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Logistics Performance Measures - Requirements and Measuring Methods

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Logistics Performance Measures - Requirements and Measuring Methods

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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1 Preface

The work of CEN/TC 273 "Logistics" has been directed towards describing and codifying best practice in logistics in terms of defining terminology, describing tasks and responsibilities for Logistics-related jobs, and specifying appropriate educational requirements for those jobs. All of the possible improvements in logistics performance which should flow from systematically addressing terminology, jobs and education will be negated if the improvements are not sustained, still less built upon.

Accordingly, CEN/TC 273 Working Group 4 has prepared this Report with a view to helping industries, enterprises and individuals measure their performance in logistics.

Attention is increasingly being paid to supply chain efficiency and effectiveness and to competitiveness in logistics. Awareness of the necessity to measure the performance of the logistics processes is reasonably widespread in industry and among logistics service providers, but systematically implemented logistics performance measurement schemes remain less common than they should be. It is certainly true that many companies genuinely do not know how to measure performance or what potential benefits they could gain.

Yet companies that fail to measure their logistics performance can never be sure why they lose business to or gain from their competitors. Since they cannot objectively compare themselves with other companies or with published industry averages or with their customers' expectations, they are attempting to manage without having the facts in front of them. They cannot even be sure that their well-meant investments in improved equipment, training, systems and working practices will be worthwhile.

Traditionally, financial performance has been the primary measure of success in most companies. Financial planning and reporting systems have been developed for measuring performance on a regular monthly, quarterly and annual basis. Today, enterprises need to establish operating system performance measurements to enable them to manage business operations effectively and to meet business and financial objectives. Conventional financially-based reporting systems generally do not provide all the required information about logistics performance. To be effective, measurements of logistics processes along the supply chain should be within a coherent system or framework in order to provide consistency, coherence and compatibility. It cannot be assumed that measurement of a randomly-chosen process attribute will actually provide a valid indicator of performance. Additionally, each measurement should have a relationship with the objectives of the enterprise, which evidently vary over time and from company to company, and should be part of the control cycle of the processes by which logistics performance is improved.

Because of differences between companies, even within the same industry, the performance of a logistics process can often be measured in a number of ways. Consequently many different performance indicators could be used. The performance measurements presented in this Report are examples of generally-accepted best practice, but each enterprise must select those which are appropriate to its circumstances and objectives. However, the descriptions provided in this Report are designed to be understood as the definition of each performance measure. This will greatly facilitate intra-firm and inter-firm comparisons by creating a common currency of logistics performance measures.

Enterprises may also wish to set target standards of performance. The Report does not propose levels of performance for any logistics performance measure; such standards must be set by the company concerned. Many companies make use of logistics service providers or other external organisations. Logistics performance measures (and standards) may be incorporated into contracts as commitments for both parties to ensure that the supply chain is under control.

2 Scope of the Working Group

To define a set of logistics performance measures, requirements and methods for performance measurement, relating to effectiveness, efficiency and associated factors in the areas of logistics management, systems and equipment.

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3 Introduction

3.1 Definition and Scope

A performance measure or indicator is information about a process that is:

- defined and recorded in a prescribed way
- supportive to the management of an enterprise
- related to standards or other information.

Processes may be measured by a suitable set of performance measures e.g. variables indicating effectiveness, efficiency or productivity.

Alternative definitions exist elsewhere for the term “performance measurement” or “performance indicator”. The definition presented in this Report is not in contradiction to other definitions, but is more complete and provides the essential conditions to which a performance indicator or measure should respond.

In a company many aspects of logistics activity may be important. With few exceptions, this Report does not cover purely statistical or financial measures or indicators.

Note 1: In general, Performance Indicators refer to a certain time period, e.g. hour, day, week, month, quarter or year. It is important to follow the development of the value of a performance indicator with the course of time (trend).

Note 2: In general, the information used for a logistics performance indicator refers to the place, time, form and ownership or possession of the goods.

3.2 Reasons for Measuring

Measurement of the logistics performance of a company in a business chain, which may extend to a local, international or global supply chain, is necessary for a number of reasons:

- a. An essential part of an improvement process is the measurement of progress against a standard performance measure.
- b. Customers require a good performance in terms of delivery time and reliability, in addition to an acceptable price and high quality.
- c. In order to initiate or to follow the changes in the market or in the technology, enterprises may need to increase the flexibility of manufacturing and distribution (e.g. reduced production lead time, changed delivery dates, re-engineering, shorter time to market, re-allocation and re-sourcing of logistics partners). These changes can only be carried out successfully if they are supported by adequate logistics performance.
- d. As industrial companies focus on their core competences, they may decide to subcontract some of their logistics activities. The performance of these logistics service providers should meet the requirements as agreed by contract (e.g. a physical distribution contract), and should be measured by one or both parties. Refer also to prEN 13011:1998 (CEN/TC 320/WG 2).

The logistics performance measures written into this document should be used and partners may agree on specific contractual values to these measures.

Managing the entire supply chain requires agreed performance measurements at both the internal and the external transfer points in this chain (See Figure 1).

Transfer points between enterprises are likely to be subject to contractual agreements and the standards of performance may therefore be contractual.

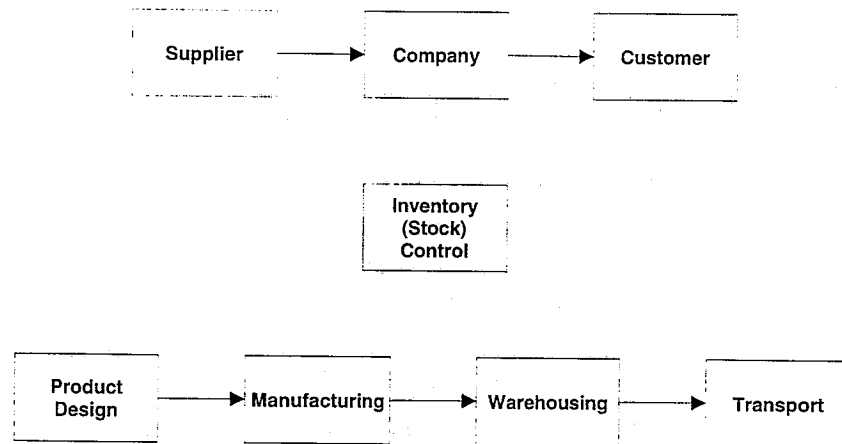


Figure 1. The external and internal supply chains

3.3 Requirements

As indicated above, there are sound business reasons for measuring the performance of the activities and processes of the supply chain. This Report lists many possible performance measures. However, this does not indicate that there is any legal requirement to maintain any specific value of performance. The selection of performance measures and their target values is an issue that should be determined by the business environment and between the customer for and supplier of the specific service concerned. Thus, this Report does not list any required values of performance measures.

Prior to selecting a logistics performance measure some basic considerations need to be made, which will be discussed in this introduction (see also 3.6 Implementation, below).

The measurement of any single logistics performance can be complex because of the interdependence of the activities along the supply chain and within the company. However an individual company's performance measures should be derived from that company's overall business objectives and should show that improvements in logistics contribute to these objectives. In practice the performance target is often defined not as a single value but as a range within which the value of the measure should stay. In addition contractual conditions have to be considered as performance measures and these have to meet the requirements of the trading environment.

Performance can also be measured in different ways and at different levels within the hierarchy of the supply chain or the company.

Nevertheless a performance measure is a part of a "control cycle" (see Figure 5) and all the elements of the control cycle should be implemented to achieve a fully functional control process. The performance measures should provide the information which is required by the management of the enterprise in a manner that eliminates misinterpretation.

Careful selection of suitable performance measures together with clear and unequivocal definitions is therefore necessary.

3.4 Transformation Process and Measures

In order to establish the performance measures which are appropriate in specific situations, the logistics (supply) chain can be broken down into a number of sequential transformation processes, each of which is comprised of the activities which transform inputs into outputs (see

Figure 2). Many of the activities in the supply chain may be found in CEN Report CR13156 "Some Occupational Profiles for Practitioners in Logistics" (CEN/TC 273/WG 2).

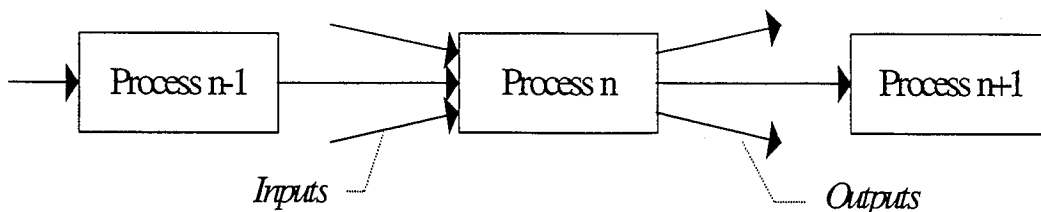


Figure 2. Transformation Process Inputs and Outputs

Performance measurements may concern data that relate to the input, the transformation process itself and/or to the output. Some examples of the process data that might be measured are:

- Input: Material, capital, personnel, information, etc.
- Transformation attribute: Stock level, throughput time, resource quantity, etc.
- Output: Production output, sales, deliveries, information, etc.

Note 1: Certain stages of the supply chain are trade transactions. These may also be considered as transformation processes.

Note 2: The performance measures and the variables from which they are derived can be expressed in physical terms or in financial terms. This report focuses on the physical measurements (the assignment of WG 4).

Frequently used performance measures can be expressed in terms of:

Input measures [iteh.ai/catalog/standards/sist/39da0852-4a72-4580-8257-676301d72d5a/sist-cr-13908-2001](http://www.iteh.ai/catalog/standards/sist/39da0852-4a72-4580-8257-676301d72d5a/sist-cr-13908-2001)

1. **Efficiency** is the ratio between the Norm input and the Actual input, or, **Utilisation** is the ratio between the Actual input and the Norm input (inverse efficiency)

Process related measures

2. **Productivity** is the ratio between Actual output and Actual input
3. **Flexibility** is a time based measure of the rate of change of output
4. **Lead Time** is the time between the initiation of a process and its completion (a time based measure of the speed of response)
5. **Inventory Level** is a quantity based measure of the stock in the system, **Stock Turns** is a ratio based on the rate at which stock is consumed.

Output measures

6. **Effectiveness** is the ratio between the Real output and the Norm output (the same ratio is true for **Reliability** and **Service Level**)

Note: - Norm can be the maximum or the planned value according to the context.

In summary, taking a process approach, the basic performance measures which can be considered as a minimum set are:

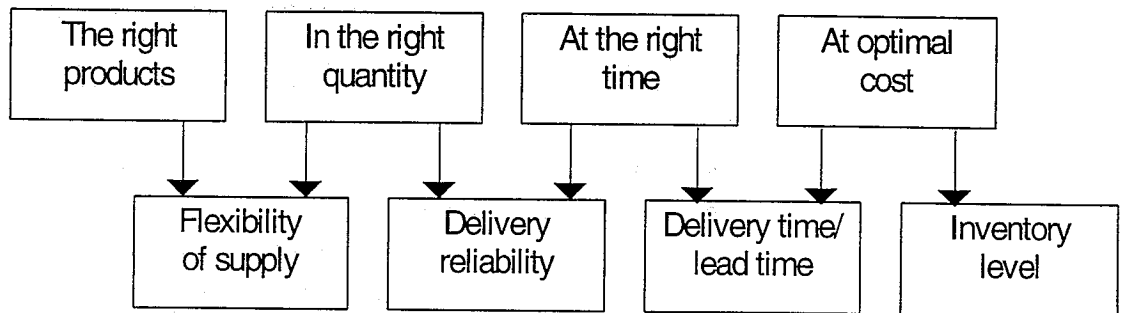
- Input: Efficiency, or Utilisation (primarily on bottleneck processes)
- Process: Productivity, Flexibility, Lead Time, Inventory Level, Stock Turns
- Output: Effectiveness, Reliability, Service Level.

The objectives concerning delivery time, delivery reliability and flexibility are directly related to customers' demand. The inventory level within a supply chain can be viewed as a derivative

of these objectives and will therefore be determined by the chosen logistics structure and processes.

Logistics is an activity that concerns the route from raw material to finished products and, in some cases, back (reverse logistics). It therefore affects the whole organisation and its trade environment, and it is the duty of top management to define and quantify the logistics objectives and the means by which they can be measured. In addition, any contractual conditions that have been negotiated will also become an objective on agreement of the contract.

In a company or a supply chain a hierarchy of objectives will exist, which for the logistics situation can be presented as in Figure 3.



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Figure 3. Hierarchy of Objectives

Individual companies should determine which priority is appropriate to their business environment. They should also determine the performance measures to be used at each of the levels of the organisation: [SIST CR 13908:2001](https://standards.itih.ai/catalog/standards/sist/39da0852-4a72-4580-8257-676301d72d5a/sist-cr-13908-2001)

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- Strategic
- Policy/tactical
- Planning and control level
- Execution or operational level

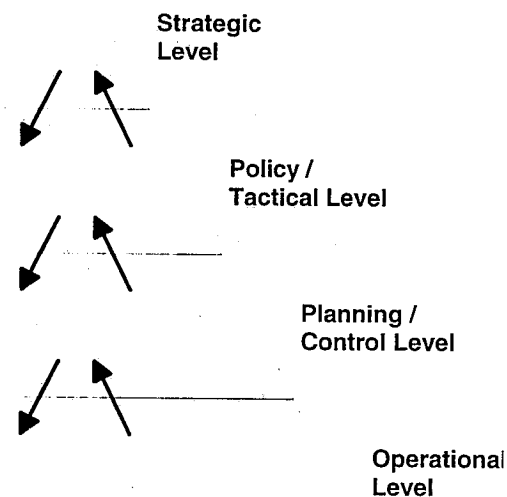


Figure 4. Control Levels within an Organisation

Between these levels (illustrated in Figure 4) a relationship exists of control (“downward”) and reporting (“upward”) information. The higher levels in the organisation are setting the objectives for the lower levels (vertical structure). For each level a set of performance measures is applicable because each level functions as a control cycle. The performance standard of each control cycle is derived from the objectives set by the higher levels (see Figure 5).

In this Report the performance measures listed below in section 5. Performance Measures Group A and Group B relate mainly to the policy / tactical level, those of Groups C and D primarily to the planning and control level and those of Groups E, F and G generally to the operational level.

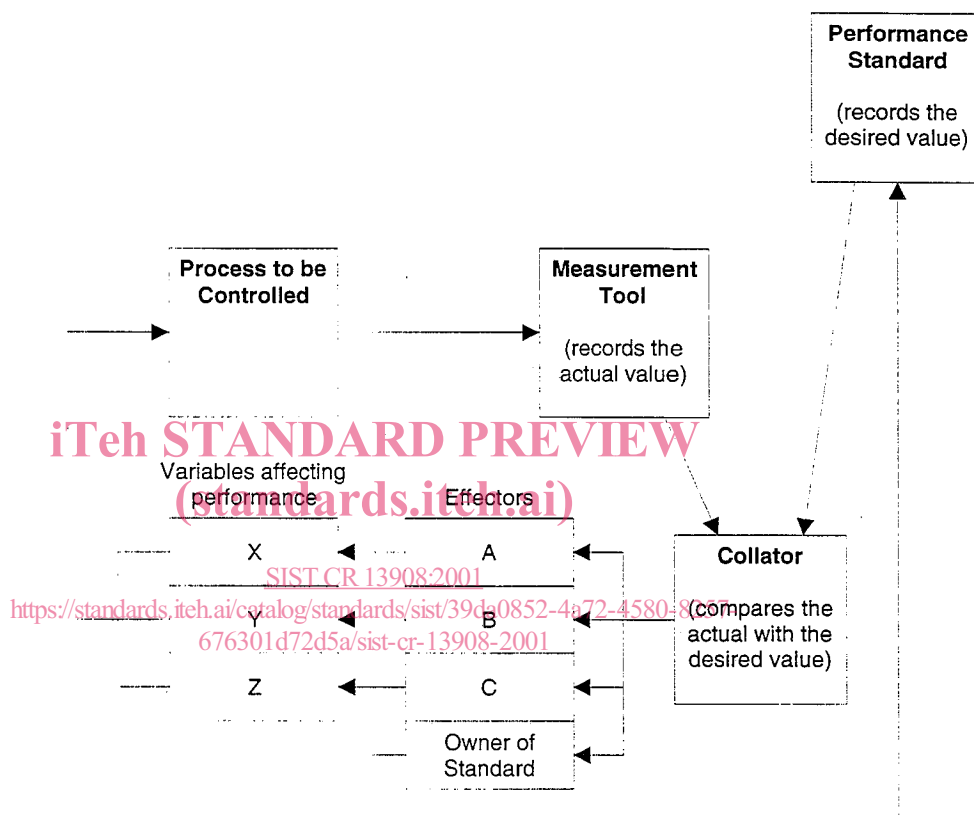


Figure 5. Feedback Control System (after Juran)

This approach should ensure that a coherent set of performance measurements is used throughout the organisation and supply chain.

3.5 Implementing Performance Improvement

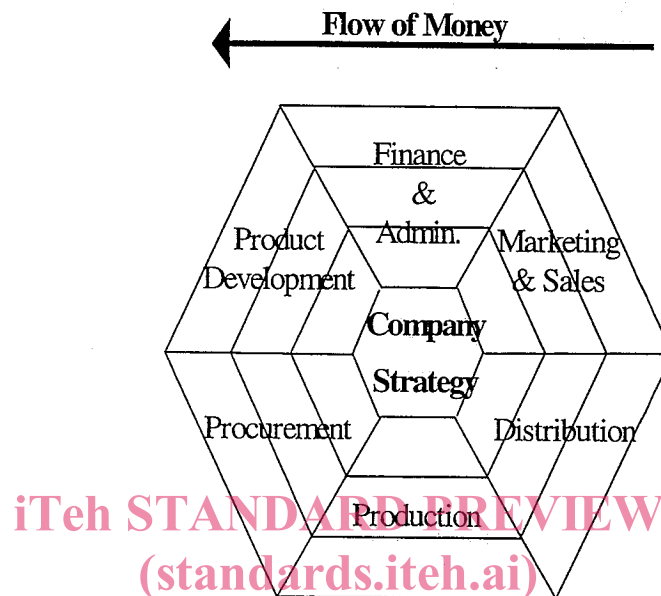
The improvement process will lead to results only if the control cycle (see Figure 5) has been implemented in the organisation in all its essential elements, relations and timing:

- The process or entity to be controlled
- The measurement tool
- The performance standard / norm with the control boundaries
- A collator to compare the actual values with the norms
- A procedure to inform all personnel responsible for the result of the comparison so that a diagnosis can be made
- Corrective actions from the personnel to change the process variables.

Note: As this is a dynamic process, the timing of the various phases of the cycle is very important.

The following conditions should be fulfilled:

- The logistics process should be defined and structured along the goods flow (horizontally). There will also be a (vertical) management structure; so the organisation should be structured in both directions (see Figure 6);



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Figure 6. Coherence of Control Levels in the Organisation

- The variables by which the process may be steered should be identified and personnel made responsible for managing the effect of the variables on the process;
- Suitable performance measures should be selected and defined;
- Systems and procedures for measuring and reporting the required data should be established;

Note: Company-wide data bases should be used to record and provide the data for performance measure calculation to provide consistency and avoid duplication.

- Norms / standards (with control boundaries, if appropriate) should be set and managed to quantify the objectives.

In order to improve the opportunity for analysis it is recommended that the logistics measures are reviewed together with those of quality and finance, and that all other disciplines in the organisation co-operate in the improvement process.

When selecting a logistics performance measure in addition to the conditions mentioned above the following requirements should be considered:

- Different product-market combinations may require a different logistics structure and therefore also different logistics performance measures;
- The performance of competitors has to be considered when establishing targets;
- The definition of a performance measure must be unambiguous (for instance, the potential trade off between high delivery reliability and low stock level).

3.6 Implementation

In order to implement a coherent system of logistics performance measures each of the following steps should be taken:

- a. Establish the (logistics) objectives,
- b. Establish the (logistics) structure of the organisation,
- c. Establish the steering instruments,
- d. Determine the criteria for the selection of the performance measures by applying the knowledge and experience of logistics analysis,
- e. Fix the norms and the control boundaries,
- f. Define the performance measures, for each level of the logistics chain and the organisation,
- g. Determine the measurement tools.

The choice of suitable performance measures should also take account of the following points:

- The list provided in this Report is not restrictive; additional performance measures beyond those listed here may be used to provide a better understanding of relevant events and to prevent any misinterpretation of their meaning;
- The value of the performance measures, compared between different operating units, may assume quite different meanings, depending upon the level or method of analysis;
- A performance measure is meaningful and comparable only if the data taken into account conform to a strict definition and their values are obtained on a consistent basis;
- The measures are related to the relevant environment, since the methods of evaluation may affect the result.

This Report may encourage the setting up of a logistics database. This should include:

- Permanent reporting structures on materials / goods flow in addition to those for financial reporting;
- Project management targets for achieving control of, or improvements to, specific logistics objectives.

When the business objectives are translated into logistics terms e.g. customer service level, manufacturing flexibility, lead times, delivery reliability and stock levels, action should be taken to measure performance improvements against the desired targets. Practical experience has shown that for full control of the supply chain multiple performance measurement is required at a number of different points. An example of a set of the key performance indicators and associated status points are shown in Figure 7, below.