



<sup>1</sup>. Esad BAJRAMOVIĆ, <sup>2</sup>. Fadil ISLAMOVIĆ, <sup>3</sup>. Dženana GAČO, <sup>4</sup>. Atif HODŽIĆ

## MEASURING THE QUALITY

<sup>1</sup>. UNIVERSITY IN BIHAĆ, FACULTY OF TECHNICAL ENGINEERING BIHAĆ, IRFANA LJUBIJANKIĆA BB, BIHAĆ, BOSNIA & HERZEGOVINA

**ABSTRACT:** The paper presents the path towards quality, based on measurement. Monitoring, based on facts, is the founding concept of any total quality management program. Quality means stability in meeting customer expectations. Measurement is the road to TQM. Each company must apply appropriate methods of monitoring, and, as applicable, quality management system process measurement.

**KEYWORDS:** monitoring, process measurement, quality, quality management, improvement, TQM

### INTRODUCTION

In order to survive and succeed in contemporary competitive business world, and undoubtedly even more competitive world of tomorrow, we need all managerial tools that we can acquire. One of the strongest will most certainly be total quality management, and in order to achieve TQM thorough measurement is required. Changes in market are nowadays extremely rapid. New technologies, new information and communication possibilities, direct growing communication, new distributors, new regulations and various technical barriers, constant customer need and expectation growth, are all conditioning new management style that needs to find rapid answers to these new challenges. It has recently been revealed that only companies that continuously invested in modern technology and enhanced their capabilities, remained on the market and improved their business [1].

Path of measuring the quality, as a program of high-quality business, will provide advice, tools, and techniques necessary for increasing the level of customers satisfaction, keeping the existing customers and gaining new ones; it will improve our relations with distributors and directs us towards profitable partnerships; it will make our activities more efficient and help us in finding means to eliminate wasting, avoiding errors, and reducing inconsistencies.

All measurements, in both service and production industry, conducted in all areas, have experienced progress, since conditions and criteria that products and services must meet have changed. Continuous narrowing of tolerances dictated completely new constructions of measurement and controlling devices and instruments, as well as their applications. European market demands this control to be in accordance with Standard ISO 9001:2008, point 7.6.

Therefore, it is necessary to plan, construct, use and manage measurement instruments, standards, etc. It is important to be familiar with the methods,

physical work principles, certain errors, their size and means to avoid them. The important part of measurement devices and measurement instruments is software, which contains increasing number of devices and measurement instruments as an indispensable part.

Knowledge of measurement is a resource that is a base for all measurement. In order to conduct measurement in production, there has to be capacity for knowing the following:

1. Instruments for production measurements and also dynamic measurements during the production, all of which affects the measuring piece.
2. Standards and artifacts, managing, maintaining and directing according to regulations that are increasingly becoming determinants of international character, without which it reduces to work market limited to the narrow national area.
3. Software and algorithms that are a part of measurement devices and are subject to changes and improvements, have limitations, and are provided for special purposes. Nowadays, even the software influence is considered to be an important source that affects measuring results accuracy.
4. Measurement strategies in production measurements are increasingly present in planning and conducting measurement, since they affect the end result of measurement and product prices.
5. Operating pieces or measuring objects are subject to measurement, and all production measurements imply that all information about the product must be known, if quality measurement wants to be achieved.
6. Special strength in the functioning of each system presents measurement and quality, under which is process quality and total system quality. That can be achieved in companies that have, in fact,

approached to quality management system implementation, model ISO 9001.

### **COST OF QUALITY**

In each process, certain activities are conducted, and as a result of process implementation of all activities, products and services occur that can be material and non-material in nature. Quality testing includes a set of different activities and implementation of secondary processes in the system, which enable assessment of the obtained process results. These secondary processes in the system are measurement, testing and control. Total quality system does not imply the measurement of everything. Instead, it directs you to measurement of correct facts, so as to maximize quality and productivity. Quality means to satisfy customer expectations. For us, the cost of quality is equal to costs directed towards fulfilling these demands in combination with costs that occur when we fail to meet the demands. In this case, it must be kept in mind that cost of quality presents measurable amount, and that by application of TQM tools we can reduce the cost. In addition, TQM method itself, such as cross-functional team work, reduces costs and increases business efficiency. If we want to achieve quality by way of measurement, we should always evaluate the percentage in relation to the quality and use it for further cost budget through the following:

- Prevention,
- Inspection and assessment,
- Internal failure costs,
- External failure costs.

It is estimated that 80% of the lost customers have stopped doing business with some company due to lack of quality. Attraction of new customers is 5 times more expensive than keeping the existing ones. Research has confirmed that 5% decrease in errors with users results in 25% to 85% increase of business profit.

Each company should establish a plan for the cost of quality analysis and apply it on the whole company. In this way we can move toward raising awareness on costs of managers and all employees. Through the plan, it is necessary to conduct the following activities:

- to establish cost of quality workgroup,
- to interview managers (how they measure the processes),
- to consider financial budget and customer data,
- to select monitoring parameters for cost of quality components,
- to establish cost of quality monitoring program,
- to monitor impact of total control management systems on cost-effectiveness.

Continuous analysis of the activities results in more precise distribution. Measurement process demands application of selected measurement system and certain measurement procedure, in order to determine the obtained measurement result. Measurement system consists of set of elements that are connected in whole, for the purpose of showing or registering measurement results. These elements are: measurement object, measurement instruments,

secondary devices, measurement machine, measurement management and surroundings [2, 3].

### **MEASUREMENTS, ANALYSES, AND IMPROVEMENTS**

#### **Measurement in general**

We continuously control product/service quality, customer satisfaction, achieved business performance and objectives, and other planned business results, as well as operationally and systematically monitor, measure, gather relevant data, analyze and assess achieved actions, and based on obtained indicators/facts we initiate appropriate improvement actions, in cases when needed and convenient.

These fundamental commitments are clearly stated through our policy and general objectives. Thereby, management is continuously developing necessary awareness of the employees, and is personally participating in the implementation of the mentioned actions, through planning and process management.

Data and information resulting from these processes are basis for review of QMS (quality management system) by the management, and making decisions and conclusions necessary for further improvements.

#### **Monitoring and measurement (customer satisfaction)**

Our basic commitment is to fulfill accepted/specified customer demands each time and on time, striving towards overcoming their expectations, when possible.

Information on customer satisfaction/dissatisfaction is continuously collected in different appropriate methods, the most convenient being:

- customer feedback in direct communication,
- customer complaints,
- customer surveys,
- customer refund in the sense of new orders of our products/services.

Primary responsibility for gathering and processing of information is on head manager, head of technical procedures and heads of processes of the contracted work implementation. All other employees have the responsibility to deliver customer satisfaction information to the head manager and/or other responsible staff, which they collected through contacts with customers (or their representatives), or any otherwise collected information.

Customers' surveys are conducted once per year through the established survey form, with the responsibility for it being on the head of the process of marketing, offer, and contracting. Processed information from the surveys, as well as those obtained from other sources, is the required item of the agenda during the QMS review by the management. Key indicators of customer satisfaction are:

- keeping existing customers and scope of cooperation expanding,
- gaining new customers,
- level of the expressed customer satisfaction assessed on the basis of gathered information (as described earlier).

#### **a. Internal audit**

One of the basic chapters of QMS planning is continuous planning and implementation of internal audits of all processes stated in the objective:

- determining implementation of planned activities prescribed by QMS documents,
- determining whether QMS is efficiently implemented and improved, according to business needs and relevant standard demands
- determining level of achievement of quality objectives, i.e. implementation of determined quality policy,
- determining areas where improvements are possible and necessary, and starting necessary correction and/or prevention action.

Annual program of internal audit consists of:

- type of audit (scheduled and unscheduled),
- determining work documents, as well as documents that are subject to audit,
- term for audit implementation,
- determining services/processes covered by the audit,
- determining audit team members,
- duration of internal audit and ways of reporting audit results.

Detail instructions for internal audit execution are described in systematic procedures for conducting internal audits.

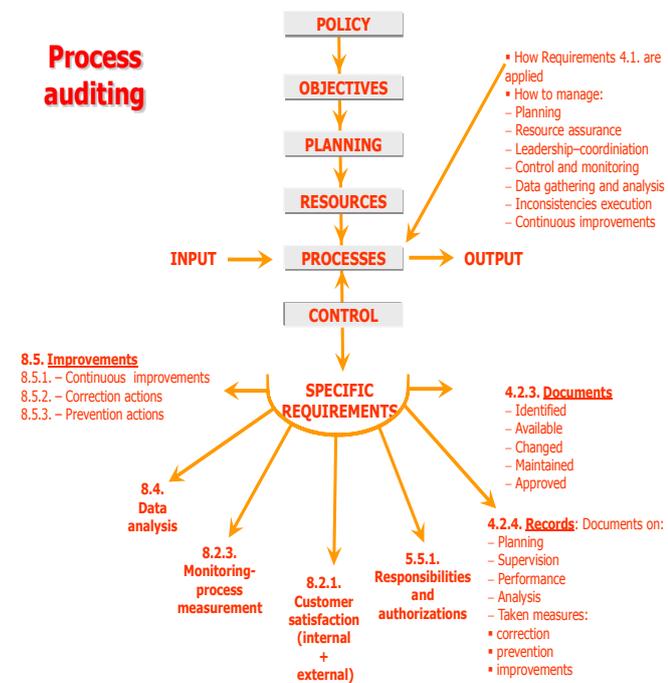


Figure 1. Process auditing

**b. Monitoring and process measurement**

Process managers, based on plan of implementation/monitoring and measurement processes, continuously implement planned activities, and based on gathered data realize assessment of the achieved results or objectives. If required they identify and implement corrections, and, if necessary, correction actions. They present the results of quality performance achievement on regular meetings of company’s management, such as review of QMS by the management.

Specific indicators of process quality are quality and quantity of the implemented products/ services, maintaining planned terms, costs, whereas specific performance indicators are safety and health protection all of employees, and environment

protection, which are determined by the corresponding programs of QMS management. By relating achieved and planned values of certain indicators, we assess the effectiveness of the process, monitor trends, and determine possible and necessary improvements.

**c. Monitoring and measurement of products/services**

In the stages of planning and preparation of realization of individual contracts, we plan quality control and testing of our products/services.

Requests for specific characteristics of products/services are defined in the corresponding technical and technological documentation and contracts/orders on the delivery of products. When considered necessary or when the customer requests, we make a plan of control and testing which contains:

- type of control/inspection,
- required measurement and testing,
- acceptability criteria,
- required operational documentation and records,
- phases, steps or activities in which control or testing is conducted.

During the procurement process, we especially implement control of purchased products and materials, as described in the procurement procedure. Managers of implementation and procurement processes are responsible for conducting activities of monitoring and measurement of products/services, for which they must take into account the competence of personnel carrying out certain activities, safety of control - measurement and testing equipment, and where necessary appropriate microclimatic conditions. Appropriate records are kept on the implemented activities that clearly indicate the persons responsible and authorized for release of products/services in the next stage, that is, delivery to the buyers. All inconsistencies of product/service shall be treated in accordance with the procedure for inconsistent products control.

**Control of inconsistent products/services**

Documented procedure is established whose effective implementation ensures that the product/service, performance activity or indicators that do not comply with the relevant requirements are identified, stopped and marked, with the appropriate procedure for resolving its status initiated. This is decided by the process manager, which can be:

- to correct determined inconsistency,
- to initiate immediate corrections for correction of inconsistencies,
- to deliver the product, as it is, to the buyer with prior consent/agreement with the buyer.

Repaired or upgraded product/service is again controlled/tested and verified, of which an appropriate record is composed. If the deviation is such that requires taking correction action, that action is initiated and conducted according to the procedures of correction action.

The treatments of inconsistent products/services after delivery to the customer, i.e. the indicators

that are above legal regulations, have the priority over all current activities in the company.

#### Data analysis

Process managers gather and analyze appropriate data for the purpose of proving efficiency of process and quality management system, and continuous improvement of the same. The following activities are analyzed:

- monitoring and process measurement results of products/services,
- customer satisfaction,
- achieving business results,
- achieving quality policy, i.e. determined objectives,
- information on distributors of products/services.

#### Continuous improvement

In accordance with our Quality Policy we continuously initiate and implement process improvement actions based on facts (information, data, analyses, measurements, internal audits, etc.) from our everyday practice, as well as based on customer needs, our objectives and business plan, and positive legal regulations.

Process managers and quality management representative are specifically responsible for initiating and beginning improvement actions, and coordinating their implementation and assessment of their efficiency. Results of constant improvement process are the required item of the agenda during the QMS review by the management.

##### a. Correction actions

In order to determine causes of certain inconsistencies and prevent their repeating, we take corresponding correction actions, after which we assess their efficiency. The procedure is prescribed by the documented procedures, which determines procedures of initiation, defining, implementation and assessment of correction action efficiency, as well as associated responsibilities and authorizations. Representative of quality management keeps record of process in relation to individual correction action, and, as needed, coordinates necessary activities for interventions in all related processes. He also keeps up to date records of status of all initiated actions, of which he prepares reports for QMS review by the management.

##### b. Prevention actions

We continuously raise awareness, and develop culture and motivation of all employees to ensure their proactive approach in everyday work, in order to prevent the appearance of any inconsistencies beforehand. Documented procedures of prevention actions determine process elements, respectively responsibilities and authorizations for process activities, such as:

- identifying potential inconsistencies and their causes,
- assessing the need for action to prevent inconsistencies,
- defining and implementation of actions,
- recording results of taken actions.

By managing (review) status of all initiated actions, quality management representative coordinates all

other processes in relation to running actions and initiates actions to be effectively implement in all related processes, as convenient/needed [4,5].

#### CONCLUSIONS

The objective of any company is to achieve and sustain competitive advantage. One good way for company to realize this is to satisfy customer needs in faster and better way than the competition. In order to achieve this, the company must find a way to accomplish this objective. In doing so, the objective should not only fulfill customer expectations, but also excel them, so as to create the impression in the eyes of customers that competition is not able to meet their needs in better way. To achieve this goal it is necessary for the company to introduce and implement a quality management system. Quality monitoring, and constant review by the management is a good way to TQM; the TQM is a guarantee of any company success. In all of this, it is management that plays the leading role, since it is responsible for the moral and physical support. The role of management in modern companies is increasingly changing and going in the direction of shifting the emphasis from leadership and management of staff towards facilitating presentation and implementation of ideas that employees have in relation to improving business processes. Management is responsible for monitoring and measurement of the process. By monitoring, measurement and analysis through the quality management system we achieve business excellence, which is often identified with the world's most prestigious award for quality.

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FACULTY OF ENGINEERING HUNEDOARA,  
5, REVOLUTIEI, 331128, HUNEDOARA, ROMANIA  
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