

PERFORMANCE MEASUREMENT IN LOGISTICS CENTERS

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Abstract: Measurement of the process efficiency and effectiveness is a basis action in management without it analysis of processes and comparison of effects cannot be possible. In the paper, the methods of analysis of performance in logistics center are presented as well as chosen measures. Then the effects of performance analysis are presented in logistics centers in Poland, Slovakia and Spain.

Keywords: logistics centers, performance analysis

1. Performance measures in logistics centres

For most logistics operations it is possible to identify certain key measures that provide an appropriate summary measurement of the operation as a whole and of the major elements of the operation. Detailed measurements are likely to differ from one company to another, depending on the nature of the business.

Measures are generally aimed at providing an indication of the performance of individual elements within an operation as well as their cost-effectiveness. In addition, the overall performance or output is often measured, particularly with respect to the service provided, the total system cost and the return on capital investment [1.].

Functioning of logistics centre is not fixed, but continues to evolve. There is a necessity to check how well it works at the moment, and how it can be improved. In order to find solution one must answer four questions [2.]:

1. What is logistics centre doing now?
Analyzing the current methods, aims and operations of logistics.
2. What do logistics centre want to do in the future?
Giving new aims and clear objectives for improvement.
3. What is the best way for logistics centre to get there?
Looking at options and implementing the best.
4. How do logistics centre know that it is getting there?
Measuring performance, comparing actual results with expectations.

Logistics centre has to measure the performance of organization. If there is no such measures, nobody can find things, which should be improved or whether they meet targets. The main problem is finding what to measure and how to measure it.

There is a huge number of possible measures of logistics. Some of these are indirect measures and often relate to finance, such as the return on capital, profit rate and others. Financial performance point where something is wrong, but it does not show what is wrong or how to correct it. In logistics practice it is much better to use direct measures of logistics,

such as the number of products delivered, stock turnover or distance traveled. There are very many possible measures to check how logistics centre is functioning.

Productivity is one of the most widely used measures of performance. There are a number of kinds of productivity. The broadest picture comes from total productivity, which relates throughput of a logistics centre to the amount of resources used. Total productivity usually is calculated as throughput divided through resources used [3.].

Throughput and resources must use consistent units, so they are normally translated into units of currency. It is difficult to find values for all the inputs and outputs.

There are four types of partial productivity relating the throughput to different types of Resource [4.]:

- *equipment productivity* – such as the number of customer visits per van, weight moved per forklift, or miles flown per plane,
- *labor productivity* – such as the number of deliveries per person, tonnes moved per shift, or orders shipped per hour worked,
- *warehouse productivity* – such as the amount stored through average amount stored, number of orders shipped through average,
- *transportation productivity* – such as shipments transported to destination through total transportation costs.

Productivity can be a very useful measure of performance. Logistics centre must carefully look at reports with its ‘productivity’ and put stress on what kind of productivity it means.

Capacity, productivity and utilisation give general measures of logistics performance. There must be particular indicators For example, some common measures of transport performance include [2.]:

- reliability of delivery,
- total travel time and distance,
- delivery cost,
- customer satisfaction,
- frequency of service,
- loss and damage,
- availability of special equipment.

Helpfulness of drivers

- time to load and unload,
- total weight moved,
- number of errors in deliveries,
- errors in processing and administration,
- size and capacity of vehicles,
- skills of drivers,
- utilisation of vehicles.

Logistics centre has a range of different performance measures, often related to the rate of stock turnover or utilisation of space. Some measures are based on the value of stock held. The average value of stock of a single product is the average number of units held multiplied by the unit value. Resource measures, which generally measure costs, will help towards improving logistics centre performance by minimising costs, or if they measure efficiency by maximising resource utilization. Examples of resource measures are equipment utilization or demand amplification and are typically used in form of performance indicators such as total cost, information cost, and inventory cost [5.].

To give a reasonable view of logistics, a measure must [2.]:

- focus on significant factors,
- be measurable,
- be reasonably objective,
- look at current performance, not historical,
- allow comparisons over time and with other organizations,
- be easy to understand by everyone concerned,
- be difficult to manipulate to give false values,
- be useful in other analyses.

One should observe logistics performance in logistics centre with use of matrix presented in Table 1.

Table 1. Logistics Performance Measures Matrix

	<i>Financial Indicators</i>	<i>Productivity Indicators</i>	<i>Quality Indicators</i>	<i>Response Time Indicators</i>
Customer Response	Total response cost Response cost per customer order	Customer orders per person hour	Order entry accuracy Status communication accuracy Invoice accuracy Flexibility of delivery	Order entry time Order processing time
Inventory Planning & Management	Total inventory cost	Inventory turns	Fill rate Forecast accuracy	
Supply	Total supply cost		Perfect PO percentage	Purchase order cycle time
Transportation	Total transportation cost Transportation cost per kilometer	Stops per route Container capacity utilization	On-time arrival percentage Damage percentage	In-transit time
Warehousing	Total warehousing cost Warehousing cost per piece Warehousing cost per square meter	Units per person hour Storage density	Inventory accuracy Picking accuracy Shipping accuracy Damage percentage Hours between accidents	Warehouse order cycle time
Total logistics	Logistics expenses Logistics profit Logistics asset value Total logistics cost Return on logistics assets Logistics value added		Perfect order percentage	

Source: [6.]

Logistics financial performance measures has a corresponding logistics financial measure. Logistics financial measures are described in Table 1. Two the most important groups are customer response and total logistics. In the first group the indicator invoice accuracy shows the delivery date, time and condition under which goods were received. By comparing these

facts with the previously made agreement, it can be determined whether perfect delivery has taken place or not. Flexibility of delivery refers to elasticity in meeting a particular customer delivery requirement at an agreed place, agreed mode of delivery [7.]. Number of return goods from customers as well as delays are also counted to the measures of customer response and service [8.]. The second group concerns total logistics measures.

Logistics expenses are dominated by labor expenses but also include telecommunications, inbound and outbound freight, fuel, fees to third parties and leased or rented space. *Logistics profit* is computed simply as revenue minus logistics expenses. The computation of logistics profit per item, per category, or per location is helpful in determining the business viability of an item, category, or location. The *logistics asset value* is the sum total of the value of assets deployed in logistics including inventory, logistics facilities, transportation fleets, material handling systems, logistics information systems, and so on. The valuation is typically based on book value, replacement value, and/or the capitalization of logistics assets. The *return on logistics assets* is computed simply as the ratio of corporate profit to logistics asset value. The ratio can demonstrate the difference between the return on logistics assets versus the return on overall corporate assets or the assets deployed in the other areas of the business [8.].

The most effective indicator of logistics accuracy or quality is the perfect order percentage, which ties together the indices for logistics quality in each of the logistics activities. The perfect order percentage and its components are defined below.

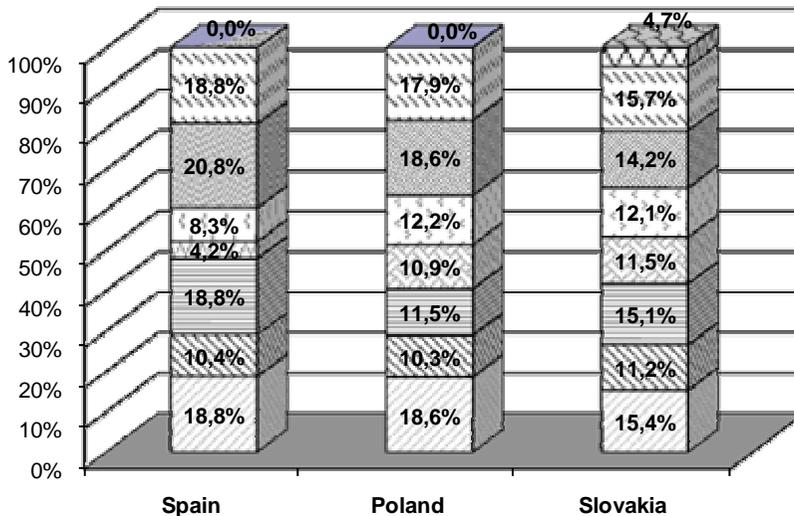
“The perfect order is logistically perfect, meaning it is:

- Perfectly *entered* (the entry is exactly what the customer wants) by the means (telephone or direct entry) the customer desired in a single entry.
- Perfectly *fillable* with the exact quantity of each item available for delivery within the customer-specified delivery window.
- Perfectly *picked* with the correct quantities of the correct items.
- Perfectly *packaged* with the customer-designated packaging and labeling.
- Perfectly *shipped* without damage.
- Perfectly *delivered* in the customer-designated time window and to the customer-designated location.
- Perfectly *communicated* with order status reports available 24 hours a day.
- Perfectly *billed* with on-time payment.
- Perfectly *documented* with customer-specified documentation means, including EDI and Internet” [9.].

Performance in a logistics centre can be improved by assuming such goals as optimization, performance measurement and complete studies. Not only logistics centre performance should be measured but its cooperating enterprises. A goal – customer satisfaction should be first on the list of preparing proper logistics measures matrix. A performance measurement program for a logistics centre should be prepared and must be shaped to varying needs of its customers.

2. Performance analysis in logistics centers

Questionnaire researches provided in logistics centers in Poland, Slovakia and Spain shows measures implemented in performance analysis in those centers. The research effects shows that in Poland, costs reductions, on time shipments and customers complains are the most important measures (Figure 1.), however it is curious that shipping errors and inventory accuracy – measures assuring high customers service are less important than in logistics centers in other countries.



- on-time shipments
- inventory accuracy
- shipping errors (either in percents or in general number)
- seasonal changes of shipment number (summer-winter)
- working capital levels
- cost reduction
- customer complaints (in % of total orders)
- other

Figure 1. Importance of performance measures of logistics center

Source: Author elaboration

In logistics center in Slovakia, the most important measures are on-time shipments, customers complains and shipments errors. Cost reduction is acknowledged more rarely as an important indicator than in Poland or Spain. In Slovakia, similarly to logistics centers in Poland, inventory accuracy and seasonal changes in shipment number are less important measures. Effect of researches in Spanish logistics centers are quite interesting because it is an example of logistics centers working in developed competitive economy. Therefore it should be an important information on the future trends of performance measurement for Polish and Slovakian managers of logistics centers. Cost reduction is the most important measures of performance in logistics centers. Three next measures: on-time shipments, shipping errors and customers complains are recognized as equally important.

3. Conclusion

Effective management of organizations require performance measurement to describe changes in organization and future direction of development. Logistics centers acting in very variable business surroundings have to especially take care about their performance perfection. Therefore presented measures set is an important tools source for performance analysis in logistics centers. The measures choice and their implementation in managerial process as well as elaboration of benchmarking database for managers are also important topics for future elaboration.

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