Operation Management (OM) Introduction

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Coordinates

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- **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** : will assigned after some theory will be presented. Accepted seminar work is the second condition to be admitted to exam)
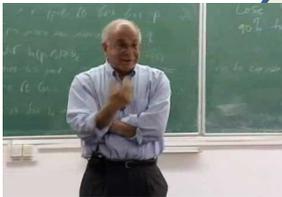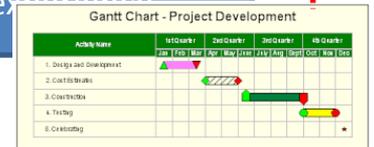- **Tuition plan :** at the **end** of this slide show

What is going on ?

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

$\longleftrightarrow$

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

$$\frac{\sum_{x_1} f_1(x_1) f_2(x_2}{\sum_{x_1} \sum_{x_3} f_1(x_1) f_2(}$$
$$\frac{\sum_{x_1} f_1(x_1) f_2(}{(x_1) f_2(x_2, x_1)}$$

Gantt Chart - Project Development

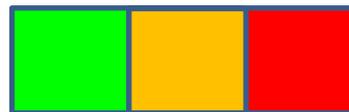Knowledge of methods and experience from research and literature - **teachers**

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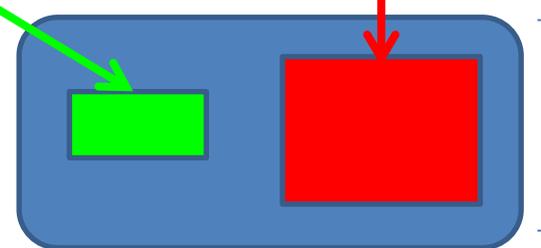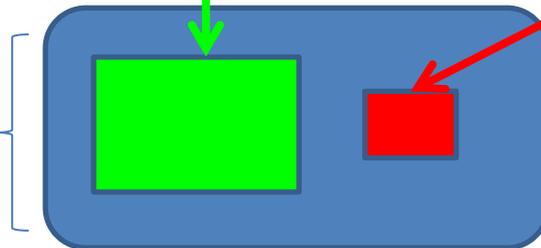
Extent of knowledge

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

Some basic processes controlled by ERP –I.

Some basic processes controlled by ERP –II.

CONTRIB - DEFAULT - Acc. Schedule Overview

General | Dimension Filters | Options

Account Schedule Name . CONTRIB
Column Layout Name . . DEFAULT

Date Filter . . . . 01.01.15..31.12.15
Budget Filter . . . . . .

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

1   7   31   3   12   ≡   ◄ ►

Functions ▼   Help

Used abbreviations : BS– Balanced Sheet

Some basic processes controlled by ERP –III.

Some basic processes controlled by ERP –IV.

OP100016 Assembling furniture - Opportunity Card

General

No.	OP100016		Campaign No.	
Description	Assembling furniture		Priority	Normal
Contact No.	CT000002		Sales Cycle Code	EX-SMALL
Contact Name.	Selangorian Ltd.		Status	Won
Contact Company Name.	Selangorian Ltd.		Closed	✓
Salesperson Code	PS		Creation Date	04.01.12
Sales Document Type			Date Closed.	21.01.12
Sales Document No.				

	Active	Action Taken	Sales Cycle Stage	Date of Change	Estimated Close Date	Estimated Value (LCY)	Calcd. Current Value (LCY)	Completed %	Chances of Success %	Probability %
▶	✔	Won	0	21.01.12	21.01.12	5 500,00	5 500,00	100	100	100
		Next	4	17.01.12	21.01.12	5 500,00	5 087,50	95	90	93
		Next	3	12.01.12	21.01.12	5 500,00	3 987,50	80	65	73
		Next	2	08.01.12	21.01.12	5 500,00	2 337,50	50	35	43
			1	06.01.12	21.01.12	5 000,00	550,00	2	20	11

Opportunity ▾   Functions ▾   Create Oppo...   Help

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

Some basic processes controlled by ERP –V.

Controlling processes in Supply Chain Management (SCM)

Planning levels

	Supply	Production	Orders (Demands)	
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	

Information flow

Reverse product flow

Supplier   Producer   Customer

Primary product flow

Primary product flow

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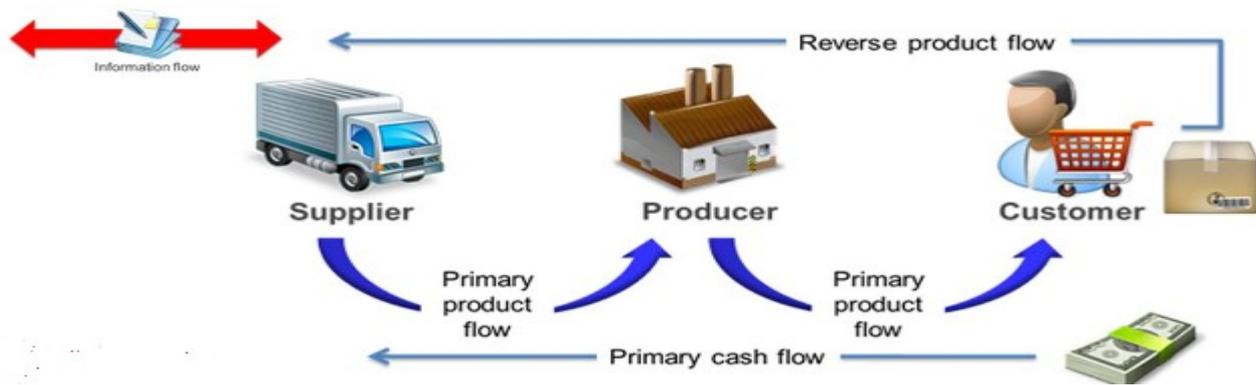
Used abbreviations : **R&D** –Research and Development; **TQM**-Total Quality Management; **JIT**- Just –In-Time; **MRP_II**-Manufacturing and Resource Planning

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

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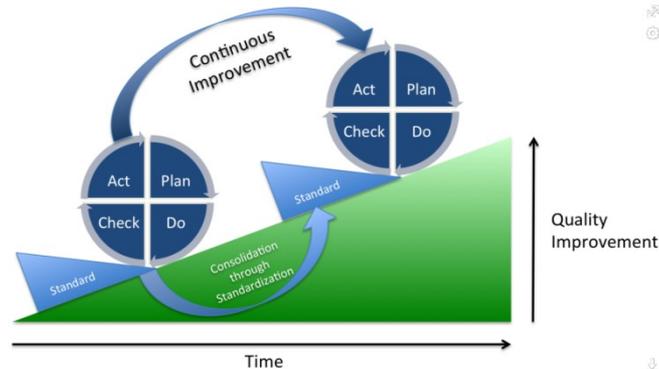
Plan*:* Define the problem to be addressed, collect relevant data, and ascertain the **problem's root cause** (e.g. by use of TOC=Theory of Constraints)

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

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)

Do: Implement algorithm controlling stock replenishment based on MRP principle and ROP and Safety Stock level setup. Metrix for efectivnes will be **inventory dollar days (IDD)** - which is one of TOC metrics

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

1l 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€.
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

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

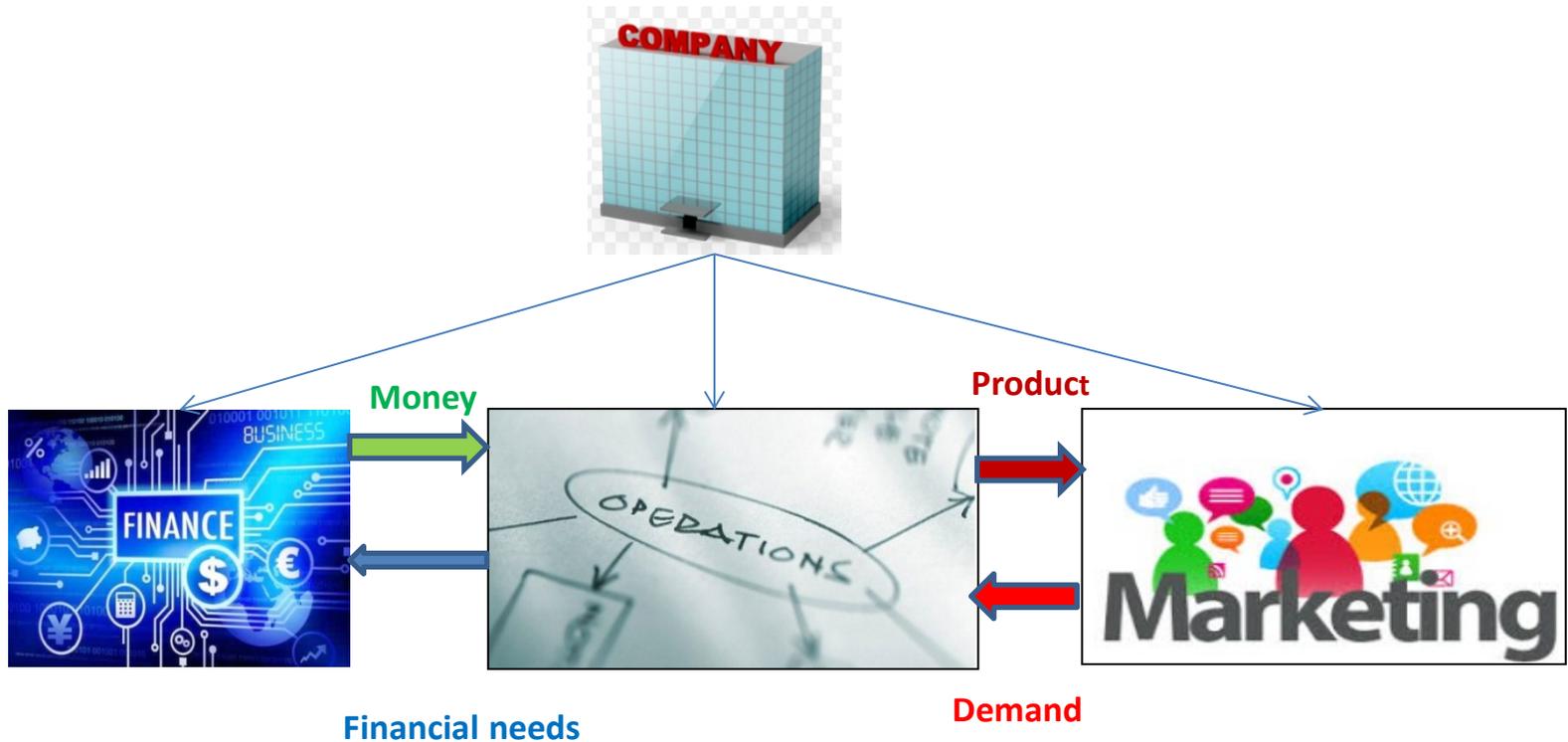**Used abbreviations** : **EOQ** – Economic Order Quantity – will be explained dúrin this course

Another point of view

This will be modified in following **South African** project show (example of Balanced Score Card use)
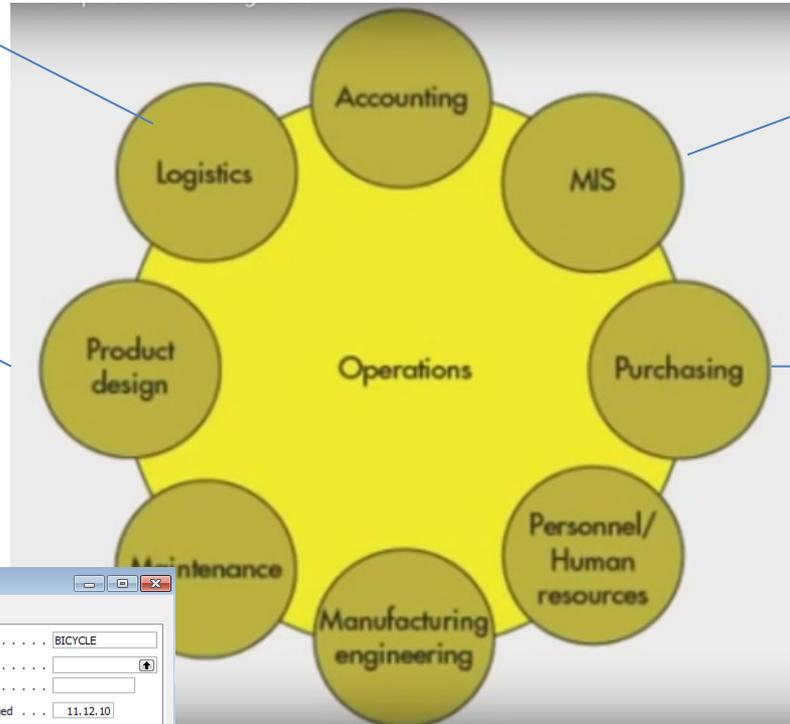
Project management	Theory of constraints	Production	Linear programming	Total quality management	Product postitioning	Business Intelligence
Workflow	Critical chain	Drum –Buffer-Rope	MRP-MRP-II,JIT,APS	Cutting, blending	Pareto, ishikawa	Boston Matrix / Gartner QM	Decision Making
SCRUM		CONWIP	Logistics		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

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

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

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
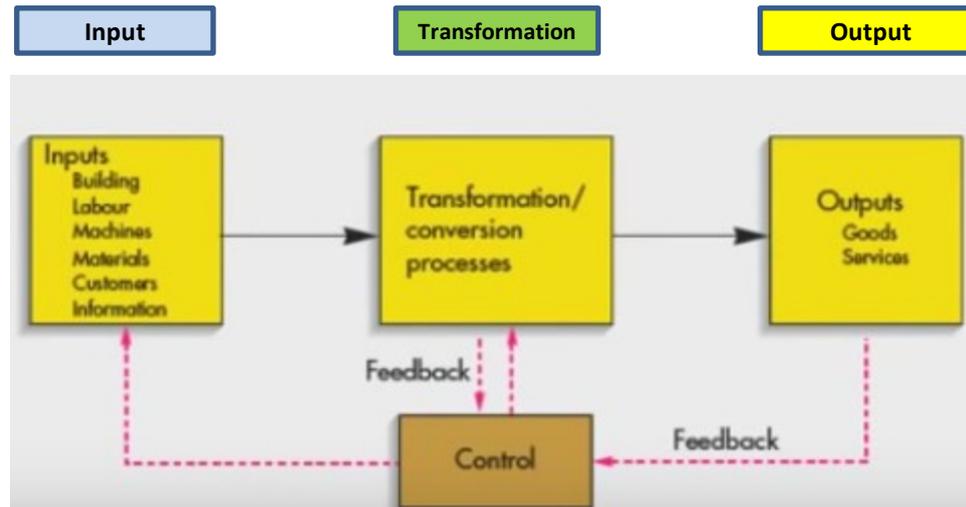- Inventory & Costing
- Analysis & Reporting
- History
- Setup

Function block Logistic-simplified
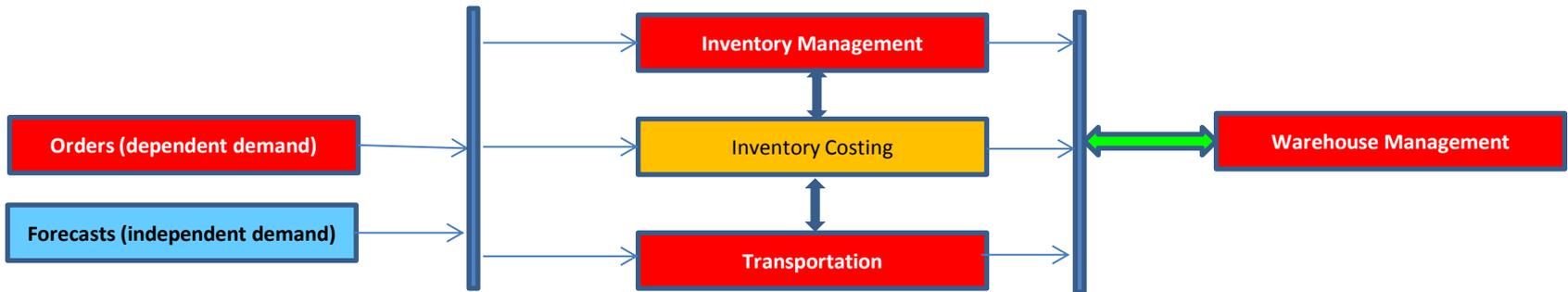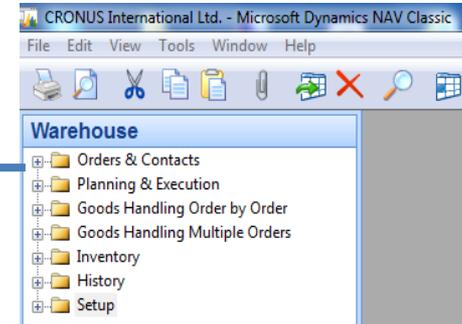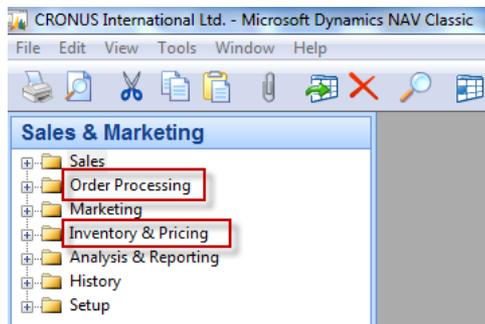
Procedures-simplified

Color agenda used later

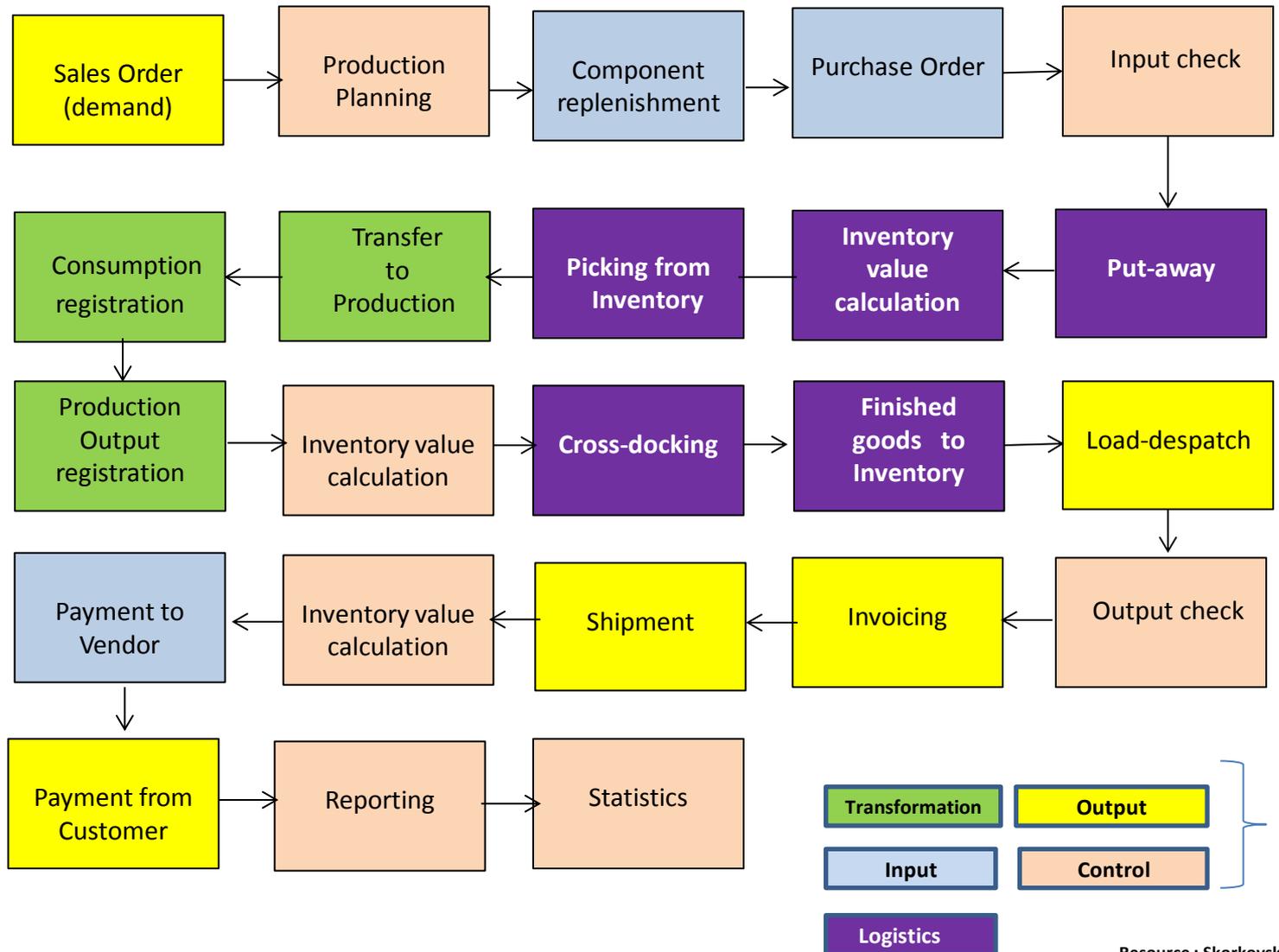# Processing (not organised set of processes, will be presented also as a introduction to project management PWP presentation later)

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)

Your main task (possible problems, bottlenecks, undesirable effects..)
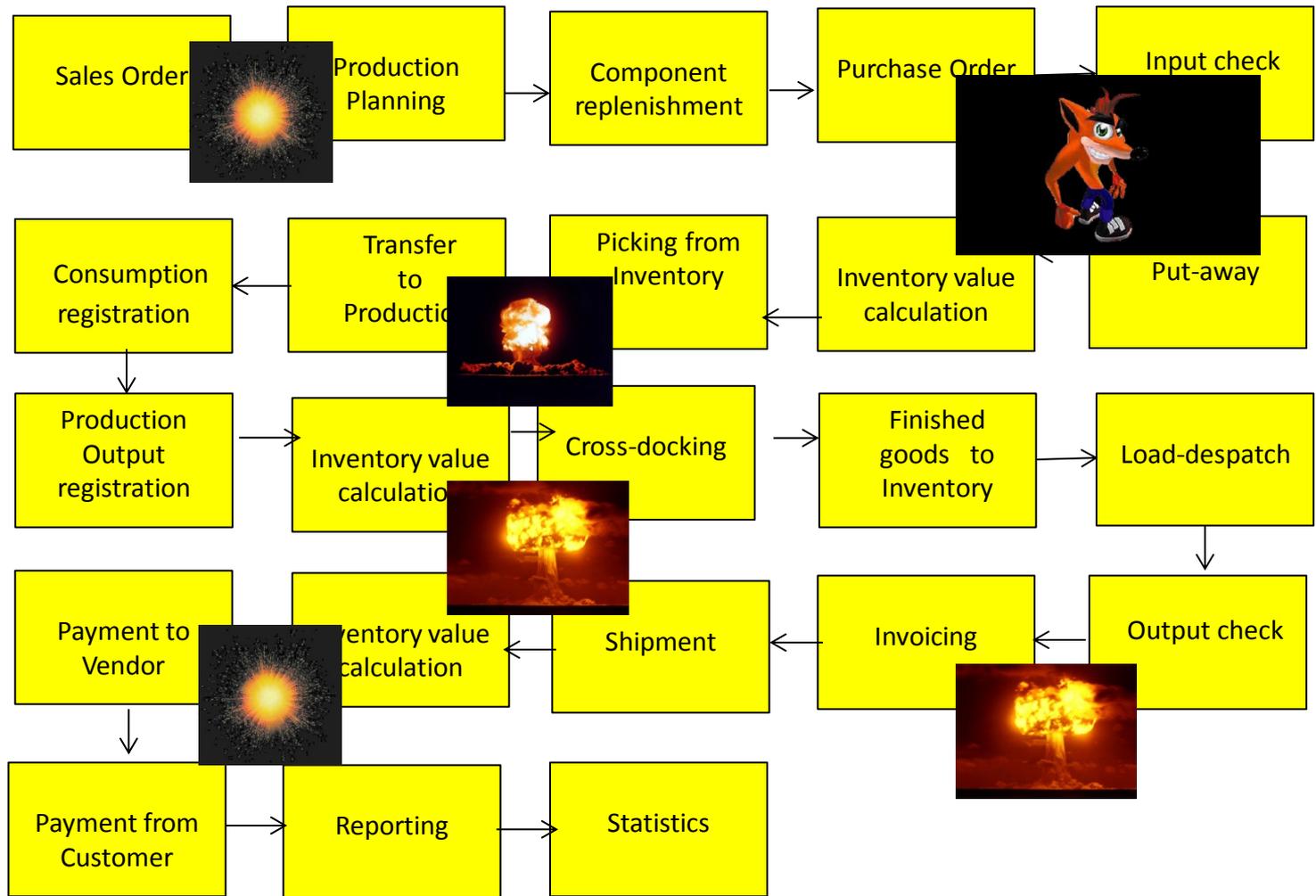
Application of TOC ->thinking tools->Current Reality Tree – first stage

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)
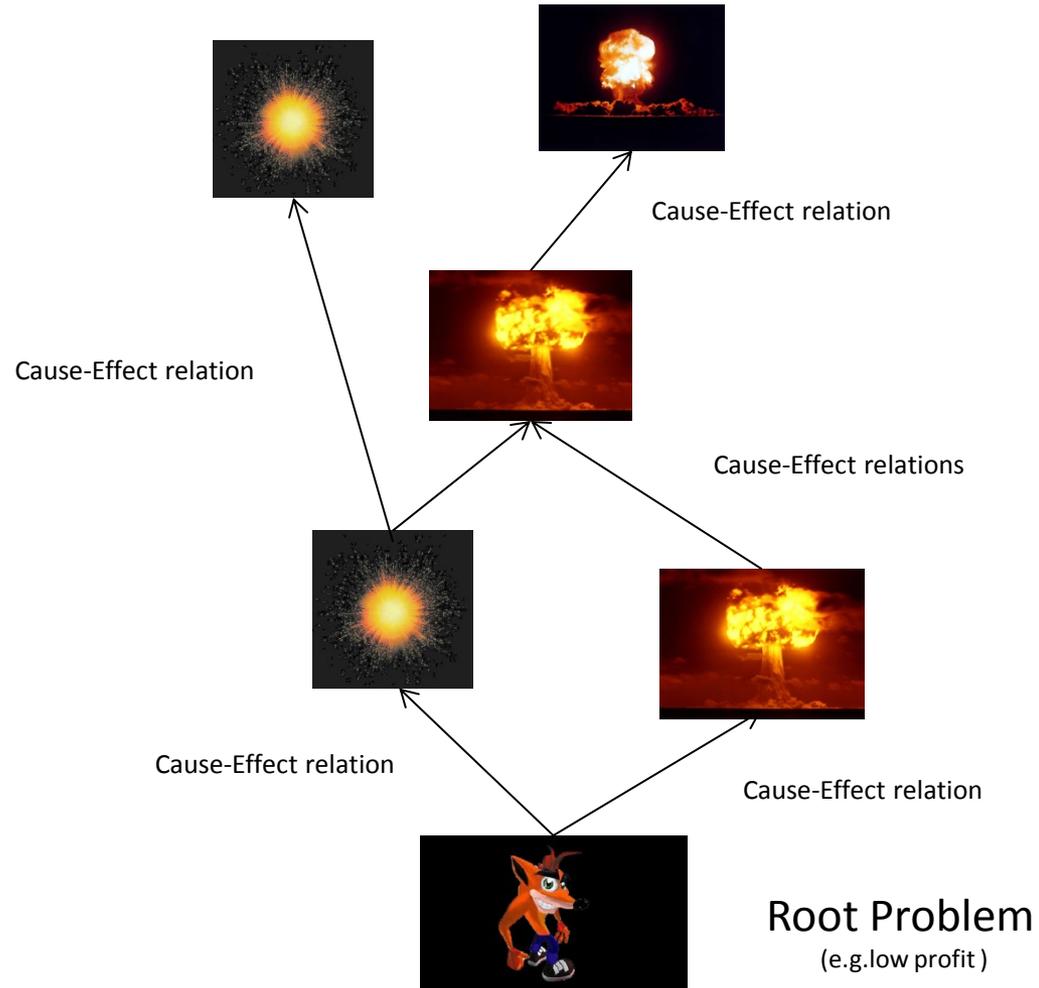
Basic problem I. (one of many)

We cannot solve our problems with the same level of thinking that created them !
Statement by Albert Einstein)

We have a huge data quantity

..and at the same time a minimum information, which could be used for **decision making !!!!**
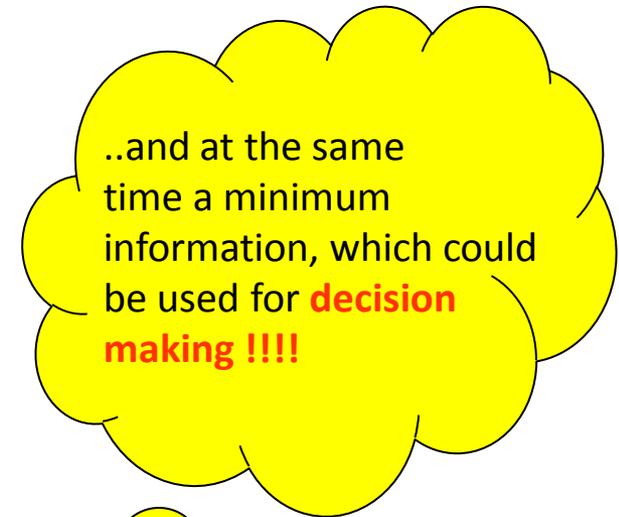
*Basic problem II. (we need reliable data)

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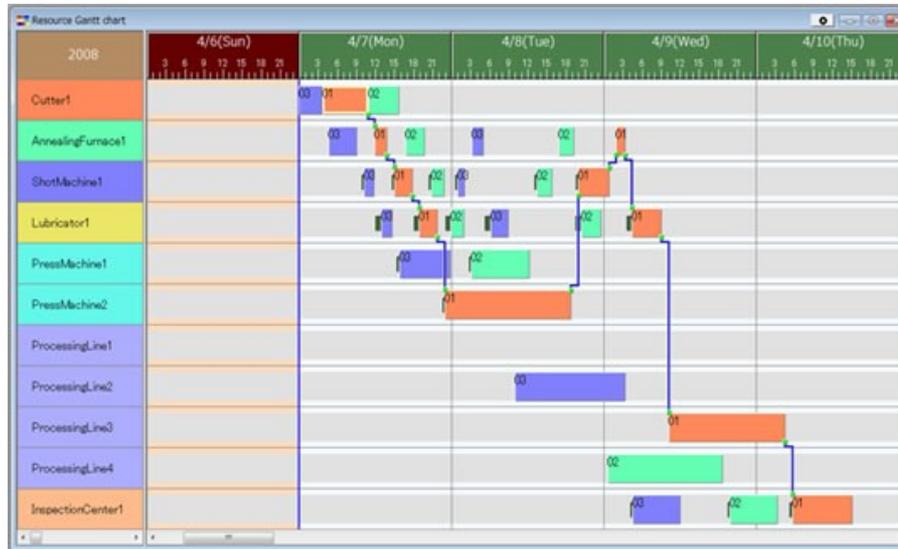
$$T1+T2=X$$

$$Opt=Min(X)$$
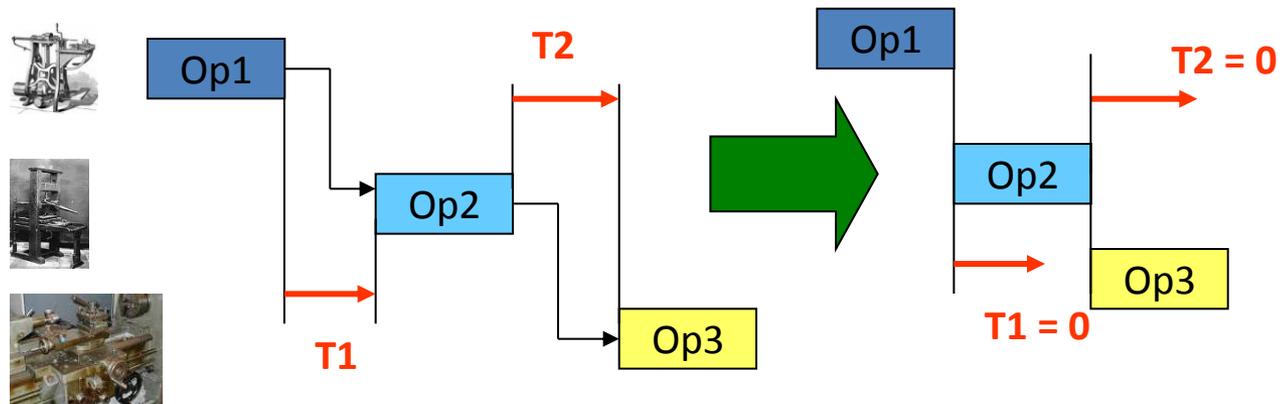
Basic problem III.
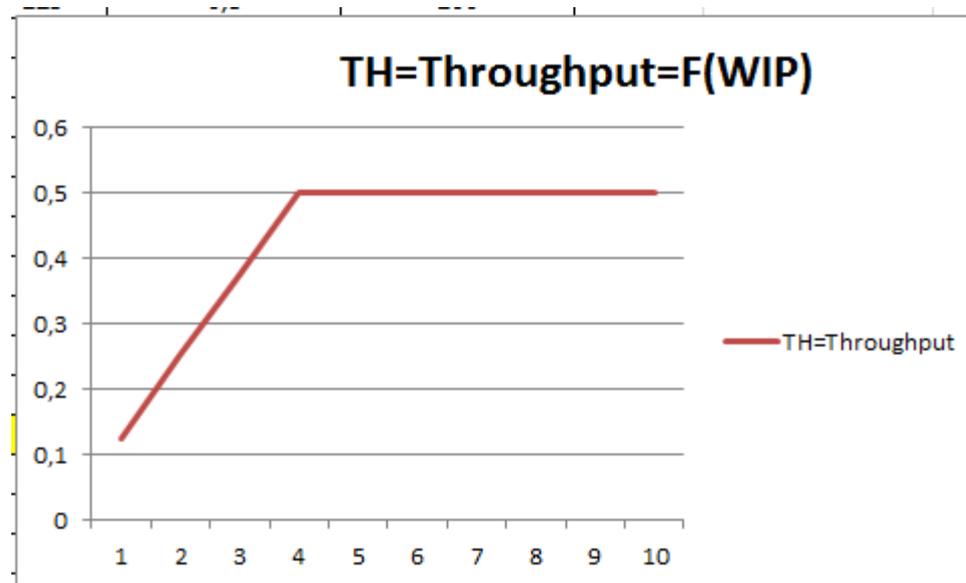
Will be explained in **Little´s law** presentation

Basic problem (setup times) IV.

Black
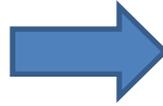
White

White
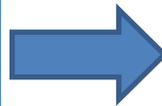
Black

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

Basic problem V-I. (availability of components, **home study !!**)
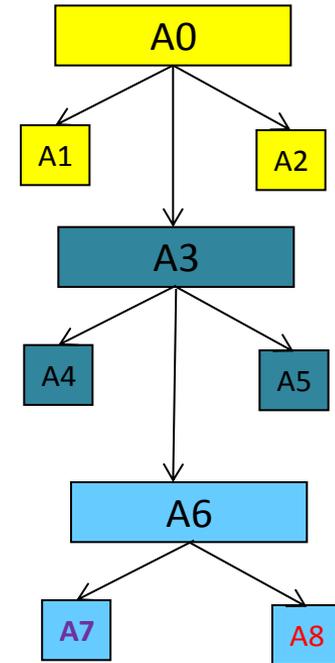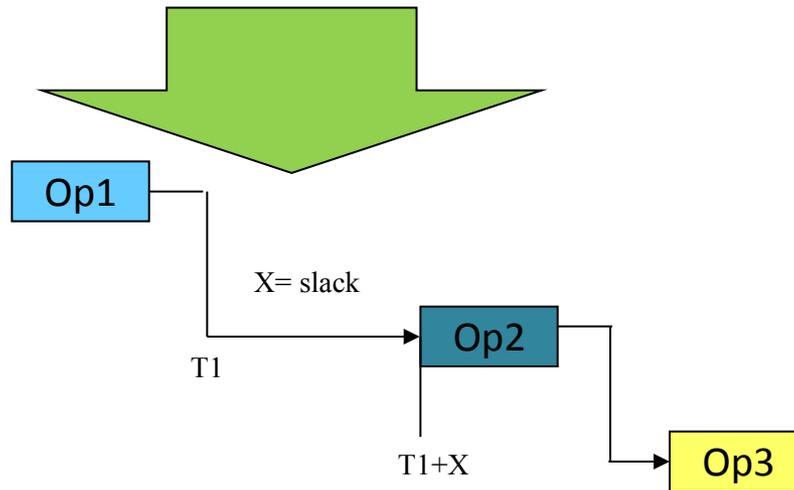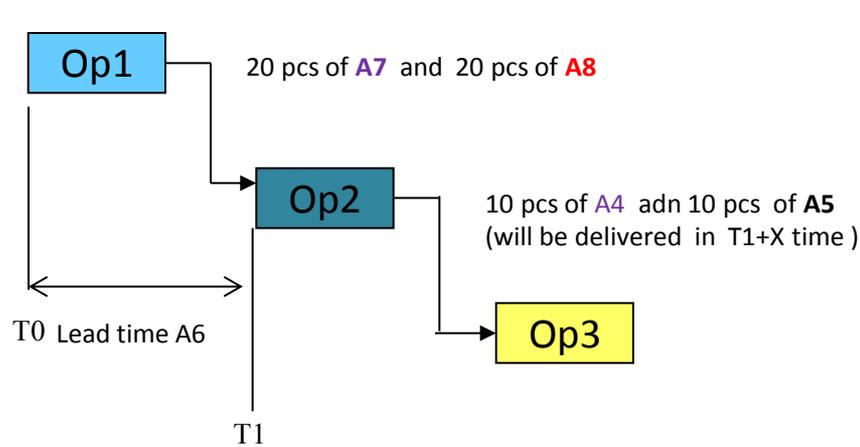
Basic problem V-II. (availability of components product PlannerOne)

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)

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
-

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