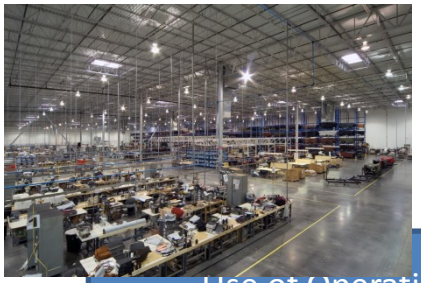
Operation Management (OM) Introduction

Ing.J.Skorkovský, CSc,
Department of Corporate Economy
FACULTY OF ECONOMICS AND ADMINISTRATION
Masaryk University Brno
Czech Republic

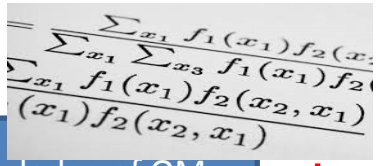
Coordinates – již bylo prezentováno

- **Lecturer :** Ing.Jaromír Skorkovský, CSc.
  - Department of Corporate Economy (5th floor)
  - miki@econ.muni.cz
  - +420 731113517
- **Study material :** will be updated regularly (is.muni.cz)
- **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 (pouze MKH-RIOP)** : will assigned after some theory will be presented. Accepted seminar work is the second condition to be admitted to exam)
- **Tuition plan :** at the **end** of this slide show

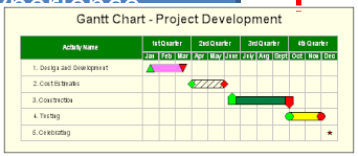
What is going on ?

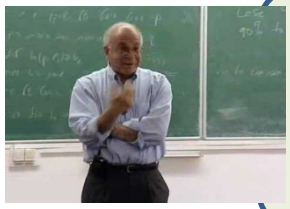


Use of Operations Management (OM) in external environment **(main target)**



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

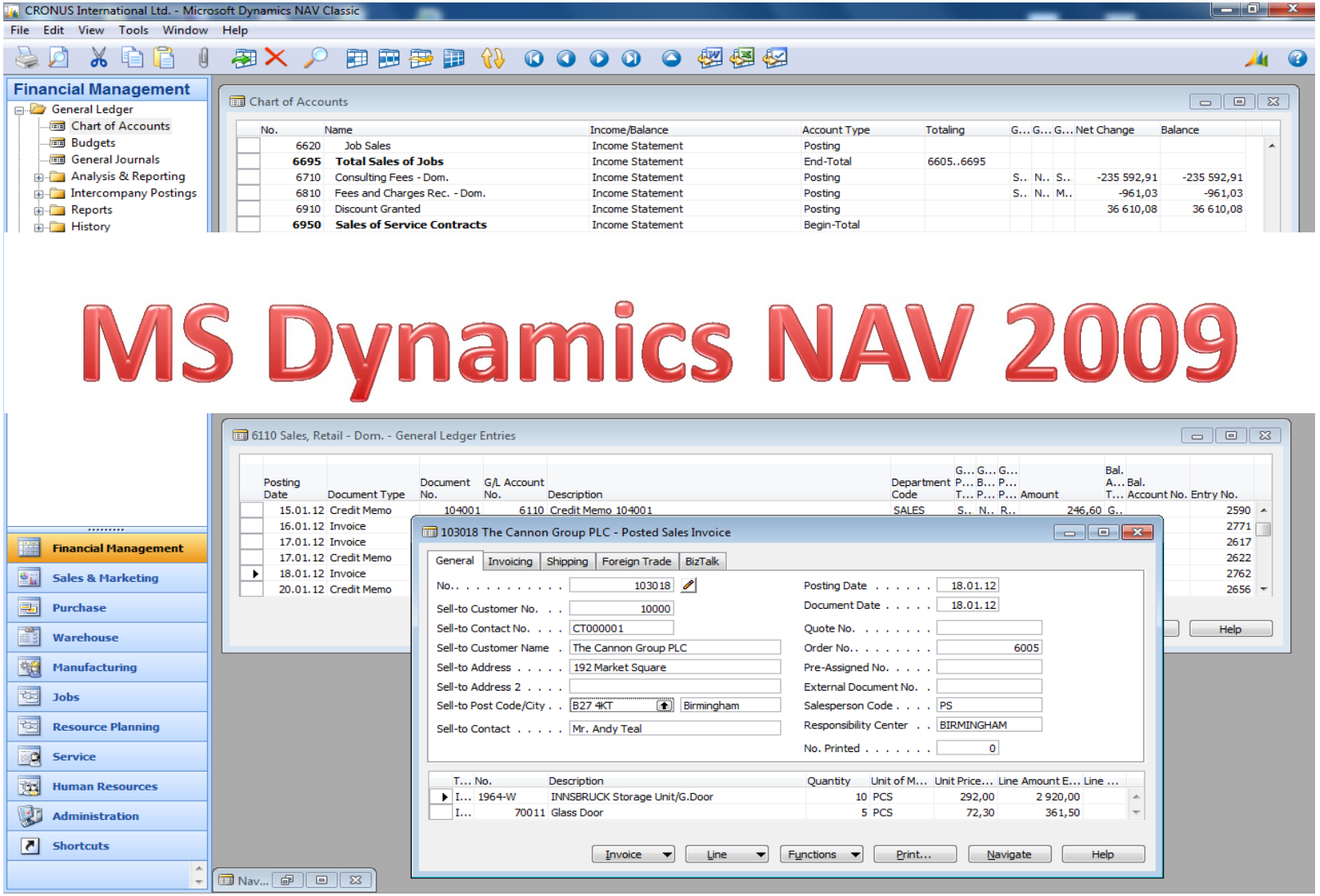
MRP, JIT, APS, Lean Manufacturing, Little´s law

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

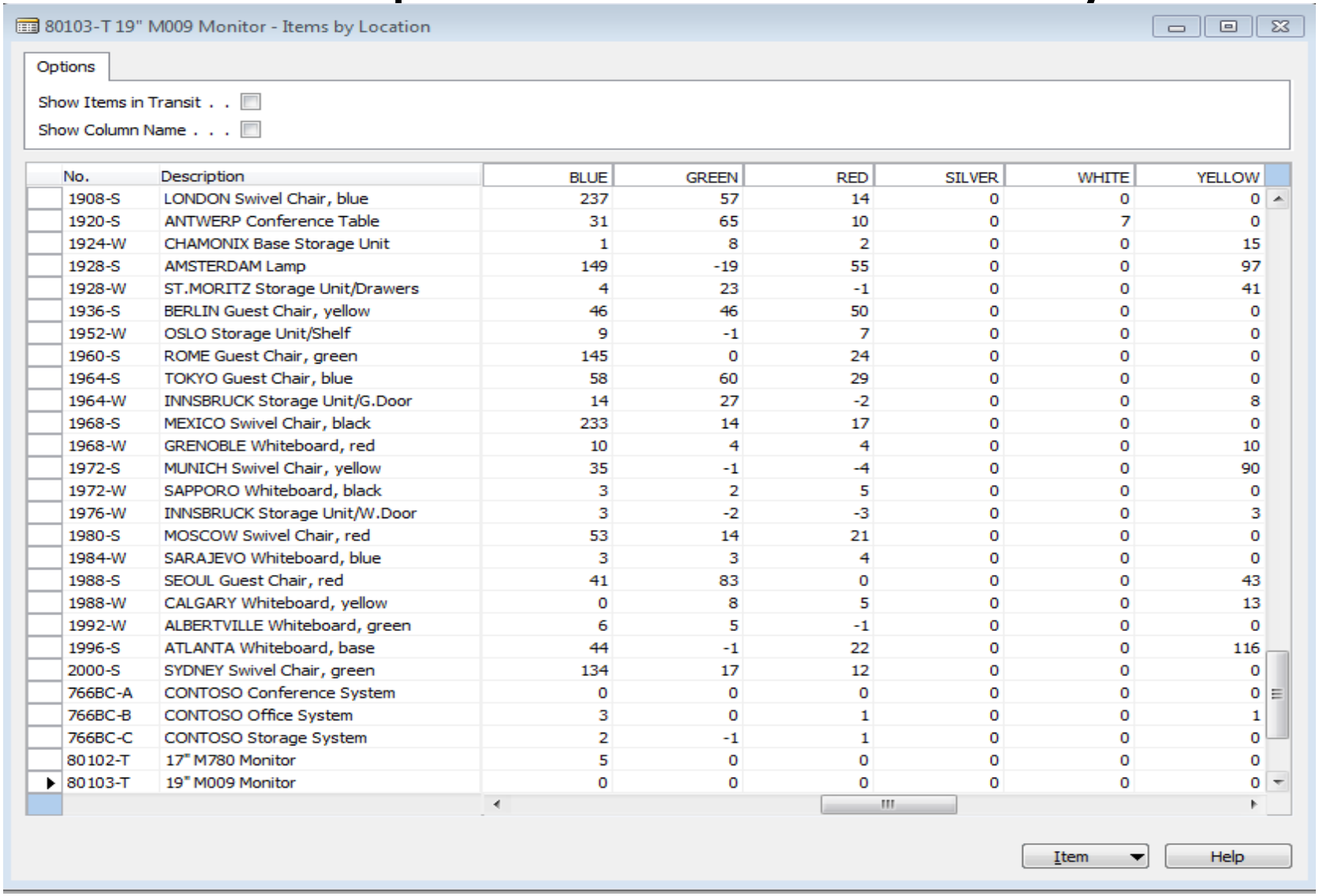
Some OM methods

- Theory of Constraints
- Balanced Scorecard
- Project Management methods (Critical Chain, SCRUM,…)
- Material Requirement Planning and Just-in-Time
- Advanced Planning and Scheduling
- Six Sigma – quality management
- Boston, SWOT and Magic Quadrant Matrices
- Little ´s Law (relations between WIP, Throughput and Cycle time)
- Linear programming (cutting, blending,..)
- Yield Management
- Kepner-Tregoe (support of decision making)

Some tools


CRONUS International Ltd. - Microsoft Dynamics NAV Classic
File Edit View Tools Window Help
Financial Management
General Ledger
Chart of Accounts
Budgets
General Journals
Analysis & Reporting
Intercompany Postings
Reports
History
Chart of Accounts
No. Name Income/Balance Account Type Totaling Net Change Balance
6620 Job Sales Income Statement Posting
6695 Total Sales of Jobs Income Statement End-Total 6605..6695
6710 Consulting Fees - Dom. Income Statement Posting -235 592,91 -235 592,91
6810 Fees and Charges Rec. - Dom. Income Statement Posting -961,03 -961,03
6910 Discount Granted Income Statement Posting 36 610,08 36 610,08
6950 Sales of Service Contracts Income Statement Begin-Total
MS Dynamics NAV 2009
6110 Sales, Retail - Dom. - General Ledger Entries
Posting Date Document Type Document No. G/L Account No. Description Department Code Amount Bal. Account No. Entry No.
15.01.12 Credit Memo 104001 6110 Credit Memo 104001 SALES 246,60 2590
16.01.12 Invoice 2771
17.01.12 Invoice 2617
17.01.12 Credit Memo 2622
18.01.12 Invoice 2762
20.01.12 Credit Memo 2656
Help
Financial Management
Sales & Marketing
Purchase
Warehouse
Manufacturing
Jobs
Resource Planning
Service
Human Resources
Administration
Shortcuts
103018 The Cannon Group PLC - Posted Sales Invoice
General Invoicing Shipping Foreign Trade BizTalk
No. 103018
Sell-to Customer No. 10000
Sell-to Contact No. CT000001
Sell-to Customer Name The Cannon Group PLC
Sell-to Address 192 Market Square
Sell-to Address 2
Sell-to Post Code/City B27 4KT Birmingham
Sell-to Contact Mr. Andy Teal
Posting Date 18.01.12
Document Date 18.01.12
Quote No.
Order No. 6005
Pre-Assigned No.
External Document No.
Salesperson Code PS
Responsibility Center BIRMINGHAM
No. Printed 0
T... No. Description Quantity Unit of M... Unit Price... Line Amount E... Line ...
I... 1964-W INNSBRUCK Storage Unit/G.Door 10 PCS 292,00 2 920,00
I... 70011 Glass Door 5 PCS 72,30 361,50
Invoice Line Functions Print... Navigate Help
Nav...

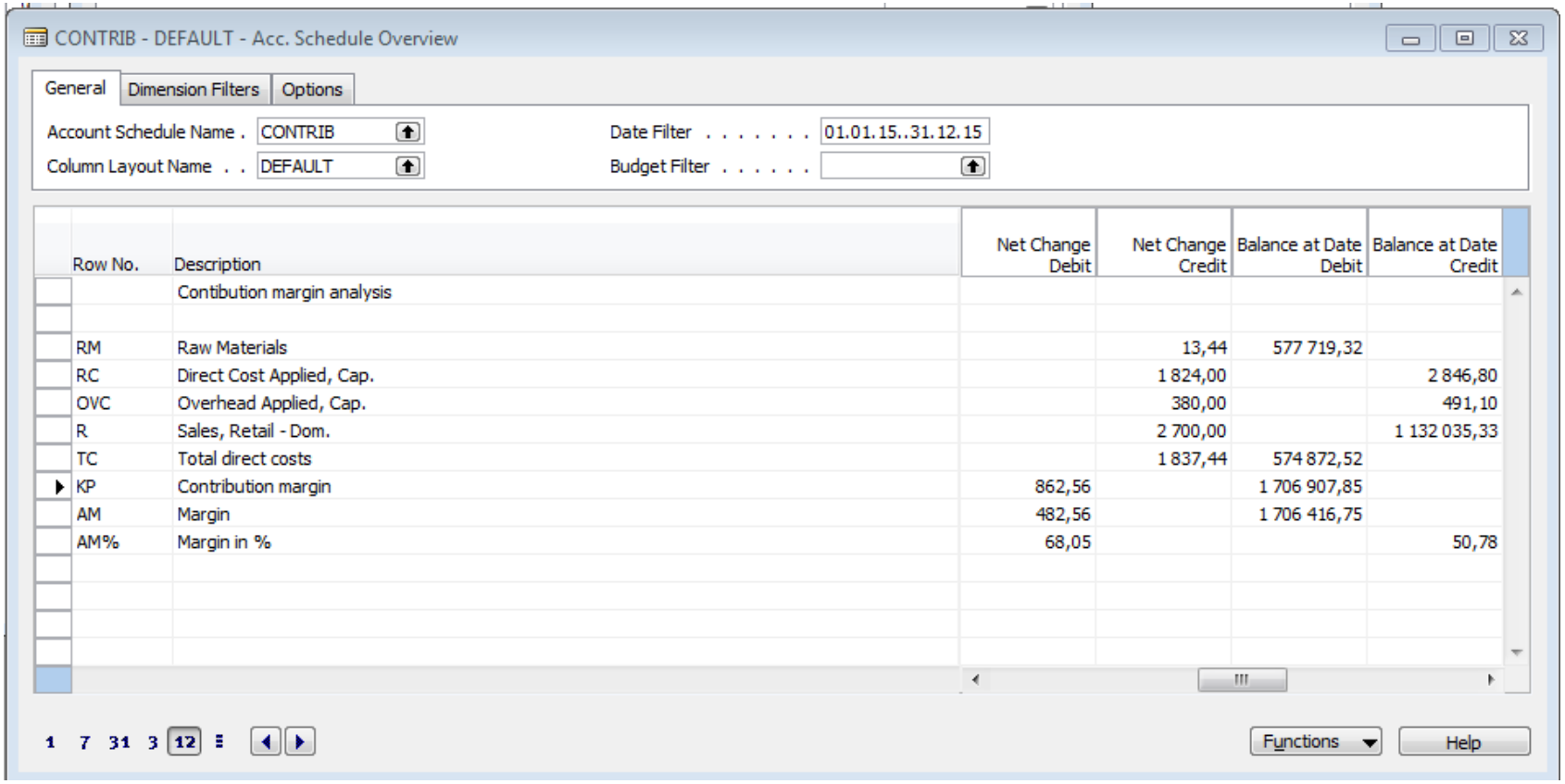
Some basic processes controlled by ERP –I.



No.	Description	BLUE	GREEN	RED	SILVER	WHITE	YELLOW
1908-S	LONDON Swivel Chair, blue	237	57	14	0	0	0
1920-S	ANTWERP Conference Table	31	65	10	0	7	0
1924-W	CHAMONIX Base Storage Unit	1	8	2	0	0	15
1928-S	AMSTERDAM Lamp	149	-19	55	0	0	97
1928-W	ST.MORITZ Storage Unit/Drawers	4	23	-1	0	0	41
1936-S	BERLIN Guest Chair, yellow	46	46	50	0	0	0
1952-W	OSLO Storage Unit/Shelf	9	-1	7	0	0	0
1960-S	ROME Guest Chair, green	145	0	24	0	0	0
1964-S	TOKYO Guest Chair, blue	58	60	29	0	0	0
1964-W	INNSBRUCK Storage Unit/G.Door	14	27	-2	0	0	8
1968-S	MEXICO Swivel Chair, black	233	14	17	0	0	0
1968-W	GRENOBLE Whiteboard, red	10	4	4	0	0	10
1972-S	MUNICH Swivel Chair, yellow	35	-1	-4	0	0	90
1972-W	SAPPORO Whiteboard, black	3	2	5	0	0	0
1976-W	INNSBRUCK Storage Unit/W.Door	3	-2	-3	0	0	3
1980-S	MOSCOW Swivel Chair, red	53	14	21	0	0	0
1984-W	SARAJEVO Whiteboard, blue	3	3	4	0	0	0
1988-S	SEOUL Guest Chair, red	41	83	0	0	0	43
1988-W	CALGARY Whiteboard, yellow	0	8	5	0	0	13
1992-W	ALBERTVILLE Whiteboard, green	6	5	-1	0	0	0
1996-S	ATLANTA Whiteboard, base	44	-1	22	0	0	116
2000-S	SYDNEY Swivel Chair, green	134	17	12	0	0	0
766BC-A	CONTOSO Conference System	0	0	0	0	0	0
766BC-B	CONTOSO Office System	3	0	1	0	0	1
766BC-C	CONTOSO Storage System	2	-1	1	0	0	0
80102-T	17" M780 Monitor	5	0	0	0	0	0
80103-T	19" M009 Monitor	0	0	0	0	0	0

Used abbreviations : **EOQ** – Economic Order Quantity; **ROP** – Reorder Point; **MRP** –Material Requirement Planning; **COGS** – Cost of Good Sold

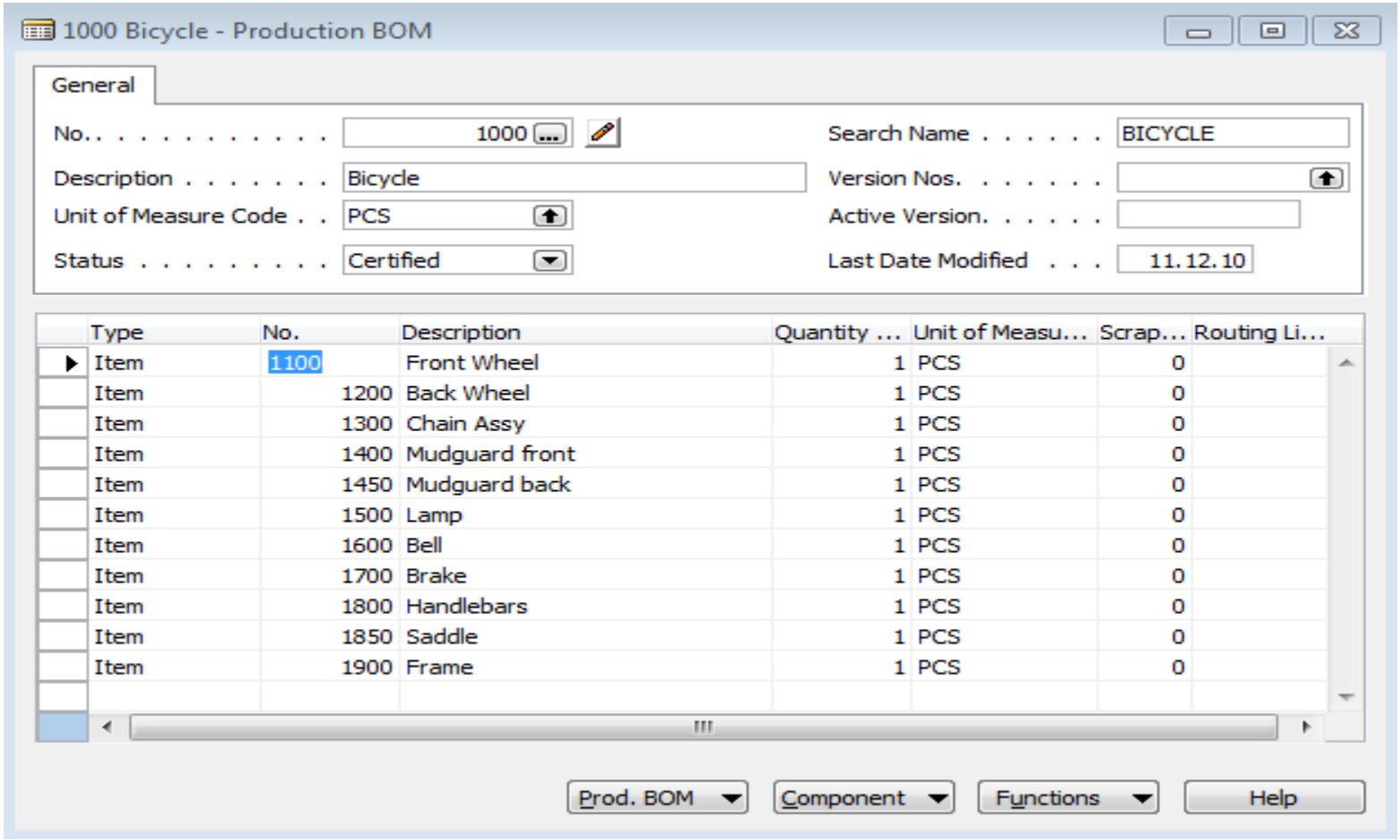
Some basic processes controlled by ERP –II.



Row No.	Description	Net Change Debit	Net Change Credit	Balance at Date Debit	Balance at Date Credit
	Contibution margin analysis				
RM	Raw Materials		13,44	577 719,32	
RC	Direct Cost Applied, Cap.		1 824,00		2 846,80
OVC	Overhead Applied, Cap.		380,00		491,10
R	Sales, Retail - Dom.		2 700,00		1 132 035,33
TC	Total direct costs		1 837,44	574 872,52	
KP	Contribution margin	862,56		1 706 907,85	
AM	Margin	482,56		1 706 416,75	
AM%	Margin in %	68,05			50,78

Used abbreviations : BS– Balanced Sheet

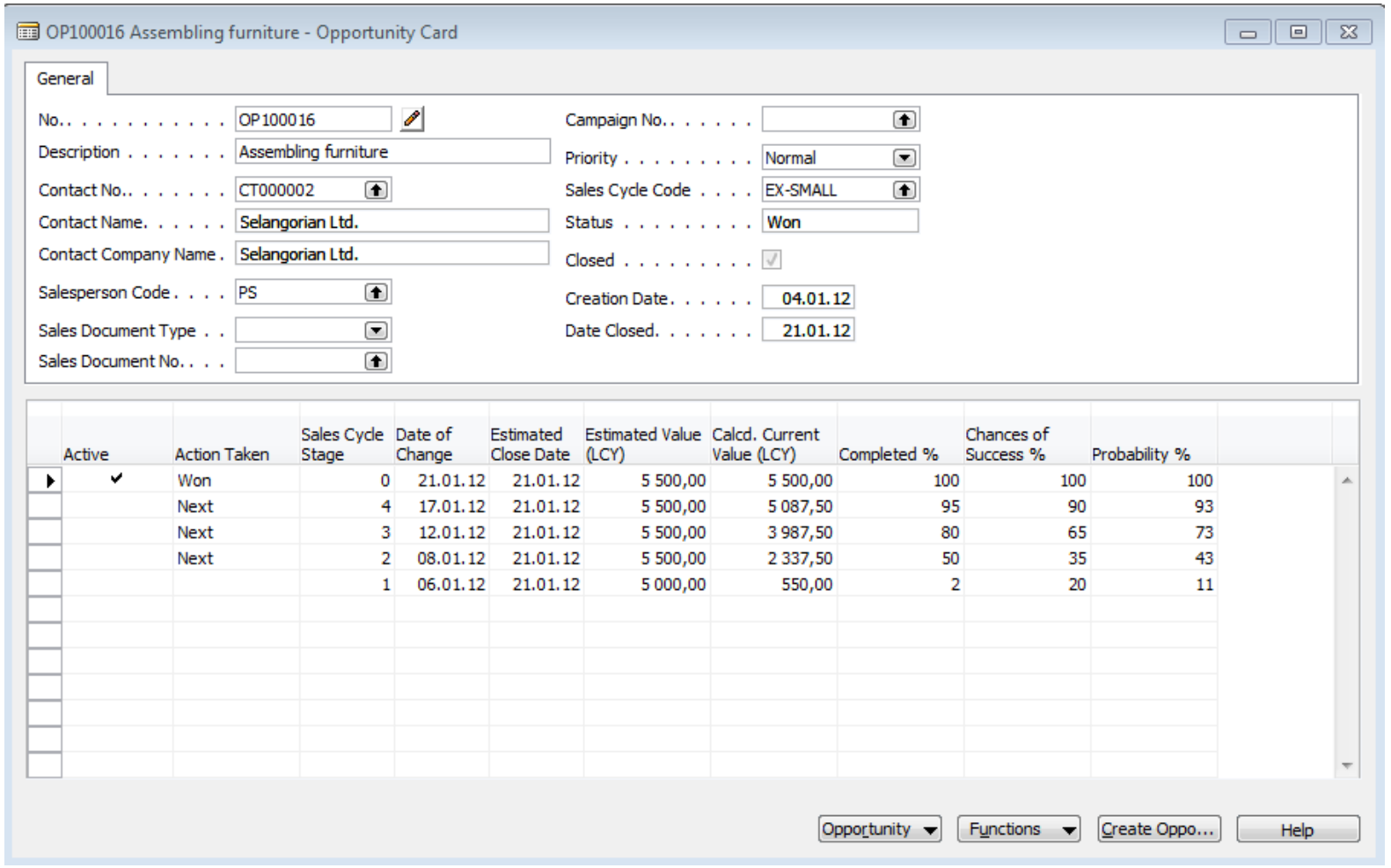
Some basic processes controlled by ERP –III.



BOM=Bill Of Material->Kusovník

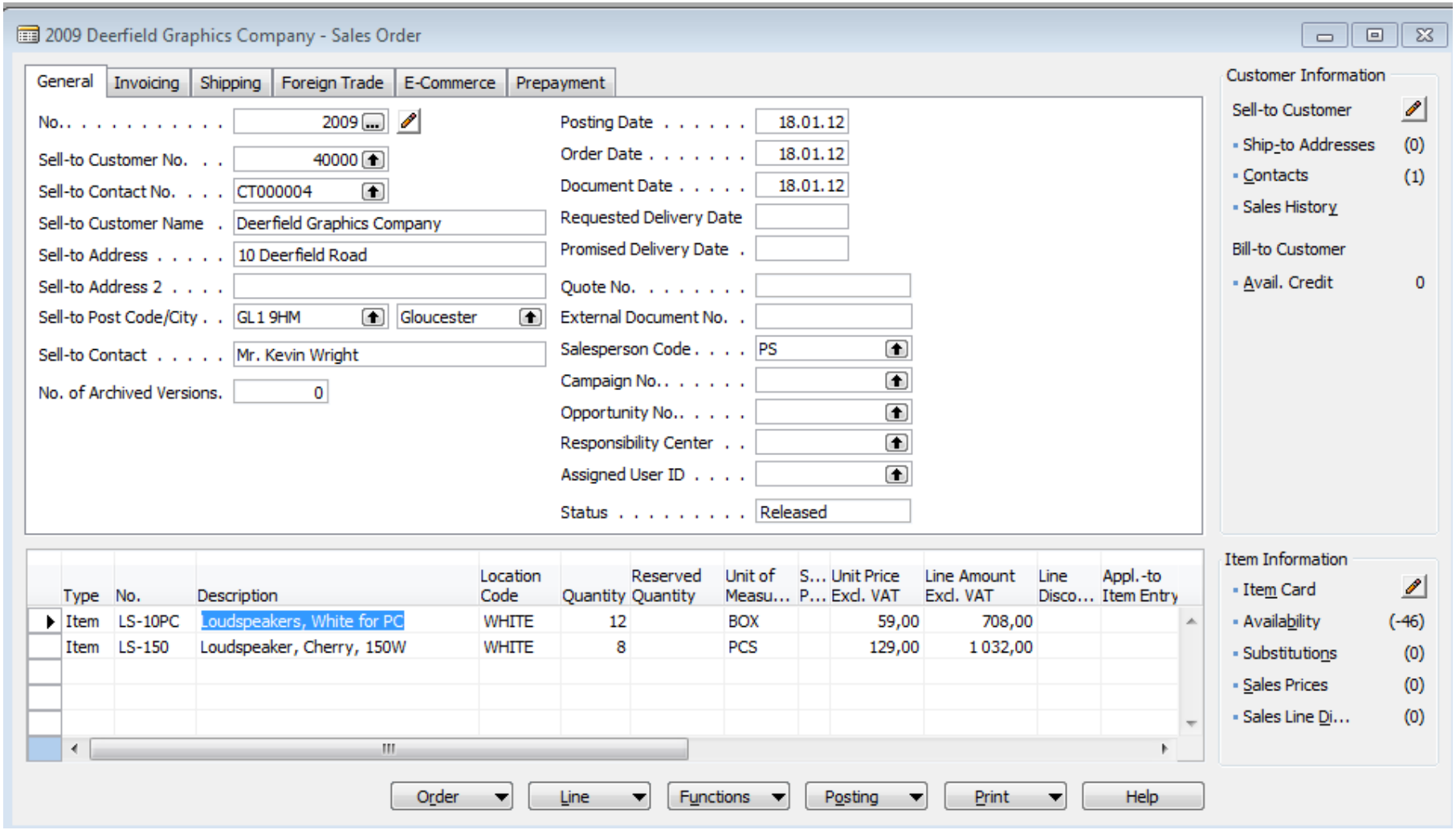
Used abbreviations : **MRP-II –** Manufacturing Resource Planning = MRP+Resource Planning ; **JIT** – Just In Time; **DBR**-Drum-Buffer; **QM**-Quality Management

Some basic processes controlled by ERP –IV.



Used abbreviations : **CRM –** Customer Relationship Management

Some basic processes controlled by ERP –V.



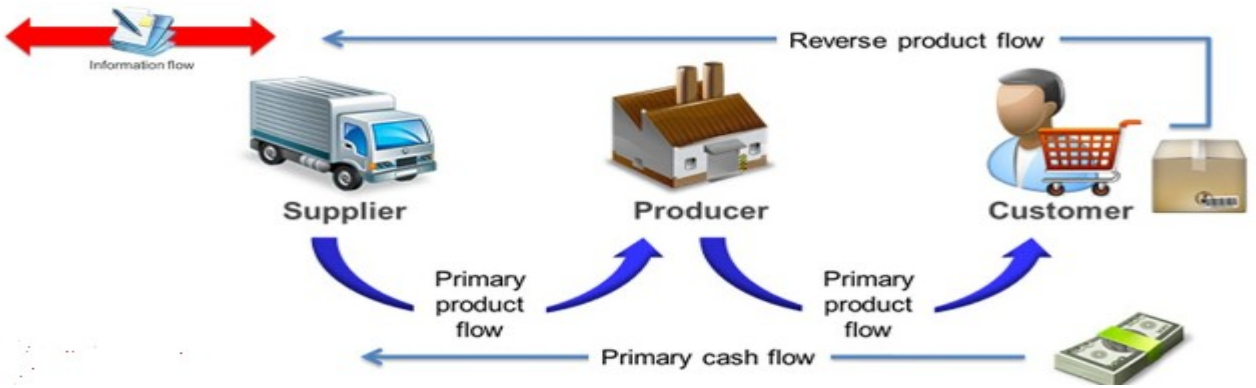
Used abbreviations : **ATP|CTP–** Available to Promise | Capable to Promise, Sales Order->Prodejní objednávka

Controlling processes in Supply Chain Management (SCM)

Planning levels

	Supply	Production	Orders (Demands)
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

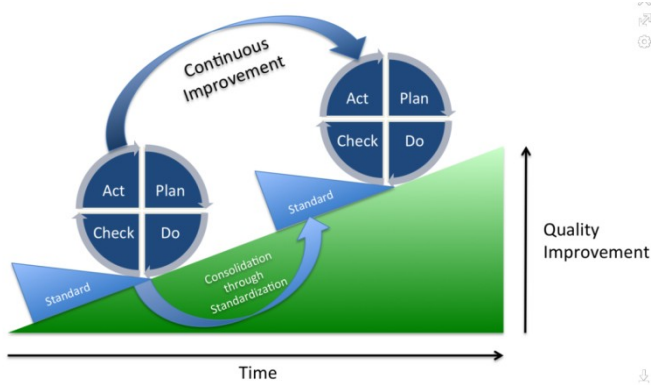
Demand Planning



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

Deming cycle (PDCA) (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 Constraints)

Do: Develop and implement a solution; decide upon a measurement to gauge 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

Simple example of Deming cycle **(home study)**

Plan*:* Excessively high value of the stock, which is one of the reasons of low liquidity of our company (converting assets to cash)= **problem's root cause** detected by use of TOC=Theory of Constraints and Current Reality Tree (will be presented later)

Do: Implement algorithm controlling stock replenishment based on MRP principle and ROP and **Safety Stock** level setup. Metrix for effectiveness will be I**nventory Dollar Days (IDD) -** which is one of TOC metrics (will be mentioned during the course)

Check: **ERP** inventory costing routines before and after implementation of stage **Do** application

Act: Document the results, inform others about process changes, and recommend how to continue in inventory management routines (e.g. use of EAN readers or calculation of **inventory service level** in order to speed up inventory procedures such as put-away and pick or optimize inventory level differently) in the next PDCA cycle.

Used abbreviations : **MRP** – Material Requirement Planning – will be presented; **ROP** – Reorder Point –see next slide); **ERP**- see slide number 12

IDD definition : https://elischragenheim.com/2016/05/23/throughput-dollar-days-tdd-and-inventory-dollar-days-idd-the-value-and-limitations/

Explanation of some terms used in PDCA Deming Cycle simple example (home study) I.

- **Service level** :represents the expected probability of not hitting a **stock-out.** This percentage is required to compute the safety stock.

Intuitively, the service level represents a trade-off (compromise) between the cost of inventory and the cost of stock-outs (which incur missed sales, lost opportunities and client frustration among others).

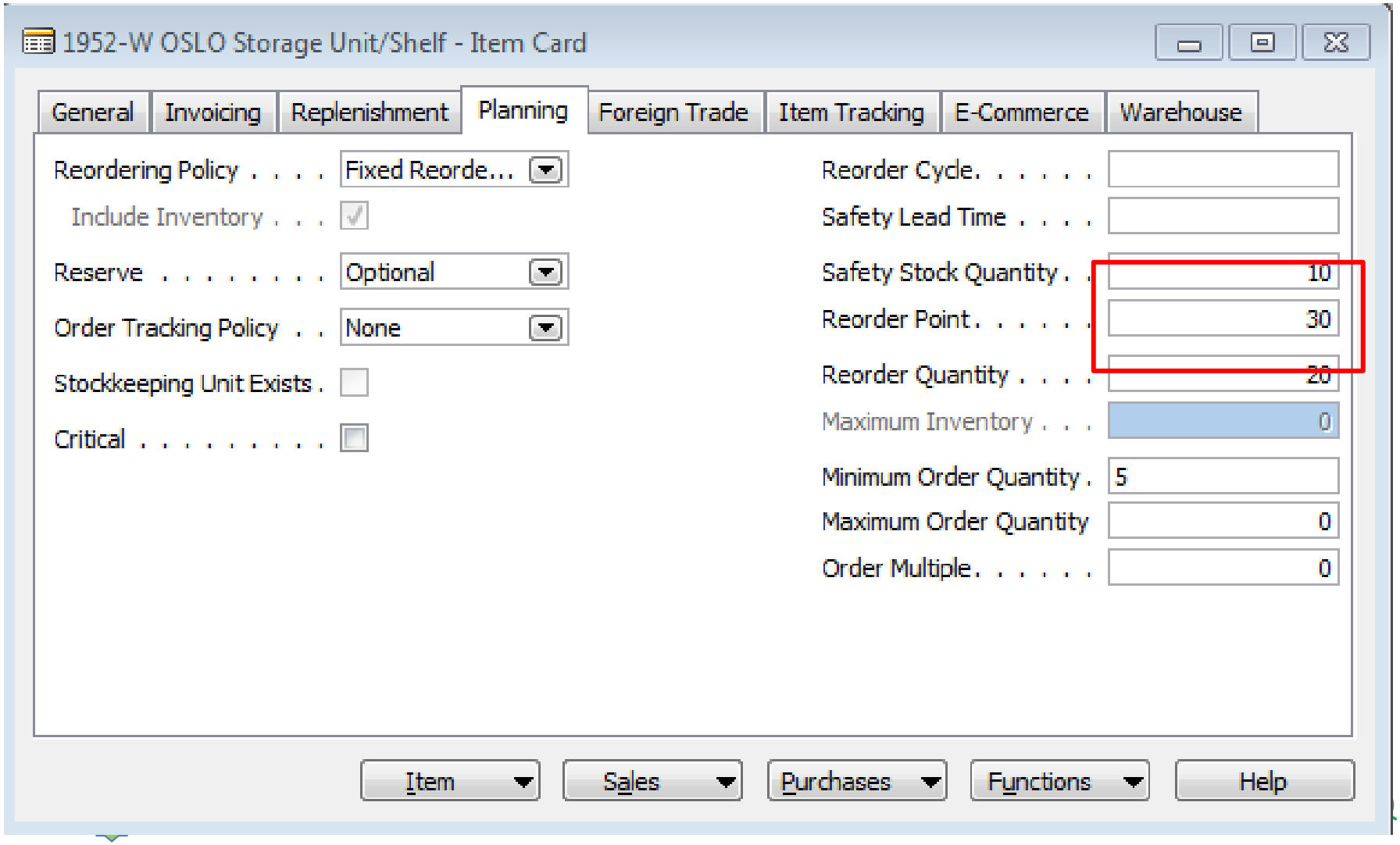
$$p = \Phi\left(\sqrt{2\ln\left(\frac{1}{\sqrt{2\pi}}\frac{M}{H}\right)}\right)$$

M - stock-out cost (often 3 time the gross margin)
H - carrying cost per unit for the duration of the lead time

1litr milk pack -> 1.50€ selling price, 10% margin -> =0,15 €. Lead time = 4 days.
The annual carrying cost is 1.50 € (the value is high because milk is a highly perishable product).
Stock-out cost ->3 time the gross margin, that is to say->M= 0.45€= 3*0,15 €
H=(4/365)x 1.5≈0.0055 -> H≈0.0055 . So p=98,5%

Resource: https://www.lokad.com/service-level-definition-and-formula
Lead time = Průběžný čas (bude mnohokrát v kurzu použito)

Explanation of some terms used in PDCA Deming Cycle simple example (home study) II.



Used abbreviations : **EOQ** – Economic Order Quantity – will be explained during this course in ERP section

Another point of view I.

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

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

SCRUM | **CONWIP** | **Logistics** | Pareto, Ishikawa | Product Life Cycle | Kepner-Tregoe

EOQ | Six Sigma | Yield management | Hurwitz

ABC | Prospect Theory

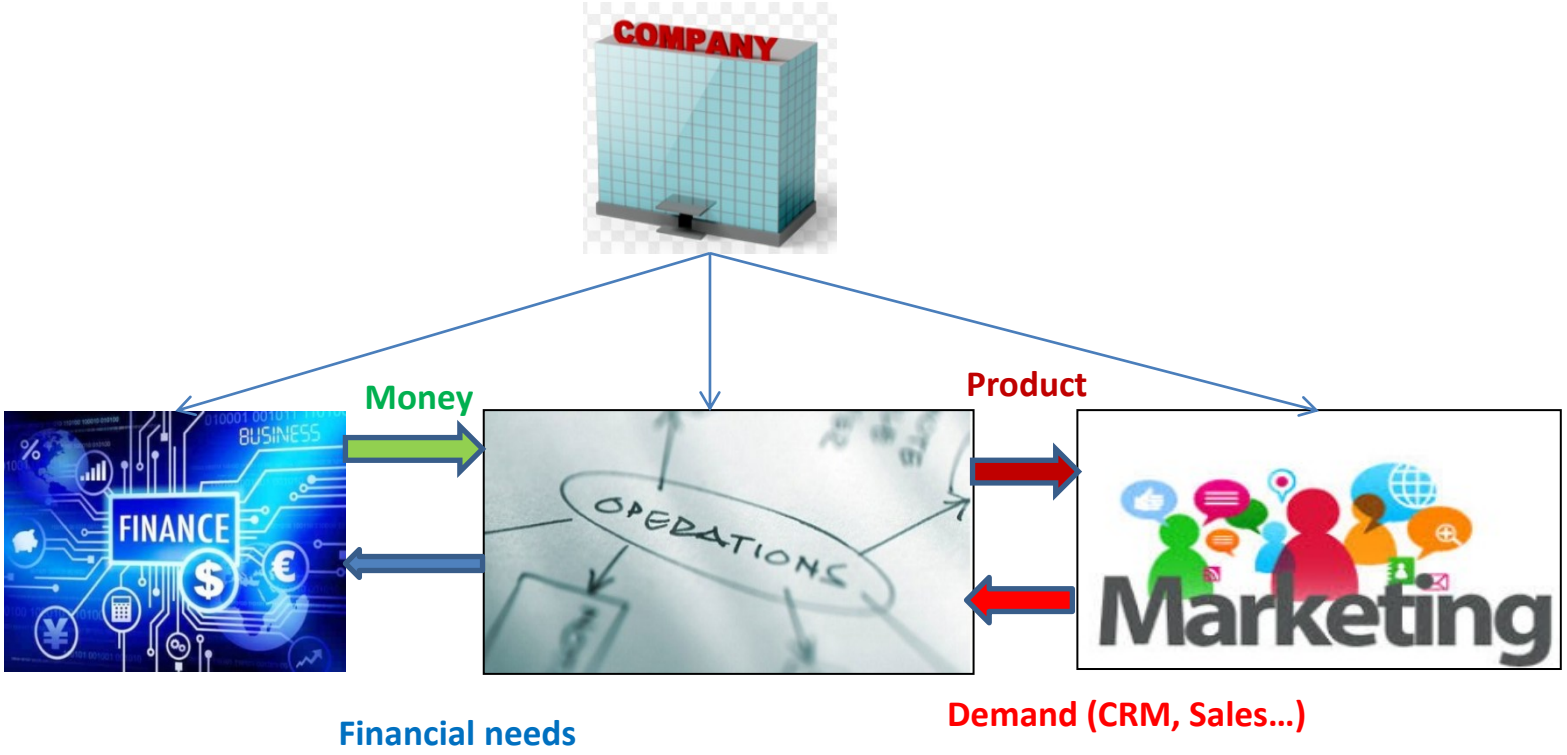
LEAN

Little´s law

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

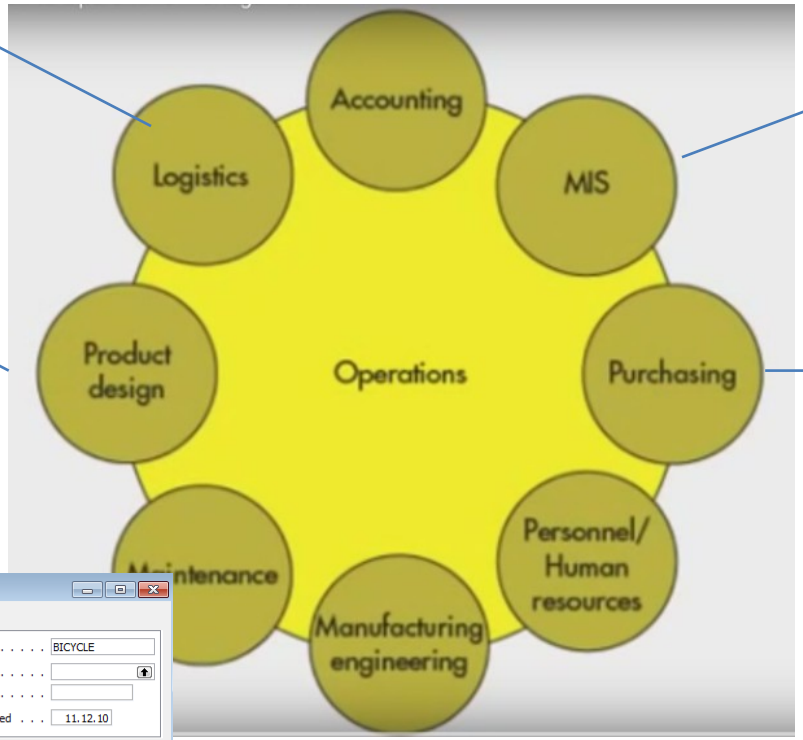
Used abbreviations : QM– Quadrant Matrix; **CONWIP –** Constant Work in Progress; **EOQ** – Economic Order Quantity ; **MRP** - Material Requirement Planning

Another point of view II.



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

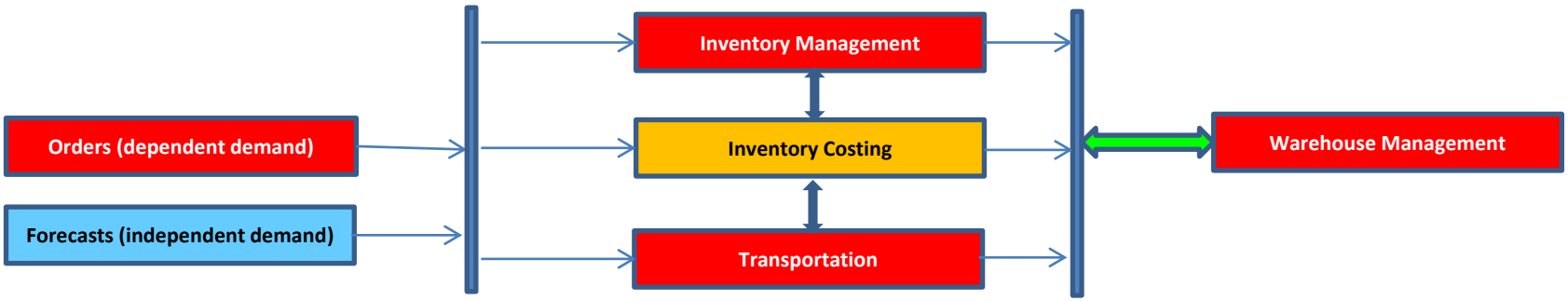
No.	1000	Search Name	BICYCLE
Description	Bicycle	Version Nos.	
Unit of Measure Code	PCS	Active Version.	
Status	Certified	Last Date Modified	11.12.10

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

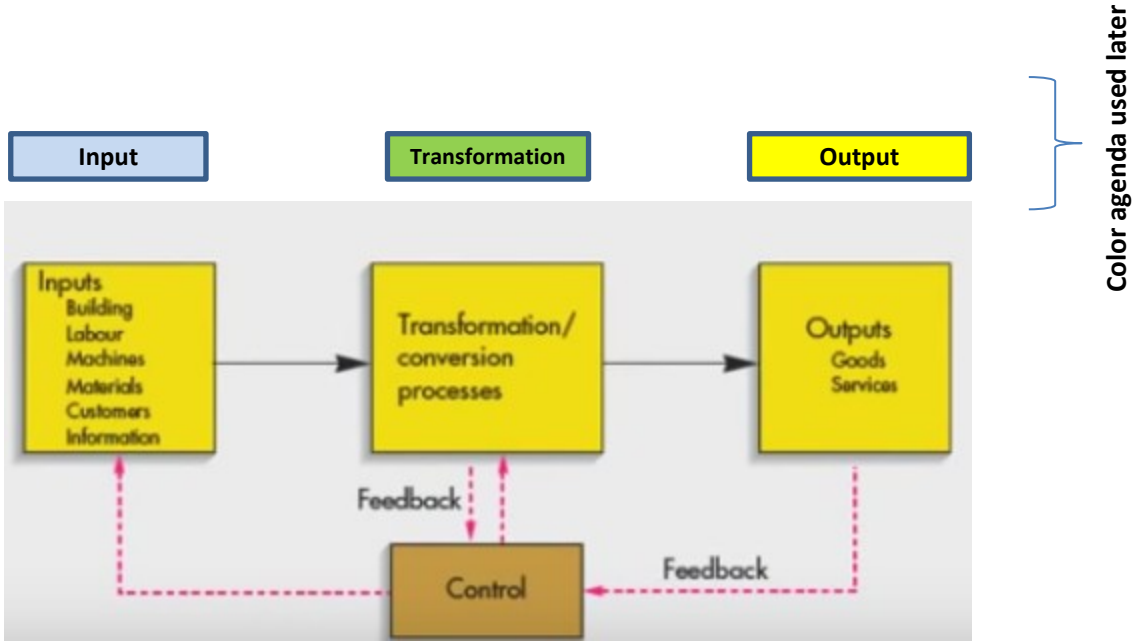
Bill of material

Function block Logistic-simplified



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

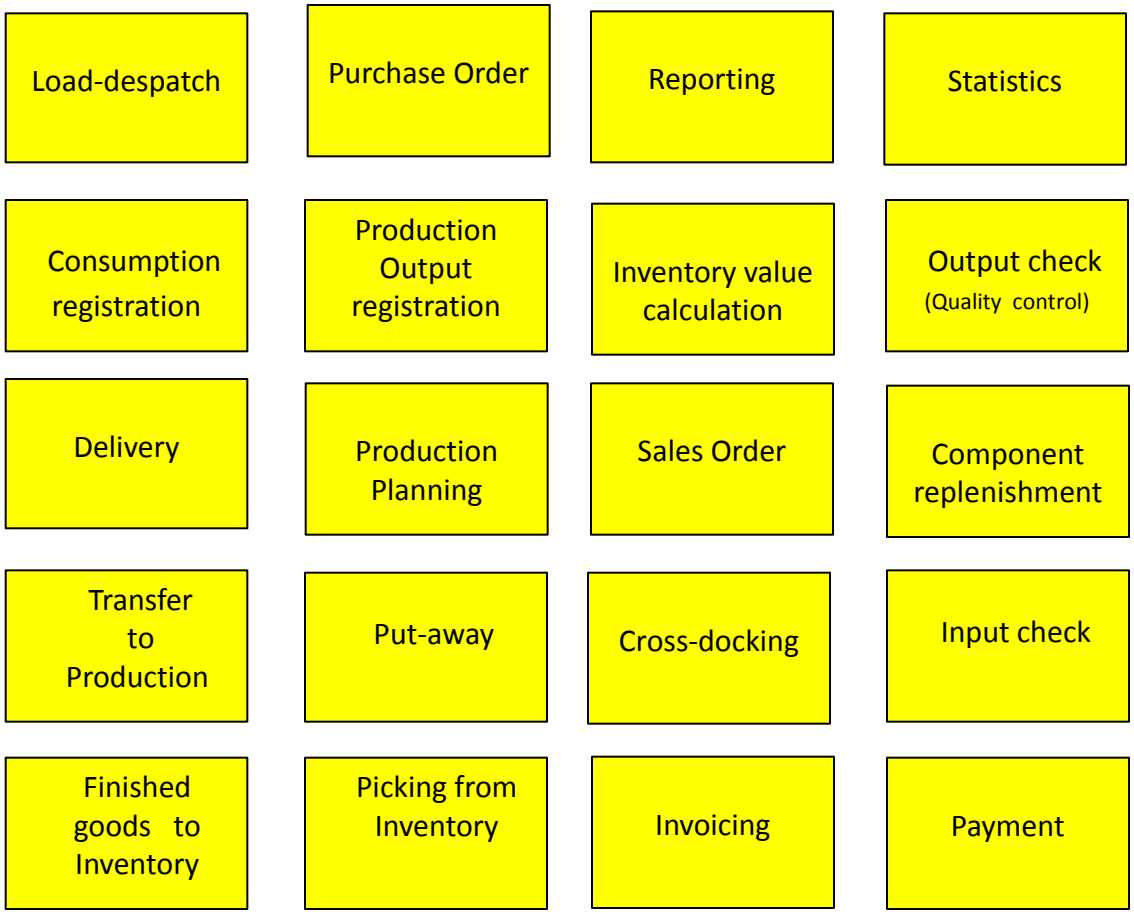
Procedures-simplified (feedback)



Color agenda used later

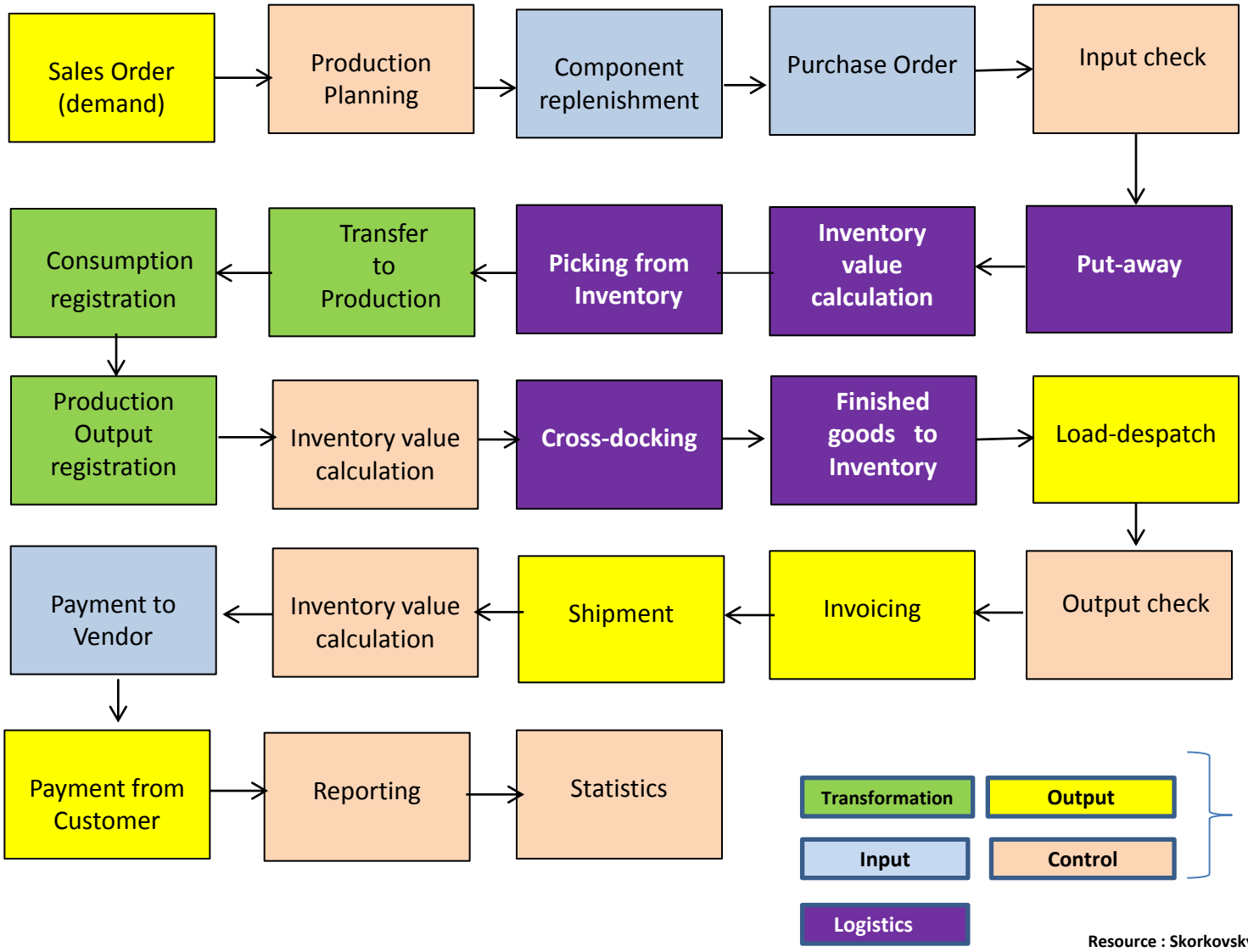
Resource (modified) : dowtsx

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



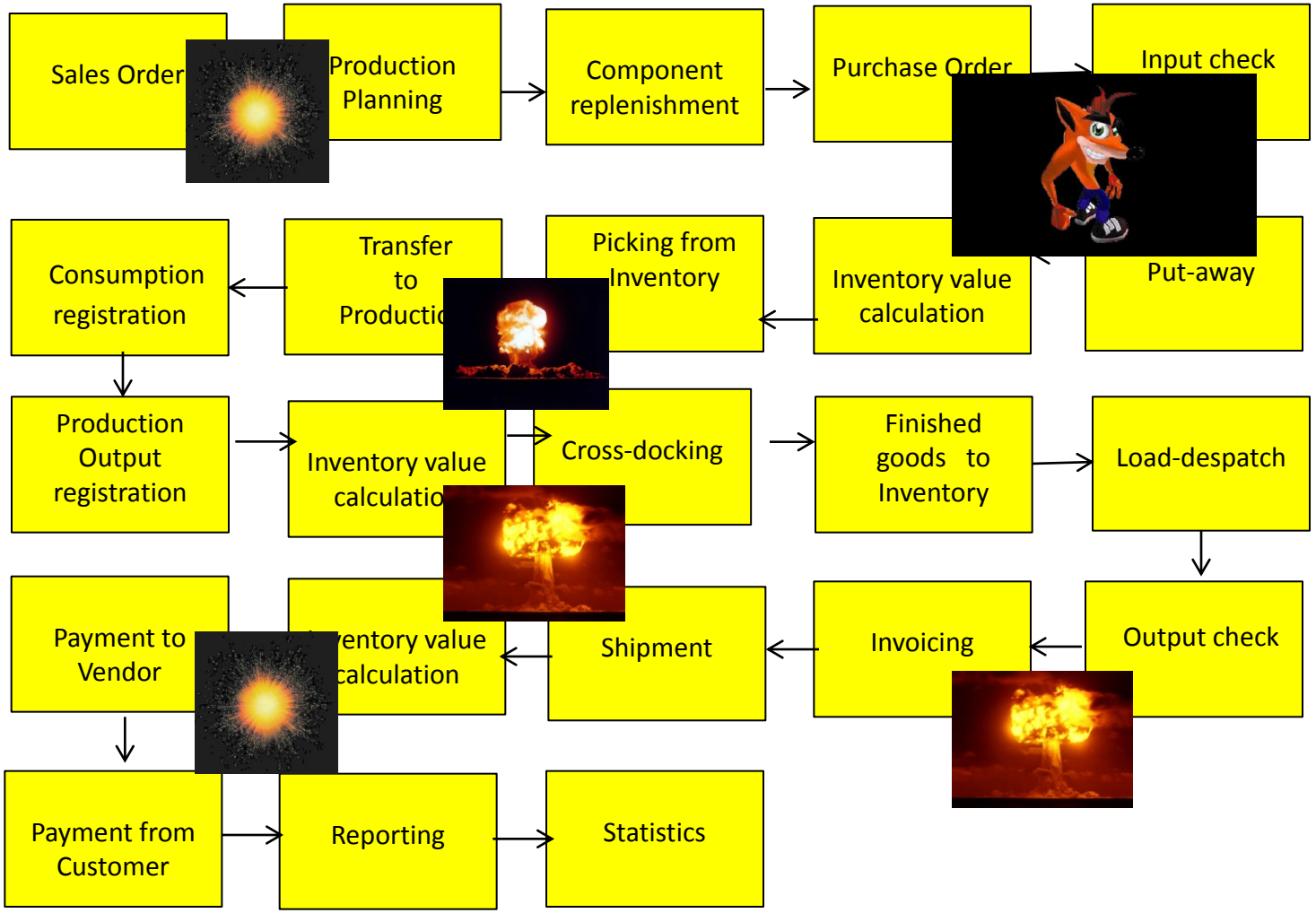
Resource : Skorkovský

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



Resource : Skorkovský

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

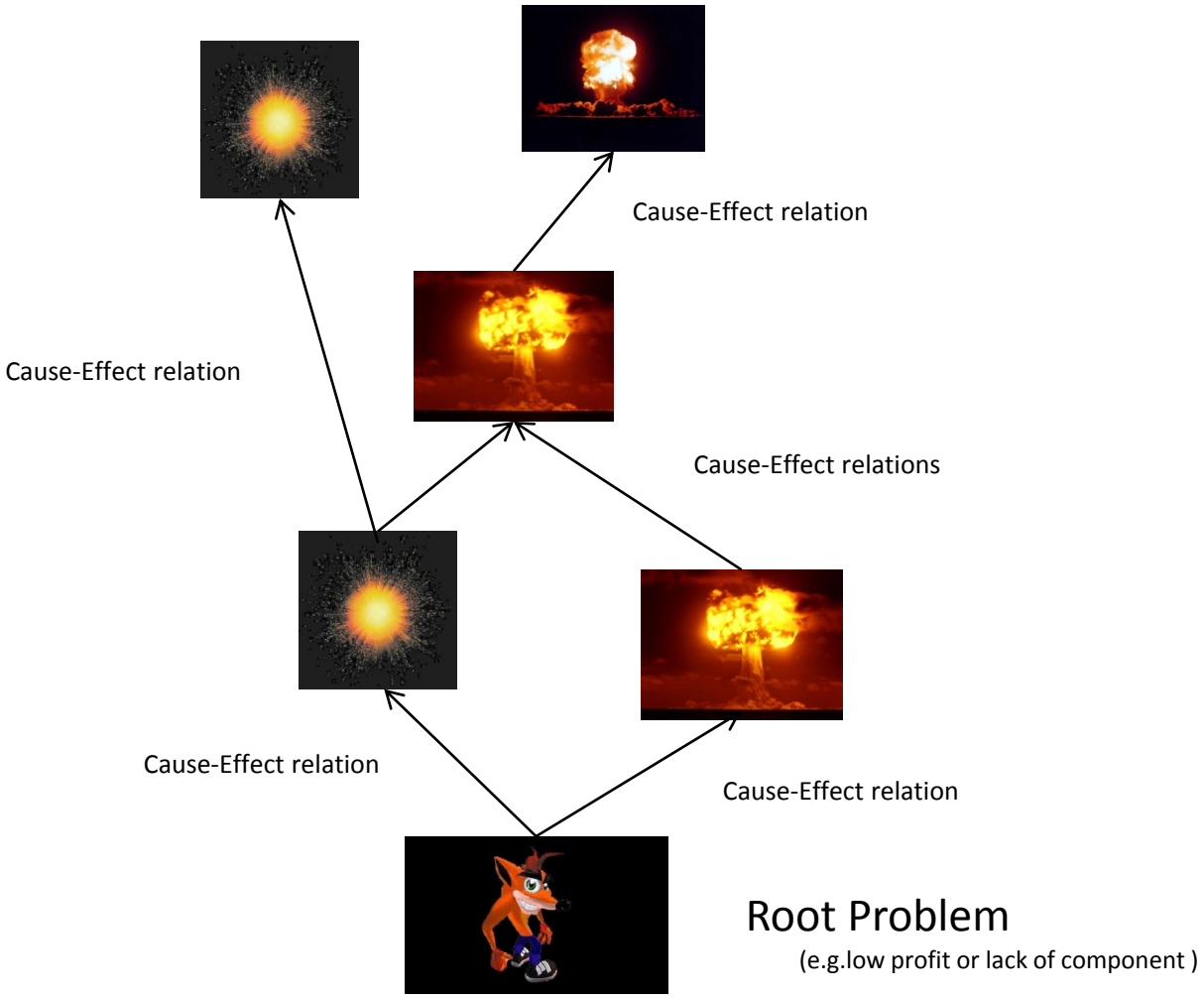


Application of TOC ->thinking tools->Current Reality Tree – first stage

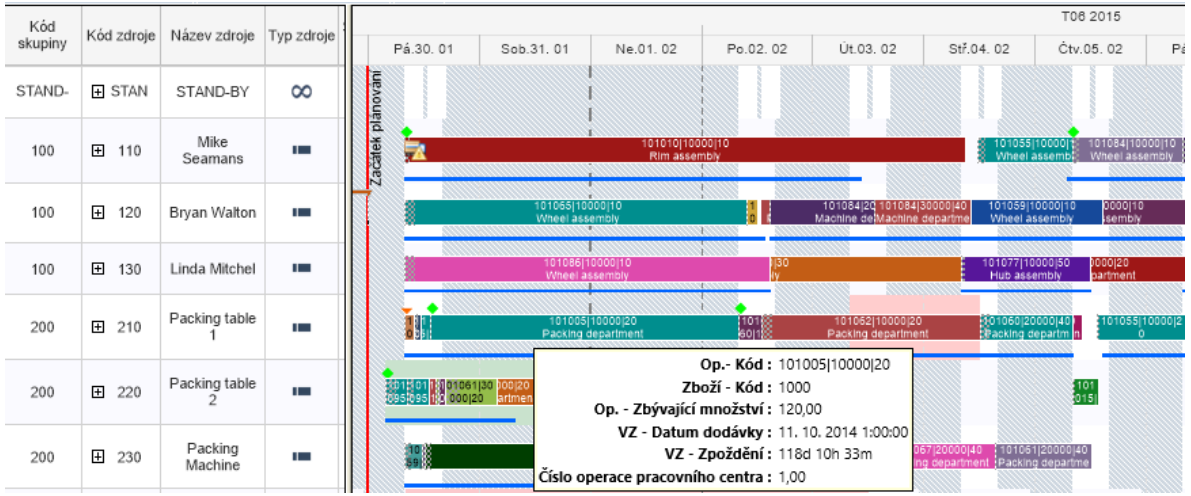
Resource : Skorkovský

Your main task

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



Basic problem I. (availability of components solved by product PlannerOne application)



Prod. Order Routing

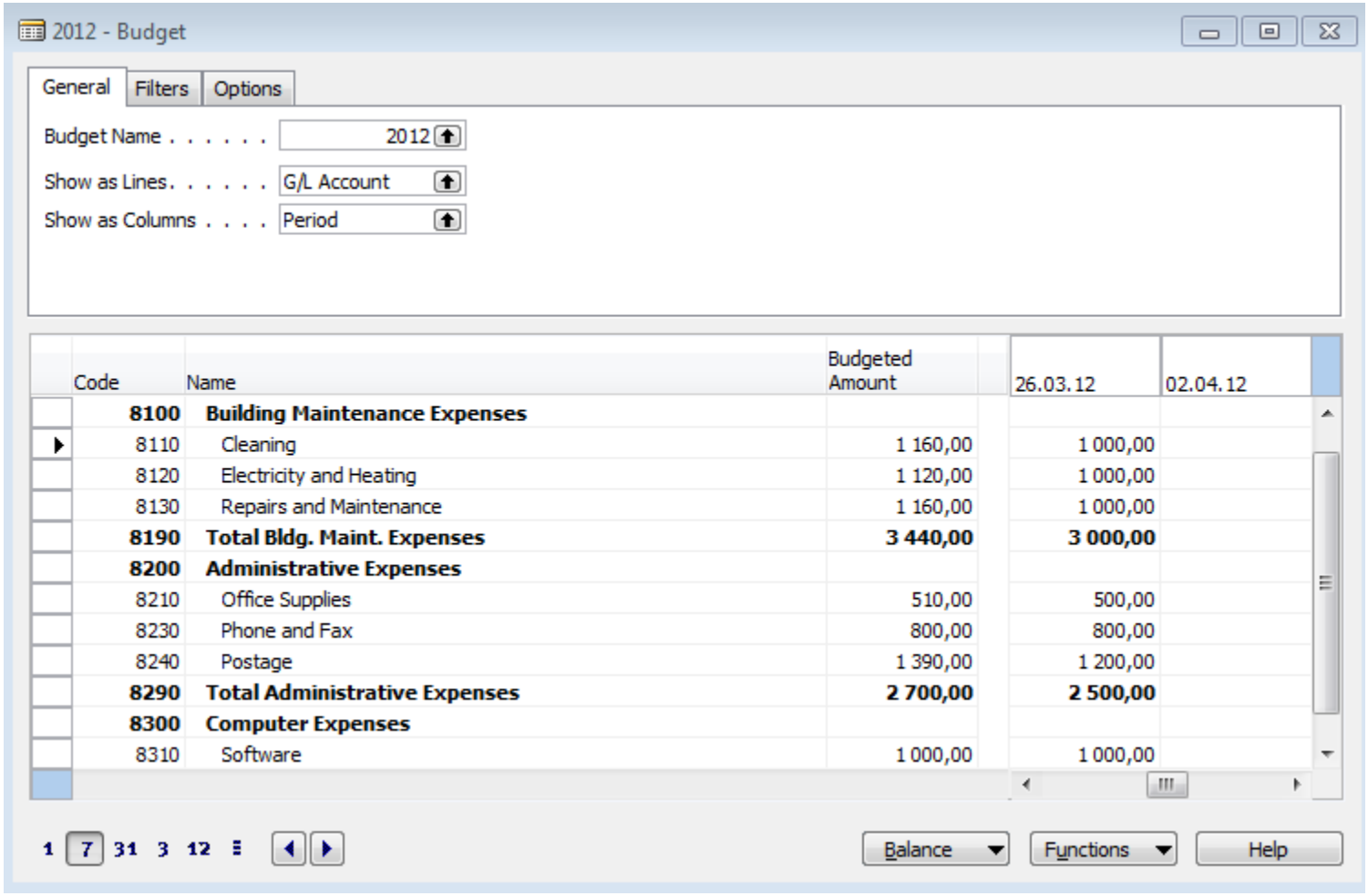
Type to filter (F3) | Prod. Order No.

Filter: Firm Planned • 101005 • 10000 • 1

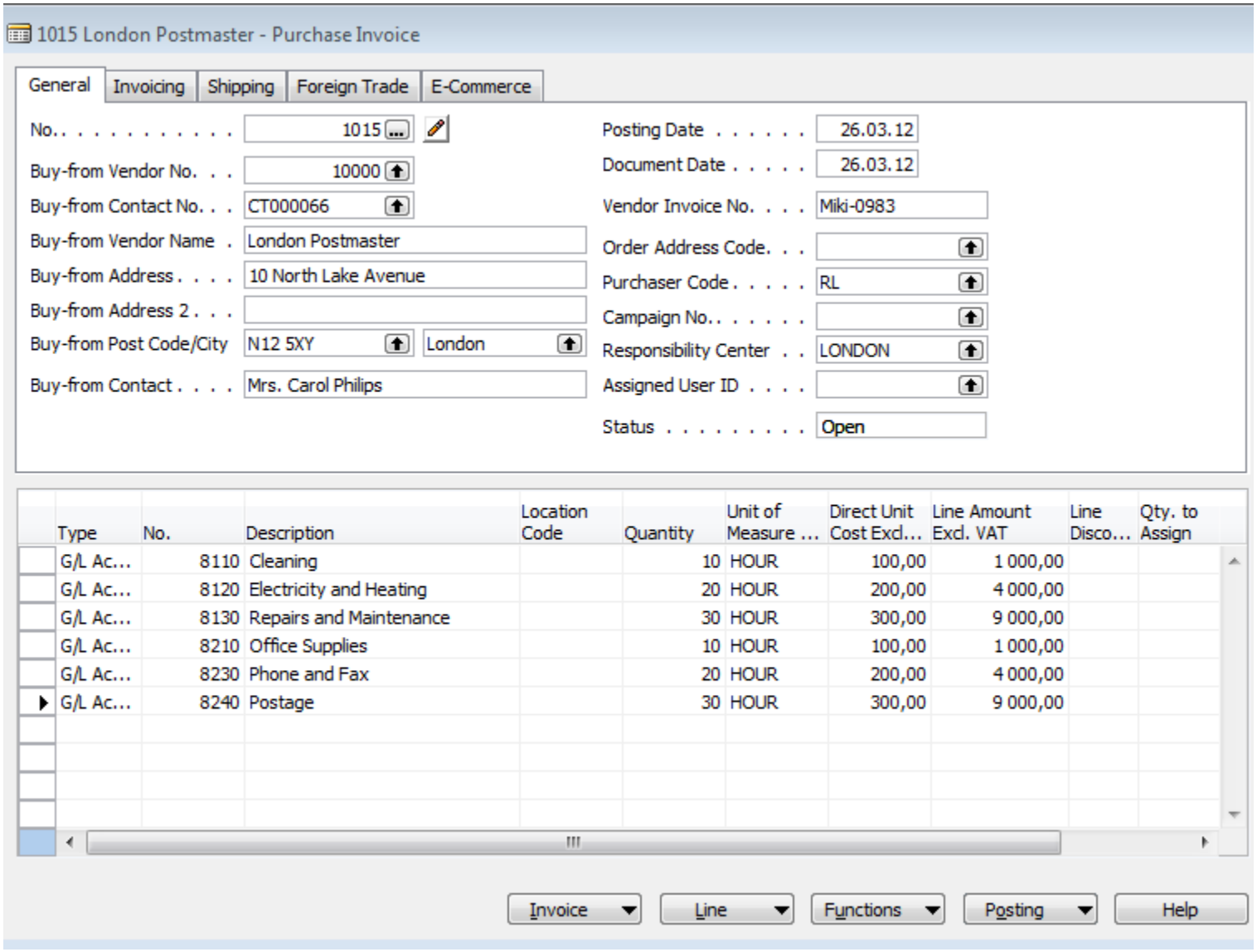
Operati... No.	Type	No.	Description	Starting Date-Time	Ending Date-Time	Setup Time	Run Time	Material Fixed Date
10	Work Center	100	Wheel assembly	18. 8. 2014 14:41	22. 8. 2014 8:31	110	12	23. 8. 2014 0:00
20	Work Center	200	Packing department	27. 8. 2014 8:31	1. 9. 2014 14:46	15	15	10. 9. 2014 0:00
30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

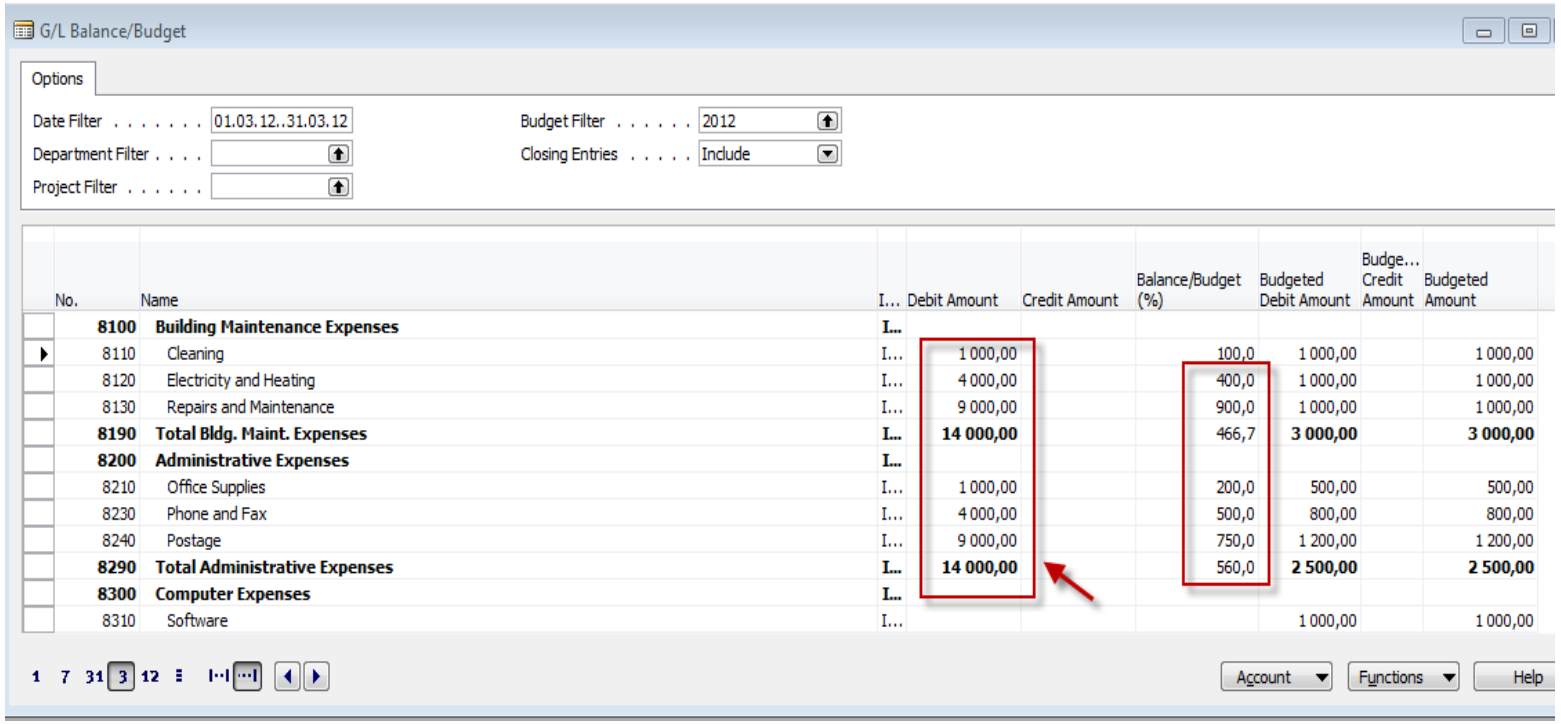
Basic problem II-I. (over budget or under budget in our case)



Basic problem II-II. (over budget) – nákup služeb



Basic problem II-III. (over budget)



Other problems (examples which could be solved are mentioned in PWP Project activities (Činnosti spojené s projektem)

Tuition –plan-theory

- OM-intro – done (this slide show)
- Real project-South African client (wholesale)
- Theory of constraints
- Critical chain and project management
- Quality management I. (Pareto+ Ishikawa)
- Quality management II. (Six Sigma, Kaizen, Poka Yoke)
- Business metrics (use of matrices – Boston, Gartner MQ)
- Balanced Score Card
- DBR , CONWIP
- Decision making (Kepner-Tregoe methodology,..)
- P&Q analysis (mix of products)
- Business Intelligence – intro and concept
- Little´s law
- Yield management – intro to concept
- Linear programming – concept and use
- Business Intelligence
- Decision trees

Tuition –plan-ERP used in OM

- ERP basics (principles) and ERP handling and installation
- Purchase – basic parameters and impacts of parameter setting (Stock, General Ledger)
- Sale - basic parameters and impacts of parameter setting (Stock, General Ledger, Discounts)
- Inventory – basics
- Transfers of items
- Banking operations (posting and payments)
- Customer Relationship Management
- Basic tools used for analysis of created transactions