Preconditions and requirements for the development and quality assurance of logistics services

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Abstract

All processes in the production and distribution of material goods, which include material and interactive information flows, are united by the term "Logistics" and are realized within the logistics processes. Logistics processes hide large technological and economic reserves that need to be identified, located and used. At the EU level, a new philosophy of realization of quality logistics processes has been created in the past decades, and it is increasingly including the environmental aspect by introducing the term Green Logistics, which highlights the demand for a healthy environment. The level of logistics process technology is still far below the level of development of material production technology, which is the main reason for giving strategic importance to the rationalization and optimization of logistics processes at the global level in order at reducing the costs of all participants in the implementation of the process, and especially in the direction of raising the quality of services and meeting the increasingly stringent requirements of service users.

***Keywords**: Logistics system, Logistics processes, Quality of logistics services*

1 Introduction

World trends of dynamic technological development and integration of the economic space raise the dynamics of the whole society and impose flexible behaviour as a condition for the survival of a modern transport company. The possibilities of further rationalization, i.e., the potential of success in the process of production of the transport service, are realized today in minimal positive developments.

Logistics, as a function of spatial-time transformation of material goods, energy, information, and knowledge according to the needs of users and the goals of companies, is imposed simply as an area of research into the possibility of increasing the success in the business of a modern transport company.

Many companies with highly developed economic systems base their business on the general legalities of logistics, i.e., logistics management. Focusing attention on this issue proves entirely justified since in the price structure.

logistical direct and indirect costs participate with more than 25%. For this reason, logistical management problems should be thoroughly investigated, diagnosed, and appropriately addressed. The fact is, however, that in modern business, quality is one of the important factors that, in addition to price, affect the position of companies in the market.

2 Logistics systems, logistics processes, and logistics services

By the basic definition, logistics represents a system of activities that are realized to devise, project, direct, manage and regulate the flow of goods, energy, people, and information within the system and between systems.

Logistical systems can be defined as systems of spatial-temporal transformation of goods and processes that flow in them as logistical processes

The main function of logistics systems is the spatial-temporal transformation of goods. Its fulfilment is related to the functions of changing the quantities and types of goods, and the functions of facilitating the transformation of

goods. Thus, these functions are performed in the following processes:

- transport, transhipments, and storage, where the processes of flows of goods are essential,
- packaging and insurance, where the processes of helping the flow of goods are essential,
- delivery and processing of orders, where information flow processes are essential.

For logistics to be adequately investigated, and to be able to define methods of planning logistics processes, it is necessary to define the holders of these logistical processes or elements of the logistics system (Transport, Storage, Stocks, Distribution, Manipulations, Factor - Man, Information, Communication and Control, Integration.

The trend in logistics systems is the development of formal quality processes. It is these processes that have enabled companies to operate safely. We can understand the development of quality processes as moving through four different stages with the following tasks:

- Quality control – determines basic procedural and statistical quality management;
- Quality assurance – emphasizes meeting the needs of customers;
- Quality management – this is not the task of superiors in logistical processes, but all subjects in the process;
- Meeting consumer needs – reflected in the procedures to be carried out to fully meet the needs of consumers.

Research in the world and our country says that within the framework of the usual procedures and processes in the field of movement of material goods, numerous and very expensive operations, procedures, processes, and systems are needed that result in losses of funds and time. These processes and systems can be optimized in a considerable scope by rationalization measures, increasing the degrees of efficiency, synchronization, and cooperation in transport chains.

Optimization carriers are usually large transport organizations, which organize transport chains in the field of transport in their direction or integration with other economic organizations, most often on a small and limited number of transport routes.

Taking advantage of existing evident rationalization reserves by combining certain functions and organizing rational transport chains becomes an obligation and imperative of the modern distribution of goods.

The requirements of the modern distribution can be systematized in four points:

1. That only what has been ordered is produced and distributed;
2. That the products are delivered as soon as possible;
3. To make the products as cheap as possible;
4. That the complete tied capital is reduced (located in the stock).

The formation of continuous transport chains ensures the above requirements (from the place of manufacture to the place of consumption). In doing so, commodity flows should be linked to information flows. Whereby we replace the term 'transport chain' with the term 'logistics chain'

Today, users of transportation services are looking for the offer of a rational conception of homogeneous logistic services. Homogeneous logistics service can best be represented by defining its associated components in a three-dimensional system. This definition of logistics service is clear, complete, and transparent, as can be seen in the following scheme (Fig.1).

With the help of defined components, a homogeneous logistics service can be described with a single sentence that reads:

To realize the distribution of the right goods at the right time, in the appropriate state, and in the right place (wasp Z) we need technique and technology (wasp X), as well as the organization and management of this process (wasp Y).

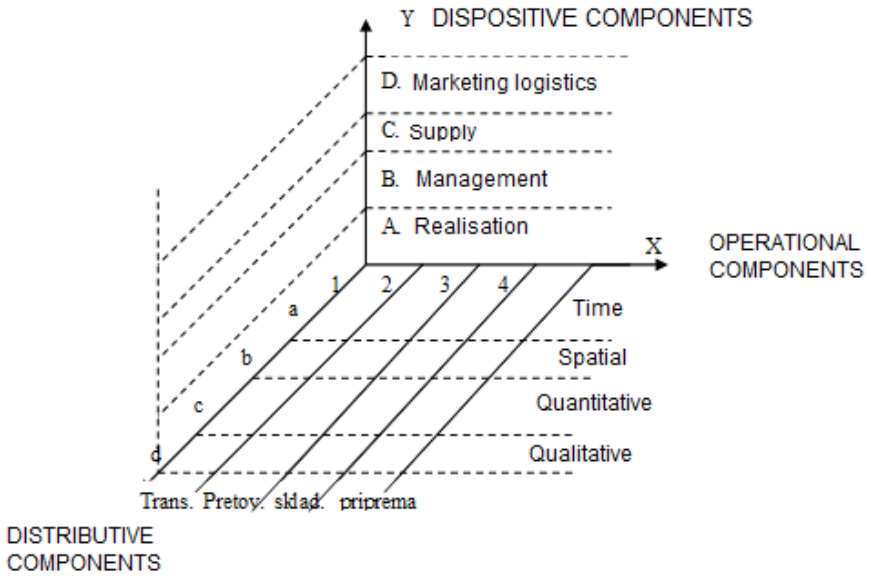

Fig. 1. Components of a homogeneous logistics service [8]

3 Logistics system performance and quality of services

Logistical performance is different parameters, surveyors, coefficients, and indicators in logistics. In a broader sense, logistical performance can be viewed as a subset of all the characteristics of (business or organizational) work of the company.

Logistical performances are part of the company's general performance, with which it performs on the market. With its business strategy, the company wants to achieve the best possible position in the market, that is, to achieve the best possible performance

To achieve this goal, the company must plan, monitor, manage and control its performance. Logistical performances are the result of business strategy, organization of work, and applied level of technique, technology, and informatics in the company.

The term **"performance"** in technique in general, quite often is met as a term that describes certain characteristics (characteristics) of elements and systems.

The terms "logistical performance" is used here as well as "logistical surveyors' performance", which include different parameters and indicators of the "success" of the functioning of logistics systems.

3.1 Display the basic performance of the logistics system

As basic logistical performance can be singled out:

- Logistical expenses;
- Quality of service;
- Techno-exploited performance and
- The security of logistical processes.

All these performances are due to the organization of work, and technical and technological solutions applied in the company. The method of functioning of technical and technological systems can be presented by a set of technological and exploitation indicators, which describe resources. This category of performance is often called logistical productivity, but the term techno-exploitation performance of logistics systems will be used here since productivity is only one of these performances. As a special category of performance, recently environmental factors have been singled out, as well as the safety of work processes, which can be seen in the block diagram (Fig.2)

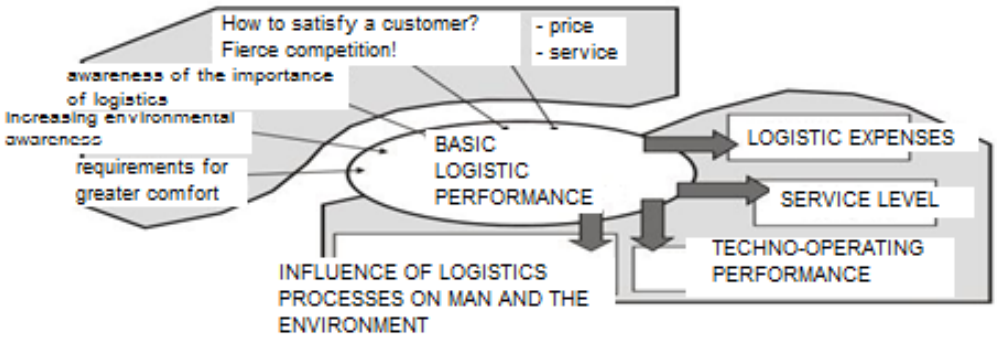

Fig. 2. Structure of basic logistics performance [10]

From the point of view of logistical performance grouping, there are:

- "hard" surveyors,
- "soft" surveyors.

The group of "hard" surveys includes costs, profits, and economic and financial indicators. These indicators can be quantified relatively easily [2]." Soft" indicators are the level of satisfied users, quality of service, delivery delay, and others. Soft indicators most often represent the user's perception of the realized service [2]. In the research so far, there are a large number of different approaches to defining logistical performance and its surveyors. Differences in approaches can be [2]: Performance set selection; Defining a surveyor for each performance; Defining dependencies measure performance and its surveyors; Different approaches to the performance surveyor's budget.

3.2 Measurement and monitoring of logistical performance

Measuring and monitoring logistical performance is the cornerstone of quality management in logistics because if something cannot be measured it cannot be improved. The creation of performance measures is directly related to the set vision and goals of the company. The metric must be clear, and precise, with defined methods, data sources, and periods [3]. It is necessary to define at the strategic level: performance plan, quantitative and qualitative methods of determination, in the function of concretization and realization of the set goals.

However, measurement is not only an end in itself but as an instrument for more effective management. Often, the results of the performance measurement show only what happened, but not why, or what to do next. To achieve the transition from measurement to performance management, it is essential that there is a conceptual framework and methodology and that top management is involved in the design and application of performance measurement systems. Also, open and effective communication with employed partners and customers is needed to exchange and share information, results, and initiatives.

To improve performance, it is desirable to establish the responsibility of individuals for measurement results, as well as a system of rewards related to output, but also to measure performance. The performance measurement system must be affirmative, and by no means restrictive. If the goals set are realistic, then the measurement can be stimulating.

The ability to use measurement results implies an intelligent mechanism for decision-making, where the results of measurements provide understandable, reliable, purposeful, and up-to-date information. The results of measurements can be used for: managing the differences between the set and the achieved goals, self-diagnosis (locating problems in the very beginning), the effect of feedback and learning, the recognition of omissions and errors, and risk management and continual improvement of quality.

4 Links between service quality and cost

Logistical costs, cover the costs of all activities that are realized to design, design, direct, manage and regulate the flow of goods,

energy, and information within the system and between systems. Logistical costs appear as the basic criterion in modern conditions when optimizing activities within the process of placing the final product on the market and meeting the customer's requirements. By investing in lowering them, as a rule, the most favourable effects are achieved, hence the constant interest in their study.

4.1 Determining the number of logistical costs

The next scheme (Fig.3) presents the process of determining, the type and structure of logistical costs.

The profitability of the company is a direct function of logistical costs because logistics costs account for a significant part of the total operating costs. The participation of logistical costs in total costs varies in production and trading companies and ranges in the interval from 15% to 50% and is observed over a wider period as a growing trend.

The link between the level of quality of the service and the costs achieved within the logistical process, as well as the logistics system, is not linear.

Logistical costs cover activities arising from the definition itself and logistics function. They represent a measure of the success of the functioning of logistics systems, i.e., logistics chains.

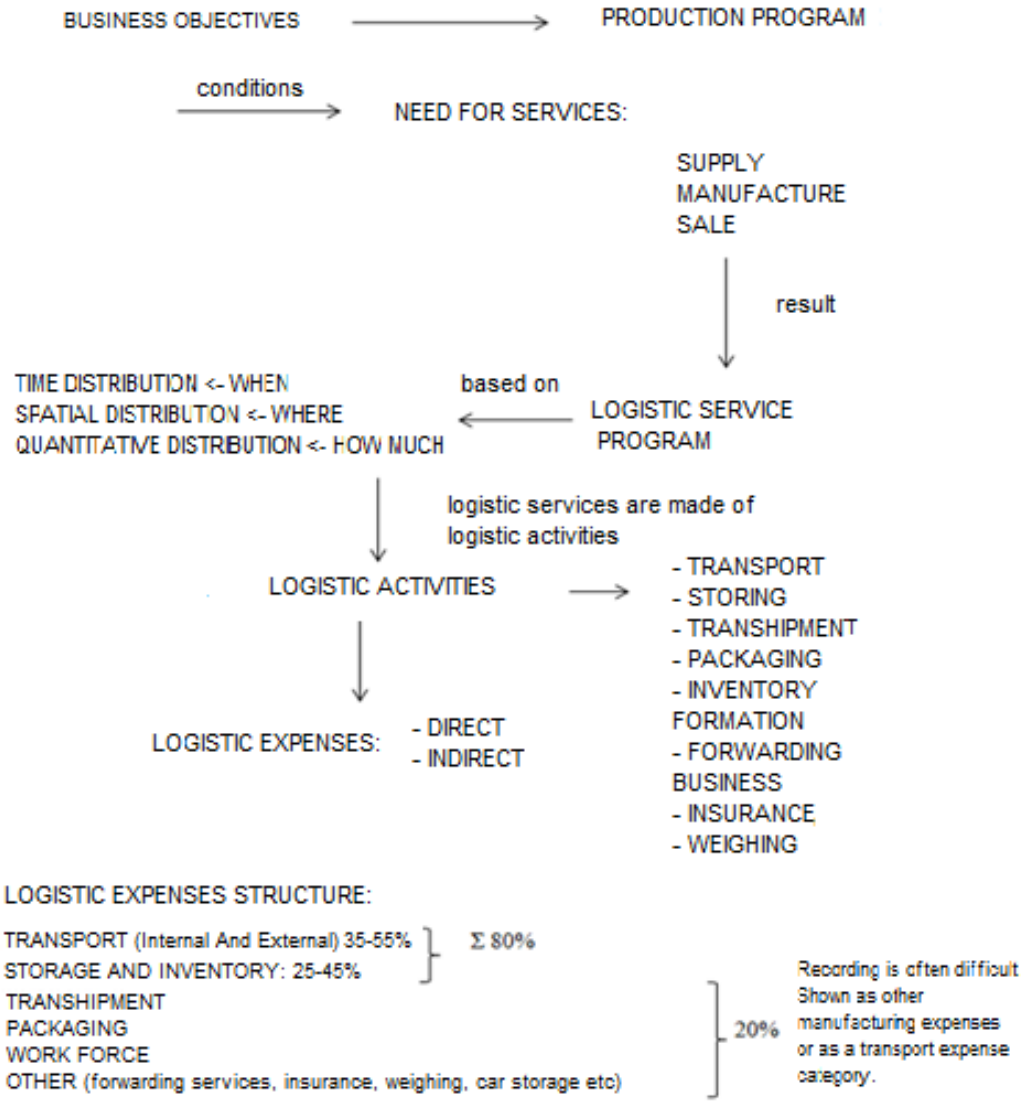

Fig. 3. The process of determining and structure of logistical costs

Logistical costs, cover the costs of all activities that are realized to design, design, direct, manage and regulate the flow of goods, energy, and information within the system and between systems [8].

Determining logistical costs is a very attractive and complex task and depends on a large number of factors. The main factors in determining logistical costs are:

- The necessity of parsing logistical costs;
- Determination of business stages and processes, which generate logistical costs;
- Determining the interdependence between different cost generators.

The main causes of problems when determining logistical costs are:

- Logistics is a service function, which is present in different subsystems of the company, so costs are much more difficult to determine than in some other areas.
- The existing cost calculation method is not adapted to the needs of logistics.
- Costs are very difficult to delineate, whereby they are not defined completely.
- Individual costs are not identifiable or delimited to each other.

The determination of the value of logistical costs can be realized in two ways:

- Calculation of logistical expenses, and
- Estimated logistical costs.

The calculation of logistical costs implies the definition of a set of surveyors and budget models, based on which the value of costs will be determined. In this case, it is necessary to define all individual logistical activities that generate costs and for each activity to determine the value of unit costs. The estimate of logistical costs is realized based on regression equations for individual categories of logistical costs.

Analysis of the structure of logistical costs can be viewed from the point of view of standstill and the point of view of movements of goods in the logistics chain, i.e., static and dynamic segments of the chain. The costs of indulgence of goods are divided into storage costs, preparation and control costs, inventory costs, and handling of goods. The costs of movement of goods include transport costs, loading and unloading costs, and the costs of serving goods after transport. To determine these costs, the unit costs of storage (per unit of quantity and time unit) must be known, the unit costs of transport and manipulation, the costs of transport on a specific or average dissolution per tonne, etc. for a specific vision and form of transport.

Viewed from a functional and technical and technological point of view, logistical costs can be analysed at the level of logistics subsystems and business and functional systems in the company.

The basic structure of logistical costs can be determined by analysing basic logistics operations. Commonly, the basic classification of logistical costs implies the formation of the following groups of theirs:

1. the cost of owning stocks,
2. costs of lack of stock,
3. storage costs,
4. transport costs,
5. Product design costs and administrative costs

4.2 Costs of ensuring the quality of services

Recently, as a special category of costs that is gaining more importance in the field of logistics, certainly the costs of ensuring logistical quality - costs associated with the realization of the appropriate level of quality of logistics service. This category of costs is derived from the TQM (total quality management) concept and represents an attempt to demonstrate the cost of the "quality ideal". The very concept of qualities has become, without a doubt, one of the key weapons of competitive struggle in the global world market. From a logistics point of view, these costs cannot be viewed separately from the quality of logistics processes, hence they should be associated with elements of the quality of logistics service.

In a conclusion, it is imposed that the way of determining logistical costs, i.e., the cost of realization of transport, manipulative, and storage processes is always due to the set goal,

the applied technology, and the relevant characteristics of the logistical process under consideration, as well as knowledge of the behaviours of static and dynamic elements of the concrete transport and logistics chain.

There is a very different time and cost structure for small ones (e.g.,100 km) and larger (e.g., 300-500 km) transport disposals per unit of transport. Essentially, both the logistical costs and the quality of the process affect the profits of the company. The reduction of logistical costs directly affects the increase in profits, and the increase in the quality of logistics services affects the increase in the number of service users, thereby affecting the growth of revenues and therefore the increase in profits. This connection can perhaps be most graphically presented through the consequences of the influence that the level of quality of service has on the profits of the company [5].

From the numerous considerations so far, it can be concluded that the logistical costs and the length of the delivery cycle are the most significant sizes that decide the performance of the business of any service provider company. Hey are directly incorporated into the price of the final product placed on the market and therefore affect the income that the production company can generate. Lowering these costs provides higher revenue either through generating higher earnings per unit of product or by creating opportunities to lower the price of the final product and therefore increase turnover and expand the market. However, in addition to acting on logistical costs and the length of the delivery cycle, there is another, very significant instrument that can be used in the process of generating higher revenues. This instrument is defined as the quality of logistics services. The consumer of the final products, when opting for one of the offered, alternative products, in addition to its price and quality, also recognizes the quality of service achieved in the purchase.

It may happen that despite the satisfactory quality and price of the product concerning the requirements of the specific consumer, the consumption of the final product is absent due to the low quality of service. For these reasons, it can be said that the quality of service in the realization of final results acts similarly to the logistical cost.

By increasing the quality of service, increased turnover can be expected and of course, therefore higher revenues from the consumption of the final product. From the numerous considerations so far, it can be concluded that the logistical costs and the length of the delivery cycle are the most significant sizes that decide the performance of the business of any service provider company. They are directly incorporated into the price of the final product placed on the market and therefore affect the income that the production company can generate.

5 Modern requirements in the design and development of logistics systems in the function of ensuring quality of service

The consequences of complex and dynamic changes in the market are increasingly felt nowadays, both from the changeability of clients' wishes, from the life cycles of products and their delivery time, as well as through increased requirements regarding time and quality factors. Companies are being forced to adjust to changes more quickly due to increasing market developments. It is in this part and these conditions that the importance and role of logistics on the market are felt, which ensures the optimal connection of transport chains on the principle of "door to door" and at the same time the distribution of goods to certain areas with short delivery deadlines (principle: JIT), all to raise the quality of the complete service.

Changes in the logistical structure, both industry, and trade, are created by the formation of a common European market and an increase in its economic power. These changes are primarily reflected in the increasing concentration, i.e., in the declining number of suppliers (reducing the number of sources of goods flows) and grouping of customers (reducing the number of confluences of commodity flows) with a strong tendency to streamline flows between production and turnover - consumption. In doing so, it is sought to production and distribution are part of a single common network with a tendency to encourage cooperation between suppliers, service performers, and customers.

The modern integrated logistical concept, in response to the changes, is based precisely on the mutual connection of production and sales with distribution to connect customers and suppliers into a unique logistics concept, that is, a logistics chain.

The integration of transport chains on large distances, especially in international transport, occurs by eliminating internal borders in the European area. The tendency is to create conditions for integrating all system elements to ensure a complete logistics service that covers all segments of the logistics chain, following the wishes and requirements of the customer. This is also called "individually integrated service packages according to the customer's request".

For closer interconnection of physical and information flows to optimally form information logistics as the basis for the realization of the adopted logistical strategy, a modern logistical demand in both industry and trade. Modern logistics as a discipline is manifested in increasing competitive ability, reducing costs, and increasing the quality of service, that is, meeting the requirements of the customer.

5.1 Definition and basic functions of logistical controlling

Definition and basic functions of logistical controlling Modern changes and turbulence in the market for the purchase of raw materials and the placement of goods require one proactive way of managing quality in logistics. Practice in the field of business of logistics providers has shown that it is not enough to be flexible and adaptable to the requirements of the market, but it is necessary to anticipate future needs and prepare promptly for the realization of the expected requirements of users. On the other hand, quality system management in logistics is based on a systemic approach and continual monitoring of all processes, activities, subsystems and resources, which requires an efficient process of managing various external and internal variable sizes and performance. *In other words, quality management in logistics requires timely, accurate and reliable information about logistics processes and systems.*

Data and parameters collected and processed based on classical information systems, legally adopted procedures and regulations, various accounting forms and reports, and analytical and synthetic contingency plans, are not sufficient for efficient decision-making. Instead of classical procedures that are mainly focused on partial subsystems and processes, with poorly usable parameters and data, it is necessary to have one comprehensive methodologically designed and elaborate system of identification, collection, processing, distribution and presentation of relevant information and data.

It is, therefore, necessary to consider the need and possibilities of applying the concept of logistical controlling, which can be defined as integrated support for quality management in logistics

5.1.1 Basic logistical controlling functions the concept of logistical controlling

Appears in the 1980s, and different authors interpret the goals, significance and functions of controlling differently in different periods. However, they all point out that the concept of logistical controlling cannot be identified with the concept of control of logistical processes and subsystems, which were some interpretations in the beginning stages of development. Controlling is much more than standard control of logistical processes and systems, and it can be said that it represents integrated support for logistical management. Likewise, in literature, and especially logistical practice, there are different formulations of the basic functions of logistical controlling, but most authors agree that these are functions: Planning, Management, Control and Informing (Fig.4)

Through the planning function logistical controlling ensures that the operations of the logistics system are based not on the reaction to market and other changes, but the prediction and anticipation of future events and phenomena. Research, prediction and planning of logistical performances are the cornerstones for defining the vision, mission and strategy of the logistics system.

Logistical control provides a proactive way of deciding, where the logistics system through the anticipation of the future can build different business scenarios and be prepared for each situation.

Logistic controlling has the function of active performance and business performance management. The basic principle is that business results are not expected, but managed. The reaction time for "signals" from the environment or the system itself should be maximally shortened. Instead of spending 90% of the time collecting and processing data, which was present in the past, it is necessary to spend 90% of the time on the analysis of causes and consequences, that is, the adoption of measures to improve the process and activities.

The control function involves measuring, monitoring and processing realized logistical performance values, i.e., determining deviations achieved from planned and projected values. Through analytical statistical processing of data, it is possible to monitor the degree of achievement of the strategic and operational goals set, i.e., the projected and projected performance values. However, the control function implies not only a literal identification of these differences but an analytical view of causal links and possible corrective measures and improvement proposals. The rapid advancement of IT theologies makes it possible to "data mine" the analysis of large amounts of data while detecting the causes of certain phenomena and understanding the behaviour of clients.

The information function implies an orderly and transparent way of processing, presenting and distracting information, to different levels of decision-making and management, from top management to direct executioners of logistical processes and activities. The impression is that today's companies are cluttered with data, but essentially there is a lack of usable and useful information.

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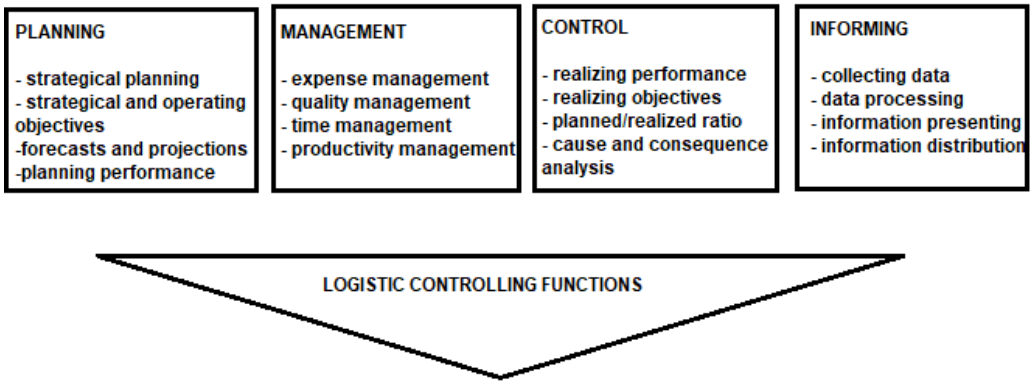

Fig. 4. Functions of logistical control

5.1.2 Logistical control in the quality wash in logistics

Quality management in logistics is a comprehensive concept, which is based on scientific methods and techniques for managing and improving quality, but also on adequate substrates and data. The application of certain approaches and models of quality management implies system collection and processing of data on logistics systems, processes and services. Various quantitative and qualitative techniques and methods are used for the collection and processing of data. A significant part of the parameters can be provided through logistical controlling, which is based on various methods, tools and applications related to the collection, processing and distribution of relevant information and variable sizes.

Through the analysis of collected and processed data, it is possible to assess the achieved performance concerning the project values and the set plans and goals. In this way, non-compliances are identified and potential areas of quality improvement are defined. Data

collected through a logistical controlling system enables multi-dimensional performance analysis, where multidimensional reports can be observed and analysed concerning different business perspectives. Logistical control gives a view of the entire logistics chain, whereby each participant can get exactly the information they need. Through the decomposition of the chain to logistical processes and activities, preconditions are created for the successful identification and measurement of performance by different dimensions.

The necessary data and parameters are determined by individual logistical processes and activities, but in no case do they represent partial and individual information, but in correlation with other parameters from the unique databases of logistical performance indicators. It can also be said that the greatest merit of logistical control is that it ensures the interconnection of different variable sizes, which describe logistics systems, processes and activities. Logistical performance, in essence, represents the sizes through which relationships of one or more functions or activities are expressed.

Logistic performance indicators enable accurate monitoring of certain processes and processes, their evaluation, editing and connection with other processes and activities in the logistics chain. For integrated quality management in logistics, performance describing the interdependence and connectivity of partial logistics areas is of particular importance. However, to describe the complex and changing structure of logistics systems and processes, a large number of logistical performance indicators are often necessary, the identification, processing and use of which is a serious problem in real systems. Out of a huge number of possible, key logistical performance indicators must be selected and an efficient method of measurement and monitoring must be defined for them.

In other words, it is necessary to define one relevant set of quality indicators, according to the needs and requirements of the quality management system. When talking about performances that support quality management in logistics, two groups of questions need to be answered:

- What are the logistical performance data for, i.e., what indicators, who, when, how, in what form and in what management place it uses and whether they need to be determined and monitored at all.
- How to identify, collect, quantify, process and present data on selected performance

The first group of questions concerns the selection and definition of key logistical performance indicators, and the second group concerns the problem of measuring and monitoring the selected performance.

Selection and definition of key indicators of logistical performance, is not at all as easy a task, as it can, be at first glance, to look. The problem is to separate the key from the ordinary indicators, that is, from several hundred, or even thousands of indicators, 15-20 key ones are selected for the quality management process in logistics. It is necessary to ensure that the selected indicators lead to an integrated quality management system and that the achievement of the strategic and operational goals of the logistics system can be measured through them. Choosing the wrong performance indicator can significantly jeopardize the quality management process itself in logistics. The selected performance qualities must be related to the strategic pyramid of quality management, where the realization of the company's vision, strategy and goals is measured through key performance indicators.

6 Conclusion

Quality management systems and logistical control have a common feature, manifested through the fact that there are no ready-made and universal solutions that can be used regardless of realistic conditions. The decision-making models themselves are similar, but with different strategies, environments, markets, processes, technologies, etc. Heterogeneous are sources of data that "feed" these systems.

The introduction of the quality system is a project that has no end. The same statement applies to logistical control. As competition becomes more aggressive, the environment becomes more unstable and the future more uncertain, the demands in front of the systems of analysis and forecasting become more complex.

However, in real systems, there are significant problems related to the introduction and development of logistical control and the model of quality management. The biggest

obstacles are the uncertainties brought by the new system. The reason employees usually resist change is because they do not know what will happen in the new "balance of power". Preparing employees for a new system is the task of those who introduce the system. It is necessary to manage the resistance to change. Resistances most often occur as a consequence: lack of vision and strategic thinking in the company, absence of understanding and support by the manatee, fear of change and unknown, constant organizational and structural changes, the resistance of IT professionals and existing "distributors of information", struggles of employees for status and position, lack of credibility of the project team that introduces the concept, etc.

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