Operation Management (OM) Introduction

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Coordinates (will be part of OM Intro as well)

- **Lecturer :** Ing.Jaromír Skorkovský, CSc.
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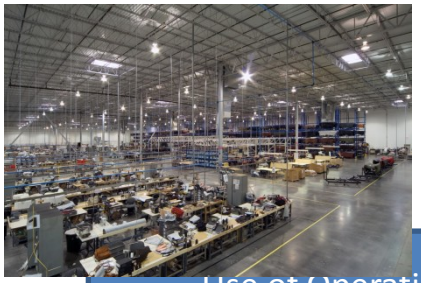
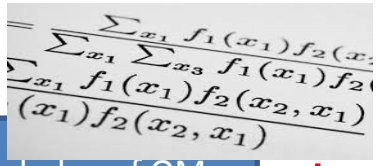
- **Study material :** will be updated regularly after every lesson (is.muni.cz)
- So far there is a lot of material there but mind you that nearly every part will be slightly or more heavily modified this year. So the correct material will have at the end of its name specification …2019 mmdd e.g. 20190916 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: 4.11.2019 and 6.11.2019
- **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: P312 (308) and VT206, AOMA: VT206 if not specified otherwise

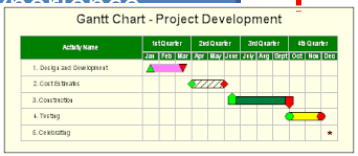
What is going on ?

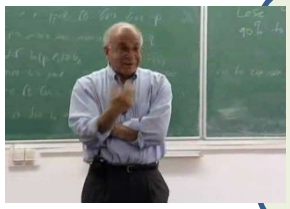


Use of Operations Management (OM) in external environment **(main target)**

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

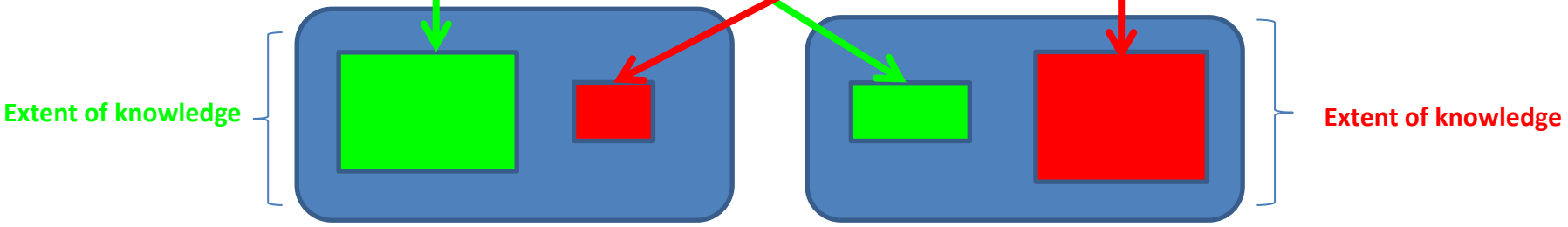






Knowledge of methods and experience from research and literature - **teachers**

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



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 – optimization -(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 2018w1)
  - Basic installation, handling and setup
  - Inventory – Items – Transports –Availability of components (items)
  - Purchase –dealing with Suppliers (**SCM**)
  - Selling – dealing with Customers
  - Payment – bank operations
  - Accounting basics
  - **C**ustomer **R**elationship **M**anagement
  - Manufacturing – Planning and Shop Floor Control
  - Cost management

SCM=Supply Chain Management

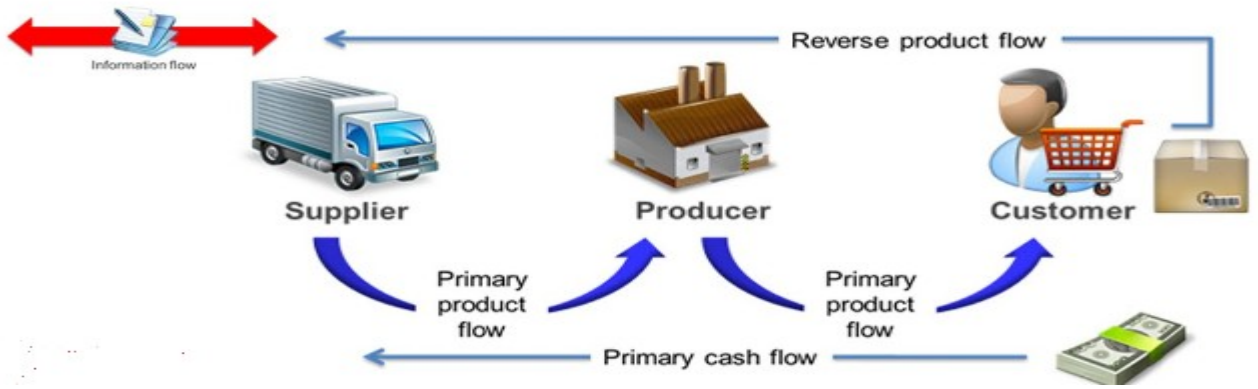
Serves as the magnifying glass to processes…

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

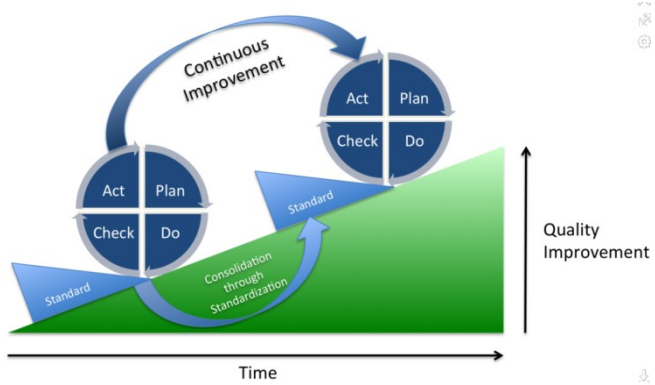
Demand Planning



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 angle of view

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

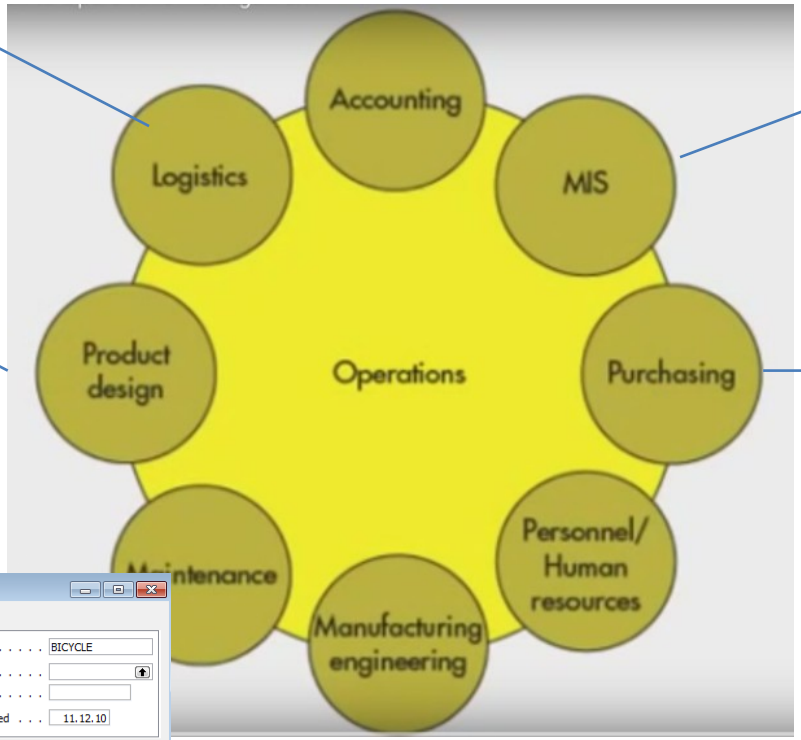
Project management
Theory of constraints
Production
Linear programming
Total quality management
Product postitioning
Business Intelligence
Workflow
Critical chain
Drum –Buffer-Rope
MRP-MRP-II,JIT,APS
Cutting, blending
Pareto, ishikawa
Boston Matrix
Gartner QM
Decision Making -trees
SCRUM
CONWIP
Logistics
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

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

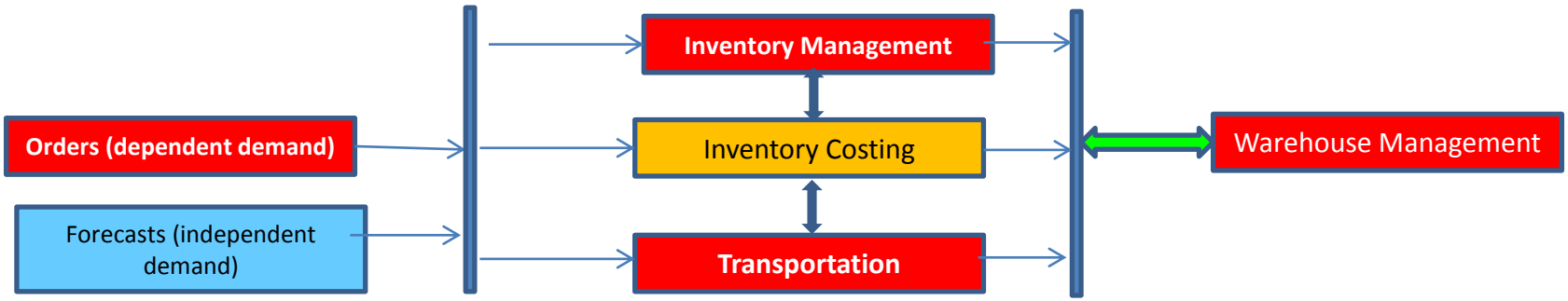
No. 1000 | Search Name BICYCLE
Description Bicycle | Version Nos.
Unit of Measure Code PCS | Active Version.
Status Certified | Last Date Modified 11.12.10

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	

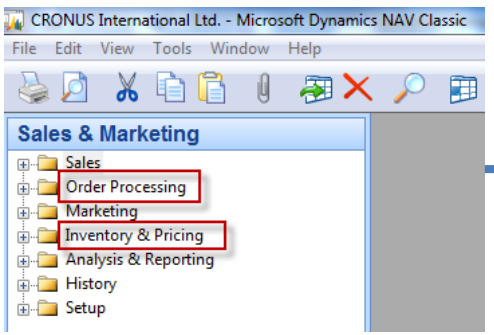
Prod. BOM | Component | Functions | Help

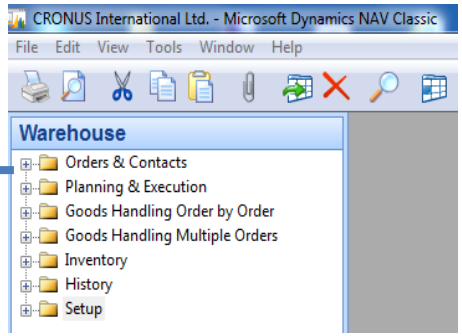
Bill of material

Function block Logistic-simplified

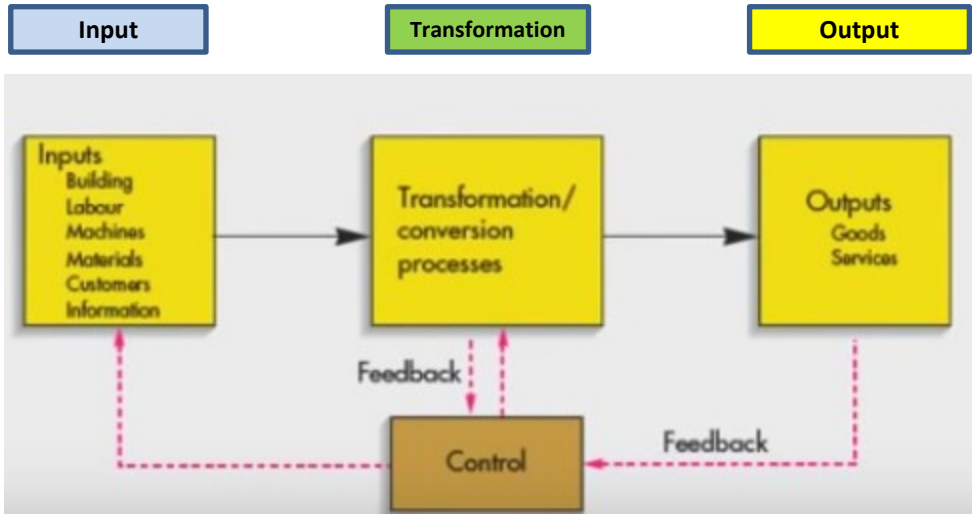


Will be part of our course regarding ERP system MS Dynamics NAV





Procedures-simplified



Color agenda used later

Resource (modified) : dowtsx

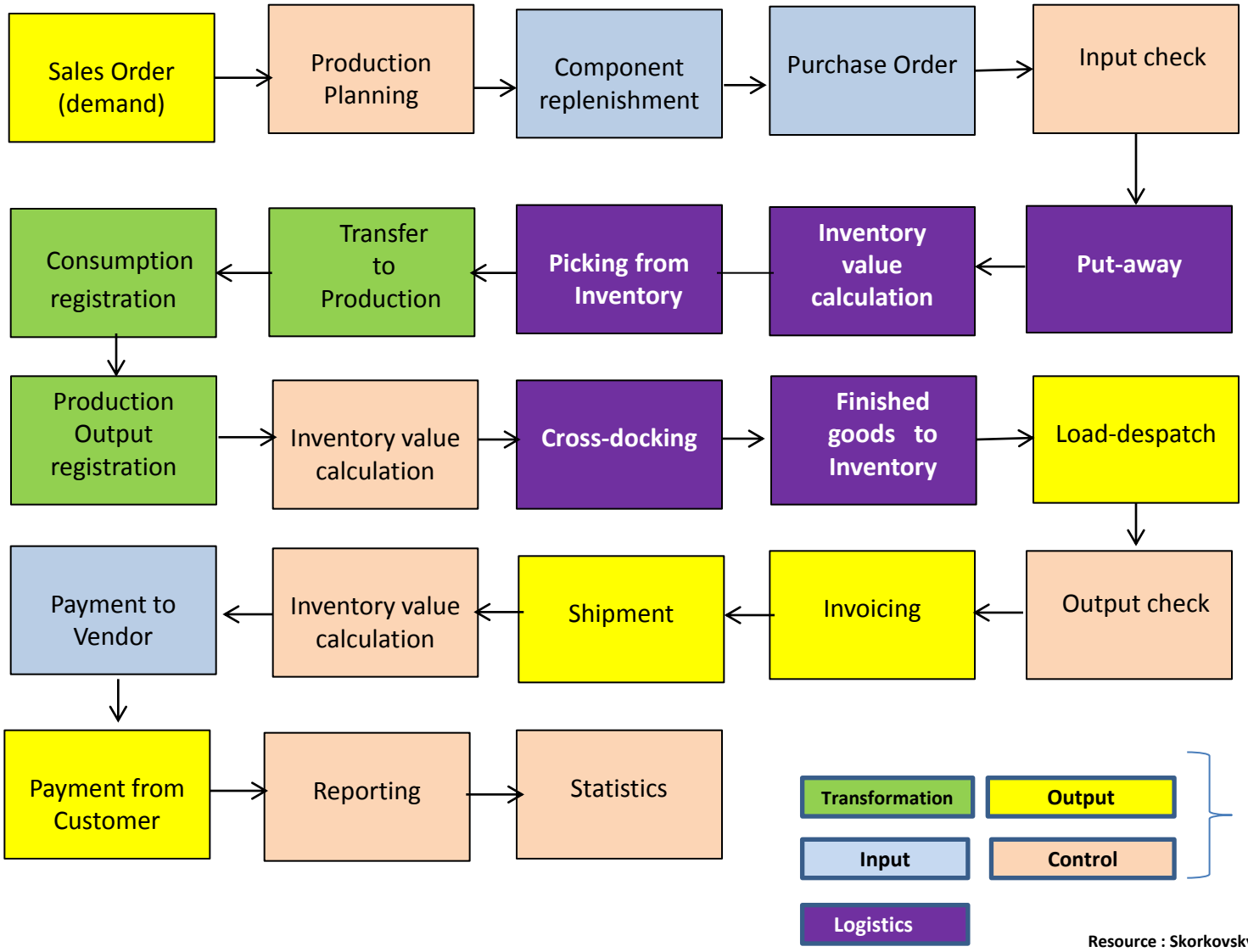
Processing (not organised set of processes, will be presented also as a introduction to project management PWP presentation later)

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

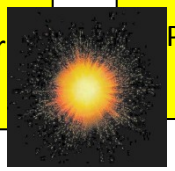
Your main task (to organize processes based on business logic)

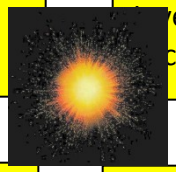


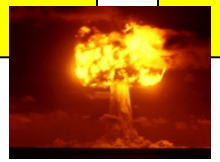
Resource : Skorkovský

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

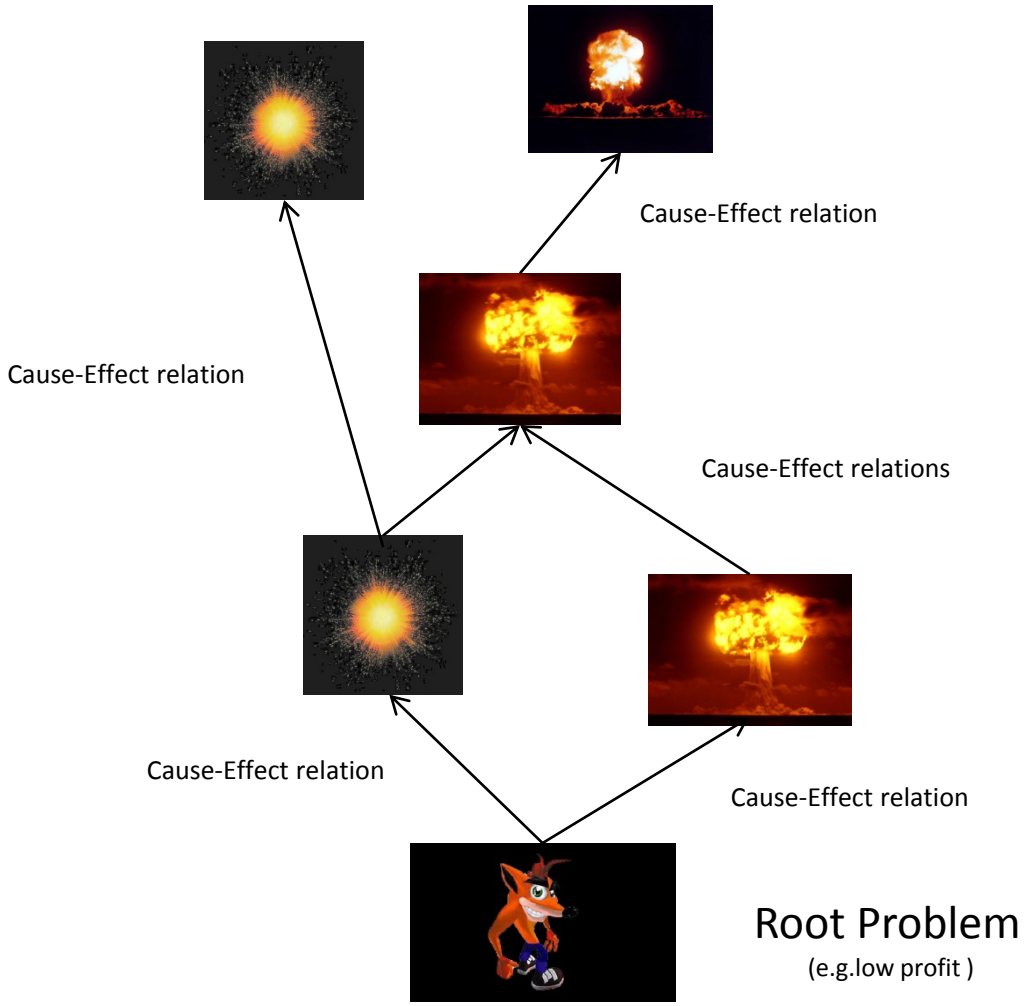
Statistics

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

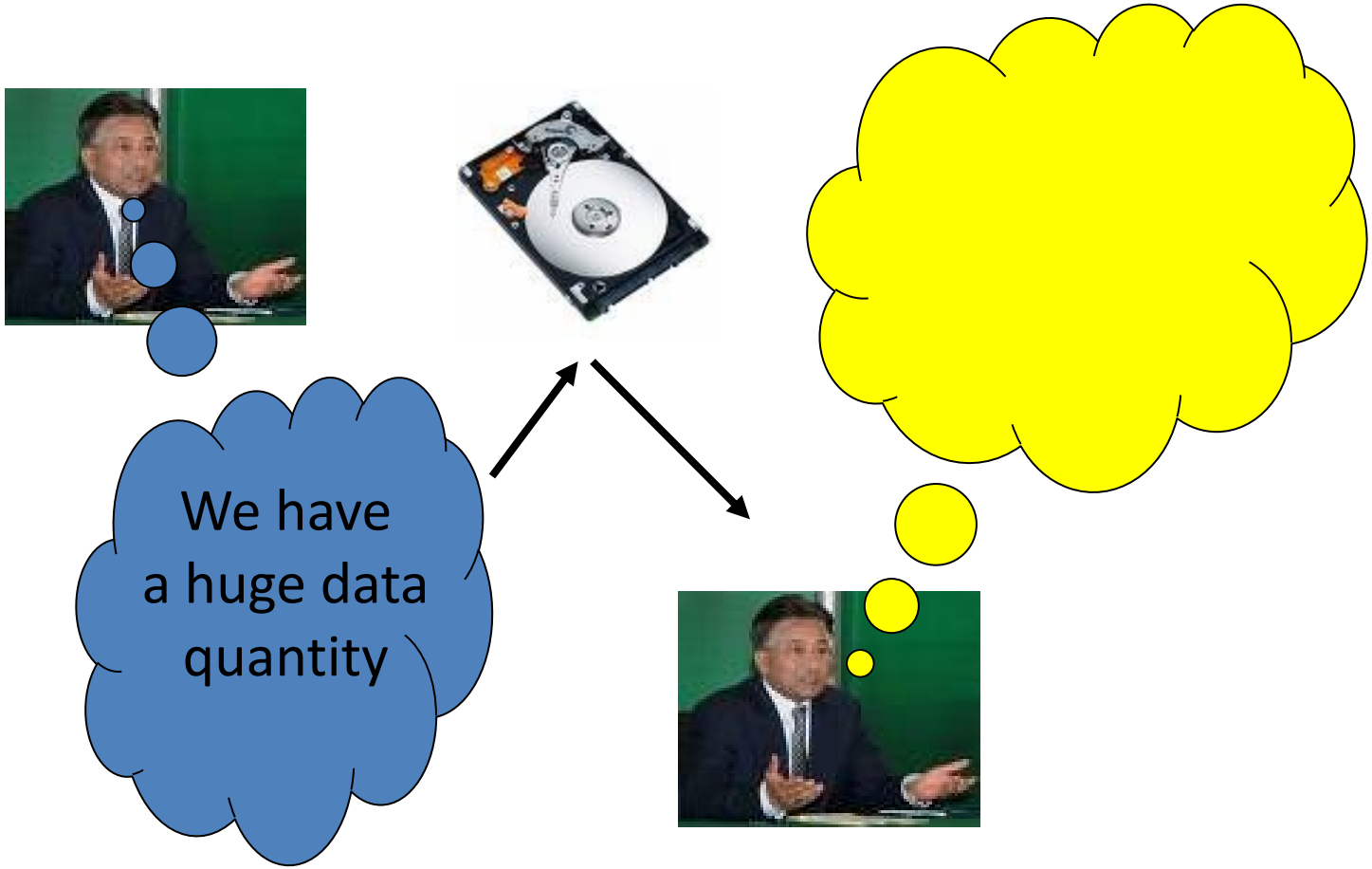
Resource : Skorkovský

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

Big data and analysis problem

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

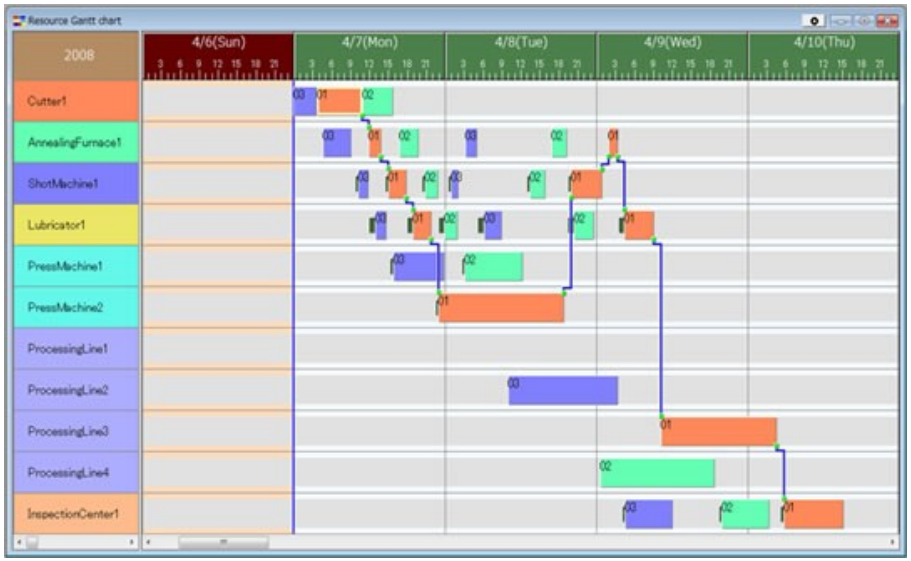
- For **every second** that the Large Hadron Collider at CERN runs an experiment, the instrument can generate 40 terabytes of data.
- For **every 30 minutes** that a Boeing jet engine runs, the system creates 10 terabytes of operations information.
- For a single journey across the Atlantic Ocean, a 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

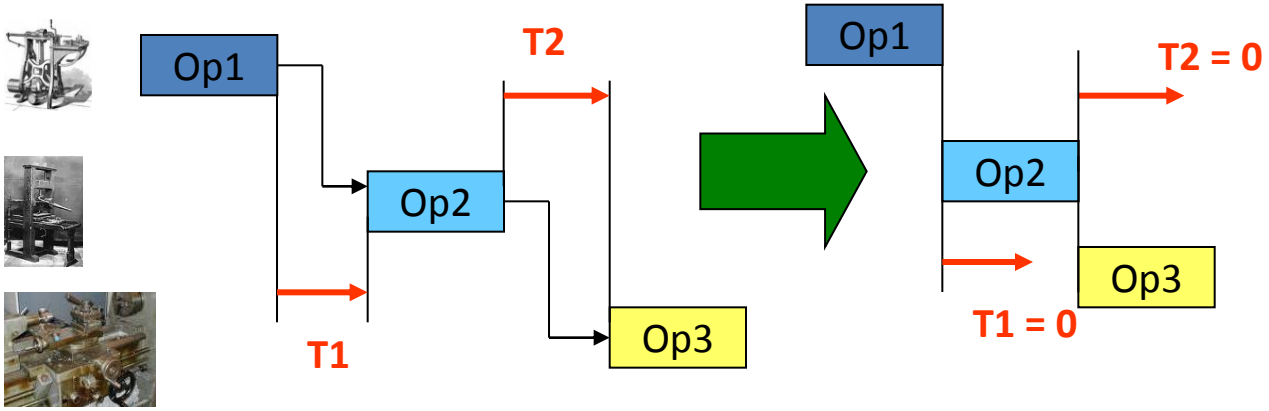
*Basic problem II. (we need reliable data)

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

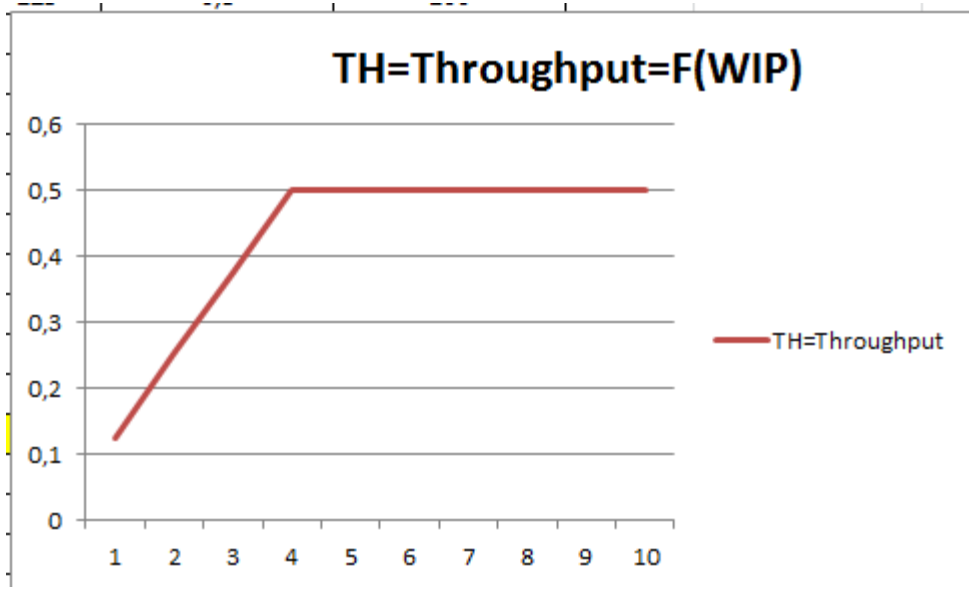


T1+T2=X

Opt=Min(X)



Basic problem III.



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

Basic problem IV.

Black

White

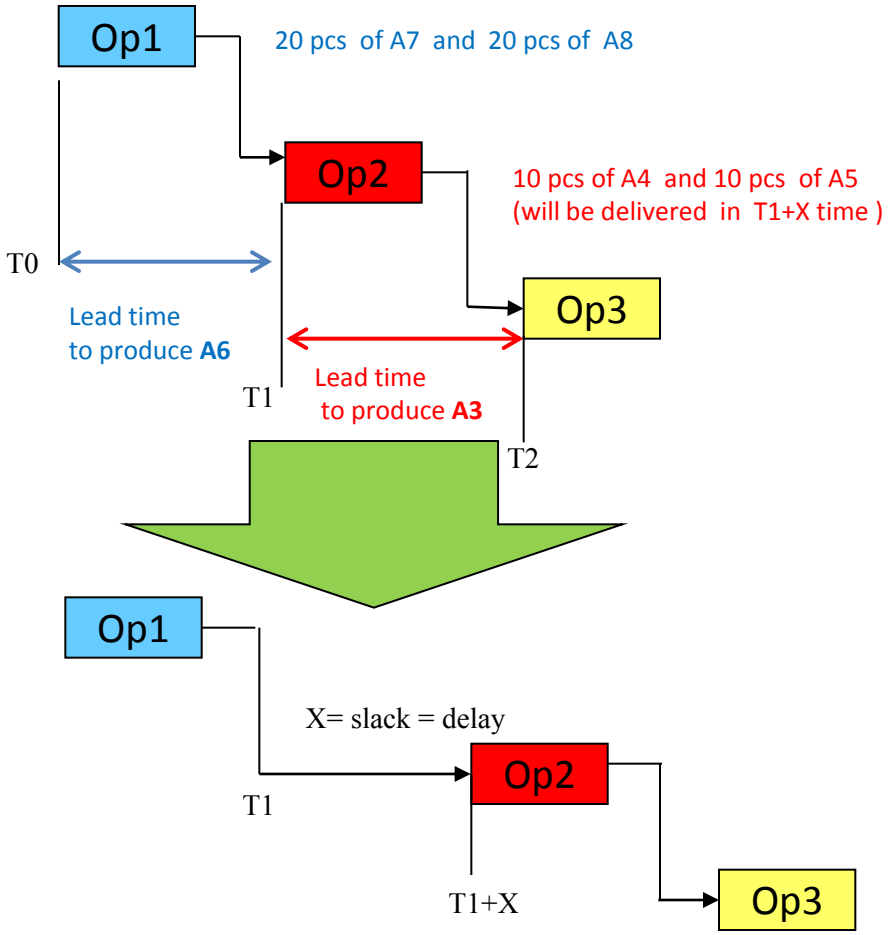
White

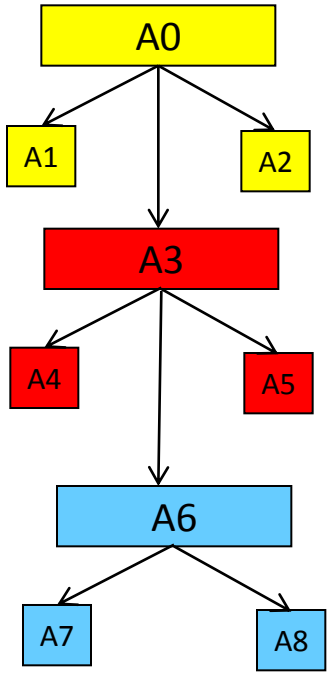
Black

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

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

Basic problem V-I. (availability of components)

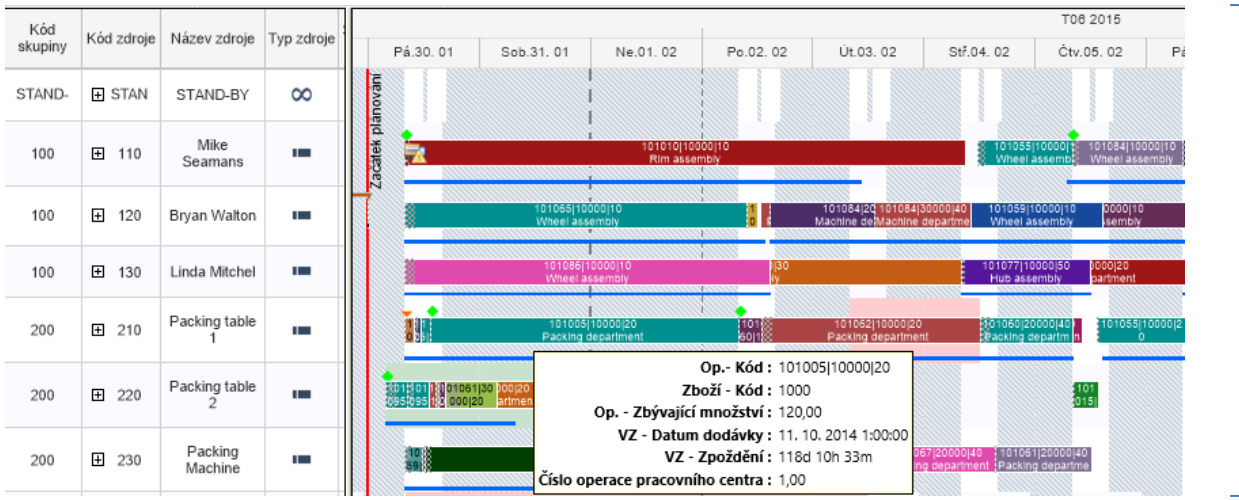




Bill Of Material=BOM
(tree structure)

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)



Prod. Order Routing

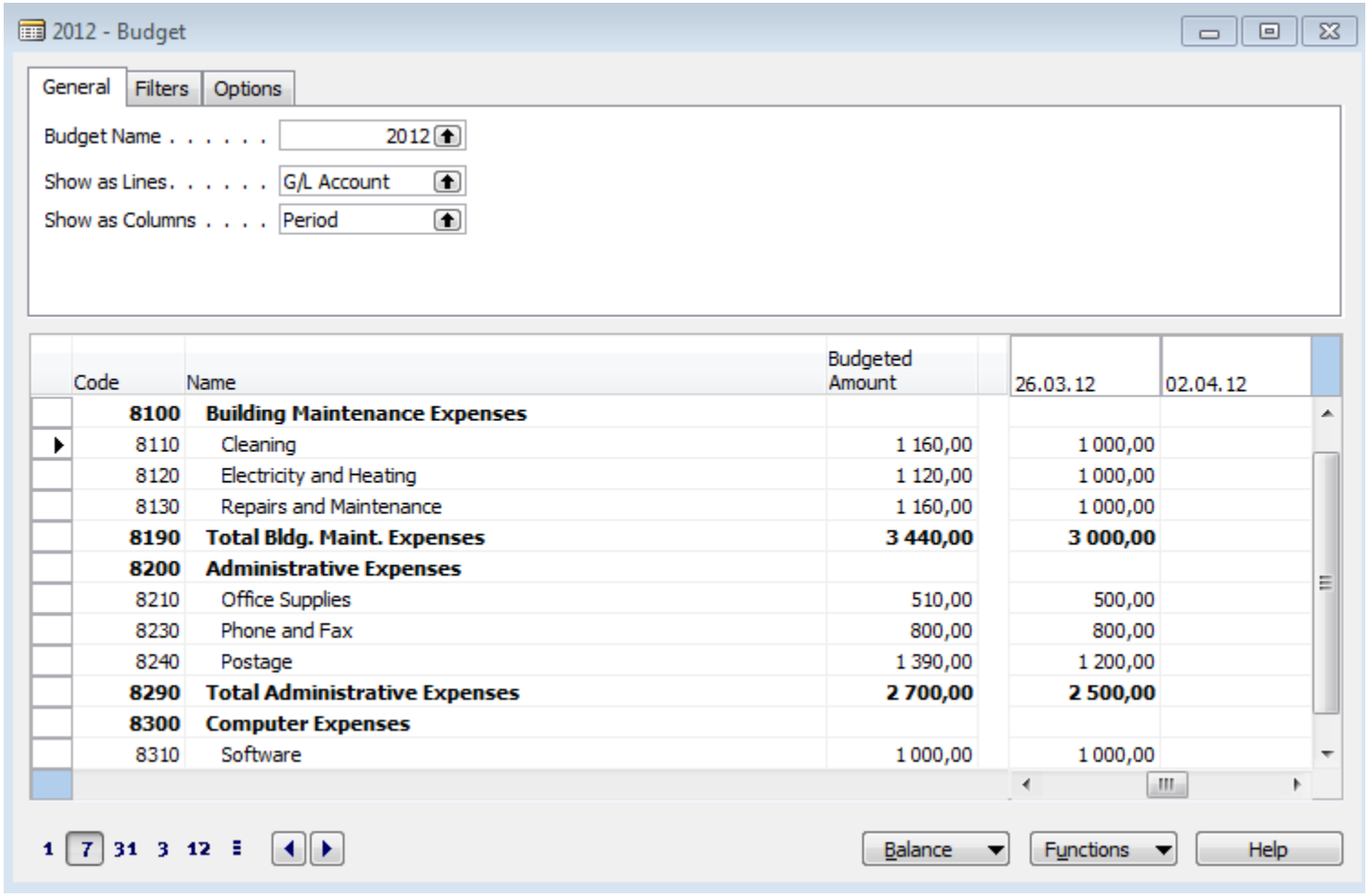
Type to filter (F3) | Prod. Order No.

Filter: Firm Planned • 101005 • 10000 • 1

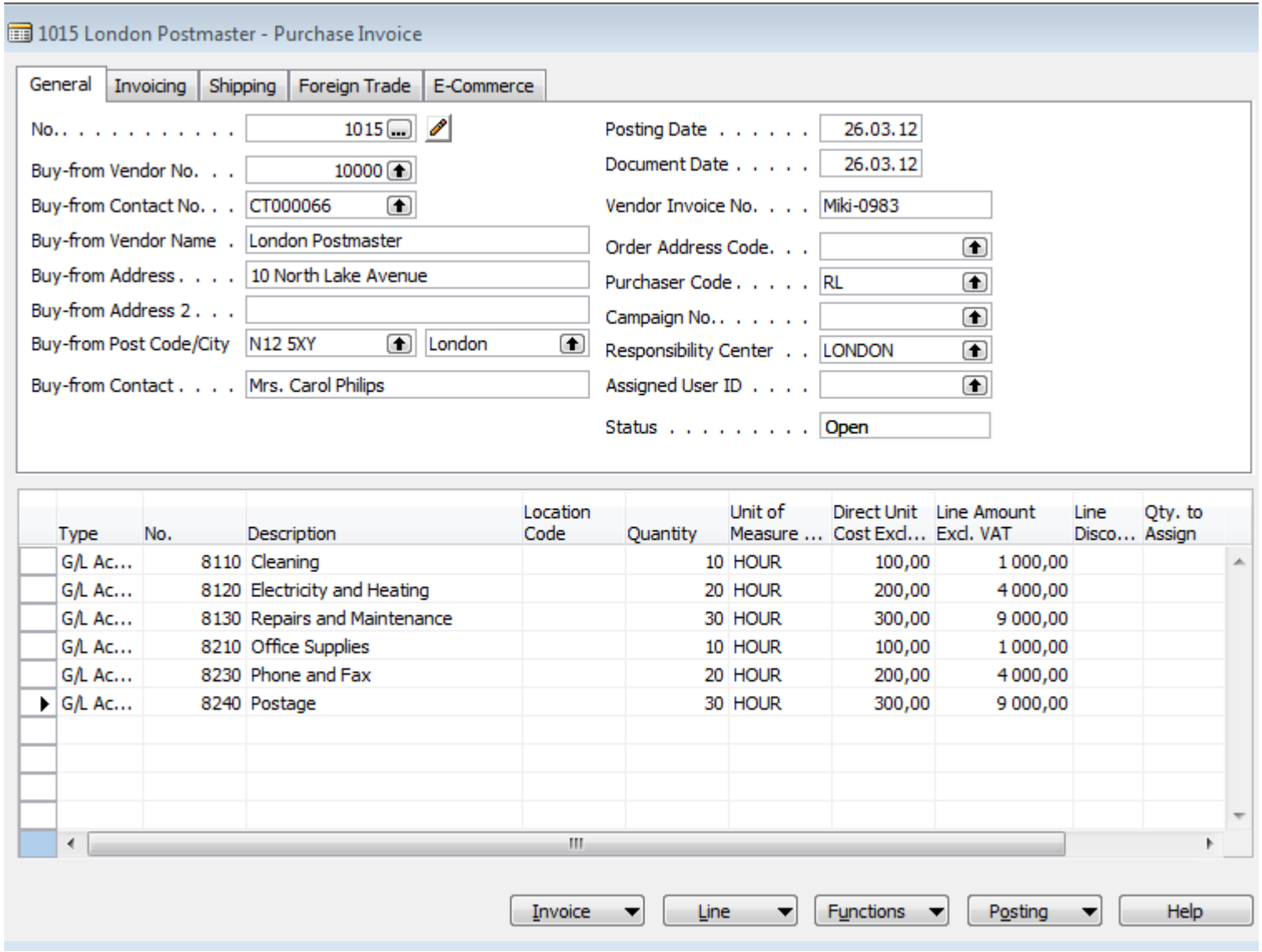
Operati... No.	Type	No.	Description	Starting Date-Time	Ending Date-Time	Setup Time	Run Time	Material Fixed Date
10	Work Center	100	Wheel assembly	18. 8. 2014 14:41	22. 8. 2014 8:31	110	12	23. 8. 2014 0:00
20	Work Center	200	Packing department	27. 8. 2014 8:31	1. 9. 2014 14:46	15	15	10. 9. 2014 0:00
30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

Basic problem VI-I. (over budget)



Basic problem VI-II. (over budget)



Basic problem VI-III. (over budget)