# Operation Management (OM) Introduction

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# Coordinates (will be part of OM Intro as well)

- **Lecturer :** Ing.Jaromír Skorkovský, CSc.
  - Department of Corporate Economy (5th floor)
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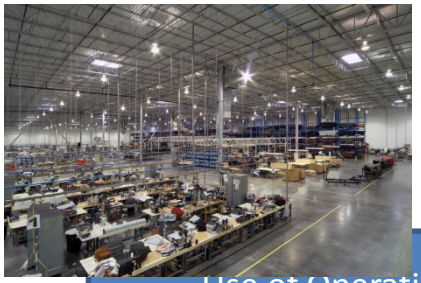
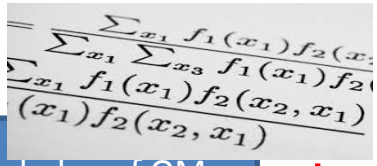
  - +420 731113517
- **Study material :** will be updated regularly after every lesson (is.muni.cz)
- So far there is a lot of material there but mind you that nearly every part will be slightly or more heavily modified this year. So the correct material will have at the end of its name specification …20YY mmdd e.g. 20YYMMDD if not specified otherwise in advance
- **Attendance :** seminar and lectures are obligatory – see subject specification (is.muni.cz) – first vital condition to be admitted to exam)
- **Excuses :** if serious reason emerges- **only written form is accepted**
- **Seminar work** : will be assigned after some theory will be presented. Accepted seminar work is the second condition to be admitted to an exam. Assign time: 4.11.2020
- **Tuition plan :** at the **end** of this slide show
- Name of the tuition plan file : Tuition plan for AOPR_20YYMMDD
- For the case of normal contact teaching : AOPR: P312 (308) and VT206
- In case of online teaching during a pandemic : MS TEAMS

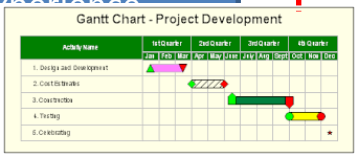
# What is going on ?

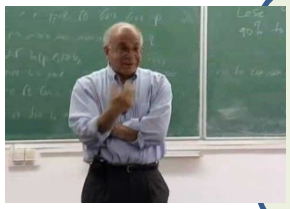


Use of Operations Management (OM) in external environment **(main target)**

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

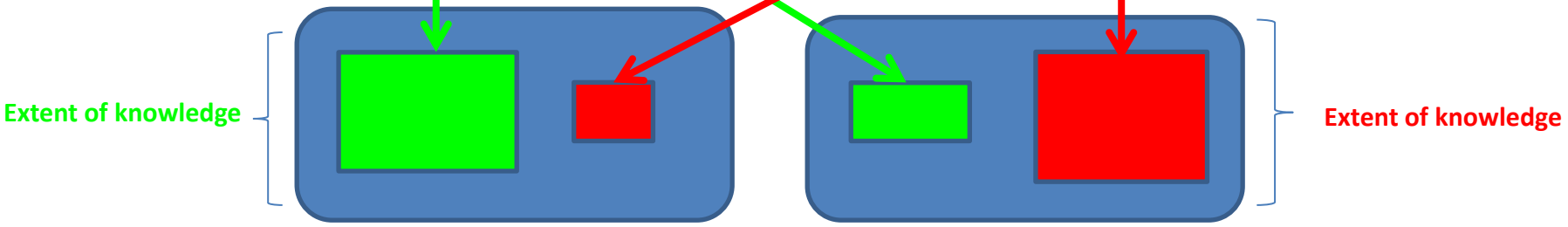




Knowledge of methods and experience from research and literature - **teachers**

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




**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









**INBOUND** — **Processing-transformation** — **OUTBOUND**

TQM = Total Quality Management,Six Sigma,…

**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 -(AOPR)
- Balanced Scorecard -(AOPR)
- Project Management methods (Critical Chain) -( AOPR)
- Material Requirement Planning (MRP) and Just-in-Time principles -(more in detail live in ESP MS Dynamics NAV 2018w1)
- Advanced Planning and Scheduling (APS) -(AOPR only basics)
- Six Sigma – quality management -(AOPR)
- Boston, SWOT and Magic Quadrant Matrices -(AOPR)
- Little´s Law (relations between WIP, Throughput and Cycle time) -(AOPR)
- Linear programming – optimization -(AOPR)
- Yield Management -(AOPR)
- Kepner-Tregoe (support of decision making) -(AOPR)
- Decision trees -(AOPR)

# Some tools which have to be used

- **ERP**-Enterprise Resource Planning (MS Dynamics NAV 2018w1)
  - Necessary installation, handling, and system setup
  - Inventory – Items – Transports –Availability of components (items)
  - 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
  - Budgets
  - Reporting

SCM=Supply Chain Management

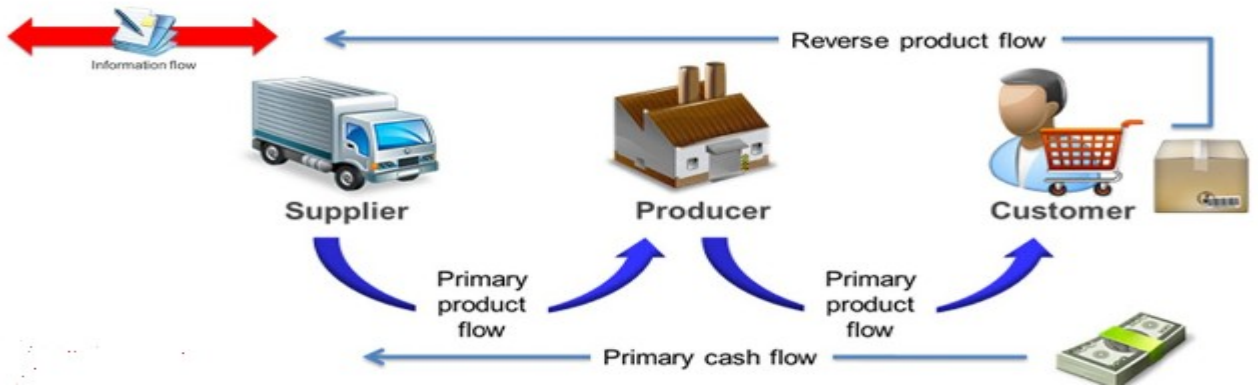
Serves as the magnifying glass to processes…

# Controlling processes in Supply Chain Management (SCM)

Planning levels

| | Supply | Production | Orders |
|---|---|---|---|
| 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 |

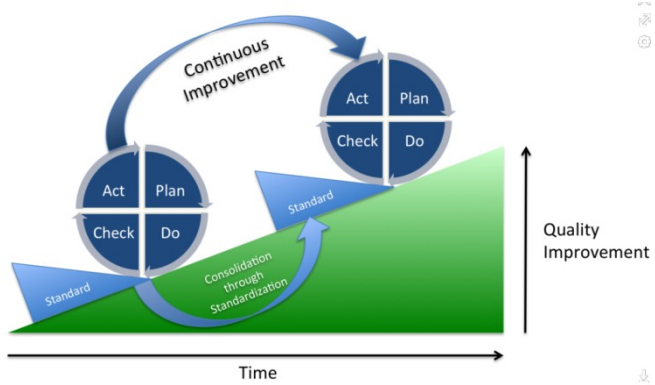
Demand Planning




**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 PDCA 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

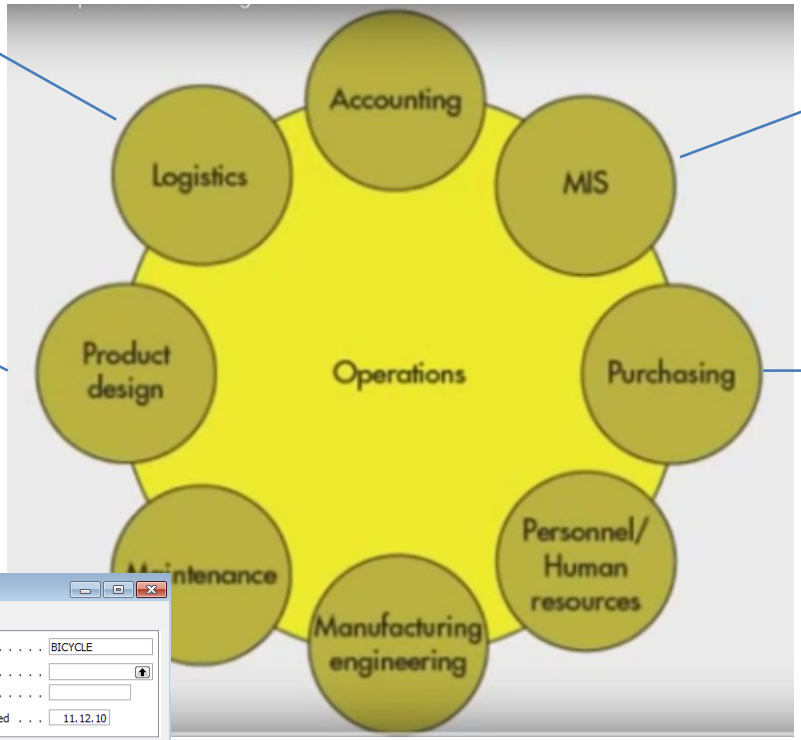
Little´s law

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

# A subset of ERP-driven operations

See next slide




**Microsoft Dynamics NAV 2009 R2**

Version W1 6.0 R2 (6.00.32012)

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**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

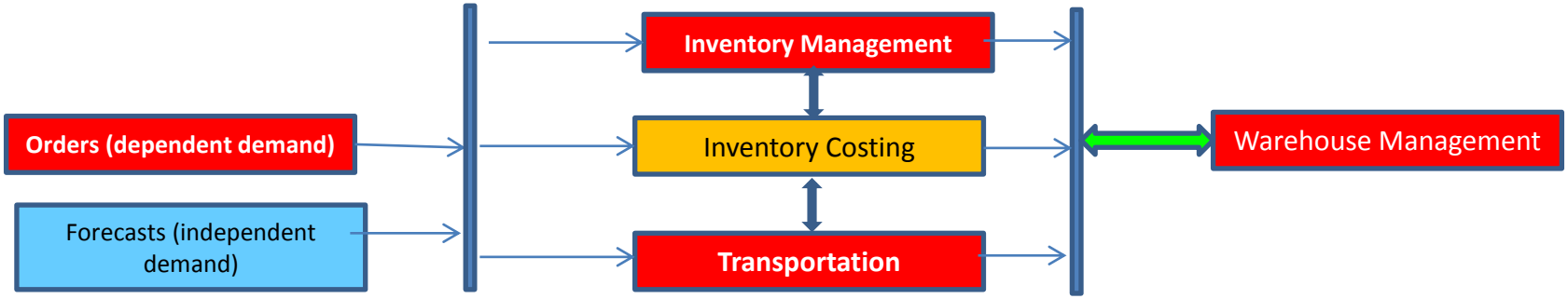
| | | | |
|---|---|---|---|
| No. | 1000 | Search Name | BICYCLE |
| Description | Bicycle | Version Nos. | |
| Unit of Measure Code | PCS | Active Version. | |
| Status | Certified | Last Date Modified | 11.12.10 |

| 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 | |

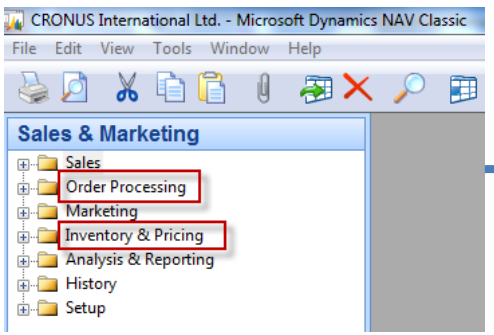
Prod. BOM | Component | Functions | Help

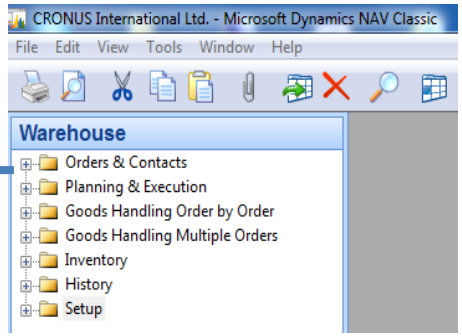
**Bill of material**

# Function block Logistic-simplified

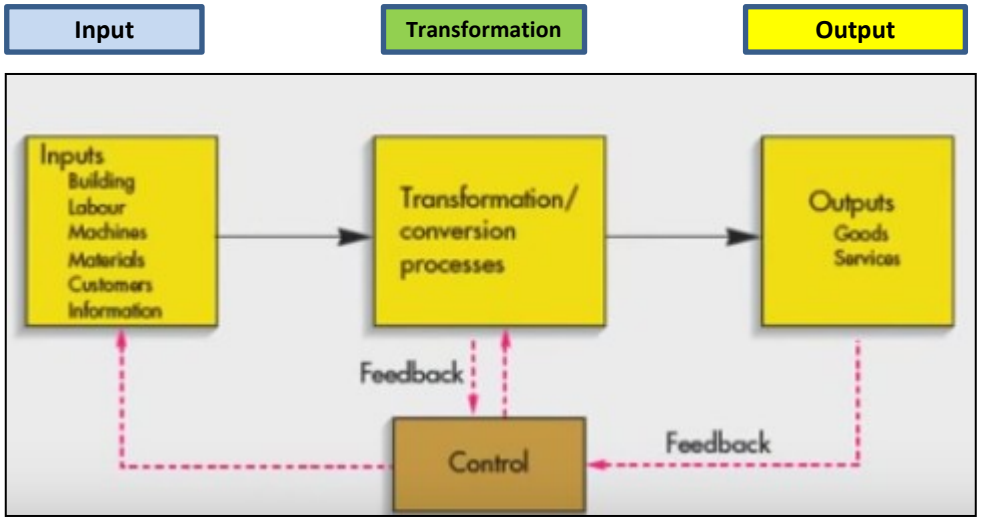



Will be part of our course regarding ERP system MS Dynamics NAV



# Procedures-simplified




Color agenda used later

Resource (modified) : dowtsx

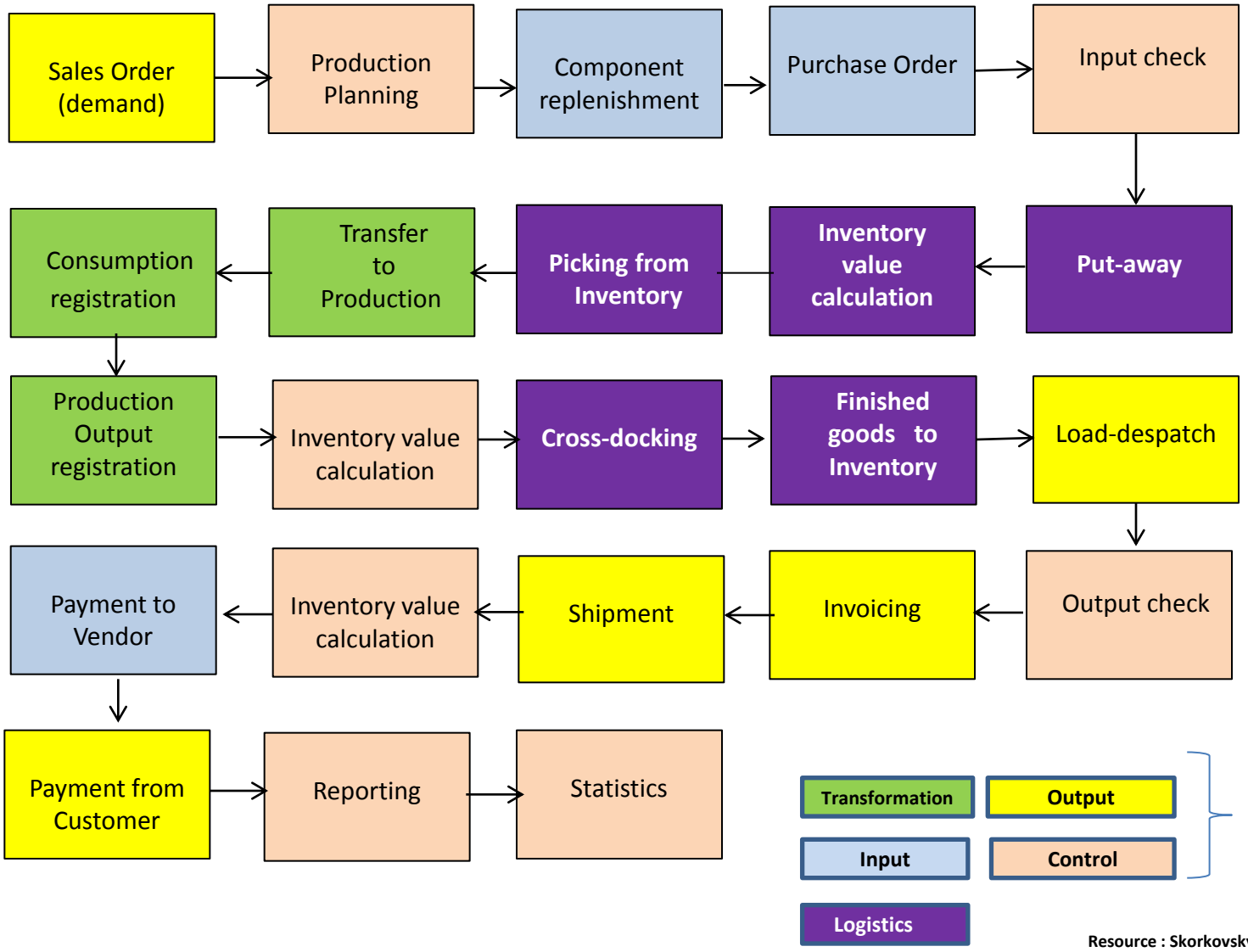
# Processing (not organised set of processes, will be presented also as a introduction to project management PWP presentation later)

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 |

**Resource : Skorkovský**

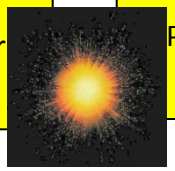
# Your main task (to organize processes based on business logic)

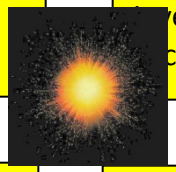


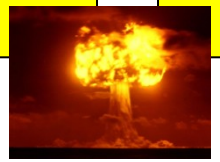

Resource : Skorkovský

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

Priorities ?







Sales Order

Production Planning

Component replenishment

Purchase Order

Input check

Put-away

Inventory value calculation

Picking from Inventory

Transfer to Productio

Consumption registration

Production Output registration

Inventory value calculatio

Cross-docking

Finished goods to Inventory

Load-despatch

Output check

Invoicing

Shipment

ventory value calculation

Payment to Vendor

Payment from Customer

Reporting

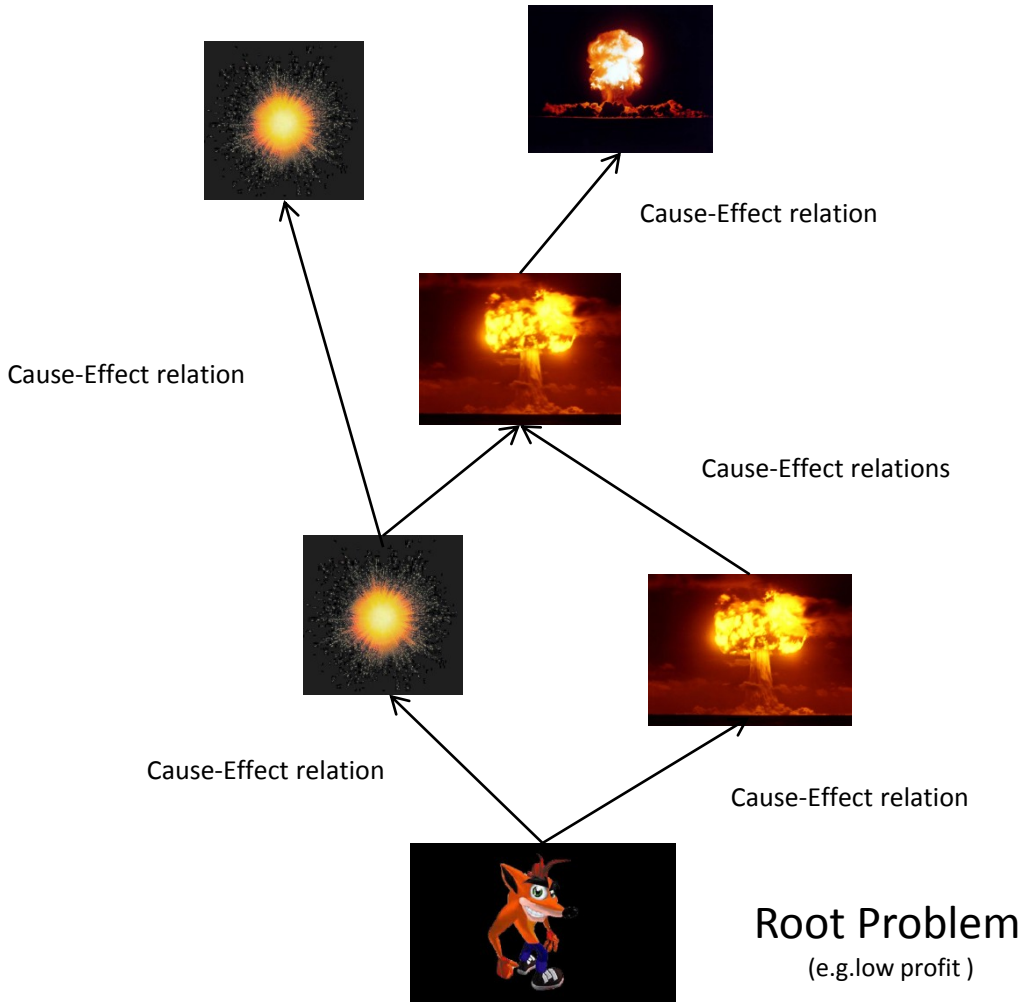
Statistics

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

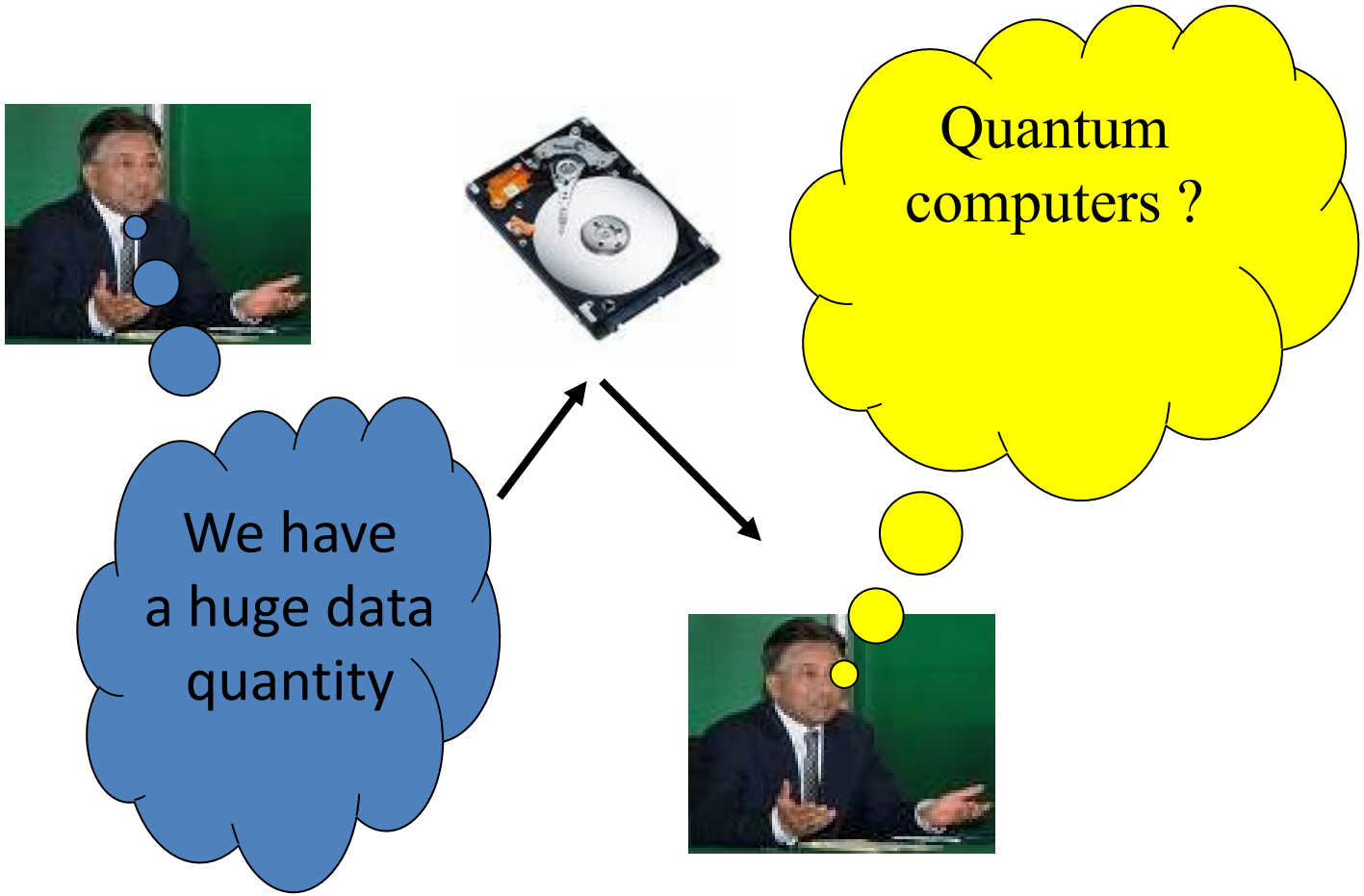
Resource : Skorkovský

# Your main task

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



# Basic problem I. (one of many)




**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 –applications temporarily solve this constraint and it is still valid afer more than 50 Years !!!

# 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."**

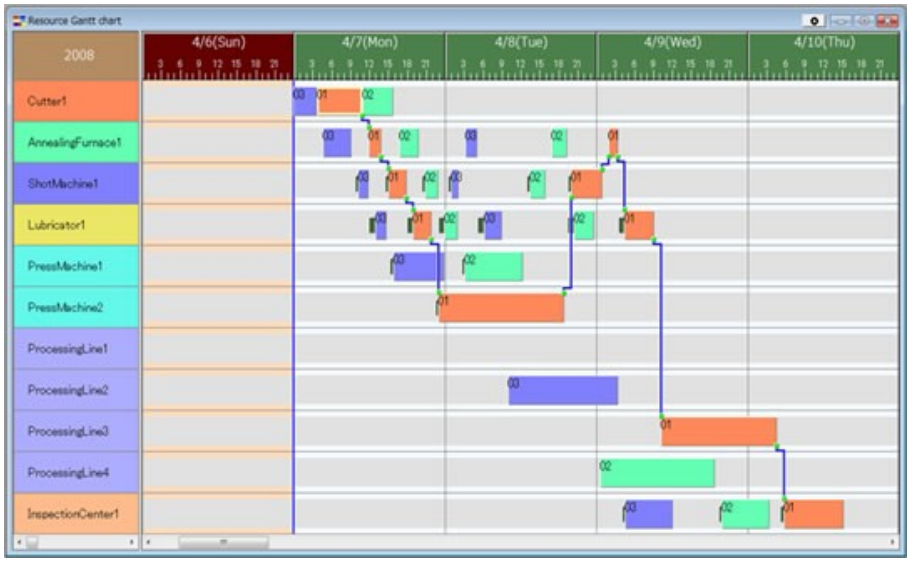
Hardon Collider-accelerator

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

# *Basic problem II. (we need reliable data )

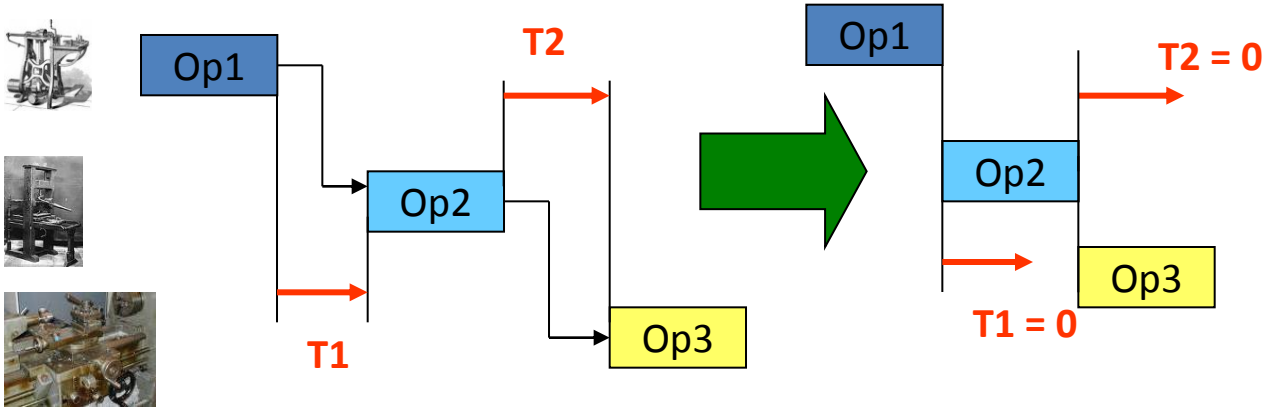
To solve it we should use finite capacity scheduling (APS)- will be presented later

Gantt

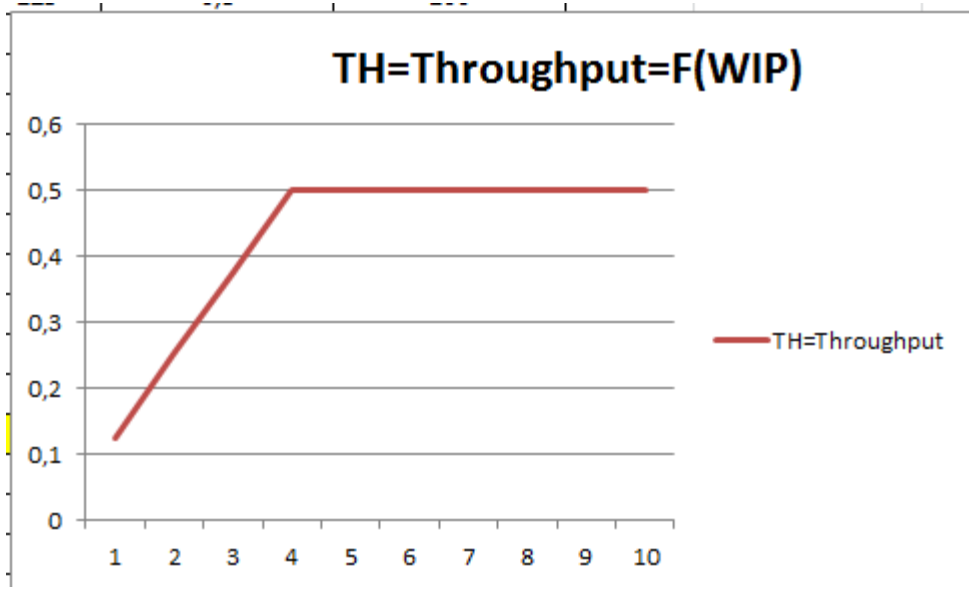



T1+T2=X

Opt=Min(X)



# Basic problem III.




Will be explained in Little´s law presentation (AOPR) : WIP= Work In Progress

# Basic problem- colouring IV.

Black

White

White

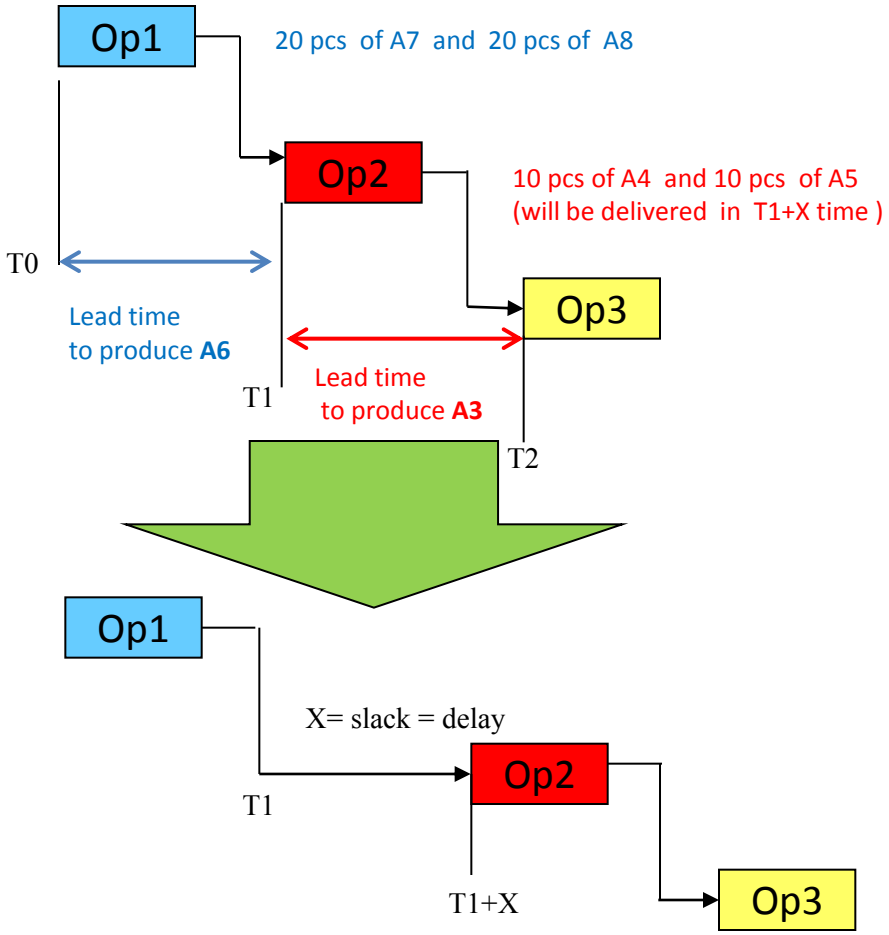
Black

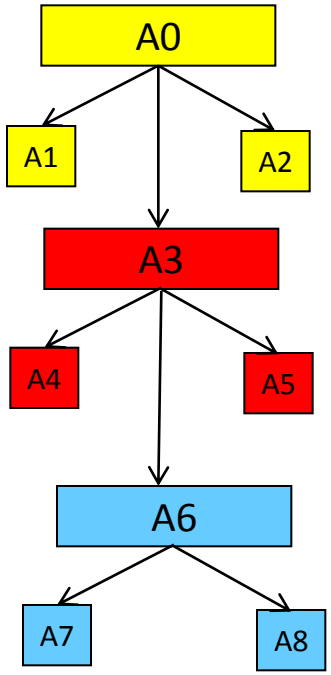
(Black ->White, Setup time=60 minut)

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

Main aim ->setup time minimization

# Basic problem V-I.(availability of components)

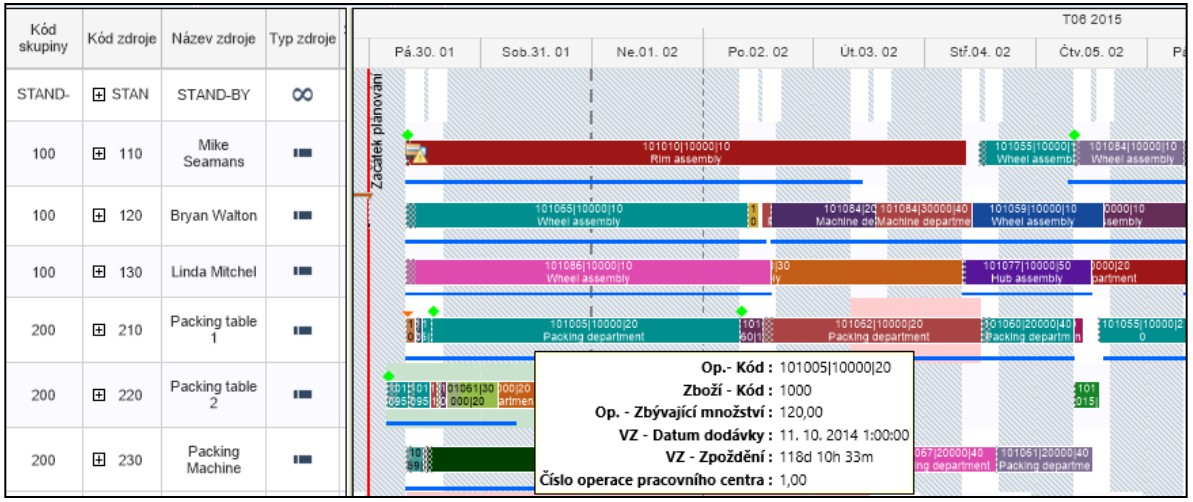



Bill Of Material=BOM
(tree structure)

**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 )




Gannt chart

Prod. Order Routing

Type to filter (F3) | Prod. Order No.

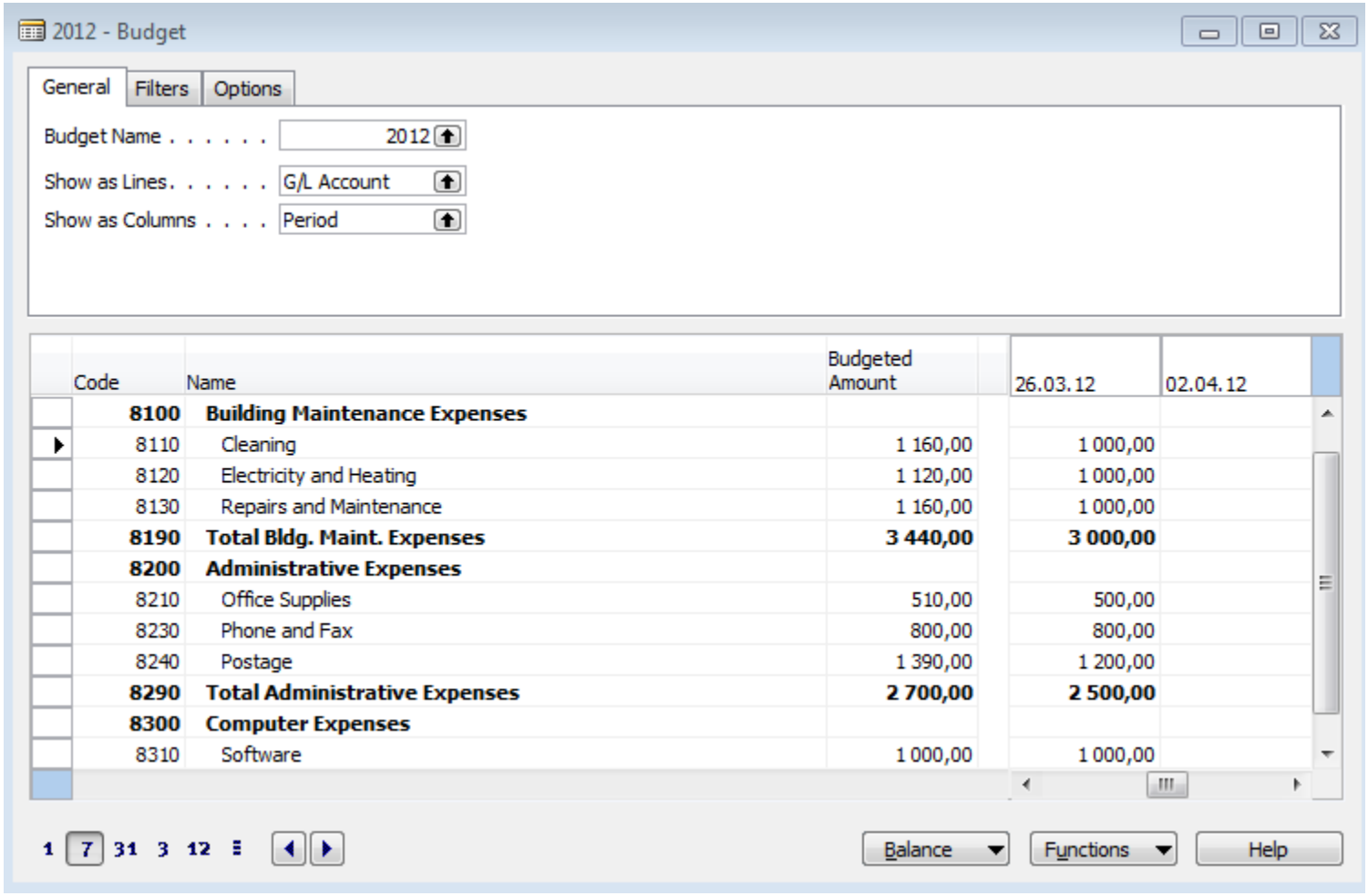
Filter: Firm Planned • 101005 • 10000 • 1

| Operati... No. | Type | No. | Description | Starting Date-Time | Ending Date-Time | Setup Time | Run Time | Material Fixed Date |
|---|---|---|---|---|---|---|---|---|
| 10 | Work Center | 100 | Wheel assembly | 18. 8. 2014 14:41 | 22. 8. 2014 8:31 | 110 | 12 | 23. 8. 2014 0:00 |
| 20 | Work Center | 200 | Packing department | 27. 8. 2014 8:31 | 1. 9. 2014 14:46 | 15 | 15 | 10. 9. 2014 0:00 |
| 30 | Work Center | 300 | Painting department | 1. 9. 2014 14:46 | 4. 9. 2014 10:46 | 10 | 20 | |
| 40 | Work Center | 400 | Machine department | 4. 9. 2014 11:11 | 5. 9. 2014 12:21 | 10 | 8 | |

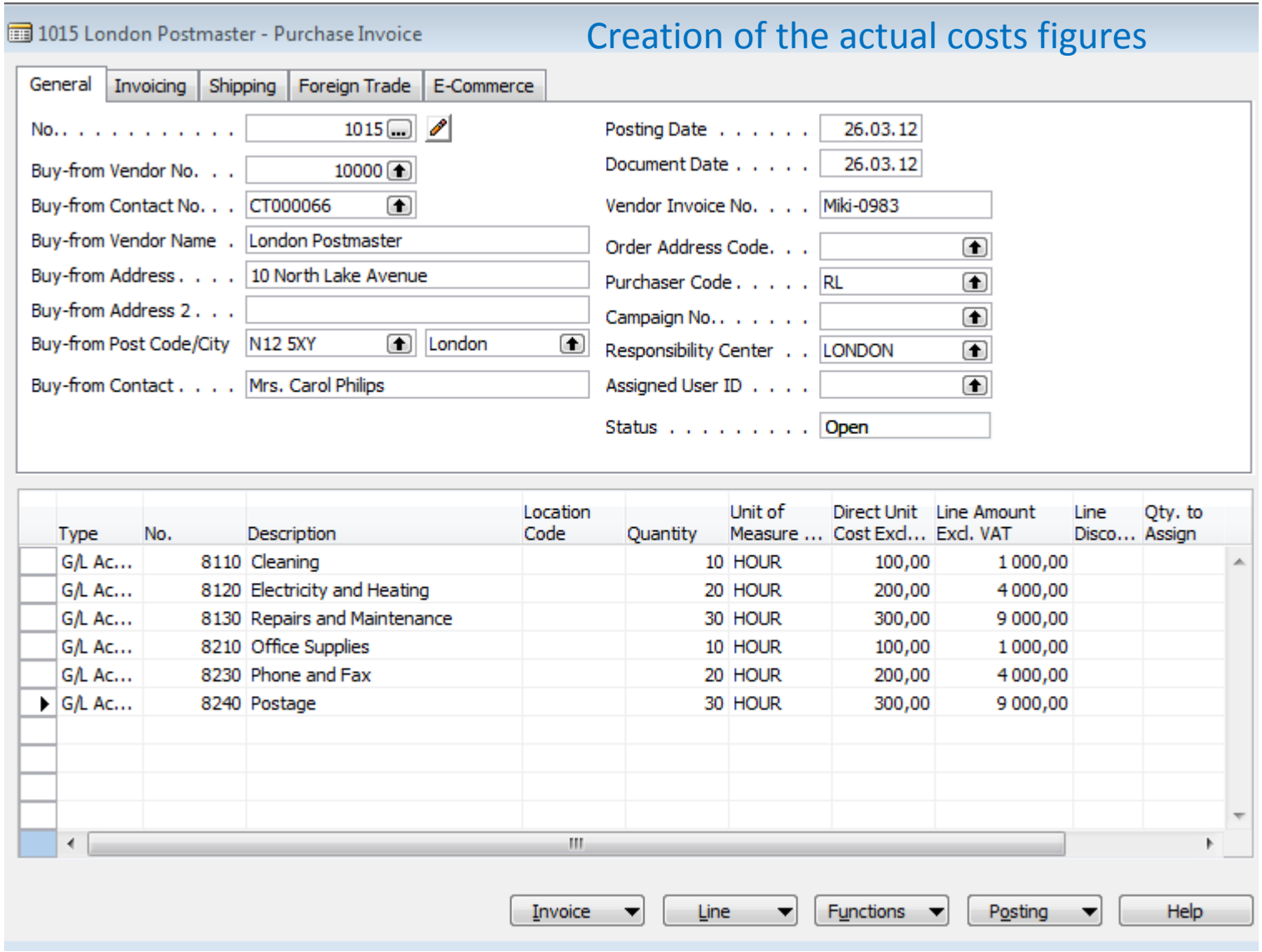
APS result ->18.8.->23.8. a 27.8.->10.9

APS = Advanced Planning and scheduling result

# Basic problem VI-I. (budget exceeded)



# * Basic problem VI-II. (budget exceeded)



# Basic problem VI-III. . (budget exceeded)