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**EFFICIENCY OF TRANSPORT PROCESSES
IN SUPPLY CHAIN - PART ONE**



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OBUDA UNIVERSITY


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**POZNAN SCHOOL
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AGENDA

- problem of defining of efficiency in enterprises and supply chain
- problem of analysis use of logistics process efficiency in business practice
- conception of complex analysis of supply chain efficiency
- analysis of transport efficiency in supply chains – workshop




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PROBLEM OF DEFINING OF LOGISTICS EFFICIENCY

Chosen definitions of efficiency in logistics management aspect (APICS, 2004):

Allocative efficiency	The use of resources to produce those goods and services most wanted by consumers.
Efficiency variance	In cost accounting, the difference between the actual volume of a resource used and the budgeted volume, multiplied by the budgeted or standard price.
Line efficiency	A measure of actual work content versus cycle time of the limiting operation in a logistics flow. Line efficiency (percentage) is equal to the sum of all station task times divided by the longest task time multiplied by the number of stations or operations.
Materials efficiency	A concept that addresses the efficiency with which materials are obtained, converted, and shipped in the overall purchasing, production, and distribution process.
Operating efficiency	A ratio (represented as a percentage) of the actual output of a piece of equipment, department, or plant as compared to the planned or standard output.
Performance efficiency	A ratio, usually expressed as a percentage, of the standard processing time for a part divided by its actual processing time. Setups are excluded from this calculation to prevent distortion.
Productivity	An overall measure of the ability to produce a good or a service. It is the actual output of production compared to the actual input of resources. Productivity is a relative measure across time or against common entities (labor, capital, etc.).
Worker efficiency	A measure (usually computed as a percentage) of worker performance that compares the standard time allowed to complete a task to the actual worker time to complete it.
Labor efficiency	The average of worker efficiency for all direct workers in a department or facility.
Labor efficiency variance	Labor efficiency variance is (actual number of hours worked minus standard number of hours worked) times standard labor wage rate. The variance is unfavorable if the actual hours exceed the standard hours.




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PROBLEM OF DEFINING OF LOGISTICS EFFICIENCY

Essential differences between efficiency, productivity, effectiveness, profitability, and reliability:

Efficiency	The quotient of effect and expenditures incurred to acquire the effect.
Productivity	The ratio of total production (goods or services), achieved by an object (an employee or group of employees, technical equipment, plant, etc.) to the total time of his work. Productivity is a feature of an object participating in the logistics process (e.g. employee, machine) regardless of whether the products will be sold or not.
Effectiveness	The degree to which the system has reached the intended objective. Effectiveness is measured by the ratio of the achieved result (e.g. completed production, delivery in time) to the intended result (e.g. planned distribution volume).
Profitability	The ratio of profits earned by the enterprise to the value of sales, value of assets, or the value of equity. We can then talk about the profit rate (profitability of sales), profitability of employed capital, and the profitability of own capital. We can distinguish various types of profit in the analysed profitability ratios: gross profit, net profit, and operating profit. Since the main purpose of any business activity is to generate profit, profitability ratios play a very important role in the evaluation of the health of a enterprise.
Reliability	Ability to perform supporting task under set conditions for a specified period of time, without any failures.



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PROBLEM OF DEFINING OF LOGISTICS EFFICIENCY


Efficiency is the ratio of (APICS, 2004):

- actual units produced to the standard rate of logistics expected in a time period,
- standard hours produced to actual hours worked (taking longer means less efficiency),
- actual volume of output in value to a standard volume in a time period in value.

In economic aspect efficiency is the result of company's activity, which is a proportion of the achieved effect to borne spending:

$$E = \frac{e}{s} \quad \text{where:}$$

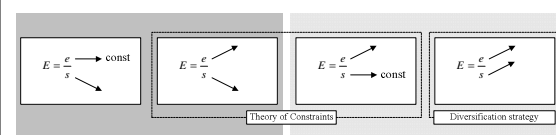
E – efficiency; e – effects; s – spending



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PROBLEM OF DEFINING OF LOGISTICS EFFICIENCY



The classic methods of improving efficiency of actions, are:

- lowering spendings and keeping the level of effects at the same time,
- lowering spendings and raising the level of effects at the same time,
- keeping the level of spendings and raising the level of effects at the same time,
- raising the level of spendings and raising drastically the level of effects at the same time.



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PROBLEM OF DEFINING OF LOGISTICS EFFICIENCY 7

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    graph TD
      Efficiency --> Economic[Economic efficiency]
      Efficiency --> Operating[Operating efficiency]
      Economic --> Org[Efficiency of the Organization]
      Economic --> Proc[Efficiency of the Process]
      Operating --> WS[Efficiency of the Work Station]
    
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The present collation is based on efficiency division presented by G. Rummler, A. Brache (Rummler, Brache 1995) and including the distinction between economic efficiency and operating efficiency.

Taking into account the economic and operating aspects, can be:

- analyze the relationships between the indicators in economic and operating terms,
- use feedback both within their respective areas of analysis, as well as between the analysis of economic and operating efficiency,
- to link the results obtained with the fundamental objectives, established at the strategic level.

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PROBLEM OF ANALYSIS USE OF LOGISTICS EFFICIENCY IN BUSINESS PRACTICE 8

- The research study was carried out in the first two quarters of 2015 in 147 logistics companies in Greater Poland's region.
- The studied companies in over 74% represented medium and large companies.
- The main aim of research studies was to identify the degree of use of logistics efficiency and difficulties in their application in business practice.

Use of analysis of logistics process efficiency

Category	Percentage
Performing analysis of logistics process efficiency in the overall evaluation of the company's activities	25%
Performing a detailed efficiency analysis on logistics process level	30%
No action, related to analysis and evaluation of logistics process efficiency	25%
No information flow on conducted analyses of efficiency in enterprises	20%

45% of surveyed companies didn't declared using the efficiency analysis to monitor and assess logistics processes or they not aware of that fact.

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DIFFICULTIES IN THE SUCCESSFUL ANALYSIS OF LOGISTICS PROCESS EFFICIENCY 9

No	Problem	Number of replies*	Percentage
1	The problem with current information flow between departments in enterprise	68	23%
2	Problems related to the implementation of the strategy chosen by the enterprise	20	7%
3	Problems related to job scheduling of logistics constraints (work station or operation with the lowest performance - the bottleneck)	23	8%
4	Problems with the reliable determination of real performance of logistics proceses	19	6%
5	Difficulties in collecting relevant data for efficiency analysis	12	4%
6	Lack of tools supporting analysis and assessment of processes efficiency	12	4%
7	Difficulties of the correct interpretation of implemented management tools (resulting confusion)	29	10%
8	Problems with transposing of strategic objectives to operational and current plans	22	7%
9	Problems related with the appropriate planning of logistics resources	32	11%
10	Problems related to planning of a balanced use of machines and resources	38	13%
11	Lack of responsible person or department for making such analysis	24	8%
Total		299	100%

* Surveyed enterprises were able to choose more than one answer.

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CONCEPTION OF COMPLEX ANALYSIS OF LOGISTICS PROCESS EFFICIENCY 10

- Operating efficiency of logistics process:

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    graph TD
      A[Selection of logistics strategy] --> B[Availability of working machines and equipment]
      B --> C[Analysis of the performance of the evaluated logistics process]
      C --> D[Allocation of tasks to individual logistics operations]
      D --> A
      D --> B
      D --> C
    
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CONCEPTION OF COMPLEX ANALYSIS OF LOGISTICS PROCESS EFFICIENCY 11

- Economic efficiency of logistics process:

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    graph LR
      subgraph Suppliers
        S1[shopping]
        S2[transport]
        S3[materials warehouse]
      end
      subgraph Production
        P[Production]
      end
      subgraph Distribution
        D1[products warehouse]
        D2[transport]
        D3[regional warehouse]
      end
      CS[Client support]
      
      S1 --> P
      S2 --> P
      S3 --> P
      P --> D1
      P --> D2
      P --> D3
      CS --> S1
      CS --> S2
      CS --> S3
      CS --> P
      CS --> D1
      CS --> D2
      CS --> D3
    
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CONCEPTION OF COMPLEX ANALYSIS OF LOGISTICS PROCESS EFFICIENCY 12

- Economic efficiency of supply process:

The issue of the supply process efficiency evaluation may be based on assumptions of Balanced Scorecard developed by R. Kaplan and D. Norton. The author proposed a balanced performance evaluation according to the relation between the objectives and the value of their measures in the following perspectives [Kaplan and Norton, 1996]:

- financial,
- customer,
- internal business processes,
- learning and growth.

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CONCEPTION OF COMPLEX ANALYSIS OF LOGISTICS PROCESS EFFICIENCY 13

- Economic efficiency of logistics process:

Measures of the supply process economic efficiency in the financial perspective

No.	Name of indicator	Data relation	Data	UoM
1.	Index of complaints and returns	$\frac{a}{b}$	a - value/cost of complaints and returns	%
	b - value/cost of all supplies of materials and raw materials			
2.	Index of valuable incompleteness of deliveries		a - value of incomplete deliveries	%
	b - total value of deliveries			
3.	Material inventory turnover index	a - costs of materials consumption	%	
	b - average inventory of materials			
4.	Average value/ cost of delivery	a -value/cost of completed orders	PLN	
		b -number of completed orders		

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CONCEPTION OF COMPLEX ANALYSIS OF LOGISTICS PROCESS EFFICIENCY 14

- Economic efficiency of logistics process:

Measures of the supply process economic efficiency in the customer perspective

No.	Name of indicator	Data relation	Data	UoM
1.	Efficiency of order realization	$\frac{a}{b}$	a - number of completed orders	%
	b - general number of orders			
2.	Quantitative and value market share		a - size of the target group of clients	%
	b - total size of the market			
3.	Average duration of delivery	a - total delivery time	h	
		b - number of deliveries		
4.	Share of incomplete deliveries to the client	a -number of incomplete deliveries	%	
		b - total number of deliveries		

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CONCEPTION OF COMPLEX ANALYSIS OF LOGISTICS PROCESS EFFICIENCY 15

- Economic efficiency of logistics process:

Measures of the supply process economic efficiency in the internal business process perspective

No.	Name of indicator	Data relation	Data	UoM
1.	Efficiency of acceptance of materials	$\frac{a}{b}$	a -average time of acceptance of materials	h/em.
	b -number of employees			
2.	Reliability of delivery		a -number of deliveries compatible with the order	%
	b - total number of deliveries			
3.	Share of faulty raw materials deliveries	a - number of faulty raw materials deliveries	%	
		b - total number of raw materials deliveries		
4.	Ultimateness of deliveries	a -number of untimely deliveries	%	
		b- total number of deliveries		

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CONCEPTION OF COMPLEX ANALYSIS OF LOGISTICS PROCESS EFFICIENCY 16

- Economic efficiency of logistics process:

Measures of the supply process economic efficiency in the learning and growth perspective

No.	Name of indicator	Data relation	Data	UoM
1.	Share of faulty raw materials deliveries	$\frac{a}{b}$	a - number of faulty raw materials deliveries	%
	b - total number of raw materials deliveries			
2.	Flexibility of delivery		a - number of deliveries that meet the special requirements	%
	b - total number of deliveries			
3.	Reliability of delivery	a -number of deliveries compatible with the order	%	
		b - total number of deliveries		
4.	Load standardization	a - the number of items included in the unified loads	%	
		b- the number of items included on general loads		

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WORKSHOP 17

- Analysis of transport efficiency in supply chain in each perspectives - elaboration the proposal system of indicators for one of perspectives (work in 8 groups)
- Importance analysis of transport efficiency indicators in each perspectives (work in groups)
- Analysis of transport efficiency in supply chain in Poland – benchmarking
- Importance analysis of benchmarking indicators in Poland (work in groups)
- Elaboration the final system of indicator for one of perspectives

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WORKSHOP 18

- Analysis of transport efficiency in supply chain

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CONCEPTION OF COMPLEX ANALYSIS OF TRANSPORT PROCESS EFFICIENCY - BENCHMARKING 19

- Economic efficiency of logistics process:

Measures of the transport process economic efficiency in the financial perspective

No.	Measure name	Data relation	Data	UoM
1.	Return on investment (ROI)	$\frac{a}{b}$	a - net profit	%
			b - investment*	
2.	Return on equity (ROE)		a - net income after tax	%
			b - shareholder equity	
3.	Return on assets (ROA)		a - net income	%
4.	Return on sales (ROS)		b - mode of total assets	%
		a - net profit		
5.	Indicator of complaints and returns	b - sales revenue	%	
		a - value / cost of complaints and returns		
6.	Indicator of the cost-transport fleet	b - value / cost of all deliveries	euro/vehicle	
		a - mileage costs		
			b - number of vehicles	

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CONCEPTION OF COMPLEX ANALYSIS OF TRANSPORT PROCESS EFFICIENCY - BENCHMARKING 20

- Economic efficiency of logistics process:

Measures of the transport process economic efficiency in the customer perspective

No.	Measure name	Data relation	Data	UoM
1.	Indicator of transportation timeliness	$\frac{a}{b}$	a - number of forward transportation	%
			b - total number of transportation	
2.	Indicator of cargo damage during transport		a - number of damaged transport units	%
			b - total number of transport units	
3.	Delivery reactivity		a - number of items delivered ahead of schedule	%
			b - total number of elements	
4.	The share of incomplete deliveries to the customer	a - number of incomplete deliveries	%	
		b - total number of deliveries		

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CONCEPTION OF COMPLEX ANALYSIS OF TRANSPORT PROCESS EFFICIENCY - BENCHMARKING 21

- Economic efficiency of logistics process:

Measures of the transport process economic efficiency in the internal business process perspective

No.	Measure name	Data relation	Data	UoM
1.	Rate of transport fleet use	$\frac{a}{b}$	a - number of driven kilometers	km/vehicle
			b - number of vehicles	
2.	Indicator of vehicles utilization capacity		a - weight of transported cargo	kg/vehicle
			b - number of vehicles	
3.	Cargo predictability		a - transported cargo (weight or volume)	%
			b - transport fleet capacity	
4.	Indicator of transport intensity	a - transportation time	h/ delivery	
		b - total number of deliveries		

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CONCEPTION OF COMPLEX ANALYSIS OF TRANSPORT PROCESS EFFICIENCY - BENCHMARKING 22

- Economic efficiency of logistics process:

Measures of the transport process economic efficiency in the learning and growth perspective

No.	Measure name	Data relation	Data	UoM
1.	The share of defective deliveries	$\frac{a}{b}$	a - number of defective deliveries	%
			b - total number of deliveries	
2.	Delivery flexibility		a - number of special deliveries	%
			b - total number of deliveries	
3.	Transport reliability		a - number of operations on time	%
			b - total number of operations	
4.	Indicator of cargo damage during transport	a - number of damaged transport units	%	
		b - total number of transport units		

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CONCEPTION OF COMPLEX ANALYSIS OF TRANSPORT PROCESS EFFICIENCY - BENCHMARKING 23

- Economic efficiency of transport process in Poland:

Legend:
0 - not important indicator, ..., 5 - very important indicator

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Thank you for your attention