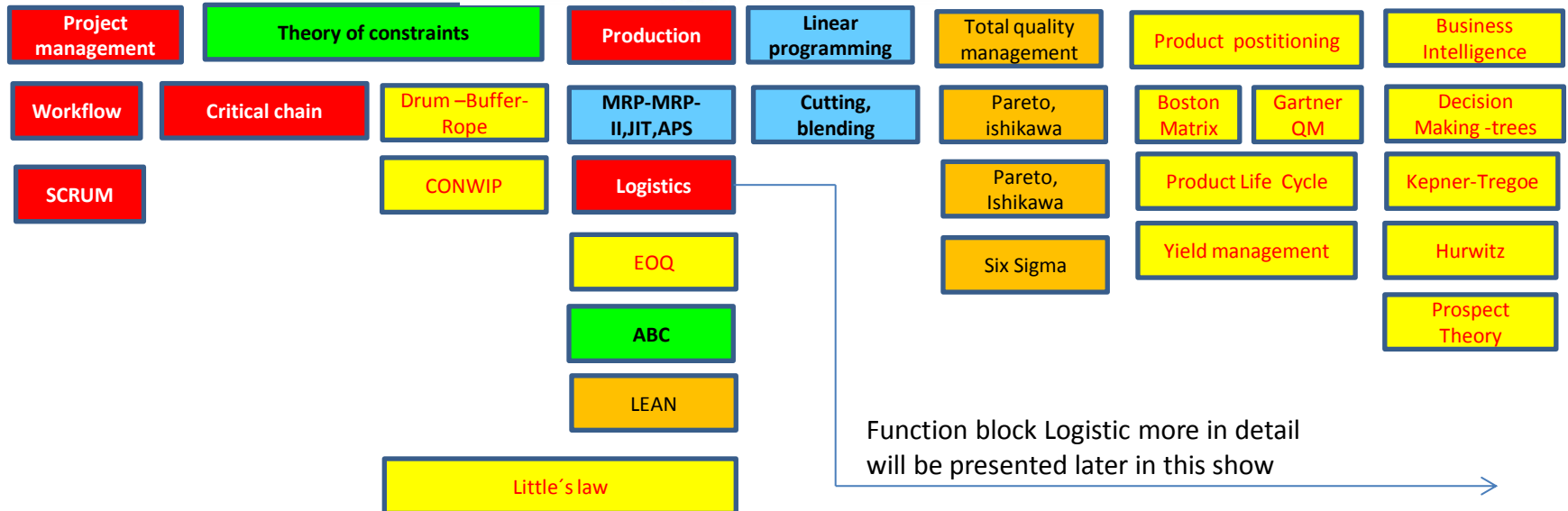
Check: Confirm the results through before-and-after data comparison.

Act: Document the results, inform others about process changes, and make recommendations for the problem to be addressed in the next **PDCA** cycle.
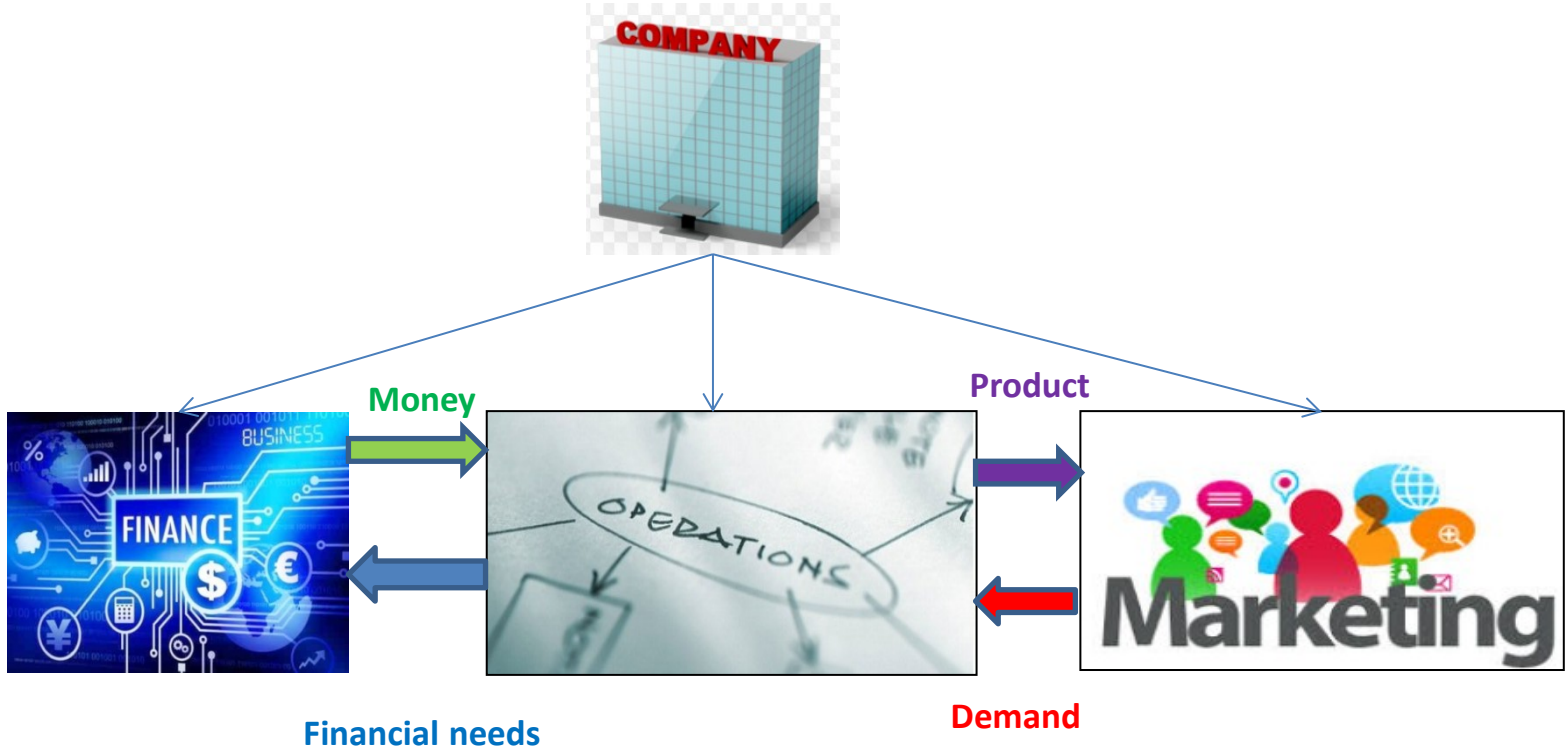
Used abbreviations : **TOC** – Theory of Constraints

Another angle of view

This will be modified in following **South African** project show (use of **Balanced Score Card**)

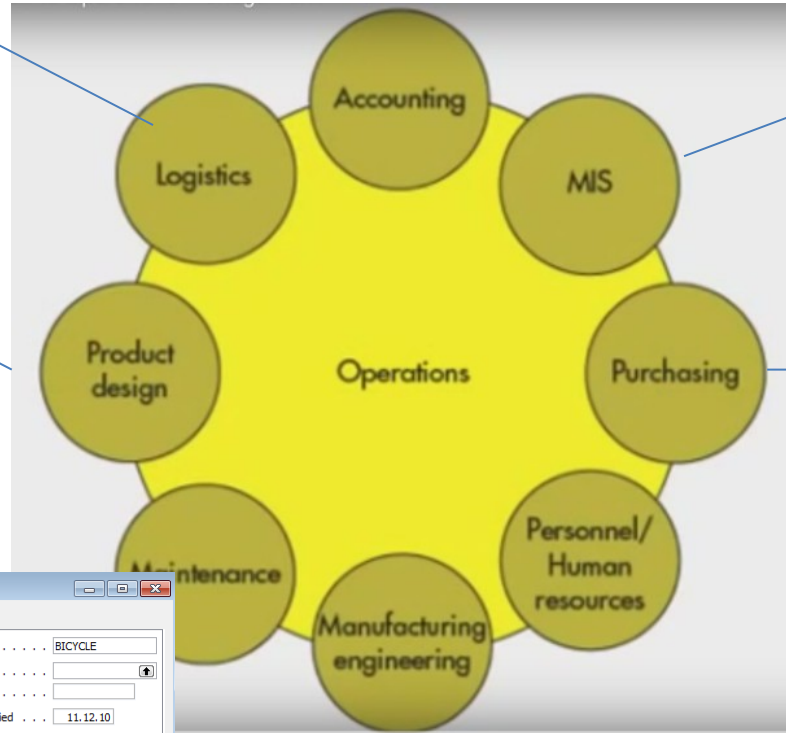|						
Project management	Theory of constraints		Production	Linear programming	Total quality management	Product postitioning	Business Intelligence
Workflow	Critical chain	Drum –Buffer- Rope	MRP-MRP-II,JIT,APS	Cutting, blending	Pareto, ishikawa	Boston Matrix / Gartner QM	Decision Making -trees
SCRUM		CONWIP	Logistics		Pareto, Ishikawa	Product Life Cycle	Kepner-Tregoe
			EOQ		Six Sigma	Yield management	Hurwitz
			ABC				Prospect Theory
			LEAN				
		Little´s law					

Function block Logistic more in detail will be presented later in this show

Used abbreviations   : **QM**– Quadrant Matrix; **CONWIP –** Constant Work in Progress; **EOQ** – Economic Order Quantity ; **MRP -** Material Requirement Planning

Another angle of view

Operations

See next slide

Manufacturing
- Product Design
  - Items
  - Production BOM
  - Routings
  - Families
  - Exchange Production BOM Item
  - Delete Expired Components
  - Calculate Low-Level Code
  - Reports
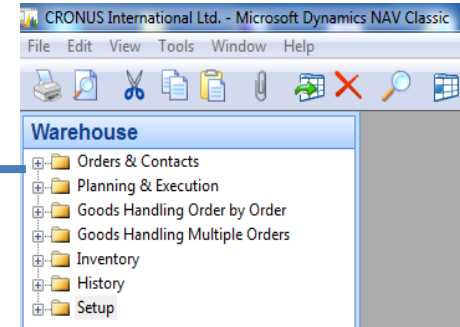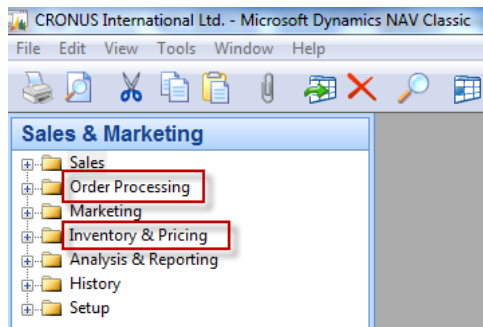- Capacities
- Planning
- Execution
- Costing

Purchase
- Planning
  - Items
  - Vendors
  - Requisition Worksheets
  - Recurring Req. Worksheet
  - Order Planning
  - Production Forecasts
  - Purchase Orders
  - Sales Orders
  - Blanket Sales Orders
  - Planned Production Orders
  - Firm Planned Prod. Orders
  - Transfer Orders
  - Reports
  - Documents
  - Setup
- Order Processing
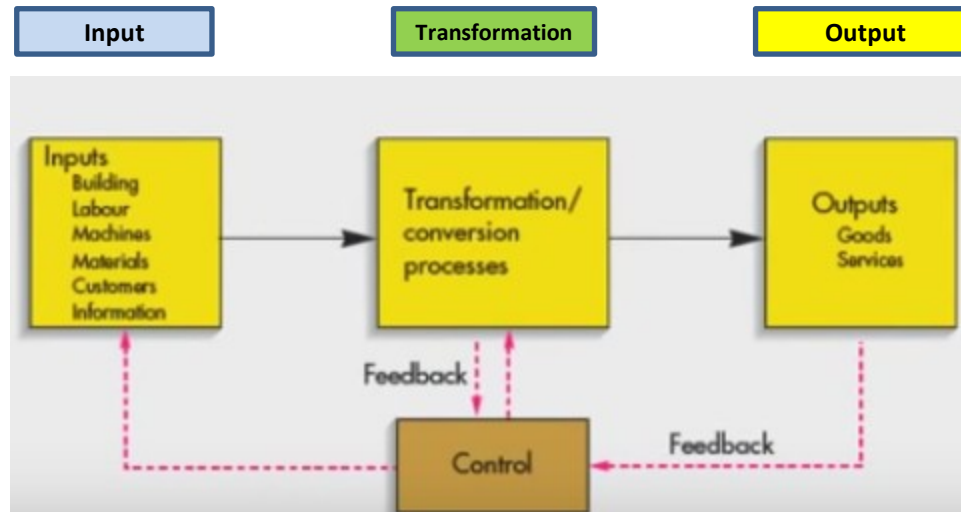- Inventory & Costing
- Analysis & Reporting
- History
- Setup

1000 Bicycle - Production BOM

General

No. 1000   Search Name . . . . . . BICYCLE
Description . . . . Bicycle   Version Nos. . . . . . .
Unit of Measure Code . . PCS   Active Version. . . . . .
Status . . . . Certified   Last Date Modified . . . 11.12.10

Type	No.	Description	Quantity ...	Unit of Measu...	Scrap...	Routing Li...
Item	1100	Front Wheel	1	PCS	0	
Item	1200	Back Wheel	1	PCS	0	
Item	1300	Chain Assy	1	PCS	0	
Item	1400	Mudguard front	1	PCS	0	
Item	1450	Mudguard back	1	PCS	0	
Item	1500	Lamp	1	PCS	0	
Item	1600	Bell	1	PCS	0	
Item	1700	Brake	1	PCS	0	
Item	1800	Handlebars	1	PCS	0	
Item	1850	Saddle	1	PCS	0	
Item	1900	Frame	1	PCS	0	

Prod. BOM   Component   Functions   Help

Bill of material

Function block Logistic-simplified
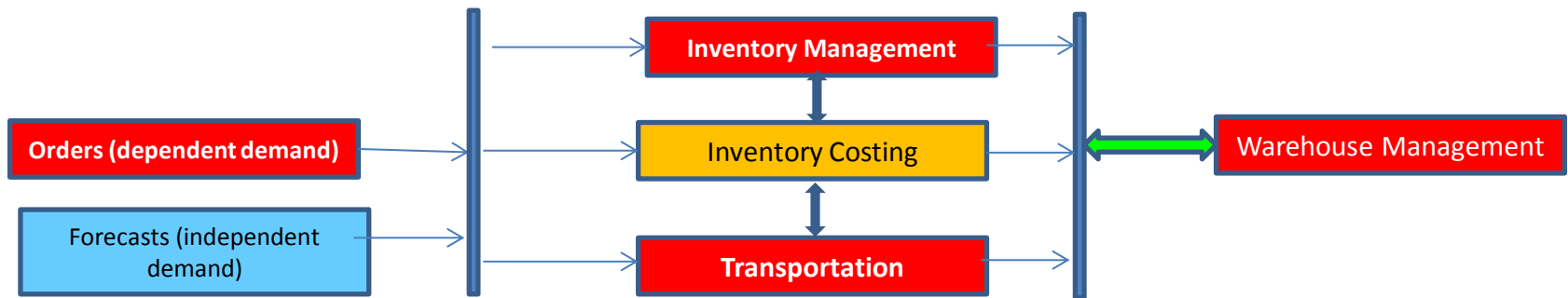
Procedures-simplified

Input   Transformation   Output

Color agenda used later

Inputs
Building
Labour
Machines
Materials
Customers
Information

Transformation/
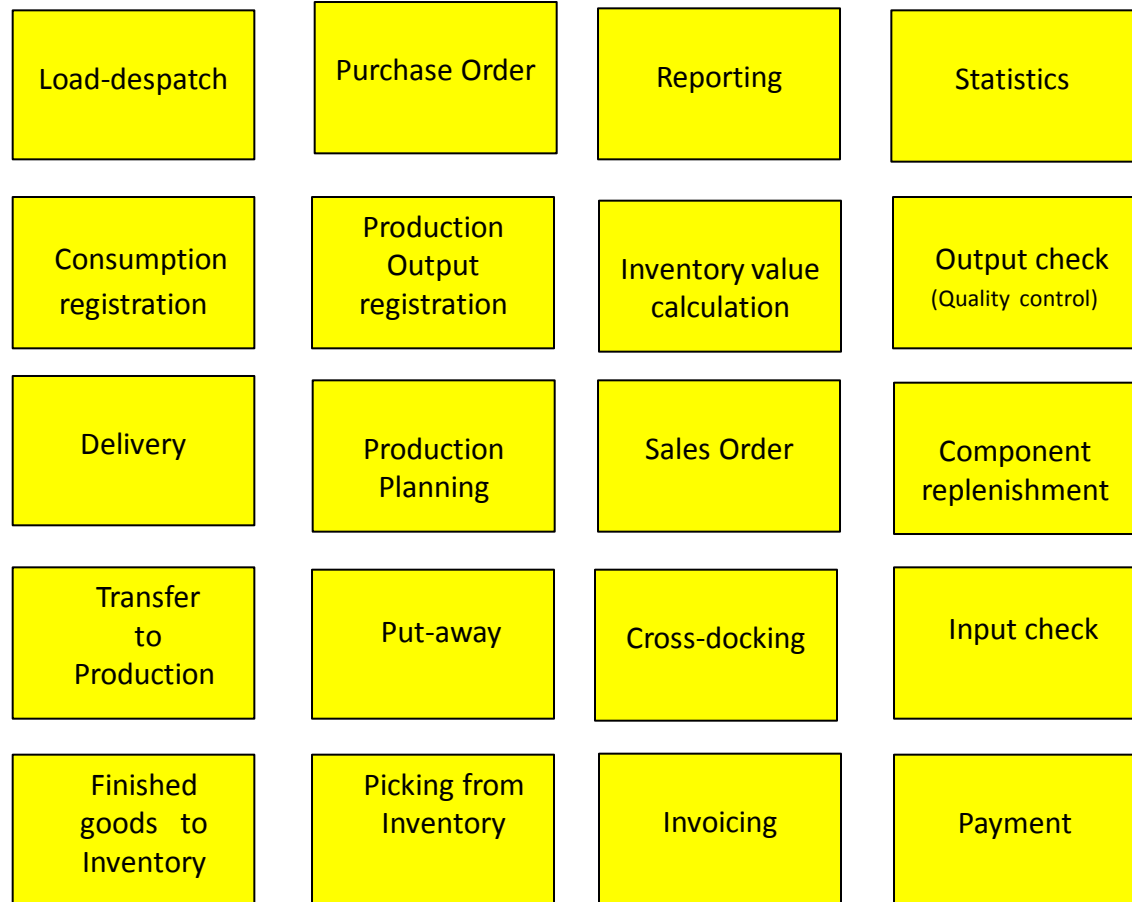conversion
processes
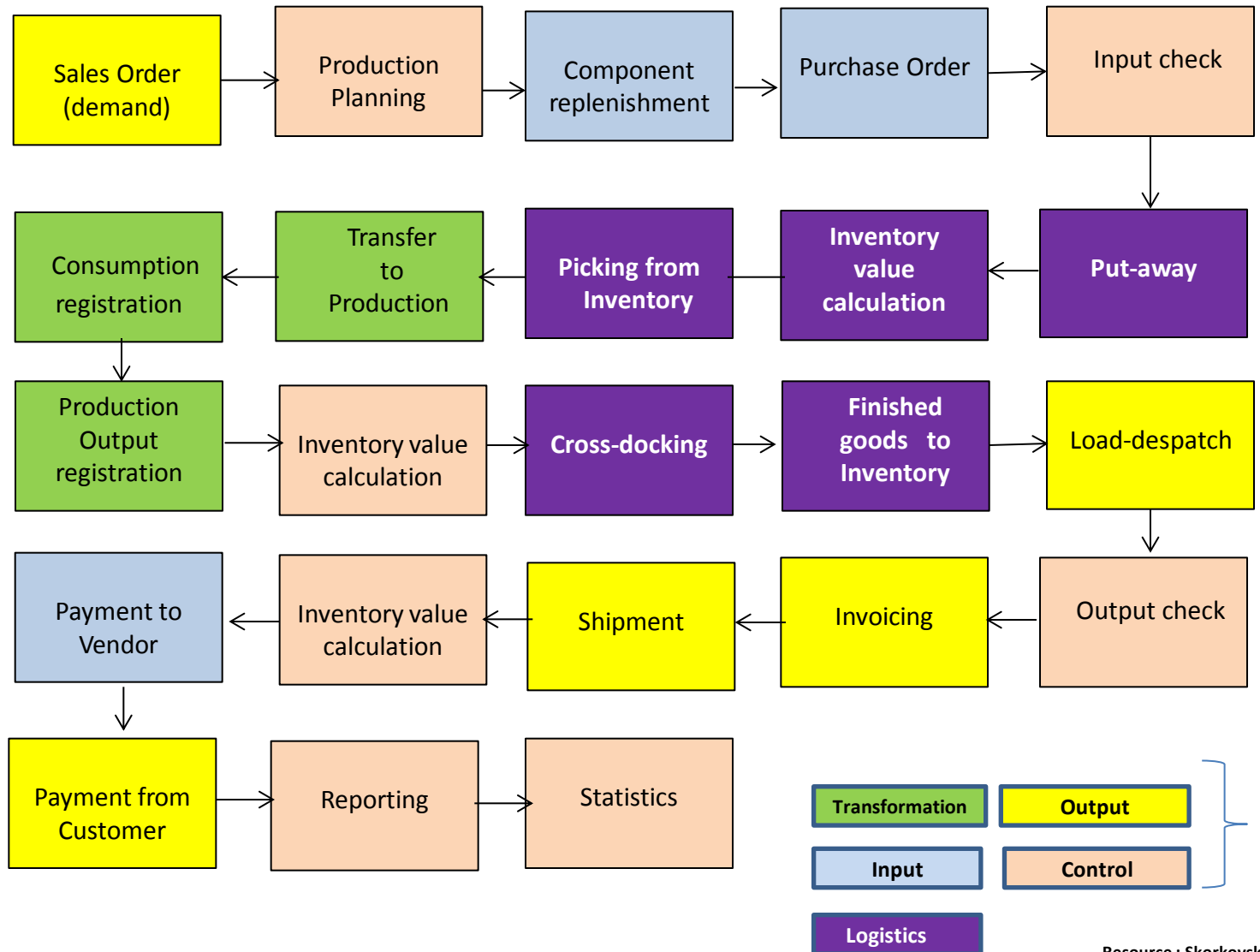
Outputs
Goods
Services

Feedback

Control

Feedback

Processing (not organised set of processes, will be presented also as a introduction to project management PWP presentation later)
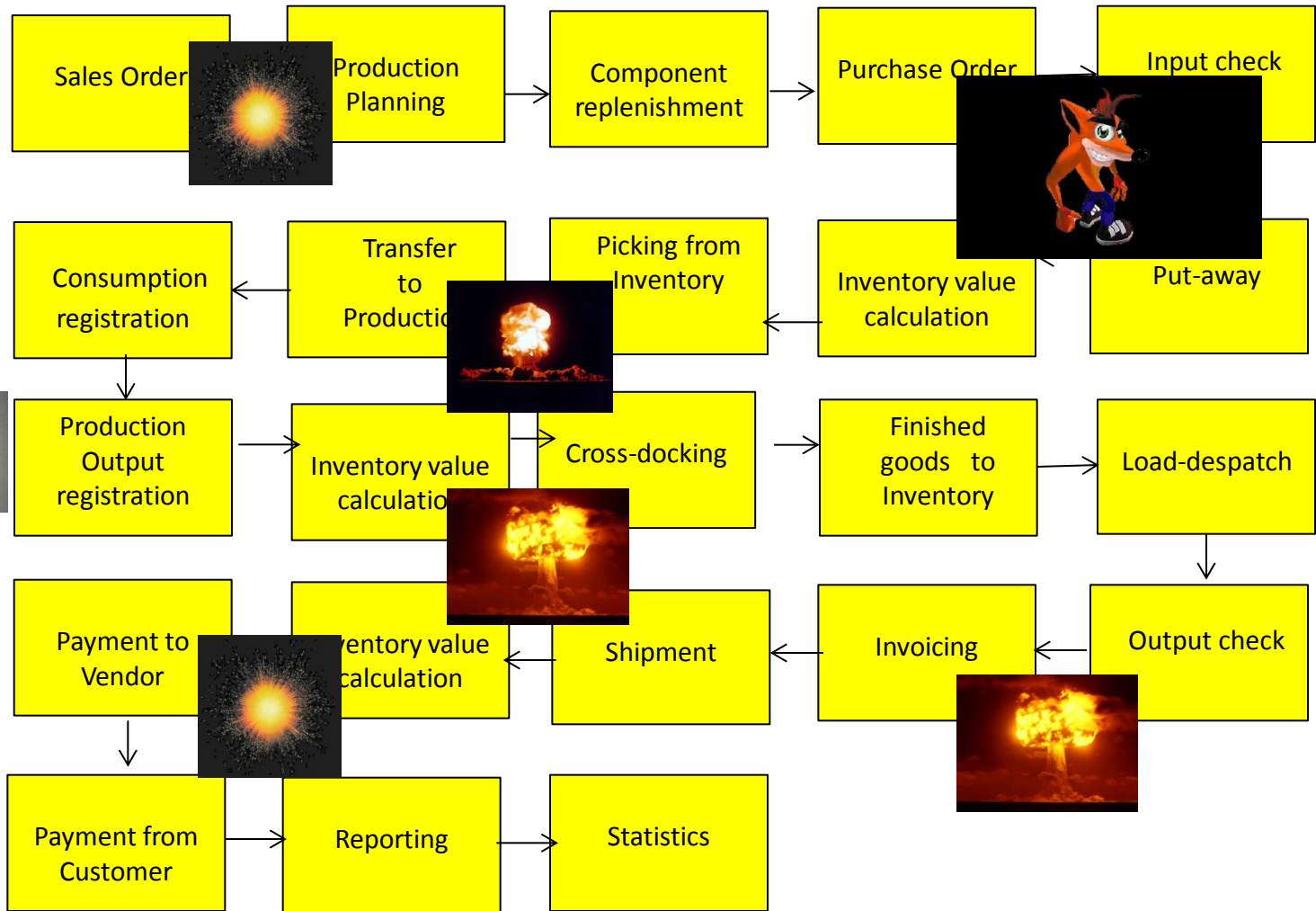
Process flow ?

Load-despatch	Purchase Order	Reporting	Statistics
Consumption registration	Production Output registration	Inventory value calculation	Output check (Quality control)
Delivery	Production Planning	Sales Order	Component replenishment
Transfer to Production	Put-away	Cross-docking	Input check
Finished goods to Inventory	Picking from Inventory	Invoicing	Payment

Your main task (to organize processes based on business logic)

```
Sales Order (demand) → Production Planning → Component replenishment → Purchase Order → Input check
                                                                                              ↓
Consumption registration ← Transfer to Production ← Picking from Inventory ← Inventory value calculation ← Put-away
        ↓
Production Output registration → Inventory value calculation → Cross-docking → Finished goods to Inventory → Load-despatch
                                                                                                                  ↓
Payment to Vendor ← Inventory value calculation ← Shipment ← Invoicing ← Output check
        ↓
Payment from Customer → Reporting → Statistics
```

Legend:
- Transformation
- Output
- Input
- Control
- Logistics

Agenda

Resource : Skorkovský

Your main task (possible problems, bottlenecks, undesirable effects..)

Application of TOC ->thinking tools->Current Reality Tree – first stage

Your main task

(Search **- HOW** ??? Measure impacts **–HOW** ??? and Destroy **– HOW** ???)

Cause-Effect relation

Cause-Effect relation

Cause-Effect relations

Cause-Effect relation

Cause-Effect relation

Root Problem
(e.g.low profit)
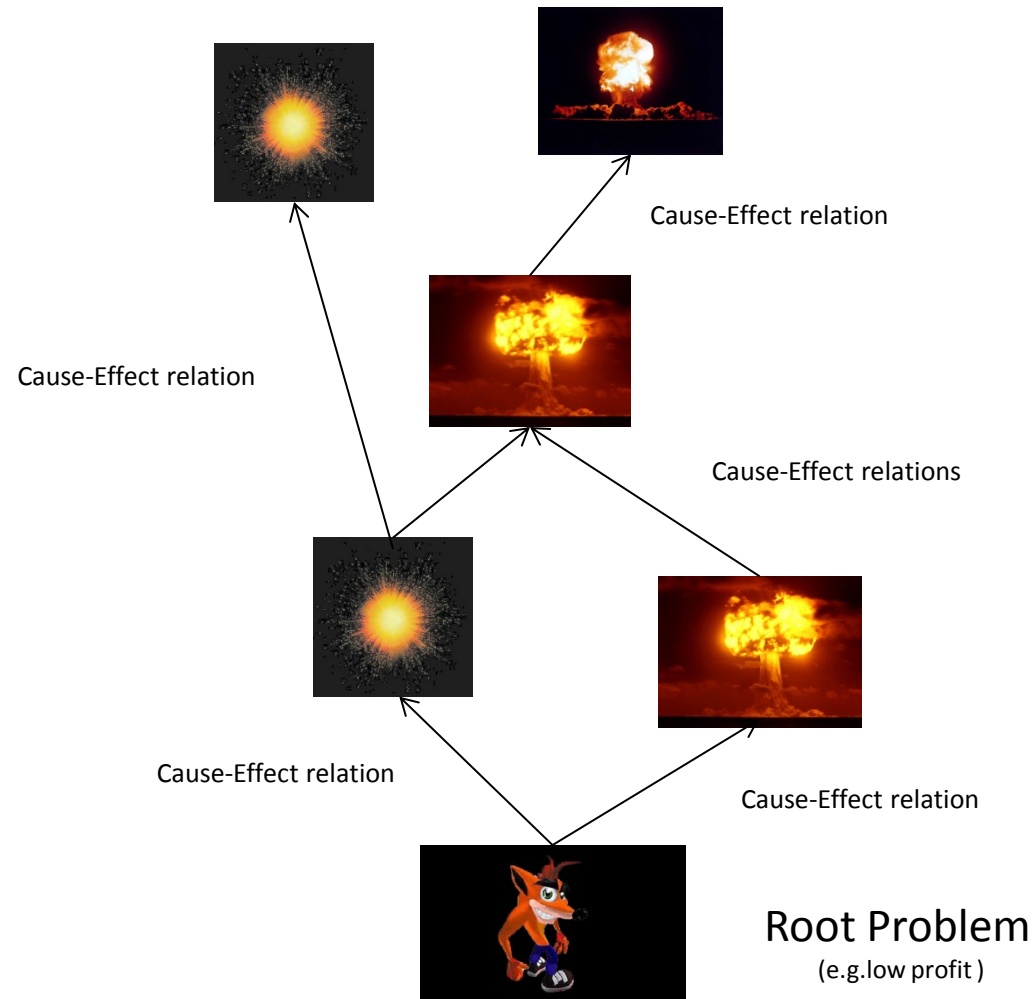
Basic problem I. (one of many)

We have a huge data quantity
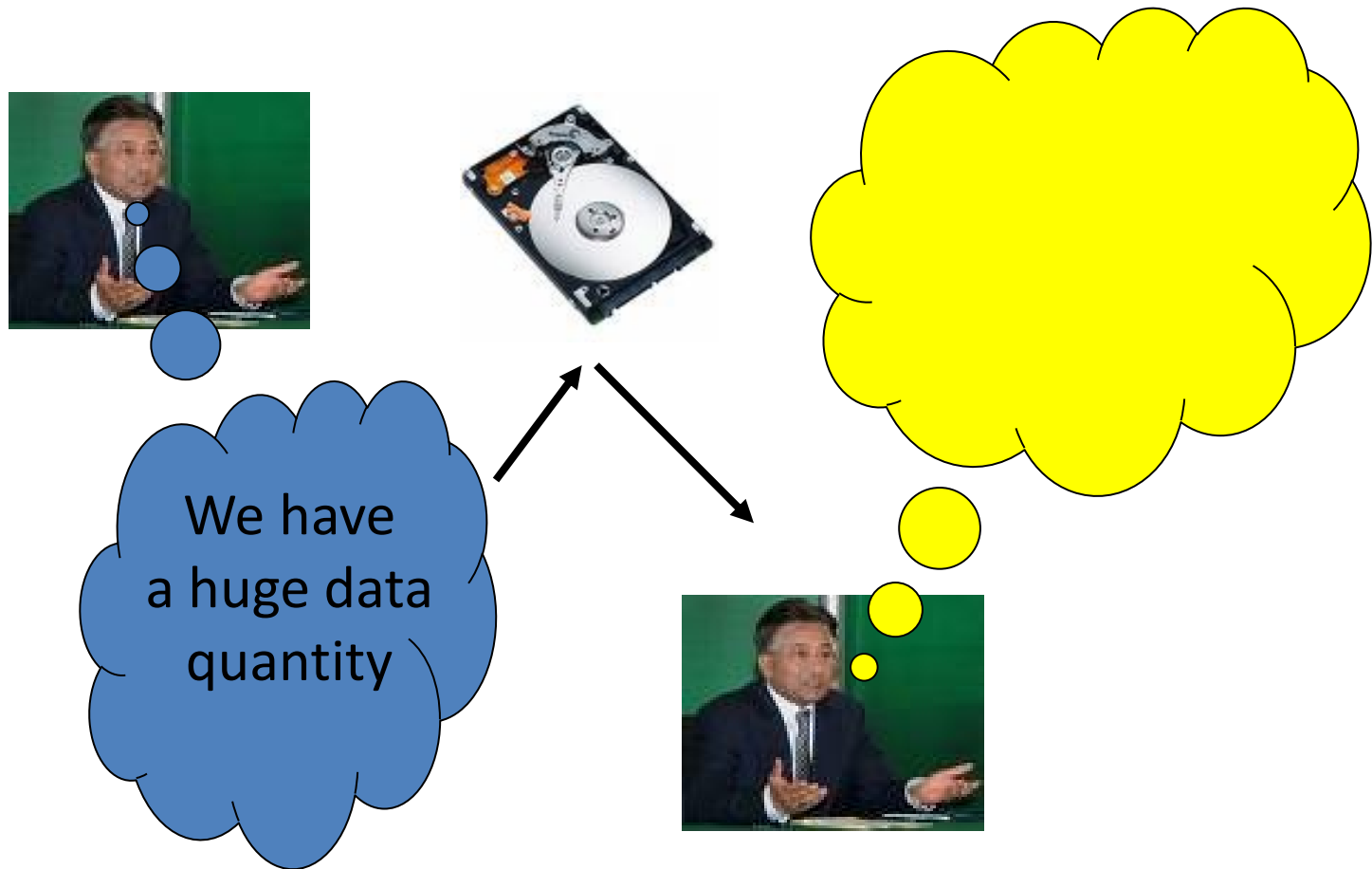
Moore's law is the observation that the number of transistors in a dense integrated circuits doubles approximately every two years – so -> capacity of memory is going up

Big data and analysis problem

In test and measurement applications, engineers and scientists can collect vast amounts of data every second of every day.

- For **every second** that the Large Hadron Collider at CERN runs an experiment, the instrument can generate 40 terabytes of data.
- For **every 30 minutes** that a Boeing jet engine runs, the system creates 10 terabytes of operations information.
- For a single journey across the Atlantic Ocean, a four-engine jumbo jet can create 640 terabytes of data.
- Multiply that by the more than 25,000 flights flown each day, and you get an understanding of the enormous amount of data that exists (Rogers, 2011). **That's "Big Data."**

CERN = Conseil Européen pour la Recherche Nucléaire –Resource : https://home.cern/about

Hardon Collider-accelerator
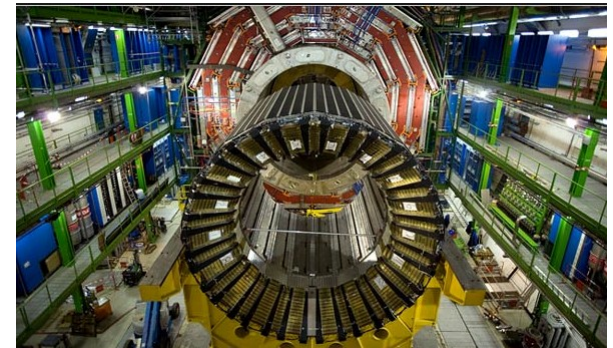
*Basic problem II. (we need reliable data)

To solve it we should use finite capacity scheduling (APS)- will be presented later
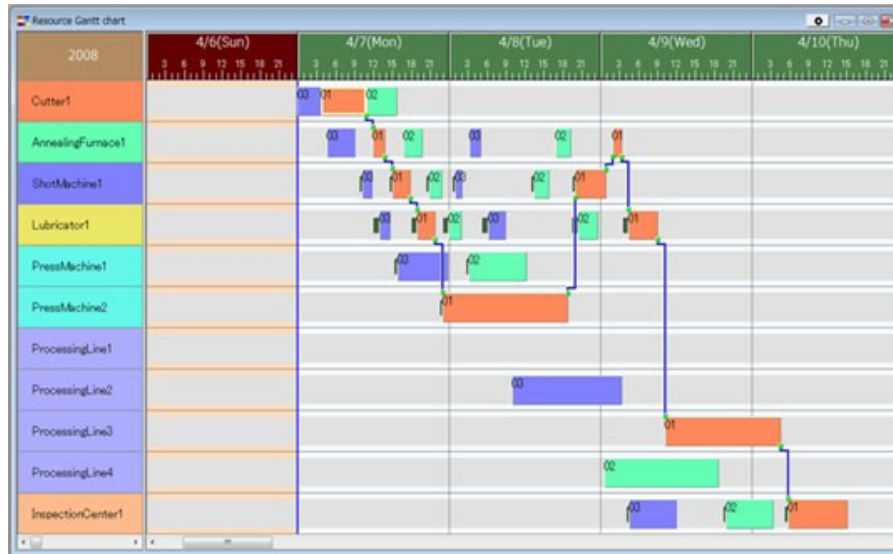
$$T1+T2=X$$

$$Opt=Min(X)$$
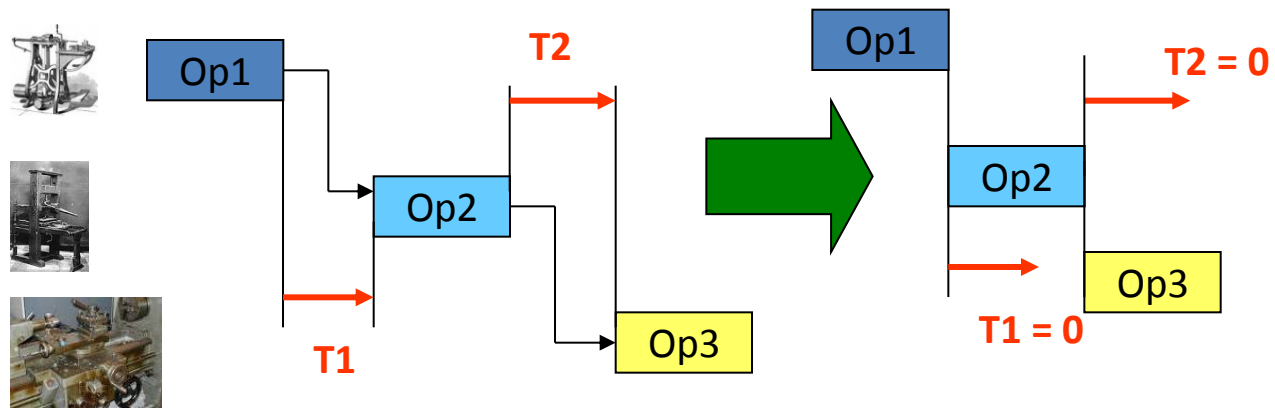
Basic problem III.
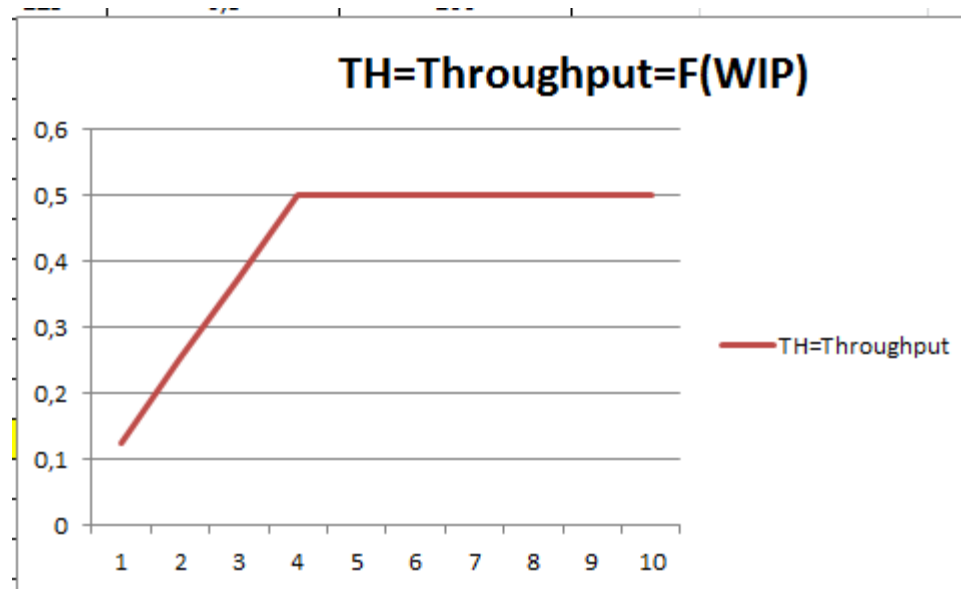
Will be explained in Little´s law presentation (AOPR) : WIP= Work In Progress

Basic problem IV.

Black
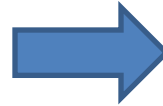
White

White
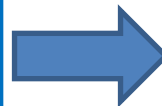
Black

(Black ->White, Setup time=60 minut)
(White->Black, Setup time = 20 minut)

Basic problem V-I.(availability of components)

Op1

20 pcs of A7 and 20 pcs of A8

Op2

10 pcs of A4 and 10 pcs of A5
(will be delivered in T1+X time)

T0

Lead time
to produce **A6**

Op3

Lead time
to produce **A3**

T1

T2

Op1

X= slack = delay

T1

Op2

T1+X

Op3

A0

A1

A2

A3

A4

A5

A6

A7

A8

Bill Of Material=BOM
(tree structure)
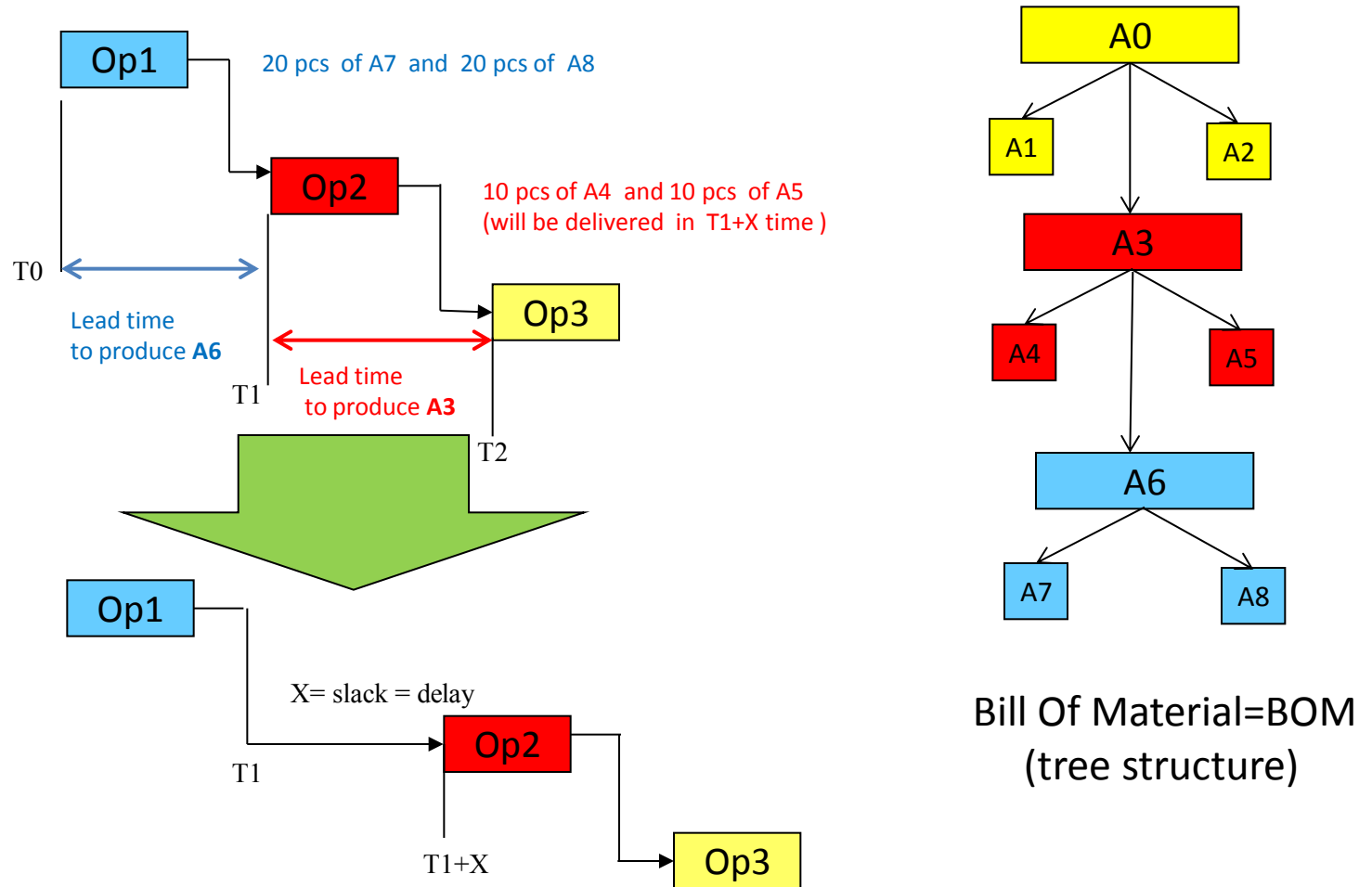
For sake of simplicity we did not mentioned components A1 and A2 and possible delays having cause in delivery times of bad quality !!!
Same with capacities of machines allocated to OP1-OP2-OP3 (sudden breakdowns)

Basic problem V-II. (availability of components)

APS result ->18.8.->23.8. a 27.8.->10.9

Basic problem VI-I. (over budget)

Code	Name	Budgeted Amount	26.03.12	02.04.12
8100	**Building Maintenance Expenses**			
8110	Cleaning	1 160,00	1 000,00	
8120	Electricity and Heating	1 120,00	1 000,00	
8130	Repairs and Maintenance	1 160,00	1 000,00	
8190	**Total Bldg. Maint. Expenses**	**3 440,00**	**3 000,00**	
8200	**Administrative Expenses**			
8210	Office Supplies	510,00	500,00	
8230	Phone and Fax	800,00	800,00	
8240	Postage	1 390,00	1 200,00	
8290	**Total Administrative Expenses**	**2 700,00**	**2 500,00**	
8300	**Computer Expenses**			
8310	Software	1 000,00	1 000,00	

*Basic problem VI-II. (over budget)

*Basic problem VI-III. (over budget)