MEASURING THE PERFORMANCE OF LOGISTICS PROCESSES IN INDUSTRY

Ryszard GRADZKI, Magdalena GREBOSZ

Lodz University of Technology, Faculty of Organization and Management, ul. Wolczanska 215, 90-924 Lodz,
gradzki@p.lodz.pl, magdalena.grebosz@p.lodz.pl

Abstract
The performance of logistics processes is one of the elements determining the upkeep of competitiveness of logistics operators on the market. This aspect is particularly significant for customers in the production branch. In logistic activity, standards and indicators can be treated as a set of analytical tools for the description and assessment of performance of its processes and systems. The use of a system of standards and indicators supports the management and enables production companies to inspect the quality of services provided by logistic operators. This is an essential aspect since the upkeep of high level of performance allows one to reach such an important objective as the maximization of the profit of a company while preserving the high quality of service of customers. In the article the methods of measuring the performance of logistics processes in industry are discussed. Standards and indicators used by logistic companies in relation to customers from the production branch have been presented as example.

Keywords:
logistics services provider, standard, indicator, quality

1. INTRODUCTION

Competitive logistics services enable to produce and sell at the best possible cost while at the same time meeting the lead times demanded by the clients. Logistic processes require a constant re-examination of production processes, both upstream and downstream. It is through such industrial management that the differentiation of the product range can take shape. Complex and competitive logistics services help to retain the existing markets when faced with the challenges of globalization. As logistics operators carry out all activities within the logistics and transport chain, the management of logistics flows and associated information systems are fully integrated as part of package. It is thanks to this “end-to-end” management system and that they are able to offer the complex logistics solutions [1].

The logistics operators support the industrial customers through all or part of the logistics chain and guarantee the benefits of complex logistics services like [2; 3]:
- technical and operational know-how,
- presence all along their supply chain,
- implementation and performance level monitoring,
- optimization of flows,
- coordination of distribution,
- productivity improvements.

The manufacturers expect from the logistics providers the optimizing processes. They need the reductions in cycle times, the integration of value added operations, and an extension in planning and scheduling capacities. They want the simplification of industrial and logistics processes and the quality management based on ISO systems. The industrial companies expect the rationalizing of logistics costs by the process of optimization, reducing of inventory and adapting of resources to the specific problems at hand including seasonal peaks and troughs, production volumes and product changes [1; 4; 5].
2. THE PERFORMANCE OF LOGISTICS PROCESSES

Continuous improvement concerns the implementation of actions focused on the competitive advantage. The regular analysis of quality of logistic processes and the comparison of standards and indicators with objectives help to improve the logistic system, ensure a proper level of services and adjust to market changes. Today, a short time of reaction to customers’ needs is a standard and it must be related to a distinct increase in quality. To meet these requirements, it is useful to determine properly selected standards and indicators that will help to take right decisions.

The Norm ISO 9001 (point 8.2.3.) says that the organization should use appropriate methods of monitoring and measurements of processes included in the quality management system, and that these methods should demonstrate the capability of these processes of achieving the planned results [6]. The questions of monitoring and measuring processes concern a much wider range of organizations and result not only from the requirements of the mentioned norm. The effective management of a company is related to the continuous control of significant parameters of the company operation. Measuring and tracing the results help the company board and management evaluate the situation of the company or its departments and take standards to rectify the departures from the development path planned. The obligation to control processes and report on the measurement results frequently arises from customers’ requirements set out as early as at an inquiry stage or in the bidding documents. In case of establishing cooperation, the company's revenue and the duration of the contract depend on the accomplishment of quality objectives [7].

The basic objectives of the evaluation include: the improvement of service performance and quality, and the reduction of costs. For the logistic service provider the standards are a tool supporting the management of resources (e.g. storage area, personnel), and the optimization of costs, proper quality being taken into account; and thereby affecting the improvement of the financial result of the company [8]. From the point of view of the customer, the system of standards is also used for the evaluation of the logistic service provider; above all, of the attractiveness of rates and service quality.

Logistic activity in an organizational structure of a company can be measured by a number of methods. Indicators constitute a comparison of the effects of the logistic activity with the objectives that have been set for different logistic functions in a company. In most cases these objectives are related to costs, time and service [9].

3. ANALYSIS OF INDICATORS

In the analysed logistic project discussed standards and indicators were determined at a stage of negotiation of the contract content between customer and logistic operator. Scopes of activity with respect to the specificity of performed operations were identified.

The presented indicators are examples of indexes which were proposed to introduce in the logistic center in France cooperated with factories of electronic devices. The basic factory is located in France. The logistic center is a distribution center and is responsible for outbound logistics (with management of transports from finished goods warehouse through consolidation hubs and/or distribution centre hubs, management of distribution center, consolidation of orders, services with added value and management of customs formalities). The products are delivered not only from the factory in France but also from other factories over the world and resend to the clients in France and in other countries.

Warehouse (distribution center) is supplied in two ways:

- Televisions are delivered directly from the production system with roller conveyors; warehouse is located near of the plant to ensure automatic flow of finished goods from the end of the production line to the storage area.

- Other products (these include among others audio and video players, televisions which are not produced in the French factory) are provided by trailers or containers from several factories located in Europe and the Middle East.
The logistics center supplies two groups of customers:
- Customers in France - wholesalers, retailers warehouses, retail stores.
- Customers outside of France - national distribution centers.

The customers in France receive the products from French factory, as well from other factories. The international customers receive products from French factory.

The logistic services provider assures the transport to the customers, the order picking of parcel (contains several products with different references) and complete (products with the same reference), homogeneous pallet (pallet of complete parcels of the same reference or kits) and heterogeneous (pallet of parcels). They guarantee the control of loading and shipment, editing of transport documents, electronic assessment of shipment, sending of transport documents and management of meeting timetables. They manage also customs operations, urgent orders, promotional operations, delivery of confirmations and all warehousing based on the IT system connected with client's IT. All operations are realized by the warehousing management system Colt which cooperates with SAP system introduced by factories.

To increase the quality of services offered by logistics services provider, the special indicators were proposed concerning four stages (reception, warehousing, expedition and complaints). The examples of applied indicators are presented in points 3.1-3.4.

3.1. The examples of indicators – stage: reception

A. The delay in unloading vehicles

Objective / Standard: 0%
Definition: The total number of vehicles with deliveries to the warehouse that were not discharged within 2 hours after the scheduled time of unloading divided by the total number of vehicles entering to the warehouse. Vehicles which are not unloaded in time due to late arrival are not taken into consideration.

Indicator \( \text{Indicator} = \frac{\text{Number of vehicles discharged with delay more than two hours}}{\text{Total number of vehicles entering the warehouse}} \times 100\% \) \hspace{1cm} (1)

Evaluation criteria:
Green: 0% (objective)
Yellow: > 0 (objective) and < 3%
Red: > 3%
Source of information: employees of logistics services provider.

B. Accessibility of products

Objective / Standard: 50%
Definition: The total number of deliveries available in Colt system after 4 hours after unloading divided by the total number of deliveries to the warehouse.

\( \text{Indicator B} = \frac{\text{Total number of deliveries available within four hours after unloading}}{\text{Total number of deliveries to the warehouse}} \times 100\% \) \hspace{1cm} (2)

Evaluation criteria:
Green: > 50% (objective)
Yellow: > 40 (objective) and < 50%
Red: < 40%
Source of information: registration of time of unloading and Colt system for the number of deliveries.

3.2. The example of indicators – stage: warehousing

C. Inventory Management – inventories – conformity of picking localisations

Objective / Standard: 0%
Definition: Number of picking localisations with differences between data in Colt system and real stock divided by all checked picking localisations (including empty localisations and without localisations where the warehouses operations were performed during the counting).

\[
\text{Indicator C} = \frac{\text{Number of picking localisations with differences}}{\text{Total number of checked picking localisations}} \times 100\% \quad (3)
\]

Evaluation criteria:
Green: 0% (objective)
Yellow: > 0% (objective) and < 1,0%
Red: > 1,0%
Source of information: employees of logistics services provider.

3.3. The example of indicators – stage: expedition

D. Performance of shipments in France

Objective / Standard: 60
Definition: The total number of shipments send to customers in France registered in Colt system divided by total number of hours spent by employees to prepare shipments (not including administrative work). This indicator is calculated daily.

\[
\text{Indicator D} = \frac{\text{Total number of shipments}}{\text{Total number of man-hour}} \quad (4)
\]

Evaluation criteria:
Green: > 60 (objective)
Yellow: > 55,9 (objective) and < 60
Red: < 55,9
Source of information: employees of logistics services provider.

3.4. The examples of indicators – stage: complaints

E. Complaints by the number of national shipments

Objective / standard: 1,0%
Definition: The number of complaints by the number of shipments sent to customers in France

\[
\text{Indicator E} = \frac{\text{Number of complaints}}{\text{Total number of shipments}} \times 100\% \quad (5)
\]

Evaluation criteria:
Green: < 1.0% (objective)
Yellow: > 1.0% (objective) and < 1.2%
Red: > 1.2%
Source of information: Base of complaints, Colt (warehouse management system) for the number of items.

F. Complaints by the number of international shipments
Objective / standard: 8.6%
Definition: The number of complaints by the number of shipments sent to customers outside France

\[
\text{Indicator } F = \frac{\text{Number of complaints}}{\text{Total number of shipments}} \times 100\%
\]

Evaluation criteria:
Green: < 8.6% (objective)
Yellow: > 8.6% (objective) and < 8.8%
Red: > 8.8%
Source of information: Base of complaints, Colt (warehouse management system) for the number of items.

4. RESULTS OF INDICATORS INTRODUCTION

For each of the scopes appropriate standards and indicators were determined so that they would meet both the customer’s and the logistic operator’s demand for information. Their definitions, the manner of calculation, objectives and data sources were agreed upon jointly by the two parties. A uniform set of standards and indicators thus formed allowed the quality of the services provided to be evaluated. Their measurement and analyses ensure the proper assessment of the project effectiveness and make it possible to compare its functioning with the requirements agreed upon with the clients.

Table 1. The results of indicator C analysis

<table>
<thead>
<tr>
<th>Day</th>
<th>Calculated Localisations</th>
<th>Localisations with movements</th>
<th>Localisations with differences</th>
<th>% of localisations with differences</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5860</td>
<td>0</td>
<td>39</td>
<td>0.7%</td>
<td>1.0%</td>
</tr>
<tr>
<td>2</td>
<td>5090</td>
<td>2</td>
<td>52</td>
<td>1.0%</td>
<td>1.0%</td>
</tr>
<tr>
<td>3</td>
<td>5067</td>
<td>0</td>
<td>80</td>
<td>1.6%</td>
<td>1.0%</td>
</tr>
<tr>
<td>4</td>
<td>5070</td>
<td>2</td>
<td>72</td>
<td>1.4%</td>
<td>1.0%</td>
</tr>
<tr>
<td>5</td>
<td>5071</td>
<td>8</td>
<td>106</td>
<td>2.1%</td>
<td>1.0%</td>
</tr>
<tr>
<td>6</td>
<td>5074</td>
<td>9</td>
<td>95</td>
<td>1.9%</td>
<td>1.0%</td>
</tr>
<tr>
<td>7</td>
<td>5069</td>
<td>0</td>
<td>54</td>
<td>1.1%</td>
<td>1.0%</td>
</tr>
<tr>
<td>8</td>
<td>5070</td>
<td>0</td>
<td>38</td>
<td>0.7%</td>
<td>1.0%</td>
</tr>
<tr>
<td>9</td>
<td>5069</td>
<td>2</td>
<td>22</td>
<td>0.4%</td>
<td>1.0%</td>
</tr>
<tr>
<td>10</td>
<td>5068</td>
<td>0</td>
<td>42</td>
<td>0.8%</td>
<td>1.0%</td>
</tr>
<tr>
<td>11</td>
<td>5069</td>
<td>2</td>
<td>42</td>
<td>0.8%</td>
<td>1.0%</td>
</tr>
<tr>
<td>12</td>
<td>5070</td>
<td>1</td>
<td>21</td>
<td>0.4%</td>
<td>1.0%</td>
</tr>
<tr>
<td>13</td>
<td>5072</td>
<td>0</td>
<td>22</td>
<td>0.4%</td>
<td>1.0%</td>
</tr>
</tbody>
</table>

Elaboration based on internal materials of logistics services operator.
The table 1 presents the results obtained after introduction of indicators for the indicator C. The analysis showed clearly that it is necessary to improve the system of data introduction (to Colt system) because the level of services is on yellow or red level which means that the standard is not maintained. There are some differences between data in Colt system and real stock. In this case introduction of indicator helped to increase the performance of logistic services and improve the result of annual inventory.

Among other things, indicators provide operator with information on the effectiveness and quality of the processes making up the logistic service of the client. These parameters have a substantial effect on the profitability of the project and the quality of the service as perceived by the client. Rates for the service are calculated on the basis of the process effectiveness assumed. The situation in which the values of the indicators are worse than the assumed norms incurs upon the operator higher costs of the activity related, among other things, to the necessity to ensure additional resources so that the service quality will not be lowered. The impairment of the service quality incurs costs both upon the operator and the client. The results of the above-assumed objective show the operator that it is possible to reduce costs by the optimization of processes and resources. The regular monitoring and analysis of the indicators allow to early identify potential hazards and chances and to take preventive and improvement measures.

5. CONCLUSION

The complex logistics services assure “door to door” integrated solutions from order management, goods collection and shipments consolidation, to delivery to final destination in the main geographical areas. These complex services are also the optimization and management of physical and information flows through IT systems, management of reverse logistics from collect to waste re-treatment, proactive re-engineering in order to meet customer targets, expertise in moving special cargo and out of gauge equipments.

The logistic services providers have to improve the high quality of services as well as the adaptation to the customers and markets needs. The selection of logistic standards and indicators appropriate for a given organization is supposed to ensure its fulfilment of the proper function in the inspection of logistic processes occurring in the space and time. In the presented logistic project standards and indicators were determined between customer and logistic operator. The introduction of these indicators helped to identify problematic areas and improve the performance of logistic processes.

LITERATURE