Logistic approach to a company’s performance assessment based on a KPI system

D Voronova*1, L Berezhnaya2

1Department of Marketing and Logistics, St. Petersburg State University of Industrial Technologies and Design, 4 Ivana Chernykh street, St. Petersburg 198095, Russian Federation
2Department of Management, Orenburg State University, 13 Victory Avenue, Orenburg 460018, Russian Federation

*Corresponding email: djusha_k@list.ru

Abstract. The aim of the article is to develop guidelines for the use of the logistic approach to evaluation of a company’s performance based on the Key Performance Indicators (KPI) system. The literature review presents the results of scientific research of Russian and foreign scientists who actively use the KPI system to evaluate the logistic activities of companies. As part of the study, the concept of a logistic approach to evaluating a company's activities based on KPIs is presented. The algorithm of development and implementation of the KPI system based on the logistic approach is presented and described. As the key performance indicators the following logistic criteria have been used: Right product, Right consumer, Right quantity, Right quality, Right place, Right time, Right costs, based on which the KPIs have been developed. In the end, conclusions have been drawn and further directions of research presented within the framework of this scientific topic.

1. Introduction

The issues of using management tools based on the logistic approach that allows companies to gain competitive advantage in the market by reducing costs and increasing resistance to market fluctuations, as well as to enter a new qualitative level of development, are always relevant. An important aspect is the availability to managers of complete and reliable information about the results of a company's activities. Obviously, this requires an appropriate tool to conduct a timely and reliable assessment, to identify shortcomings and deviations of the obtained results from the planned ones and to take an adequate managerial decision to eliminate problems that impede the achievement of the goals of the company. One such tool may be a specially designed KPI system.

In the economic literature, various systems of this type are widely represented, which are modern concepts of strategic management based on a targeted approach. The most effective and popular among companies from various spheres of activity is the balanced scorecard (BSC) system, developed by Kaplan and Norton (1996 [1], 2001 [2]); the system uses four key aspects to determine a company’s effectiveness: (1) the perspective of “training and growth”, (2) the perspective of internal business processes, (3) the perspective of customers, and (4) the financial perspective. This concept allows implementation of a company’s strategy through its decomposition to the level of operational management and control based on KPIs. BSC is designed to strike a balance between financial and non-financial performance indicators, between the interests of internal and external stakeholders, as...
well as between presenting past results and forecasting future ones. It allows a company to directly extract long-term (strategic) goals from the overall strategy and associate them with short-term (operational) goals [3].

It is worth noting that recent economic trends and company development processes indicate the need to use logistic criteria to evaluate companies’ activities, since the management of a modern company has already stepped over the scope of a single company and is associated with the organization of joint work of all participants in the formed supply chains.

In scientific works of foreign and Russian scientists, theoretical and methodological provisions on the application of the logistic approach to the development of a KPI system as an instrument for assessing and making optimal managerial decisions are insufficiently presented. The use of only classic success factors - “finance”, “customers and marketing”, “business processes”, “personnel”, limits companies in applying the concept of logistics and supply chain management to assessing their performance. The use of logistic criteria in the formation of a KPI system also has not received the necessary coverage in the works of scientists.

In general, both foreign and Russian researchers are involved in the application of BSC to the process of carrying out logistic activities. Foreign authors, as a rule, more widely apply this approach in their work. So, the features of using BSC were considered, for example, for organizing humanitarian supply chains [4], developing a multi-criteria approach to selecting suppliers [5], evaluating the effectiveness of marketing channels and distribution of products [6]. The possibilities of using BSC are so wide that they can be used not only for a particular company, but also for new forms of cooperation due to the rapid development of information and communication technologies: virtual enterprises, network companies and professional virtual communities [7].

Russian scientists mainly concentrate their attention on the implementation of the logistics activities of individual companies, by elaborating in more detail the methodological aspects of applying BSC. Tulikova et al. [8] proposed a methodological approach to improving logistics systems based on the use of BSC. The fundamental structure of the system for the formation and evaluation of key indicators of the logistics management of an industrial enterprise was studied by Greyz et al. [9]. Sapлина and Kurylova [10] proposed a matrix approach to the analysis of four projections in a balanced scorecard. However, as noted by Kuzheva [11], BSC itself will not provide a qualitative leap in logistics management and improvement of performance: for this it is necessary to translate the strategic goals of the company into the operational goals of departments and employees and evaluate the results of their activities in the context of implementation of the strategy with the help of key performance indicators.

2. Methods and Materials

To develop a company’s strategy and evaluate its management effectiveness, a set of defined KPIs is needed that measure the progress towards the achievement of the company’s goal. Based on the principles of the logistic approach, the achievement of goals is determined by the fulfillment of seven conditions, the so-called “seven rules of logistics”: the required products (services), in the required quantity, of the required quality, at the right time, at the right place, with the lowest costs, to the pre-defined consumer.

Based on the abovementioned, we offer the following sequence of development of a KPI system for assessing the effectiveness of a company based on a logistic approach presented in figure 1.

As shown in figure 1, in accordance with a company’s strategy based on the logistics concept, areas of activity that are significant for the enterprise are identified, for which a set of KPIs is established that are subject to a regular measurement based on data.
### 1. Developing logistics strategy of a company

- Forming a vision of the future and mission of the company
- Identification of key success factors for the company (prospects) and its goals based on logistic criteria

### 2. Building a strategic map of a company

- Development of a strategic map structure
- Distribution of strategic goals by key success factors
- Establishing causal relationships between goals

### 3. Defining a KPI system

- Choosing KPIs to measure goals by prospects
- Identification of sources of information for KPIs
- Setting valid values for KPIs

### 4. Linking a company’s goals with logistics processes

- Appointment of persons responsible for their implementation
- Linking goals to logistics processes

### 5. Cascading goals

- Linking top-level KPIs with logistic process KPIs
- Building a KPI Tree

### 6. Implementation of a KPI system

- Tool selection
- Logistic Audit

**Figure 1.** Logistic approach to the development and implementation of a KPI system.

Stage 1. Long-term directions of a company’s development are identified on the basis of the principles of logistics and supply chain management, which are based on cross-functional and inter-organizational coordination and integration, and strategic goals are identified. An essential condition for achieving the goals of a company will be their formalization, assessment and adjustment. To do this, it is necessary to highlight the key factors for the success of a company (prospects). Application of a logistic approach to a company’s management determines the use of logistic criteria as such factors - the right product or service (Right product), the right consumer (Right consumer), the right amount (Right quantity), the right quality (Right quality), to the right place (Right place), at the right time (Right time), with the right costs (Right costs).
Stage 2. A strategic map is designed, which is a graphical description of the key success factors (projections) that determine their strategic goals and cause-effect relationships between them.

Stage 3. The numerical characteristics of the selected goals are determined - KPIs, allowing them to be measured. KPIs selection is subject to special requirements.

After the selection of KPIs, the next important task is to determine the sources of information for their assessment, the difficulty of which is to develop and implement a mechanism for searching and collecting the necessary and adequate information on a regular basis, which is practically absent in Russian companies. Basically, they use forms to collect data used to assess financial performance, and a limited amount of data to determine the time of loading, unloading, transportation, the degree of loading of vehicles, and the distance from the point of departure to destination.

However, to obtain a more complete and clear picture of the functioning of a company and the effectiveness of its logistics activities, only quantitative data are not enough. It is also necessary to take into account the qualitative components of the assessment: perceptions, feelings, opinions, responsibility and trust, using the following methods: observation, interview, and questionnaire. At this stage, acceptable values for KPIs are also established, so that during the evaluation to further compare the actual values of indicators with them.

Stage 4. The goals of a company will be achieved if responsible persons are appointed for their implementation. This can be the heads of departments, as well as any of their employees who need to be motivated to achieve them through the same KPIs.

The binding of goals to the logistic processes is carried out by distribution over projections (logistic criteria). In the future, the structure of the KPI system may be periodically reviewed. In this case, it is necessary to adhere to the principles of effective interaction of supply chain participants [12].

- documenting cause-effect relations. The company performance evaluation system is designed in such a way that the relationships between factors, goals and indicators are clear. Each parameter included in a KPI system becomes an element of the chain of cause and effect relationships with which the company receives information about the strategy of a business unit;
- the relationship with financial results (costs). KPIs are aligned with financial goals through a chain of cause-effect relationships. This allows us to more effectively manage the movement of financial flows, taking into account the implementation of the overall strategy of the company and the implementation of individual business processes;
- factors for achieving results. The assessment system based on the logistic approach is a complex of KPIs and activity factors, ensuring a balance of results and factors for their achievement.

Stage 5. To conduct an objective assessment of the effectiveness of a company, as well as to develop adequate solutions on its basis, the integration of many KPIs into one or more global systemic indicators is carried out. As a result, there is a “linking” of the KPIs of the upper level with the KPIs of the process level, forming a “KPI Tree”.

Stage 6. The use of information systems that allow monitoring and optimization of logistics processes can help introduce a KPI system based on a logistic approach in a company. The information system supports the rapid exchange of data with performers, intermediaries, suppliers and customers. That will allow us to quickly carry out a logistics audit and make appropriate management decisions based on it.

3. Results and Discussion
In accordance with the above algorithm, a strategic map was developed to evaluate a company’s activities, the components of which are formed on the basis of logistic criteria (figure 2). This fundamentally distinguishes it from the classic interpretation of the BSC of Norton-Kaplan.
Figure 2. Logistic approach to designing a strategic map of a company.

To measure the goals presented in figure 2 using a special technique considered in the authors' works earlier [13, 14], KPIs were selected and distributed according to the projections as follows (table 1).

It should be noted that the presented KPI system is regularly reviewed in accordance with customer requirements and the company’s ability to satisfy them.

Thus, we can conclude that the application of a logistic approach to evaluating a company’s activities based on KPIs will allow the management to analyse the status and prospects of current activities, taking into account supply chain development trends, quickly bridge the gaps between the existing strategy and its implementation, and also respond in time to emerging issues.

Table 1. KPI system for a company’s assessment based on a logistic approach.

| Purpose | KPI projections "Costs" | KPI projection "Consumers" |
|---------|--------------------------|----------------------------|
| Increasing company profitability from logistics activities | Unit costs for logistics, p./t (kg, l) | Customer Satisfaction Level, % |
| Losses during delivery, % | Profitability of logistics activities (general and by function), % | Customer Loyalty Index, % |
| Client flow growth | The proportion of repeated applications, % | |

Table 1.
**Purpose**

| KPI projection "Products and quantity" | KPI projection "Time and place" | KPI projection "Quality" |
|---------------------------------------|---------------------------------|--------------------------|
| Providing the consumer with the necessary resources, products, services | Decrease in time for creation and delivery of value to consumers | Improving logistics service |
| Effective use of logistics infrastructure | | Increasing employee competency |
| Increase in the number of resources (products) passing through the logistics system | | Improving order fulfillment reliability |
| **KPI** | **KPI** | **KPI** |
| Correspondence of the parameters of the delivered resource (product) to the requirements of a customer, % | Coefficients of uniformity and rhythm of order fulfillment | The level of quality of service, % |
| The breadth and depth of the range of products (services) | The coefficient of timely delivery of resources (products) | Employee Competency Index |
| Vehicle idle rate | Labor productivity, t · km / person | The coefficient of unprocessed applications |
| Fleet update rate | Productivity per one transport-ton-hour of work, t | Downtime of the enterprise in connection with the shortage of necessary resources, pcs. |
| Warehouse load factor | The turnover rate of material resources (products), days | The share of delivered goods of the required quality, % |
| Utilization rate of material handling equipment | Dynamic utilization of payload per revolution | The share of delivery errors (deliveries with defects, deliveries with erroneously sent products, incomplete deliveries, etc.), % |
| Warehouse turnover, t (kg, l) | | The coefficient of discipline of storage (errors in the distribution of goods for storage) |
| Dynamic utilization of payload per revolution | | |
| Fulfillment of logistic plans (for providing resources, for transportation, for sales), % | | |
| Warehouse turnover, t (kg, l) / period | | |
| Warehousing, p. | | |

4. Conclusions

As a result of the study, the following conclusions have been formulated:

- the developed algorithm for the formation of a KPI system for assessing the effectiveness of a company on the basis of the logistic approach is a logical sequence of steps related to the development of the company's logistics strategy, building a strategic map and defining a KPI system, linking the
company's goals with the logistics processes, cascading goals and introducing this system into the system monitoring, planning and controlling the company:

- the presented KPI system, which includes six main blocks of strategic goals, distributed according to the criteria of “costs”, “consumers”, “product and quantity”, “time and place” and “quality”, and measuring their indicators, will make it possible to comprehensively evaluate the activities of companies focused on logistic management principles, and timely develop and implement adequate management decisions.

Thus, the KPI system, developed on the basis of the logistic approach, is one of the main tools of companies in order to verify the presented materials

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