# INDICATORS PROPOSAL FOR PERFORMANCE PROCESS BASED ON PULL SYSTEM IN CONTEXT OF QMS PRINCIPLES

MALINDZAKOVA Marcela[1], ROSOVA Andrea[1], STRAKA Martin[1], BUSA Michal[1]

*Institute of Logistics, Faculty of Mining, Ecology, Process Control and Geotechnology, TU Kosice, Slovakia,*
*marcela.malindzakova@tuke.sk*
*[1]Technical University of Kosice, Kosice, Slovak Republic, EU*

## Abstract

Production processes (PP) consist of continuous and discrete types of technology operation, transport, manipulation and storing processes regards the flow of material and also the equipment and machines. Other specifics are: long production cycles, great inertia, tree structure of production processes (from roots up to the leaves), high level of investments etc. These characteristics resulted in some specifics of production logistics. This article deals with these specifics and explains it using the conditions of production processes. For process approach it is important that outputs and their Quality & Quantity match the inputs. The principle of Q & Q is about the responsibility of a systems approach.

**Keywords:** Process approach, quality, customer requirements, customer services, process

## 1.    INTRODUCTION

The aim of QMS is to provide clear instructions and generally applicable behavior for the organization in terms of quality implementation. This system must constantly adapt to the changing demands of customers, or purchaser, or competing consumers of company products. The current quality management systems operate on so-called strength principle, which means that customers 'pull' businesses towards their requirements. The principle of "prosumer" (producer - consumer) pressure from future users is more proffered.

## 2.    PROCESS APPROACH

One of the conditions for successful implementation of quality management system is thorough detection and identification of all processes affecting conformity to the customers' requirements to make them compatible and provide for business development. Processes are divided according to their nature into:

1)    Main: custom management, proposal management and development, security of supply, ensure the conformity of the product (production, handling, packaging, shipping).
2)    Control: documentation management, planning, management review, internal audits, corrective and preventive action.
3)    Support: inspection, testing, measurement and metrology, service, maintenance and repair of nonconforming products, employees' training.

The organization has to document the quality management system, to maintain and to continually improve its effectiveness in accordance with the requirements of EN ISO 9001:2015 - Quality Management Systems. Requirements. It is the responsibility of an organization to determine the sequence and interaction of processes. All of the above described processes need to be monitored, measured and analyzed (**Figure 1**) [1].
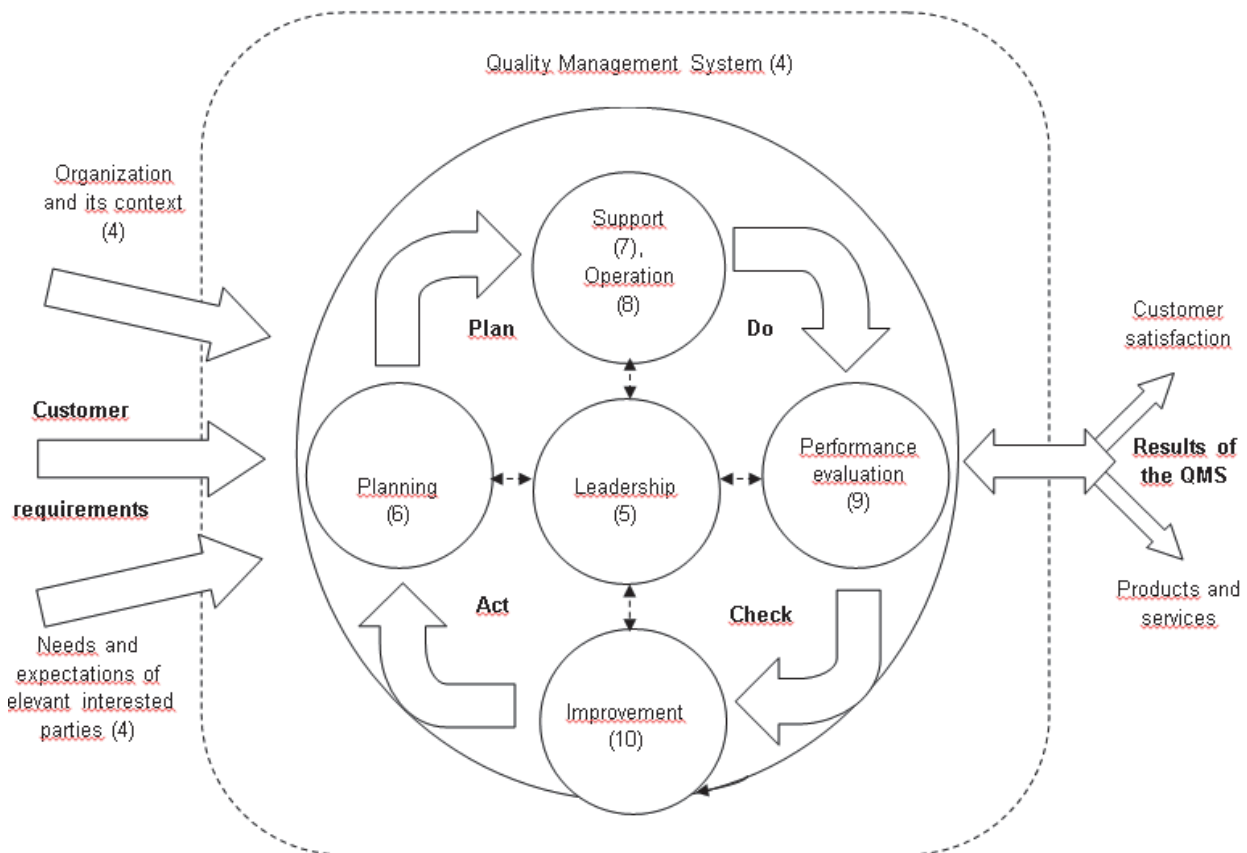
**Figure 1** Quality Management System Model based on the process approach [ISO 9001:2015]

The basic document for the EMS standard is the EN ISO 14001:2015 Environmental Management Systems. Requirements with guidance for use [2]. The current joint evaluation of "integrated" management system for quality and environment (sometimes called POEMS) contributed to the expansion of application area by combining standards 9001 and 14001. If we consider standard Cartesian axis system, the x axis or the depth represents quality, the y-axis or the width represents environment and the z-axis or the height represents the benefits of joint action [3]. The strategy of socially responsible business, based on the principle of sustainable development, which provides for current needs, but also considers the needs of future generations, is also called a strategy of double benefit. Problems of relation between man and the individual environmental components are the logical consequence of the uneven development of the human population and its access to usage and influence upon nature and competitiveness of the business entity improves [4].

## 3. CUSTOM LOGISTICS AND CUSTOMER SERVICE

Problems of relation between man and the individual environmental components are the logical consequence of the uneven development of the human population and its access to usage and influence upon nature and competitiveness of the business entity improves [4]. In order for the custom logistics to fulfill all the tasks that are required, it must integrate all business activities related to planning and providing for manufacturing process, to meet customer requirements at reasonable cost conditions [5]. Customer service is a process in which the participants in the supply chain significantly benefit from added value in a cost-effective manner. This process takes place between the buyer, seller and the third party. The result of this process is a value added product or service that is subject to change. Customer service as part of the overall business philosophy can be seen from three aspects, namely:
1) activity or function that needs to be managed,

2)     actual performance set to specific parameters,
3)     individual activities and measurement of their performance.

Components of customer service can be divided into three groups: pre-sales, sales, after-sales. This classification follows the definition used in marketing that is based on the understanding of market transactions carried out before, during and after the sale. Basic indicators of custom logistics and customer service are handled in **Table 1**.

**Table 1** Indicators custom logistics and customer service, source: own processing

| Structural framework and indicators |
|---|
| 1)     The sales volume of individual products in units (pcs, kg, t, l, m$^3$), [MAX] |
| 2)     The volume of sales of products in the financial units (EURO), [MAX] |
| 3)     Number of orders for the period (number), [MAX] |
| 4)     The total sales volume for the entire range of financial units (EURO), [MAX] |
| 5)     The structure of sales variable = sales volume of the item in EURO / total sales in euro x 100 (%) [MAX] |
| 6)     Average customer turnover = total sales in EURO / number of customers (EURO / customer), [MAX] |
| 7)     The average order size = item / order number (pcs / order) or sales volume in EURO / number of orders (EURO / order), [MAX] |
| 8)     Number of expeditions during the reporting period (number), [MAX] |
| **Productivity indicators** |
| 1)     The average length of the delivery period = Σ delivery times for the period / number of deliveries for the period (day / van), [MIN] |
| 2)     Productivity expeditionary operations = number of shipments for the period / length of the period (consignment / year), [MAX] |
| 3)     The average speed of response to customer special requirements = Σ times consumed on special equipment requirements / number of special requirements for the reporting period (time / special requirement), [MAX] |
| 4)     The average speed of warranty repairs = Σ time used for the equipment warranty repairs / number of warranty claims for the period (time / repair) [MAX] |
| 5)     The average traffic speed = time used for transport for the reporting period / number of shipments for the reporting period (time / shipment), [MAX] |
| 6)     Average complaints handling duration = Σ complaints handling time used for the handling of complaints / number of complaints during the reporting period (time / complaint), [MAX] |
| **Quality indicators** |
| 1)     The consistency of delivery time = (number of deliveries, maintaining the length of delivery time / total number of deliveries during the reporting period) x 100 (%), [MAX] |
| 2)     The level of service during the delivery period = (number of orders per year - number of transports per year / number of orders per year x 100 (%), [MAX] |
| 3)     Annual service level = number of stocks transports per year (number), [MAX] |
| 4)     Average delivery time = Σ additional delivery time required to perform additional supplies / number of additional supplies (day), [MIN] |
| 5)     Ratio of accepted items = number of items / total number of delivered items x 100 (%), [MAX] |
| 6)     Value of accepted items = value of received items / total value of delivered items x 100 (%), [MAX] |
| 7)     The share of supplies received = number of supplies / total number of completed deliveries x 100 (%), [MAX] |
| 8)     Value share of received supplies = value of supplies received / realized total value of supplies x 100 (%), [MAX] |
| 9)     Percentual fulfillmentof item = number of items delivered on time / total quantity of ordered items x 100 (%), [MAX] |
| 10)    Supply emergency of item = number immediately made demands / total number of requests x 100 (%), [MAX] |
| 11)    Availability of spare parts = number of spare parts delivered from stock / total number of delivered spare parts x 100 (%), [MAX] |

## 4. IMPORTANCE OF THE GROUP INDICATORS

### 4.1. Structural, framework and productivity indicators

They report on the scope and structure of expeditionary operations within a company. They reflect the speed of response to customer orders, requests for other services provided by the supply service and response duration to changing customer requirements.

### 4.2. Quality indicators and logistics costs

They quantify the level of service provided. They are the most important group of indicators, because they have the highest weight in assessing the supply of customer service. Costs that arise in contract logistics and are related to the time demands on order fulfillment. Another, no less important costs are the records of orders and order processing costs. Other costs are costs for technical and technological assessment, costs for economic and capacity assessment and other costs. These include, for example, the cost of confirmation of the purchase contract and legal costs.

### I. Costs for orders processing

The cost of order registration ($C_{RO}$)

$$C_{RO} = P_S + P_H + P_{ICT} + W_W \tag{1}$$

where:

$P_S$ - software price, $P_H$ - hardware price, $P_{ICT}$ - price for ICT, $W_W$ = workers wage.

The cost of order processing ($C_{OP}$)

$$C_{OP} = C_{PE} + C_{ICT} + CPO + W_W \tag{2}$$

where:

$C_{PE}$ - cost of pc equipment, $C_{ICT}$ - cost of ICT, $C_{PO}$ - cost of orders preparation, $W_W$ - workers wage.

### II. The cost of technical and technological assessment ($C_{TTA}$)

$$C_{TTA} = (P_C + C_A) \cdot N_A + C_{MDDTP} + W_W \tag{3}$$

where:

$P_C$ - price certificate, $C_A$ - audit costs, $N_A$ - number of assessments, $C_{MDDTP}$ - the cost of maintaining and developing databases of technological processes, $W_W$ = workers wage.

### III. The costs of economic assessment ($C_{EA}$)

$$C_{EA} = C_{SW} + C_{CE} + C_D + W_W \tag{4}$$

where:

$C_{SW}$ - software costs, $C_{CE}$ - cost of computer equipment, $C_D$ - cost of documents, $W_W$ - workers wage.

### IV. The capacity assessment cost ($C_{CA}$)

$$C_{CA} = C_{FI} + C_C + C_{PS} + W_W \tag{5}$$

where:

$C_{FI}$ - cost of information flow from storage, $C_C$ - communication costs in the logistics chain, $C_{PS}$ - costs of production scheduling, $W_W$ = workers wage.

## V. Other costs associated with the orders logistics

Costs for confirmation of the purchase contract ($C_{CPC}$)

$$C_{CPC} = C_D + F_V + F_N \tag{6}$$

where:

$C_D$ - cost of documents, $F_V$ - fees for verification, $F_N$ - fees for notary.

Cost of legal services ($C_{LS}$)

$$C_{LS} = (F_{VD} \cdot N_D) + F_N \tag{7}$$

where:

$F_{VD}$ - fee for verification of documents, $N_D$ - number of documents, $F_N$ = notary fee.

The main problem of the costs that may arise, is an insufficient level of customer service. Thus unwanted costs may incur caused by the loss of unused opportunities even the loss of a customers. The costs spent later on a new customer acquisition are approximately five times higher than the costs that are necessary to maintain the customer's satisfaction. The cost of customer service can be divided into four major groups. The costs of the first group are formed prior to the sale of goods or services. This includes for example the cost of providing information to customers, the cost of presentations and exhibitions. The second group consists of costs incurred during the sale. Here are shipping costs, costs for presentation or installation costs of ICT. The third group includes all costs incurred after the sale of goods or services, such as the cost of claims, and the costs of customer service. The fourth group consists of customer service audit costs. All these groups are further subdivided. Common costs for all four groups are labour costs, energy costs, depreciation, insurance, repairs, etc. [6].

## VI. Costs before sale

The cost of providing information to customers ($C_{PIC}$)

$$C_{PIC} = (W_W \cdot N_E) + P_S \tag{8}$$

where:

$W_W$ - workers wage, $N_E$ - number of employees, $P_S$ - price of services.

Cost of presentations and exhibitions ($C_{PE}$)

$$C_{PE} = C_P + C_E \tag{9}$$

$C_P$ - cost of presentation, $C_E$ - cost of the exhibition.

## 5. CONCLUSION

Today's business strategy is focused on the so-called 3Cs - Customer, Competitors, Company, while providing high corporate culture, that is -Commitment, Competment, Consistent. QEMS integration based on the process

and the customer approach, as one of its main pillars, requires the monitoring and evaluation of all eligible costs for providing support processes, which are customer service and customer logistics. Success factors and business growth not only benefit the customers, their loyalty/satisfaction, customer experience, customer perception by staff, speed up of processes, but also employee productivity and their satisfaction / loyalty.

**ACKNOWLEDGEMENTS**

**REFERENCES**

[1]     Norm EN ISO 9001:2015 Quality management systems. Requirements.

[2]     Norm EN ISO 14001:2015 Environmental management systems. Requirements with guidance for use.

[3]     MALINDZAKOVA, M. Coordination of enterprise management systems. [Koordinacia podnikovych manazerskych systemov]. Kvalita pro zivot, Vol. 12, No. 2, 2011, pp. 40-44, www.dtocz.cz.

[4]     MALINDZAKOVA, M. The synergistic effect of mutual aid between EMS and LCA. [Synergicky efekt vzajomnej podpory EMS a LCA]. Kvalita pro zivot, Vol. 10, No. 2, 2009, pp. 27-29, http://www.dtocz.cz/download/casopis/casopis_KPZ_2_2009.pdf.

[5]     ROSOVA, A. Controlling and Logistics of Industrial Company 2 [Controlling a logistika priemyselneho podniku 2]. Kosice: ES F BERG TU Kosice, 2010.

[6]     ROSOVA, A. Contribution to the evaluation of the performance of logistic system [Prispevok k hodnoteniu vykonnosti logistickeho systemu podniku]. Kosice: TU Kosice, 2012.