

International Logistics Management



- dr Marian Krupa

AGENDA:

- 1. Introduction to the International Logistics Management**
- 2. International Supply Chain Management (SCM)**
- 3. IT and International Logistics Management – ERP software overview**
- 4. International transportation systems**
- 5. International logistics structures and networks management**
- 6. Strategic and operational information management in Logistics - towards Global Business Intelligence.**
- 7. International Logistics Management – case study**

5. International logistics structures and networks management

Simulation / Simulation process / Model

Bizagi / Flexsim Method

Dilemma of geographical localization

„k center“ problem

Logistics performance evaluation / KLPI



Decisions, questions, dilemmas...



Introduction

- ✓ The ability of **asking right questions** is a recipe for success in business – in logistics too.
- ✓ However... **good managers, though, are responsible for delivering good answers – and finally to make right decisions!**
- ✓ Key issue for logisticians:

What is the best way, METHOD to deliver the best answers (business solutions in logistics)?

Simulation and optimization

Simulation process

Models

Simulation, Simulation process



SIMULATION – introduction:

- ✓ Since, there is no opportunity to perform **live experiments** in business activity, simulation is the only option to:
 - 1) better **understand the business model** and/or
 - 2) to find the best solution (define KLPs and business objectives) – **optimization approach**.
- ✓ **Simulation represents one of the tools most frequently implemented as a decision support system in SCM** (management, economics).

Simulation, Simulation process



SIMULATION – definition:

- ✓ **The imitation** of the operation of real-world process or system over time.
- ✓ SIMULATION is a process of:
 1. building a **model** with data and
 2. **experimenting** with it (what-if)
 3. in order to develop insight into a system's behavior – cause-and-effect (**understanding** business model)
 4. based on a specific set of **inputs** (data) and assist in decision-making processes (**priorities/KPI**).

Simulation, Simulation process



SIMULATION – benefits:

- ✓ Better **understanding** of business model;
- ✓ Shows the **system behavior over time**;
- ✓ Allows to **evaluate proposed strategies (different business options)** without their live implementations;
- ✓ Allows „**What-if**” analysis (optimistic / pessimistic)
- ✓ Shows key performance indicators KPIs (defines business **priorities**)

Simulation, Simulation process



SIMULATION – limits:

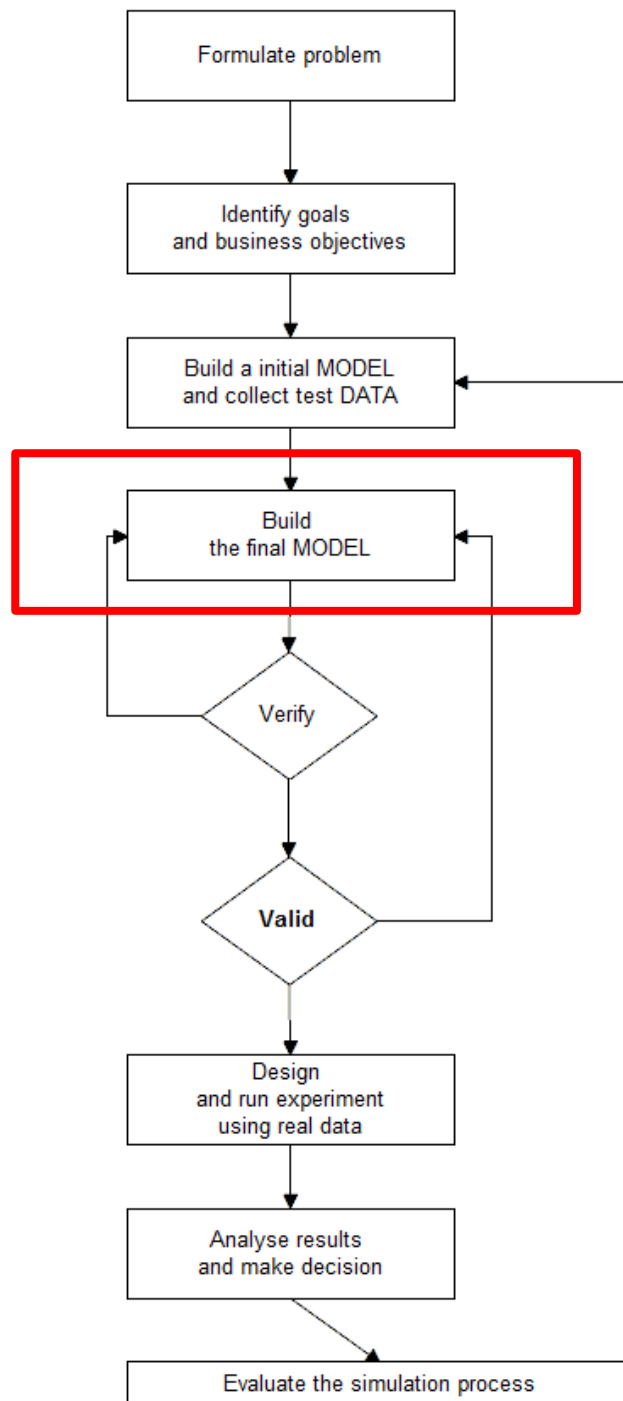
- ✓ If data is not very well structured;
- ✓ There is no historical data;
- ✓ There are not good practices (benchmarks)
- ✓ The the benefit is too low - cost of doing simulation is greater than the cost of impact on the decision;
- ✓ The cost of simulation is greater than the cost of experiment.

Simulation, Simulation process



SIMULATION – proces:

1. Formulate / define a **problem**.
2. Identify business **goals** and **objectives**. Define supply chain key performance indicators (priorities).
3. Design (conceptualise) prototype **MODEL** (variables).
4. Collect test **data** (inputs).
5. Develop the **final MODEL**.
6. **Test** / verify, check the effectiveness of the model.
7. **Valid** the final model.
8. Plan and run **experiments** using the validated model.
9. **Analyse** results and determine **decisions**.
10. Evaluate the simulation process – the value of the model.



Simulation proces

Verification - The evaluation of whether or not a product, service, or system complies with a regulation.

Validation. The assurance that a product, service, or system meets the needs of the customer and other identified stakeholders.

Mangan, Lalwani, Butcher, Javadpour, Global Logistics and Supply Chain Management, Wiley & Sons, 2012.

Simulation, Simulation process



MODELS – definition:

- ✓ **Model** – simplifies and presents key cause-and-effect relationships.
- ✓ To build a model we can refer to:
 - ✓ business cases
 - ✓ algorithms
 - ✓ formulas
 - ✓ analytical tables
 - ✓ diagrams
 - ✓ Software solutions
 - ✓ ?

Simulation, Simulation process



SIMULATION – conclusion:

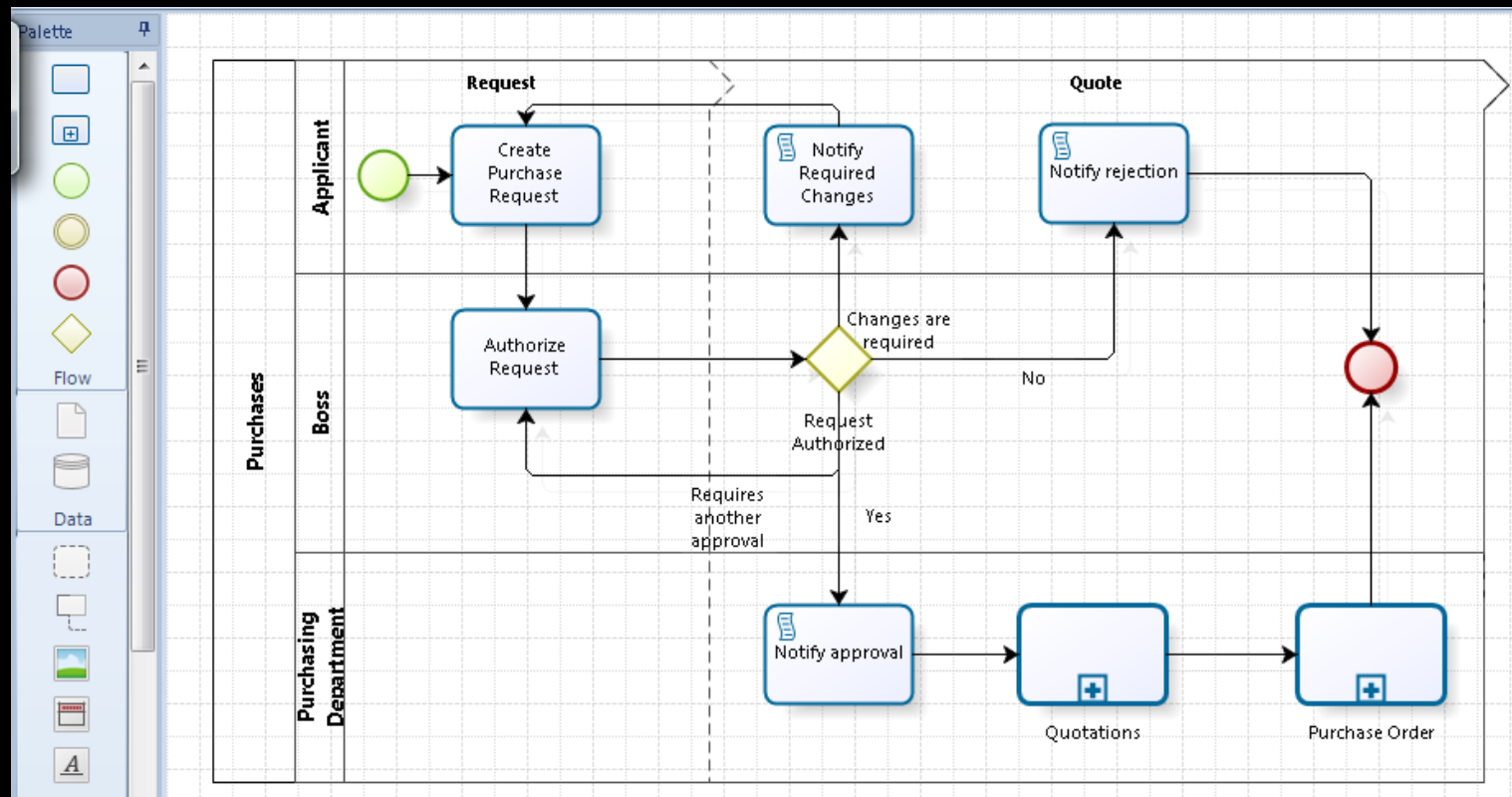
- ✓ The quality of business decisions depend on the **quality of model** we use to support them.
- ✓ The answer derived from simulation is always a **hypothetic** idea how the business should be run.
- ✓ To build effective simulation processes it is necessary to adopt IT – **Business Intelligence / Simulation** software solutions.

Simulation, Simulation process

SIMULATION – examples:

Simulation, Simulation process

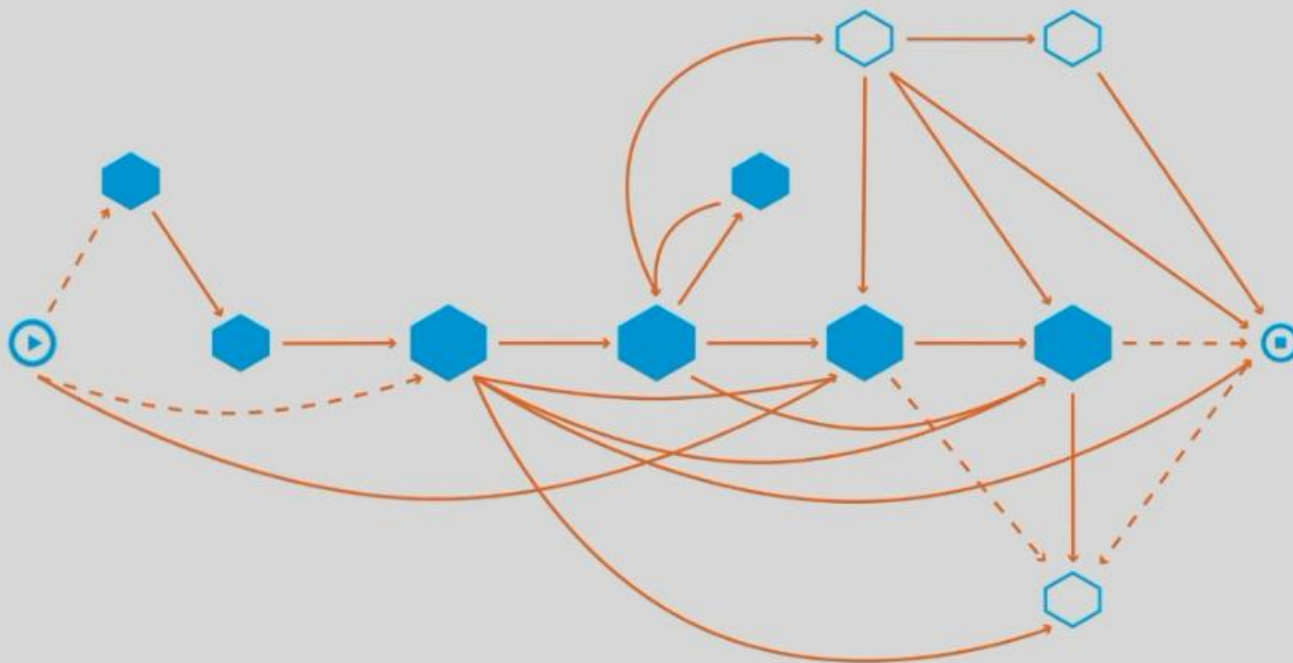
SIMULATION – examples:



Simulation, Simulation process

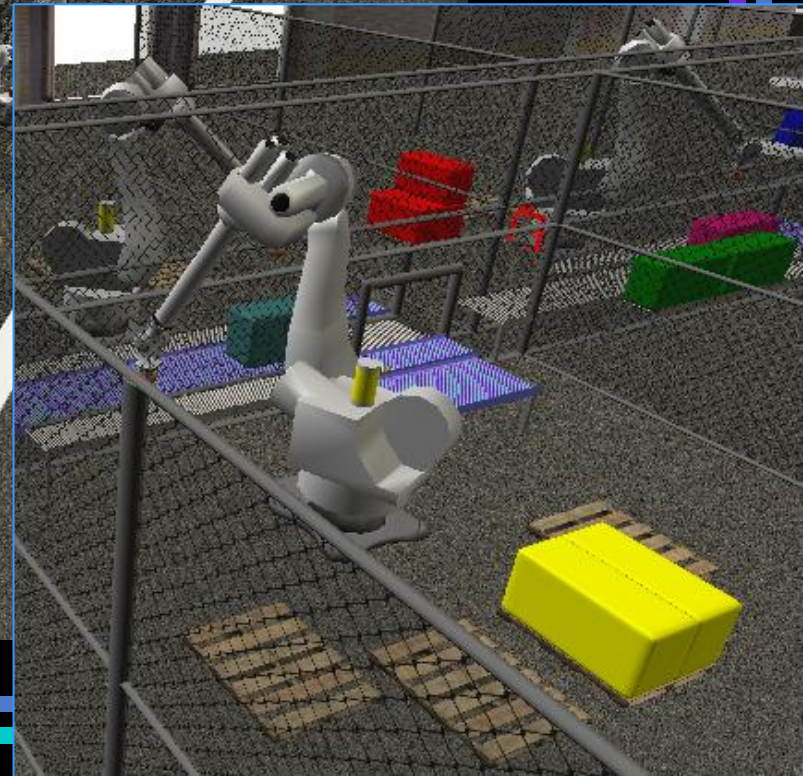
SIMULATION – examples:

SAP Process Mining by Celonis



Simulation, Simulation process

SIMULATION – examples:



International Logistics

Network optimization

- Dilemma of geographical localization**

Facility location



OPTIMIZATION – definition:

- ✓ **Optimization (optimality)** – making the best of or most of something [Oxford Dictionary].
- ✓ For example: in logistics, **optimisation techniques (MODELS)** can be used to determine, define the supply chain network that will:
 1. deliver the highest level of service (QUALITY)
and
 2. produce minimum total transport COST.

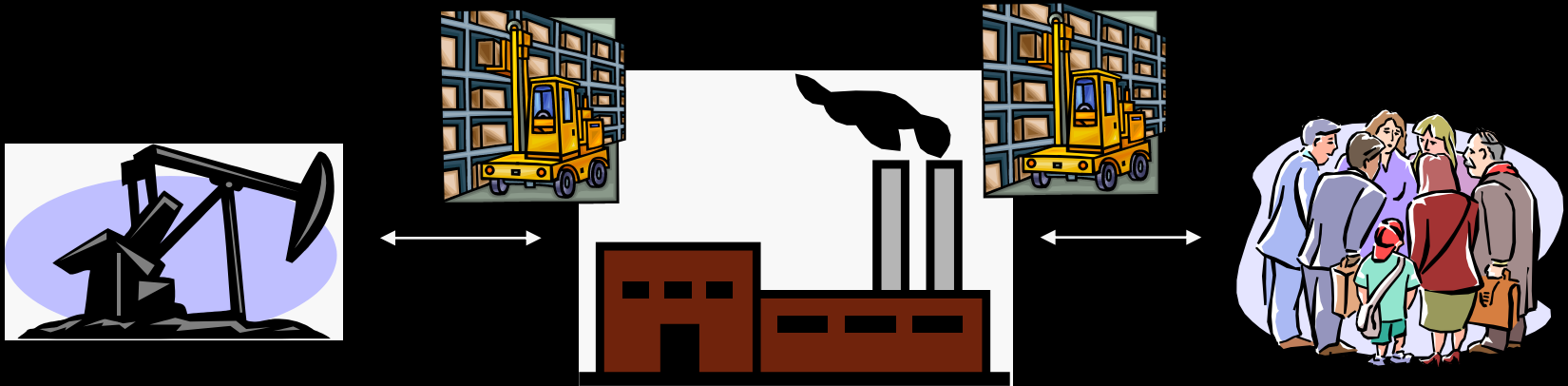
Facility location



Facility location is related to:

Logistics points: plants, warehouses, distribution centers, resources sites, etc.

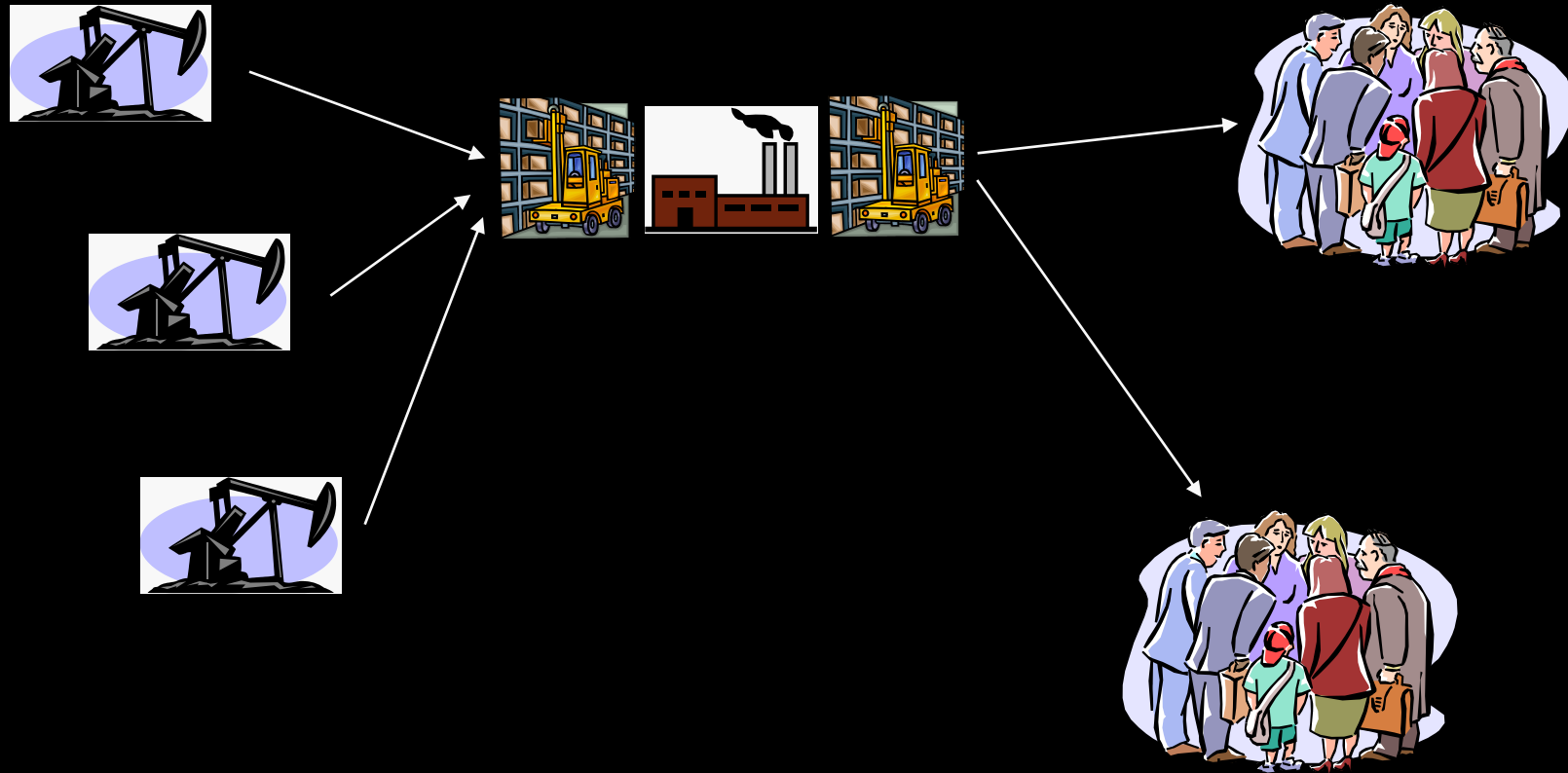
- with reference to markets (**Demand**),
- and manufacturers / procurement (**Supply**).



Facility location

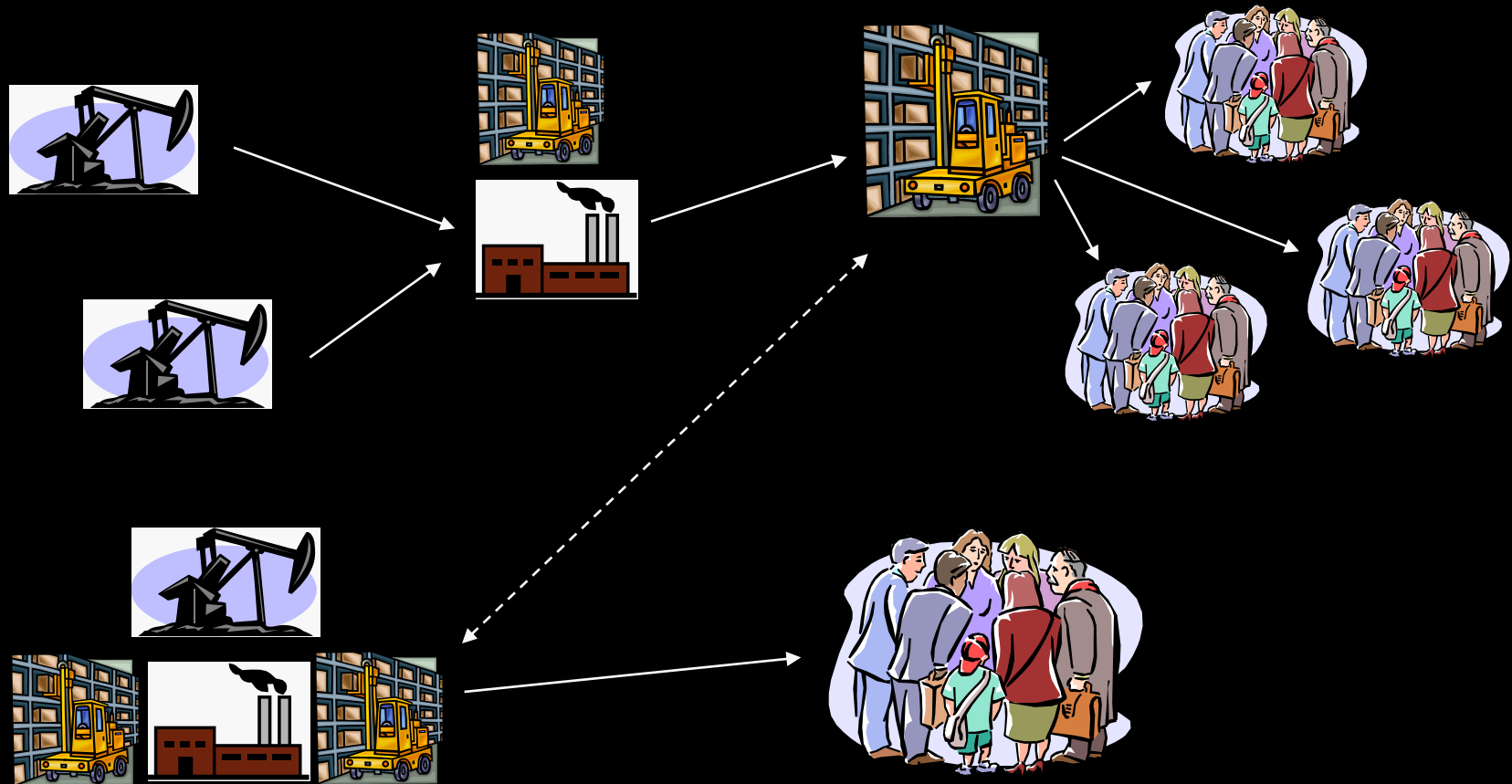


Simple supply and distribution network -
example:



Facility location

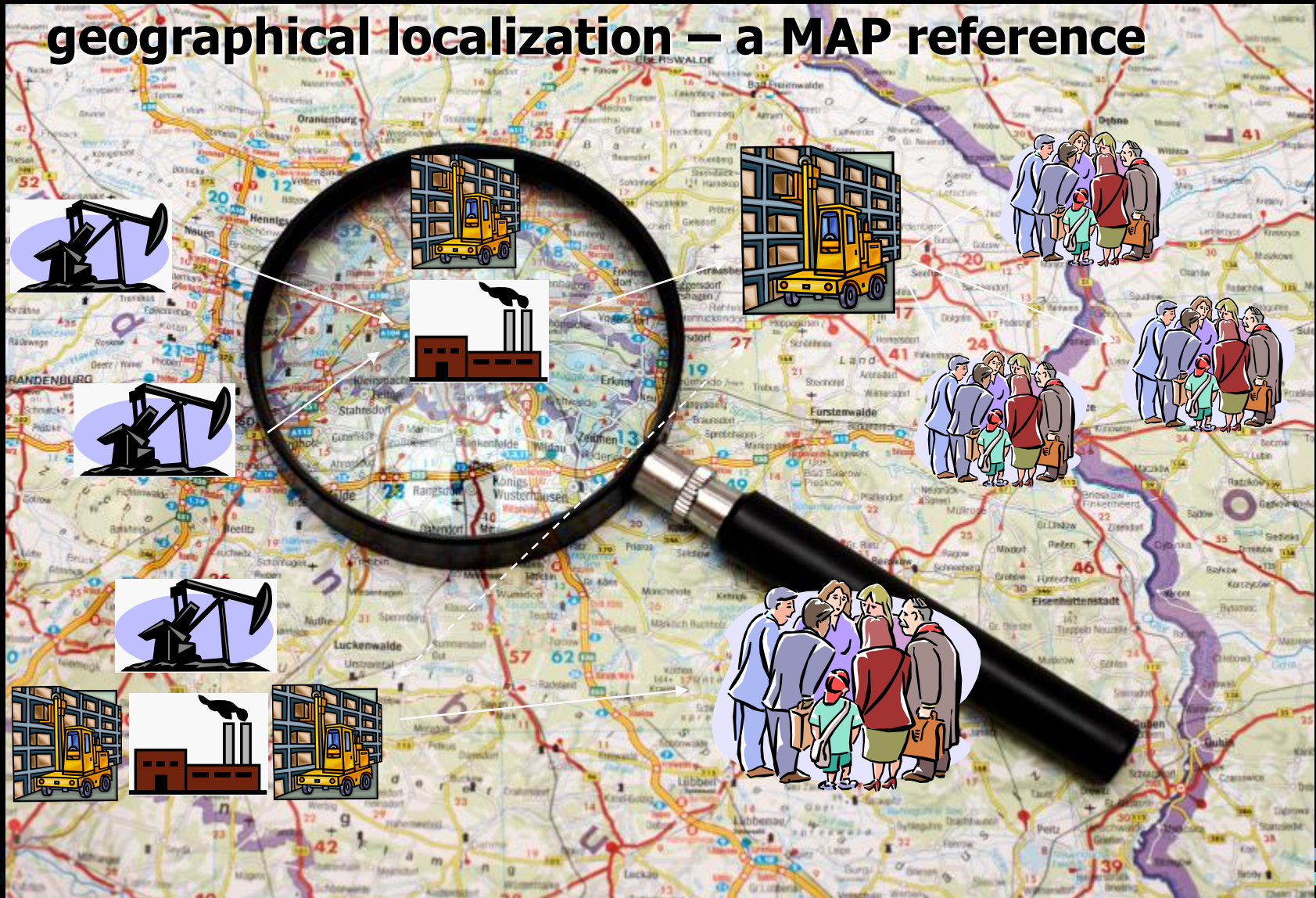
Complex supply and distribution network:



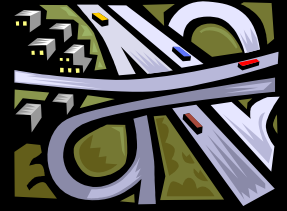
Facility location



geographical localization – a MAP reference



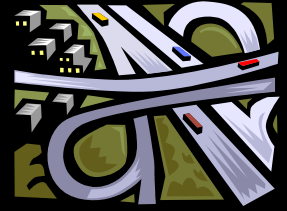
Facility location



Key Business Objectives (Quality / Cost):

1. **Readiness to deliver** all goods needed by our customers in changing demand environment.
2. To deliver all goods in **appropriate quantity** to **all places** (markets, points of delivery) **rapidly**.
3. To avoid high **level of inventory** (JiT).
4. To ensure the highest logistics **efficiency and quality** performance standards of management.
5. To produce the **lowest possible total COSTS**.

Facility location



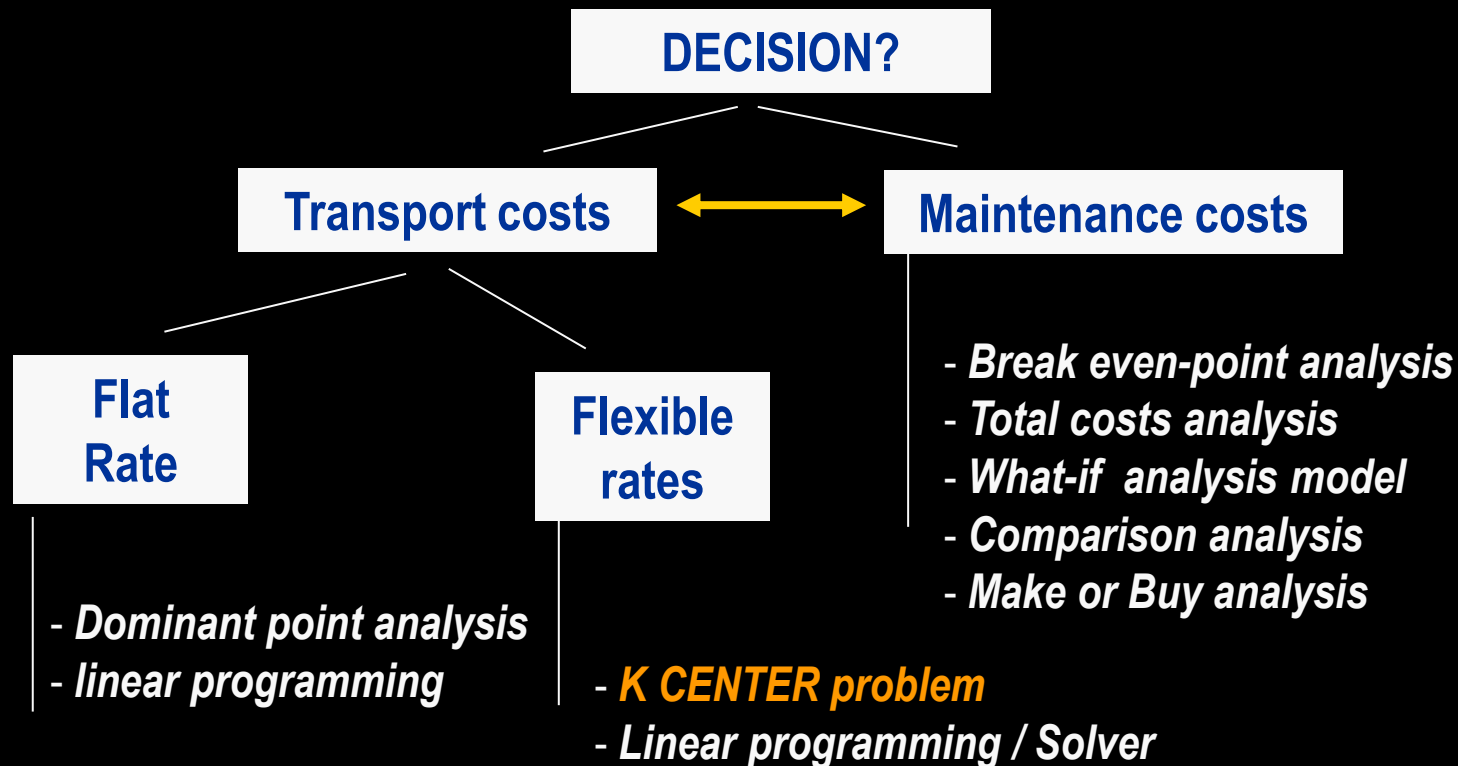
Decision dilemmas:

1. The final model can be **too complex**.
2. To perform a perfect total cost evaluation is **too difficult and risky**.
3. To implement IT is **too expensive** and too much time consuming.
4. It is impossible to define **business priorities** (all is important)
5. There is **no skill, experience** and/or knowledge to take full advantages of all scientific optimization models (linear programming).

Facility location



Decision Dilemmas:



Location evaluation

- „k center“ problem**

Logistics network optimization



K CENTER problem – definition:

- ✓ **Facility location / location analysis / k center problem** – mathematical modeling and solution of problems concerning optimal placement of facilities (Distribution centers, plants, Main warehouses) in order to minimize transportation costs.
- ✓ *What is the optimal placement / location of a new plant or distribution center?*

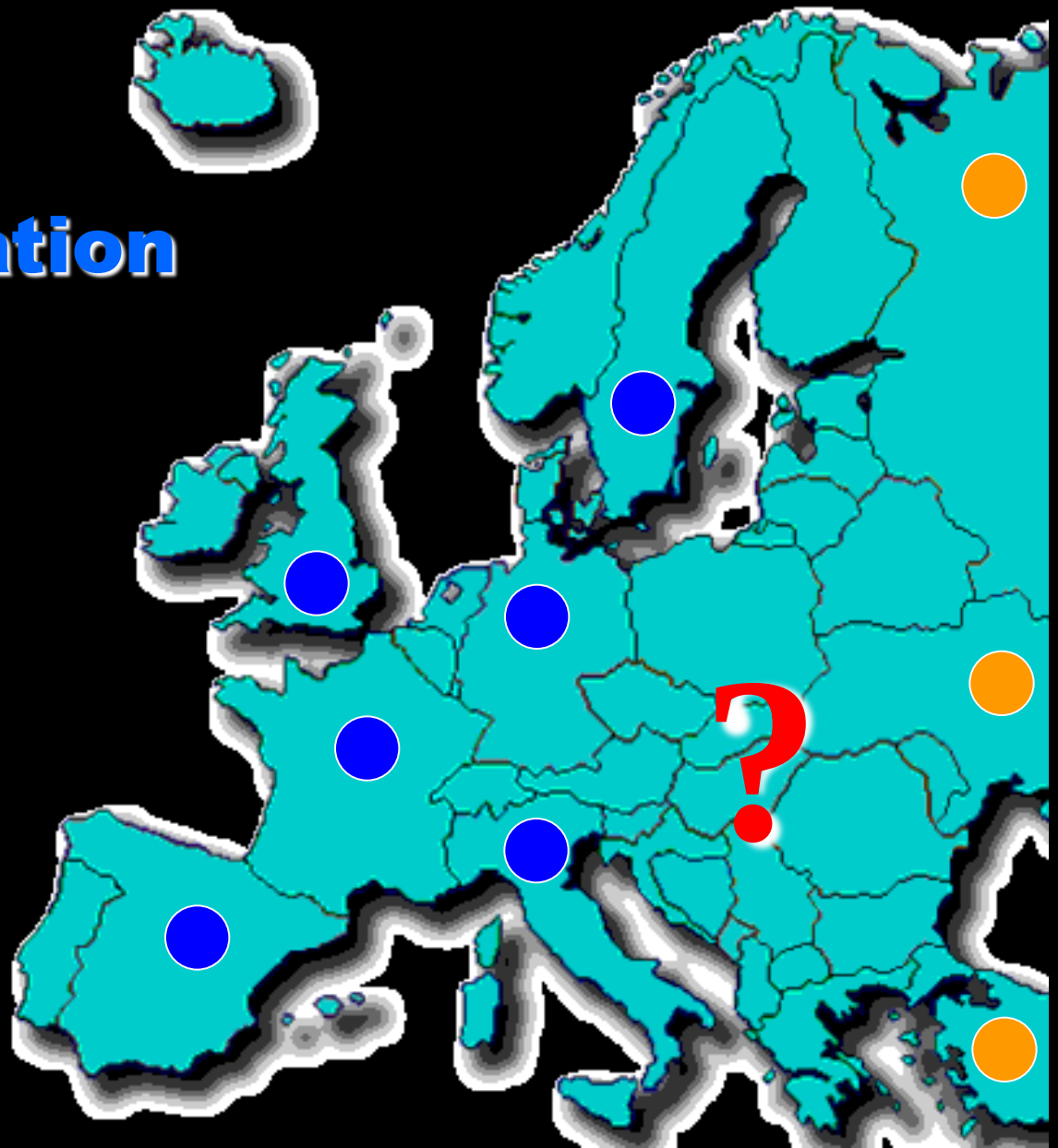
Facility location

- Case study



Project

Facility location



Resources / Procurement Centers



Markets / Distribution Centers

Project: ***Facility location***



TASK:

1. Indicate (point out) the most optimal (?) facility location. *Optimal – check KLPI!*
2. You have to take into consideration (conditions/data):
 - All points of supply resources
 - All point of delivery (markets)
 - The cost of transportation (flexible rate!)
 - The different volume of goods / transportation units on different routes.

Project: ***Facility location***



How to deliver SOLUTION:

QUESTION: What is the most optimal facility geographical location?

ANSWER - procedure:

1. Define the appropriate KLPI accordingly to key objects
2. Choose the formula and collect data (DOMAIN POINT)
3. Build the model using business data
4. Perform the experiment (model + data = solution)
5. Deliver the answer - solution.

Project: *Facility location*

Formula

Domain Point:

$$C = \frac{\sum_{i=1}^m r_i d_i S_i + \sum_{i=1}^m R_i D_i M_i}{\sum_{i=1}^m r_i d_i + \sum_{i=1}^m R_i D_i}$$



C – coordinates of the optimal point X/Y

M_i – coordinates for delivery points (markets)

S_i – coordinates for supply points (natural resources)

D_i – number of transportation units (goods to be sold)

d_i – number of transportation units (material and resources)

R_i – transportation rate for goods delivery (markets)

r_i – transportation rate for materials and resources

Project: ***Facility location***

MODEL creation – METHODOLOGY

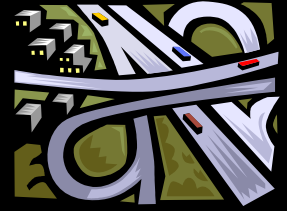


1. Create a graph (net) over the geographical map (i.e, map of Europe) and put an appropriate scale on x/y coordinates.
2. Define x/y coordinates for all points of supply (S) and demand (M)
3. Enter all input data to the appropriate defined, structured **table**.
4. Based on the presented **formula** perform all calculations. Evaluate coordinates for the new localization of plant.
5. Point out the optimized localization of the logistics point on the map.
6. Perform some „**what if**” analysis for different business scenarios.

KLPI / Key Logistics Performance Indicators

- recommended formulas

Key Logistics Performance Indicators



KLPIs: introduction

- To better control all business, logistics processes it is necessary to define key indicators that help managers to **quick evaluate their efficiency**.
- Over the years, managers spend a significant amount of time to create a list of **the most useful** logistics performance indicators that can be adopted also in international logistics management.

Logistics Performance Indicators

Sales and Distribution



$$\begin{array}{l} \text{Sales Plan Performance} \\ \text{by product or item} \end{array} = \frac{\text{Actual unit sold for (month)}}{\text{Planned sales for (month)}} \times 100$$

- We evaluate the **sales performance** with reference to plan.
- If the value is higher it is better.
- It is necessary to take into consideration regional, industry standards / benchmarking.

Logistics Performance Indicators

Sales and Distribution



$$\text{Customer Delivery Performance} = \frac{\text{Number of items shipped on time}}{\text{Number of items due to ship}} \times 100$$

- We evaluate **the quality of distribution services** / proceses.
- If the value is higher it is better.
- It is necessary to take into considaretion regional, industry standards / benchmarking.

Logistics Performance Indicators

Sales and Distribution



$$\text{Average Cost of Sales Order (SO) Processing} = \frac{\text{Total cost of SO processing}}{\text{Number of SO processed}}$$

- We evaluate the **cost level of Sales Order processing**.
- If the value is lower it is better.
- It is necessary to take into consideration regional, industry standards / benchmarking.

Logistics Performance Indicators

Procurement



$$\text{Supplier Delivery Performance (PO)} = \frac{\text{Numbers of orders (PO) delivered on time}}{\text{Number of purchase orders (PO) due}} \times 100$$

- We evaluate the **quality of procurement** / suppliers performance.
- If the value is higher it is better.
- It is necessary to take into consideration regional, industry standards / benchmarking.

Logistics Performance Indicators

Procurement



$$\text{Inventory Record Accuracy} = \frac{\text{Numbers of correct items / inventories due to location}}{\text{Number of all items / inventories}} \times 100$$

- We evaluate the **quality / accuracy of inventory / procurement management**.
- If the value is higher it is better.
- It is necessary to take into consideration regional, industry standards / benchmarking.

Logistics Performance Indicators

Procurement



$$\text{Warehouse Work Efficiency} = \frac{\text{The average time of delivery processing}}{\text{Number of warehouse employees}}$$

- We evaluate **the warehouse work efficiency**.
- If the value is higher it is better.
- It is necessary to take into consideration regional, industry standards / benchmarking.

Logistics Performance Indicators

Transport



$$\text{Shipment Efficiency (Delivery on time)} = \frac{\text{Number of shipments delivered on time}}{\text{Number of all shipments}} \times 100$$

- We evaluate the **quality of shipment services with reference to time factor**.
- If the value is higher it is better.
- It is necessary to take into consideration regional, industry standards / benchmarking.

Logistics Performance Indicators

Transport



$$\text{Transport Efficiency} = \frac{\text{Total transport time (houres)}}{\text{Number of shipments}}$$

(Average time of delivery)

- We evaluate the **average time of single shipment**.
- The lower value it is better.
- It is necessary to take into consideration regional, industry standards / benchmarking.

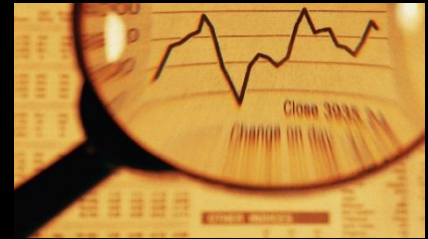
Benchmarks / Business Ratios

- review

Benchmarking

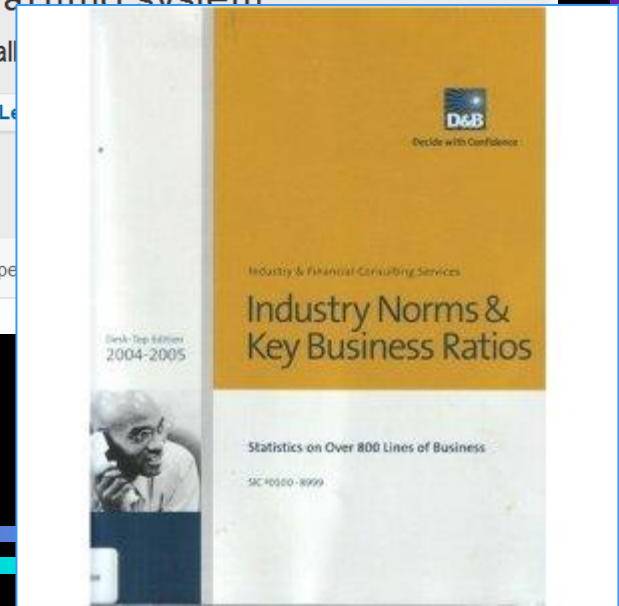
Dun & Bradstreet (D&B)

Industry norms and key business ratios



The screenshot shows the Dun & Bradstreet (D&B) website homepage. The header features the D&B logo, a dropdown menu for "United States", a phone number "(866) 203-3151", and a "CUSTOMER LOGIN" link. Below the header is a navigation bar with links for "OUR DATA INSIGHT", "LEARNING CENTER", "ABOUT US", and a search bar. The main content area has a large teal graphic with the text "EVERY DAY 260 BUSINESSES FILE FOR BANKRUPTCY". To the right of this graphic, the text "D&B is your early warning system" is visible. Below the graphic, there are two buttons: "Protect your cash flow" and "Get credit scores in seconds".

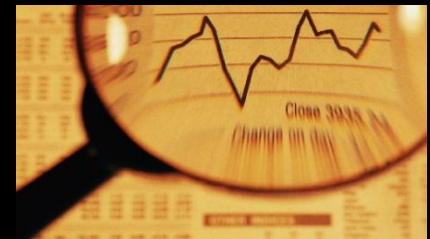
<http://www.dnb.com/>



Benchmarking

Dun & Bradstreet (D&B)

Industry norms and key business ratios



Decide with Confidence

Key Business Ratios

Solvency

Efficiency

Profitability

Report

[Help](#)

[Log Off](#)

800x800

[Go](#)

Ratios

My Financials

Print

Export

SIC: 8071

Line of Business: MEDICAL LABORATORIES

Asset Range: All Asset Ranges within SIC Group

Industry Quartiles

2010

2009

2008

Statement Sampling: 31

Statement Sampling: 47

Statement Sampling: 41

Solvency

Upper

Median

Lower

Upper

Median

Lower

Upper

Median

Lower

Quick Ratio (times)

2.5

1.4

1

2.8

1.2

0.5

4.4

1.4

0.9

Current Ratio (times)

3.4

2

1.1

4.3

1.5

0.7

4.9

1.8

1

Current Liabilities / Net Worth (%)

17.4

41.7

90

14.8

38.2

105.5

11.3

31.2

111.9

Current Liabilities / Inventory (%)

175.2

547.1

999.9

253.7

999.9

999.9

323.9

998.5

999.9

Total Liabilities / Net Worth (%)

28.4

105.3

236.5

16.1

79.2

166.5

12.6

58.5

217.9

Fixed Assets / Net Worth (%)

12.2

38.2

92.5

9.2

35.9

96.6

10.4

24.3

78.1

Efficiency

Upper

Median

Lower

Upper

Median

Lower

Upper

Median

Lower

Collection Period (days)

34.5

45.3

54.4

32.1

42.7

54.8

35.6

51.8

66.5

Sales / Inventory (times)

96.2

48.4

24.9

175.5

57.5

25

178.5

80.7

40.4

Assets / Sales (%)

41.1

73.7

99.4

50.4

88.5

120.7

39.6

84.4

103.6

Sales / Net Working Capital (times)

20.6

7.5

4.1

12.8

6

2.1

17

6.3

2.5

Accounts Payable / Sales (%)

3.4

5.1

9.9

2.9

4.9

7.9

3.2

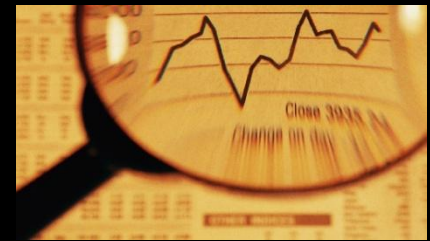
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12.1

Benchmarking

Dun & Bradstreet (D&B)

Business Reports



Benchmarking

Wzorce branżowe

Bisnode D&B Polska <http://www.dnb.com.pl>



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Tel: 22 533 24 00

Fax: 22 533 24 24

E-mail: info@bisnode.pl

"Zawsze pamiętajcie, że własne postanowienie osiągnięcia sukcesu jest najważniejsze"

Abraham Lincoln (1809-1865) pracownik D&B w roku 1859, późniejszy prezydent USA.

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Partnerzy

Bisnode D&B Polska

Już od ponad 170 lat dostarcza usługi i wiedzę niezbędne do podejmowania pewnych i bezpiecznych decyzji biznesowych.

Autorski proces DUNSRight™ pozwala dostarczać klientom informacje wysokiej jakości, dostępne online 24 godziny na dobę. To właśnie solidność informacji jest podstawą rozwiązań D&B, na których polegają Klienci firmy. Rozwiązania w zakresie zarządzania ryzykiem wykorzystywane są w celu zwiększania rentowności oraz minimalizowania ryzyka w obrocie gospodarczym. Rozwiązania w zakresie sprzedaży i marketingu umożliwiają zwiększanie przychodów poprzez wyszukiwanie potencjalnych partnerów handlowych i nawiązywanie współpracy z nowymi kontrahentami.

Produkty i usługi oparte są na największej na świecie bazie danych tego typu, zawierającej informacje o 200 milionach firm z całego świata. W celu zapewnienia dokładności i kompletności informacji, stosujemy zaawansowane narzędzia zbierania danych i aktualizujemy naszą bazę danych prawie milion razy dziennie. Nasza troska o jakość oznacza, że otrzymują Państwo najświeższe i najbardziej użyteczne informacje, na podstawie których podejmowane są decyzje biznesowe.

Polskie biuro powstało w Warszawie w 1992 roku. Do dnia dzisiejszego dzięki proaktywnemu zbieraniu danych stworzyliśmy największą i najbardziej aktualną bazę danych, liczącą ok. 3,5 mln polskich firm. Oznacza to, że w bazie znajdują się wszystkie zarejestrowane podmioty, prowadzące działalność gospodarczą w Polsce. Od 2003 roku

Zaloguj się

Wybierz produkt

[Przejdź](#)

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Dane o firmach na
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Benchmarking

Wzorce branżowe

Bisnode D&B Polska <http://www.dnb.com.pl>



Dun & Bradstreet Poland



Analiza branżowa

badanie struktury i kondycji branży

Analiza branżowa to finansowe opracowanie przygotowane na temat całej wskazanej branży lub wybranych firm, będących np. bezpośrednimi konkurentami.

Korzyści z analizy branżowej:

- pozwala uzyskać obraz sytuacji w badanych przedsiębiorstwach z branży,
- dostarcza informacji o wynikach i sytuacji finansowej firm, niezbędnych w procesie zarządzania, planowania, prognozowania i budżetowania,
- daje możliwość porównania własnych wyników z wynikami innych firm z branży,
- dostarcza informacji na temat sektora w którym firma zamierza inwestować.

Benchmarking

Industry ratios



<http://www.dnb.com.pl>

- Wskaźniki finansowe

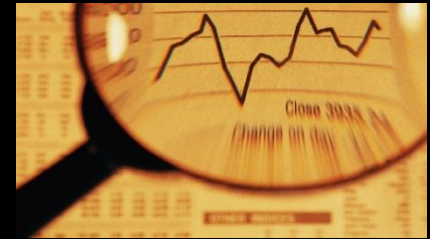
Wskaźniki branżowe są wyliczane na podstawie zagregowanych danych GUS, uzupełnionych o dane finansowe posiadane przez D&B o firmach zatrudniających poniżej 10 osób.

Wskaźniki branżowe wyznaczono dla branży oznaczonej SIC 5063

Wskaźniki finansowe		Firma				Branża		
		2012-12-31	2011-12-31	2010-12-31	2009-12-31	2011	2010	2009
Płynność								
Stopa bieżąca	?	15.86▲	0.82▼	1.38▲	0.75▼	1.47▼	1.48▲	1.47
Wskaźnik wypłacalności szybkiej	?	15.86▲	0.71▼	1.18▲	0.69▼	1.01▼	1.02▲	1.00
Wskaźnik natychmiastowy	?	14.36▲	0.25▼	0.52▲	0.15▼	0.18▲	0.17▼	0.20
Rentowność								
Rentowność netto	?	0.00▼	0.22▲	0.00▲	-0.07▲	0.03▼	0.03▲	0.03
Wskaźnik rentowności kapitałów własnych (ROE)	?	0.00►	0.00►	0.00▼	0.39▼	0.13▼	0.15▲	0.13
Wskaźnik rentowności aktywów (ROA)	?	0.00►	0.00►	0.00▲	-0.14▲	0.06►	0.06►	0.06
Zadłużenie								
Wsk. wartości netto	?	882.64▲	2.58▲	1.23▲	-0.32▼	0.75▼	0.81▼	0.84
Dług do kapitału	?	0.00▼	0.39▼	0.81▲	-3.60▲	1.28▲	1.21▲	1.15
Wskaźnik ogólnego zadłużenia	?	0.00▼	0.21▼	0.43▼	1.29▲	0.54▲	0.52►	0.52
Wskaźnik zadłużenia długoterminowego	?	0.00►	0.00▼	0.57▲	-0.24▼	0.18▲	0.15►	0.15
Wskaźnik udziału zobowiązań długoterminowych w kapitałach obcych (x 100)	?	0.00►	0.00▼	70.70▲	6.63▲	13.98▲	12.29▼	13.39
Wskaźnik zadłużenia długoterminowego II (x 100)	?	0.00►	0.00▼	36.44▲	-31.38▼	0.15▲	0.13►	0.13

Benchmarking

BizStats <http://www.bizstats.com>



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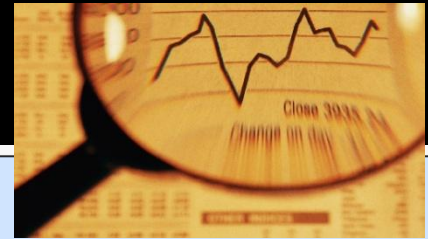
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Income-Expense Statement

Furniture

Sole Prop Annual Average Sales, Income & Expense

2010

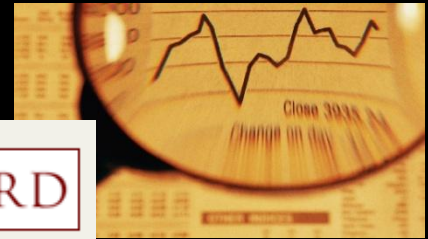
Sales	100.00%
Inventory (% of Sales)	3.54%
Cost of Sales	0.32%
COS-Labor Portion	2.94%
Gross Profit	67.60%
Salary-Wages	8.06%
Contract Labor-Commissions	1.71%
Rent	2.08%
Taxes	1.02%
Interest paid	0.25%
Amort. & Dep.	1.11%
Advertising	0.20%
Benefits-Pension	0.01%
Insurance (non-health)	1.04%
Home Office Expense	0.52%
Other SG&A Exp.	10.72%
Total Expenses	26.73%
Net Profit	40.88%
Total Direct Labor & NP	53.59%

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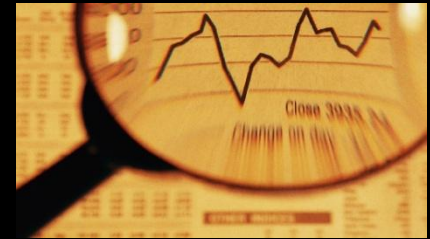
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ENTERPRISE AND INDUSTRY

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Enterprise and Industry

Small and medium-sized enterprises (SMEs)

- ▶ Small Business Act for Europe
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- Entrepreneurship 2020 Action Plan
- ▶ Promoting Entrepreneurship
- ▶ Access to markets
- Regional SME policies

SME Performance Review

The SME Performance Review is one of the main countries' progress in implementing the Small Business Act, the measures from the SBA Action Plan, the review of SMEs in EU Member States and other 9 partner countries. European SMEs and SBA country fact sheets.

Brussels, 26 November 2013 - The European Commission has published the Annual Report on European SMEs. The Report on European SMEs is a key document that provides an overview of the structure and importance of SMEs to the European economy, emphasised in the Small Business Act and Europe's growth strategy outside the EU and with the large enterprise sector.

Annual Report on European SMEs



2013 is likely to mark a turning point for the EU SMEs. After five years of an uncertain economic environment, 2013 is expected to be the first year since 2008 with a combined increase in aggregated employment and value-added of EU's SMEs. The total employment in the EU SMEs is expected to increase by 0.3% and value-added by 1% as compared to 2011. Preliminary forecasts expect the positive developments further accelerating in 2014. These promising projections are backed up by other positive signals. Over the last three years, an increasing number of Member States have seen their small business sectors returning to an expansion of employment and value-added, or at least a petering out of the decline. If the macroeconomic conditions hold, this development would mark the end of the most challenging crisis the European SMEs have experienced in the recent history.

Reports are available here:

- Annual report: 2013 [12 MB] ; 2012 [3 MB]
- Database for the Annual report: 2013 [5 MB]
- Forecast methodology: 2013 [364 KB]

<http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/>

Questions ?



- dr Marian Krupa

Exam Questions (5):



- ✓ Highlight the potential role of simulation in SCM decisions.
- ✓ Explain the steps involved in simulation process.
- ✓ What are the advantages and disadvantages of using simulation in SCM?
- ✓ Explain the location analysis or „k center” problem.
- ✓ What kind of SCM decisions can a simulation model be beneficial for?