

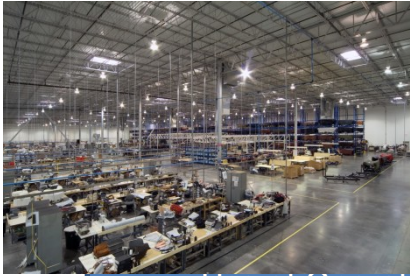
Operation Management (OM)

Introduction

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Department of Corporate Economy
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Czech Republic

- **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 form 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 ?

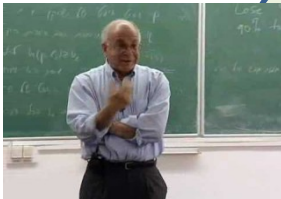
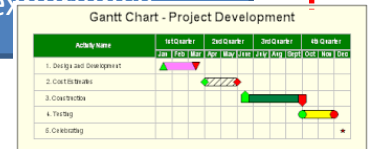


Use of Operations Management (OM) in external environment
(main target)



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

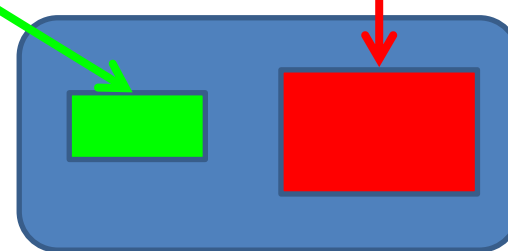
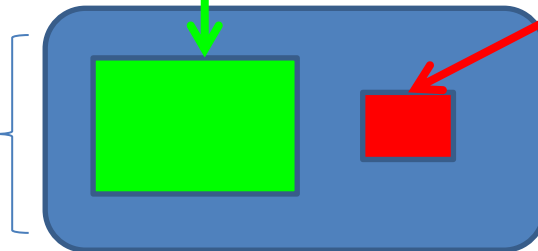
$$= \frac{\sum_{x_1} f_1(x_1) f_2(x_2, x_1)}{\sum_{x_1} f_1(x_1) \sum_{x_2} f_2(x_2, x_1)}$$



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)

ERP jako užitečný pomocník

Účetní osnova ▾ 601* | Číslo

Číslo	Úplný název	Název	Výsledov...	Typ účtu	Součet	Typ obecnéh...	Obecná obch.účt...	Obecná účto s...	Pohyb	MD částka	Dal částka
601020	Vlastní výroby	Vlastní výroby	Výsledovka	Účet		Nákup	NÁRODNÍ	OBCHOD	23 205 660,16	24 276 970,16	1 071 310,00

Věcné položky ▾ 30.12.17 | Zúčtovací datum ▾ 372,44

Zobrazit výsledky:

- ✗ Kde Číslo účtu ▾
- + Přidat filtr

Zúčt... datum	Datum DPH
30.12.2017	30.12.2017
30.12.2017	30.12.2017

Úpravy - Navigace - Vybráno - Zúčtovaná nák.faktura

DOMOVSKÁ STRÁNKA AKCE CRONUS CZ

- Zobrazit související položky
- Hledat podle dokladu
- Najít
- Hledat podle obchodního kontaktu
- Tisk...
- Hledat podle odkazu zboží

Proces Hledat podle

Doklad

Číslo dokladu: 108090 Zúčtovací datum: 30.12.17

Související položky	Počet položek
Zúčtovaná nák.faktura	1
Věcná položka	7

Nákup - Faktura Strana 1

UPLiberec s.p.
Paní Nicholas Christopoulos
Masanykova 12
697 01 Kyjov
Česká republika

CRONUS, centr.odp. Liberec
Magdalena Wróblewska
Knihařská 22
697 01 Kyjov
Česká republika

Číslo věřitele 10000
Číslo faktury 108090
Číslo objednávky 106092
Datum dokladu 30.12.17
Zúčtovací datum 30.12.17
Datum splatnosti 31.12.17
DIČ 895741963

Telefonní číslo +44-999 154642
Domovská stránka
e-mail
DIČ CZ1234567890
Číslo žira 888-9999
Banka Celosvětová banka
Číslo účtu 99-99-888
Nákupě Richard Lum

Platební podmínky Běžný měsíc
Způsob dodávky Náklady, pojištění a dopravné
Ceny včetně DPH Ne

Číslo	Popis	Množství	Měrná jednotka	Nákupní cena	Sleva %	Povol fakturační slevu	Identifikátor DPH	Částka
JB-PŘEPRAVA	Poplatek za přepravu (JB-přeprava)	100	Kilometry	20,00		Ne	DPH25	2 000,00
Celkem CZK bez DPH 25% DPH								2 000,00
Celkem CZK včetně DPH								2 500,00

Specifikace částky DPH

Identifikátor DPH	DPH %	Částka na řádku	Částka základu fakt.slevy	Částka fakturační slevy	Základ DPH	Částka DPH
DPH25	25	2 000,00	0,00	0,00	2 000,00	500,00
Celkem		2 000,00	0,00	0,00	2 000,00	500,00

Číslo položky 3756 3834

Logistika – kde co mám uloženo

80103-T 19" M009 Monitor - Items by Location

Options

Show Items in Transit . . .

Show Column Name . . .

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

Item Help

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

Prodej a ATP-CTP (bude vysvětleno blíže v TOC sekci)

DOMOVSKÁ STRÁNKA AKCE NAVIGACE

Pohled Úpravy Účtovat a vytisknout... Účtovat a poslat mailem... Účtovat... Účtování
Nový Odstranit Vydát Znovu otevřít Testovací sestava...
Spravovat Vydát Účtování

Kopírovat doklad... Přislíbení vyřízení obj. Statistika Montážní zakázky Archivovat doklad
Objednávka

Dodávky Faktury Potvrzení emailem... Tisk potvrzení ...
Dokumenty Potvrzení objednávky

1075 · BYT-KOMPLET s.r.o.

Obecné

Zákazník-číslo:	10000	Datum objednávky:	11.1.2018
Zákazník-název:	BYT-KOMPLET s.r.o.	Datum dokladu:	11.1.2018
Zákazník-město:	Kyjov	Požadované datum dodávky:	
Kód textu položky:		Číslo externího dokladu:	
Text položky:	Objednávka 1075	Kód prodejce:	PK
Zúčtovací datum:	11.1.2018	Stav:	Vydáno
Datum DPH:	11.1.2018		

Řádky

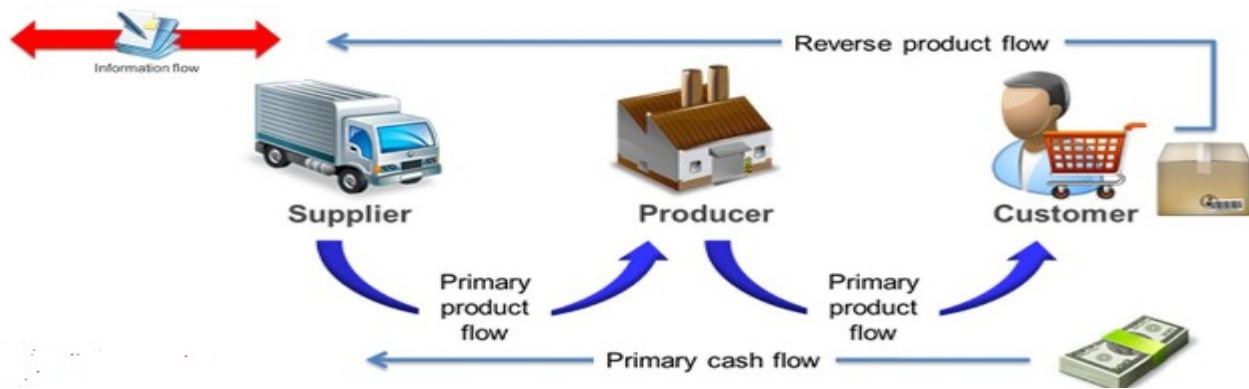
Řádek Funkce Objednávka Nový Najít Filtr Vymazat filtr

Typ	Číslo	Popis	Kód lokace	Množství	Rezervované množství	Kód měrné jednotky	Jednotková cena bez DPH	Částka na řádku bez DPH	Částka řádkové slevy	Částka fakturační slevy	Plánované datum dodávky
Zboží	1936-S	Křeslo BERLÍN, ...	BÍLÝ	13		KS	5 410,00	70 330,00	0,00	0,00	13.1.2018

Used abbreviations : ATP|CTP– Available to Promise | Capable to Promise

Controlling processes in Supply Chain Management (SCM)

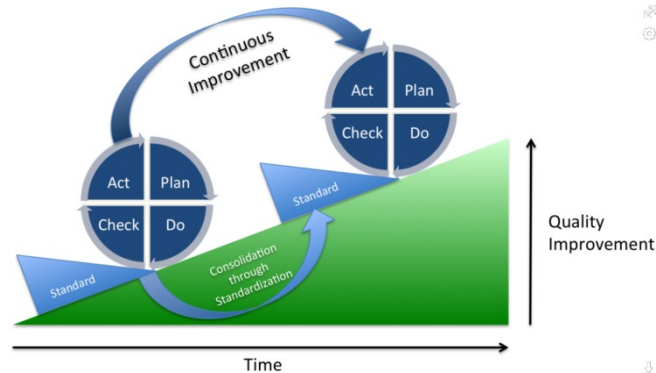
		Supply	Production	Orders (Demands)	
Planning levels {	Strategic	← Operation Strategies and Innovations , R&D →			Demand Planning
	Tactical	Forecasts, Blank Orders	Long term planning	Marketing	
	Operational	Logistic operations	Routing control, TQM	Packaging , Transportation	
	Operational	MRP, Replenishment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



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.

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 today)

Do: Implement algorithm controlling Stock replenishment based on MRP principle and **ROP** and **Safety Stock** level setup. Metrix for effectiveness will be **Inventory 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);

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 (roční) 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 . Takže p=98,5%

Resource: <https://www.lokad.com/service-level-definition-and-formula>

Lead time = Průběžný čas (bude mnohokrát v kurzu použito)

Karta zboží a některé řídicí parametry

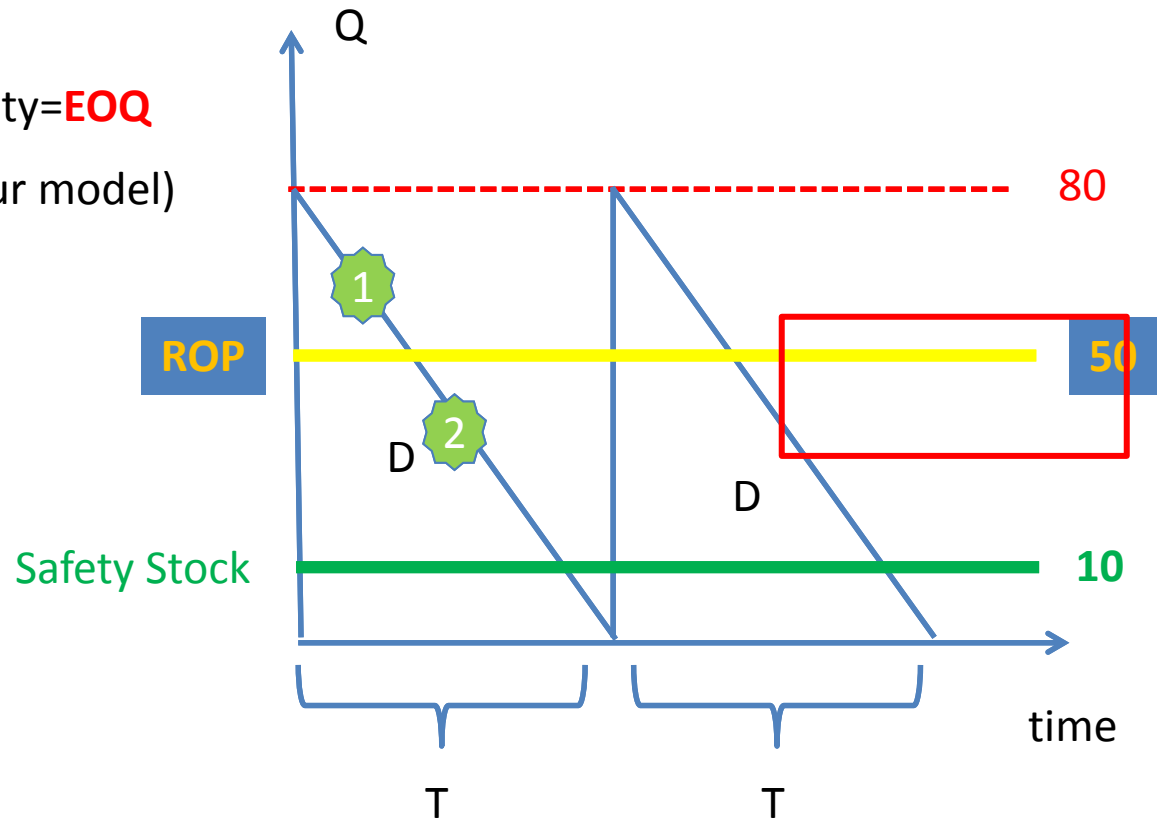
Plánování	
Způsob přibjednání:	<input type="text" value="Pevné přibj.množ."/>
Rezervovat:	<input type="text" value="Volitelně"/>
Způsob sledování zakázky:	<input type="text" value="Žádné"/>
Skladová jednotka existuje:	<input type="text" value="Ne"/>
Období prodlevy:	<input type="text"/>
Prodleva (množství):	<input type="text" value="0"/>
Kritické:	<input type="checkbox"/>
Bezpečná průběžná doba:	<input type="text"/>
Minimální zásoby:	<input type="text" value="10"/>

Parametry šarže-pro-šarži	<input checked="" type="checkbox"/>
Včetně zásob:	<input type="text"/>
Období kumulace dávky:	<input type="text"/>
Období přepínávání:	<input type="text"/>
Parametry bodu-přibjednání	
Bod přibjednání	Přibjednané množství
<input type="text" value="25"/>	<input type="text" value="0"/>
Úroveň přetečení:	<input type="text" value="0"/>
Interval času:	<input type="text"/>
Modifikátory objednávky	
Minimální obj.množství	Maximální obj.množství
<input type="text" value="0"/>	<input type="text" value="0"/>

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

D= Demand = Reorder Quantity=**EOQ**

ROP= Reorder Point =50 (in our model)



1

- No replenishment suggestion (current quantity \geq ROP)

2

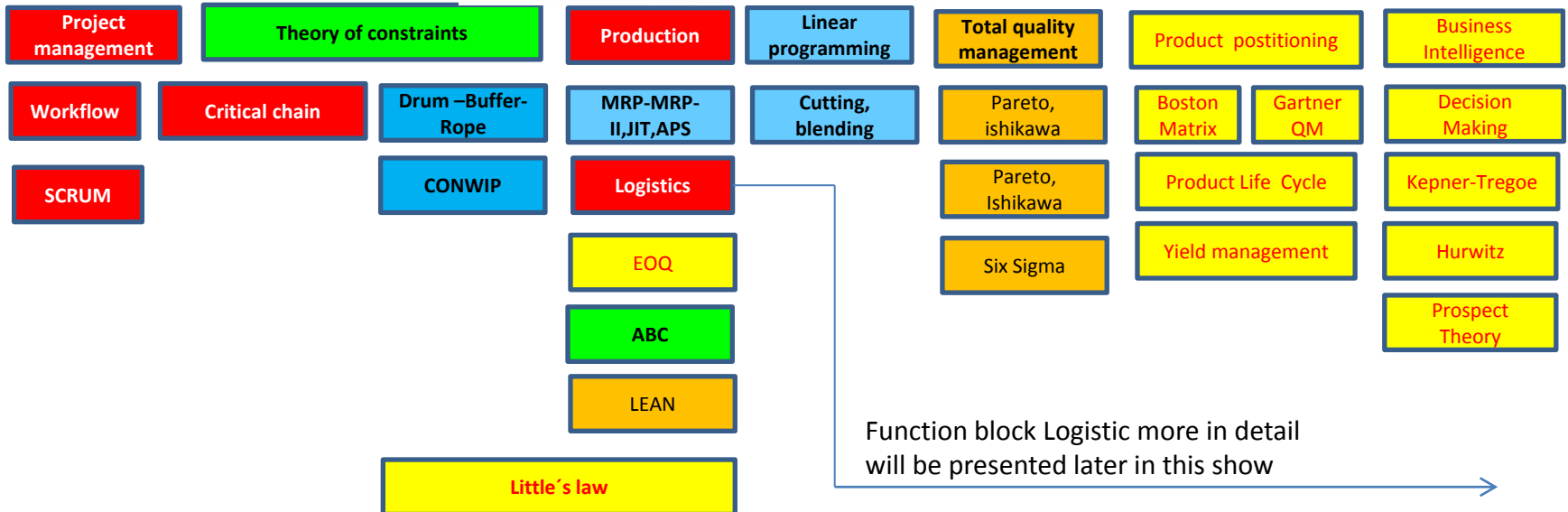
- Replenishment is suggested (current quantity $<$ ROP and quantity may be EOQ)

Used abbreviations : EOQ – Economic Order Quantity – will be explained during this course

Another point of view I.

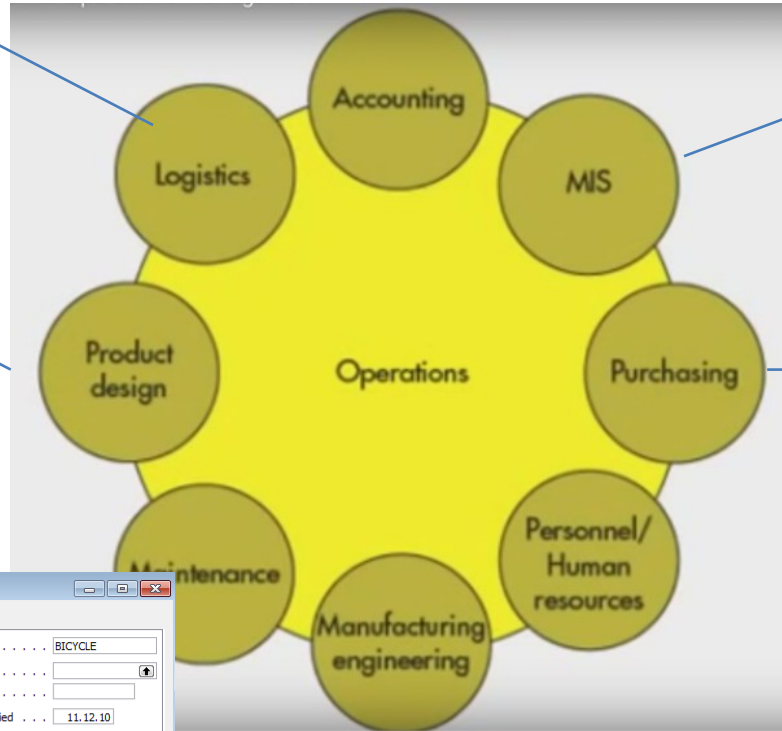


This will be modified in following **South African** project show (example of Balanced Score Card use)



Operations

See next slide



Microsoft Dynamics NAV 2009 R2
 Version W1 6.0 R2 (6.00.32012)
 Copyright (C) 2010 Microsoft. All rights reserved.
 This product is licensed to:
 4805500
 NAVERTICA a.s.
 Sumavska 15

 Brno 602 00
[Check your license information](#)
 Warning: This computer program is protected by copyright law and international treaties.
 Unauthorized reproduction or distribution of this program, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.

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 No.

Unit of Measure Code PCS Active Version

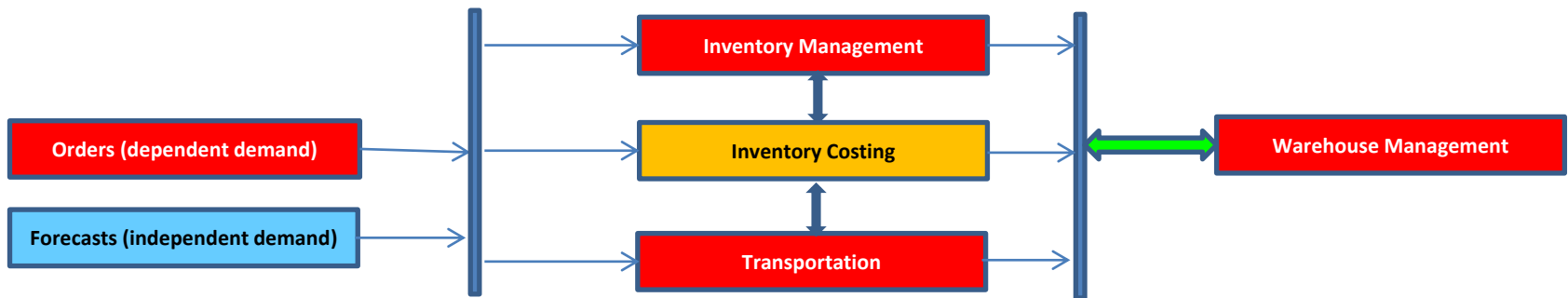
Status Certified Last Date Modified 11.12.10

Type	No.	Description	Quantity	Unit of Measu...	Scrap...	Routing Li...
Item	1000	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	

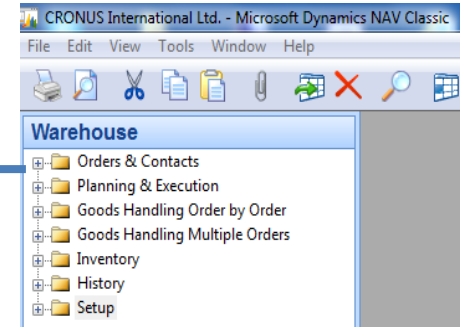
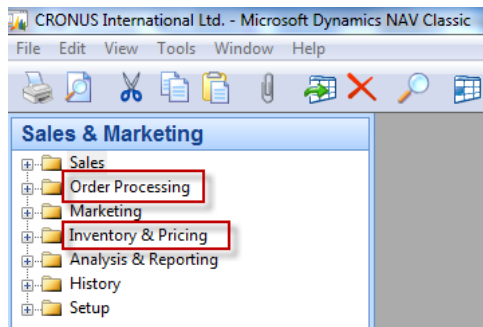
Prod. BOM Component Functions Help

Bill of material

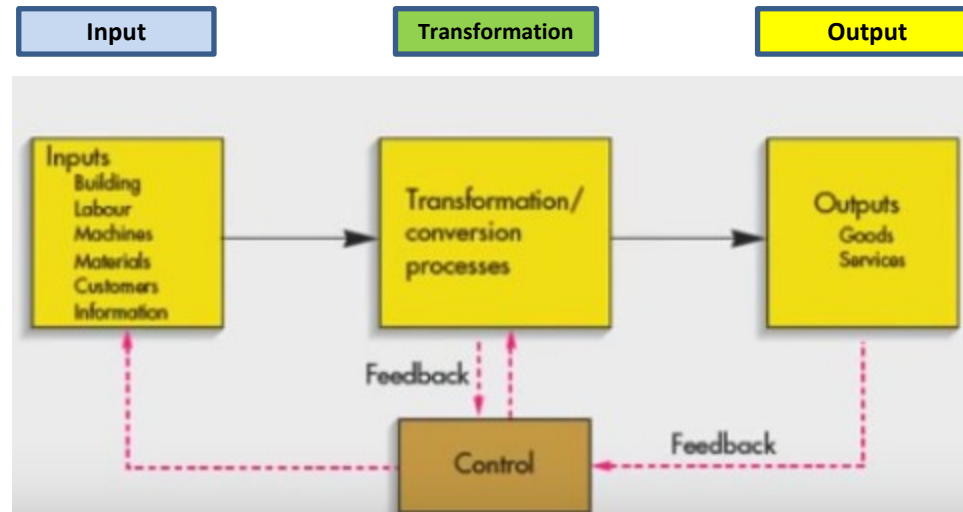
Function block Logistic-simplified



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



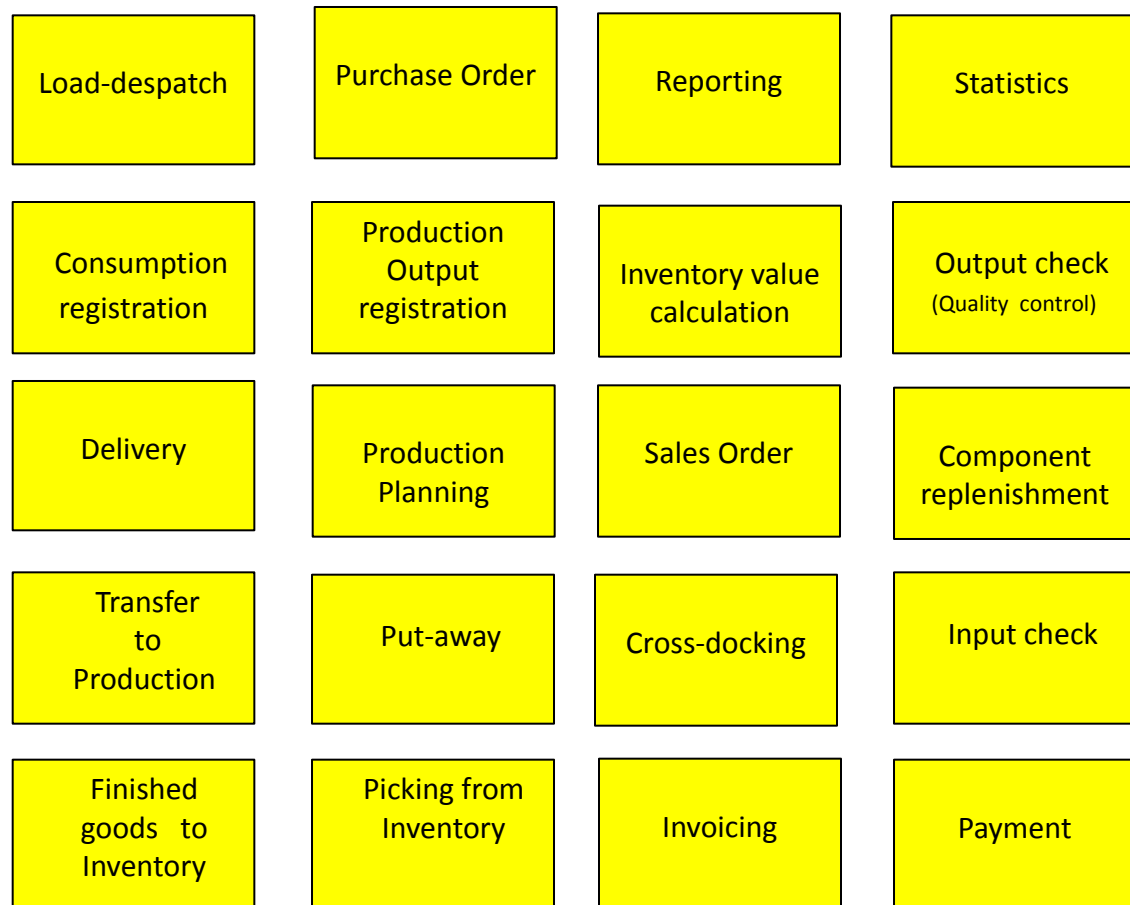
Procedures-simplified (feedback)



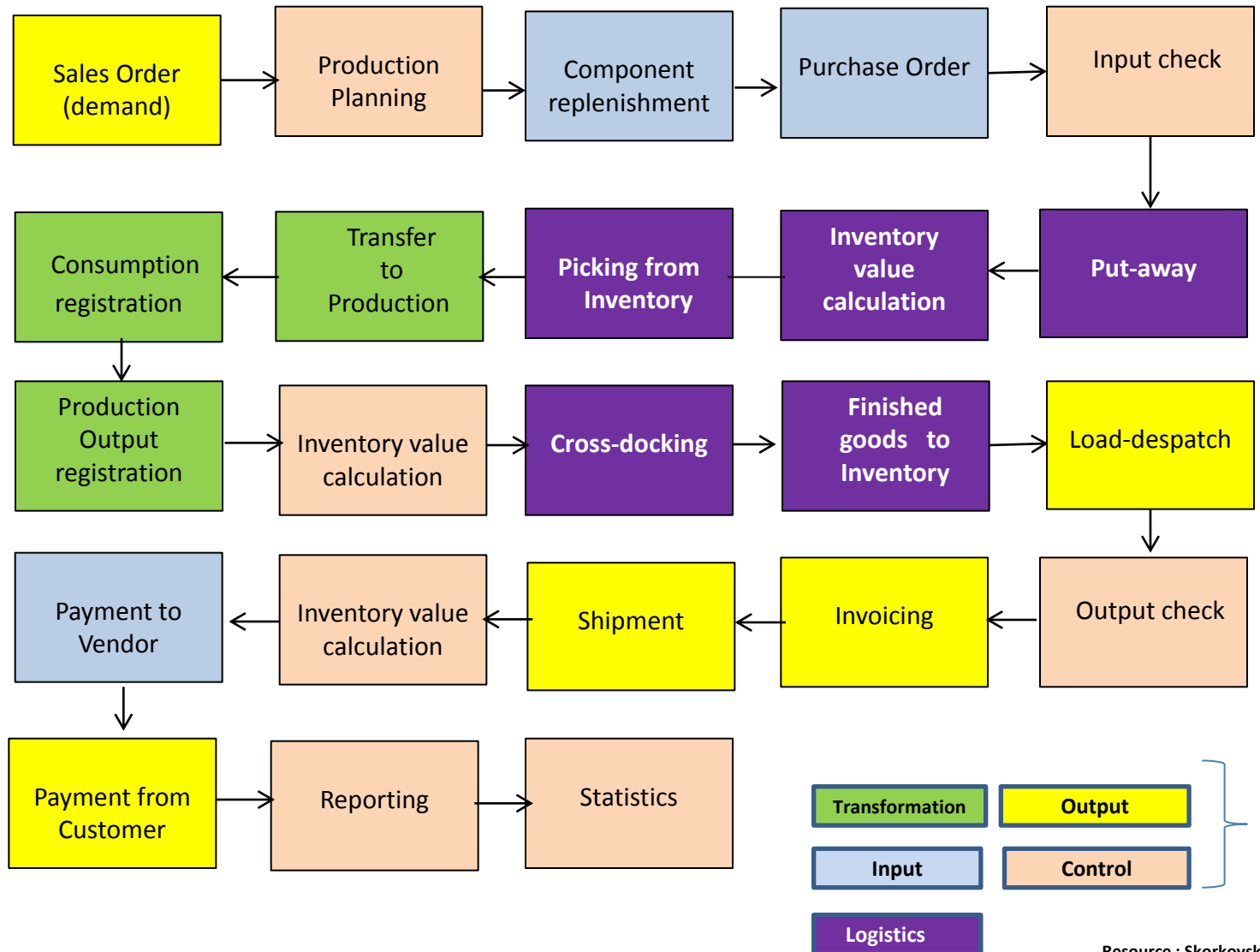
} Color agenda used later

Processing

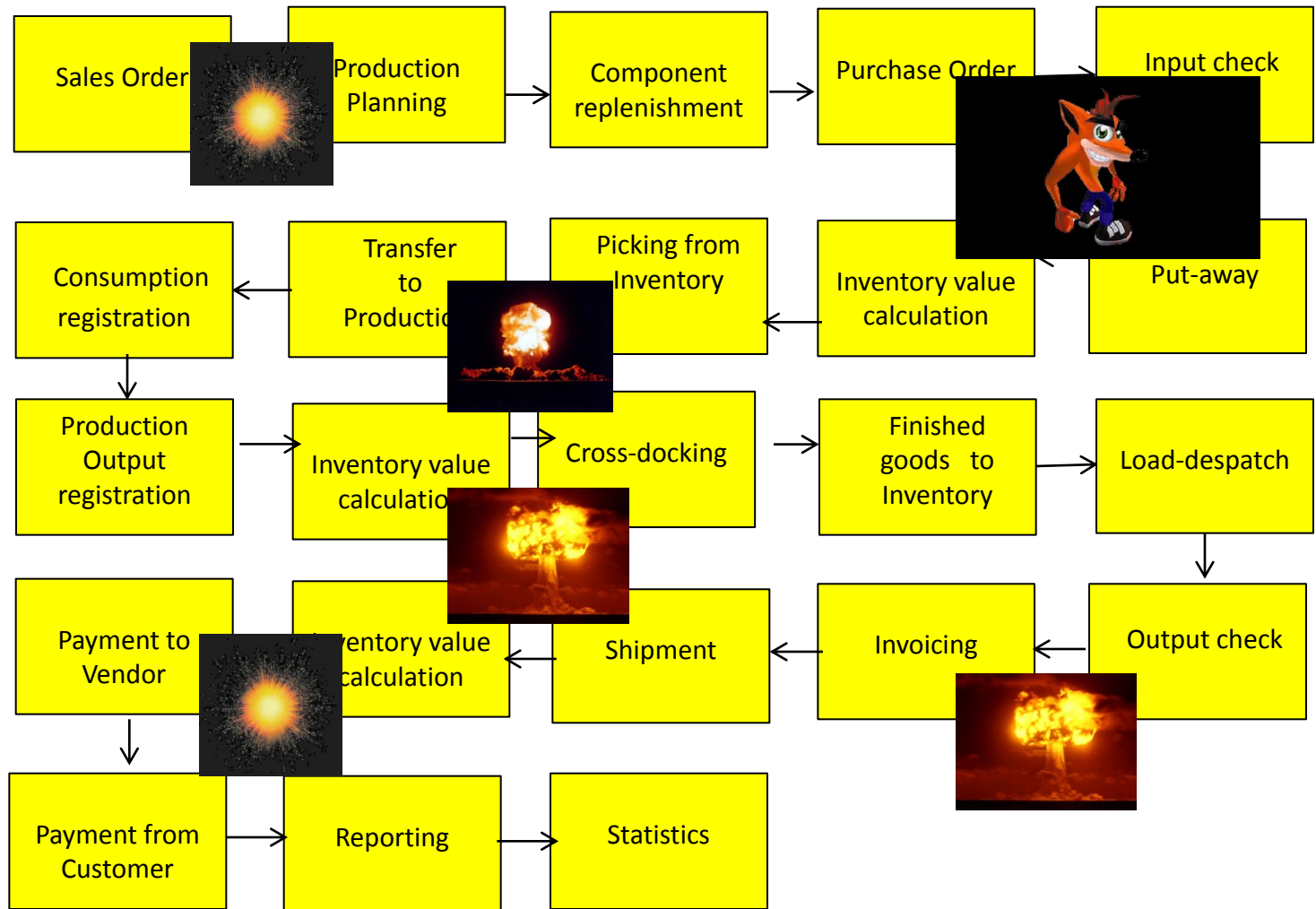
(not organised set of processes, will be presented also as a introduction to project management PWP presentation later)



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



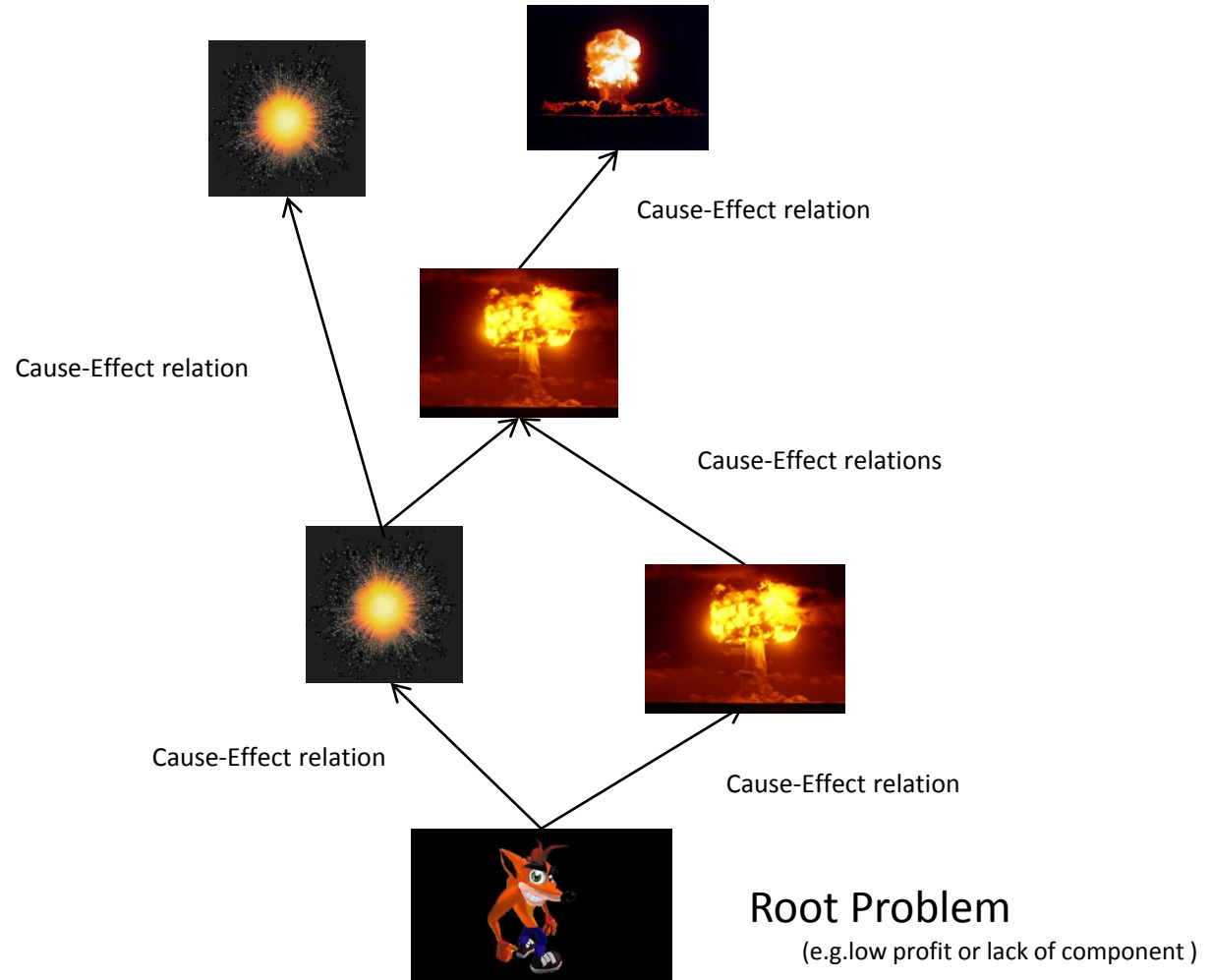
Your main task (possible problems, bottlenecks, undesirable effects..)



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

Your main task

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



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

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 II-II.

(over budget) – nákup služeb

1015 London Postmaster - Purchase Invoice

General Invoicing Shipping Foreign Trade E-Commerce

No. 1015 [edit] Posting Date 26.03.12

Buy-from Vendor No. 10000 [up] Document Date 26.03.12

Buy-from Contact No. CT000066 [up] Vendor Invoice No. Miki-0983

Buy-from Vendor Name London Postmaster Order Address Code. [up]

Buy-from Address 10 North Lake Avenue Purchaser Code RL [up]

Buy-from Address 2 Campaign No. [up]

Buy-from Post Code/City N12 5XY [up] London [up] Responsibility Center LONDON [up]

Buy-from Contact Mrs. Carol Philips Assigned User ID [up]

Status Open

Type	No.	Description	Location Code	Quantity	Unit of Measure ...	Direct Unit Cost Excl...	Line Amount Excl. VAT	Line Disco...	Qty. to Assign
G/L Ac...	8110	Cleaning		10	HOUR	100,00	1 000,00		
G/L Ac...	8120	Electricity and Heating		20	HOUR	200,00	4 000,00		
G/L Ac...	8130	Repairs and Maintenance		30	HOUR	300,00	9 000,00		
G/L Ac...	8210	Office Supplies		10	HOUR	100,00	1 000,00		
G/L Ac...	8230	Phone and Fax		20	HOUR	200,00	4 000,00		
▶ G/L Ac...	8240	Postage		30	HOUR	300,00	9 000,00		

Invoice Line Functions Posting Help

* Basic problem II-III. (over budget)

G/L Balance/Budget

Options

Date Filter 01.03.12..31.03.12 Budget Filter 2012

Department Filter Closing Entries Include

Project Filter

No.	Name	I... Debit Amount	Credit Amount	Balance/Budget (%)	Budgeted Debit Amount	Budget... Credit Amount	Budgeted Amount
8100	Building Maintenance Expenses	L...					
▶ 8110	Cleaning	I... 1 000,00		100,0	1 000,00		1 000,00
8120	Electricity and Heating	I... 4 000,00		400,0	1 000,00		1 000,00
8130	Repairs and Maintenance	I... 9 000,00		900,0	1 000,00		1 000,00
8190	Total Bldg. Maint. Expenses	L... 14 000,00		466,7	3 000,00		3 000,00
8200	Administrative Expenses	L...					
8210	Office Supplies	I... 1 000,00		200,0	500,00		500,00
8230	Phone and Fax	I... 4 000,00		500,0	800,00		800,00
8240	Postage	I... 9 000,00		750,0	1 200,00		1 200,00
8290	Total Administrative Expenses	L... 14 000,00		560,0	2 500,00		2 500,00
8300	Computer Expenses	L...					
8310	Software	I...			1 000,00		1 000,00

1 7 31 3 12 Account Functions Help

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