June 22, 2011 (Wednesday) 55th EOQ Congress

CONCURRENT SESSIONS **Wednesday 8:30 – 10:30**
KEMPINSKI HOTEL CORVINUS **Erzsébet tér 7-8, Budapest V.**

SALON BANDINI/MARZINO

9.3. EDUCATION OF QUALITY – QUALITY OF EDUCATION III. 8:30 – 10:30

Co-Organizer: Óbuda University

Session Chair: ***Gábor Veress****, University of Pannonia, Hungary*

9.30 Integrated Quality Management Training
Albert Balogh, Hungarian National Committee for EOQ, Hungary

Balogh, Albert (Hungary)

Dr. Albert Balogh got M.Sc. in mathematics in 1957 at the University Kossuth Lajos in Debrecen. Between 1957 and 1990 he was senior research worker in the Reliability Department of the Research Institute for Telecommunication. His research field was to develop statistical methods for the evaluation of test results relating to electronic components and systems. Since 1990 he is Honorary Associate Professor of Budapest University for Technology and Economics, where he is giving lectures in post-graduate courses for quality management. He is the Vice-President of HNC for EOQ.

Integrated Quality Management Training

Dr. Albert Balogh (Vice-President of HNC for EOQ)*

1. Introduction

One of the most important objectives of a training course in the field of quality management is to present advanced quality management principles, best practice techniques, tools and skills, which are interrelated and coherent. In order to achieve this target, relationships between the subjects of the course should be developed. Based on the experiences of the Institute organizing post-graduate courses at Budapest University of Technology and Economics, this paper gives an overview about the subjects and Body Of Knowledge (BOK) for Quality Engineer- Quality Manager course. In addition to the harmonization efforts between the subjects, some particular examples are presented to integrate the terms, principles and tools in the fields as follows:

- Interpretation of the term quality for organizations based on ISO 9004:2009;
- Implementation of integrated management systems based on management standards;
- The application of PDCA process improvement model for products, processes and quality management system;
- Examples for home work (time management with quality tools and integration of quality measures with financial metrics).

First of all, the Body of Knowledge (BOK) for quality system managers are compared with the knowledge criteria given in EOQ Competency Specification 9000 – 2009 in **Fig. 1-3**. The greatest part of requirements in EOQ CoS 9000-2009 can be satisfied by a detailed BOK covering the subjects from TQM to quality tools, only social, legal and regulatory aspects are not discussed in this BOK.

e-mail address: *balogh@eoq.hu

2. Interpretation of the term quality for organizations based on ISO 9004:2009

Let us consider the definition of the term quality given in ISO 9000:2005:

> "**degree to which a set of inherent characteristics fulfils requirements."**

The sustained success is defined in ISO 9004:2009 as follows:

> "**(organization) result of the ability of an organization to achieve and maintain its objectives in the long term**."

Taking into consideration that ISO 9004:2009 gives the following statement:

> "**…to achieve the sustained success top management should identify all its relevant interested parties and determine how to meet their needs and expectations in a balanced way."**

The interested parties of an organization and their needs can be seen in **Fig.5**. On the basis of these definitions the suggested interpretation of the term quality for organizations can be derived as follows:

> "**degree to which an organization meets the requirements of their interested parties in a balanced way."**

3. Integration of management systems

The integrated management system is based on the definition of different management systems given in ISO standards. Let us consider the definition of the **quality management system** in ISO 9000: "Management system to direct and control an organization with regard to quality." If we substitute the term quality with the term environment, we get the definition of **environmental management system**. Therefore, integrated management systems can be implemented with the integration of different ISO management systems, such as **EMS (14001), OHSAS (18001) and ISMS (27001**). EMS=Environmental Management System, OHSAS=Occupational Health and Safety Management System, ISMS= Information Security Management System.

The other type of integration is based on the combination of quality management system given in ISO with the specifications of the industrial sectors, such as **food industry,** extended to **risk management, financial management, human resource management and knowledge management**, too.

4. Integrated PDCA model for ISO 9001

The well-known model of a process based quality management system given by ISO 9001 can be seen in **Fig.8**. This model can be divided into 4 PDCA cycles: **product, process, system and customer focus** PDCA cycles. These cycles (see **Fig. 9-12**) help the students to understand the basic practical principles for the application of PDCA continuous improvement process. This integrated PDCA model is illustrated in **Fig.13**. The figures detail the **plan** phase, **do** phase, **check** phase and **act** phase based on the different requirements of ISO 9001.

5. Integrated application of continuous improvement and quality tools

The continuous improvement process usually has **7 problem solving steps** from the description of the problem to the implementation of the improvement. In these steps different quality tools shall be applied. It is well-known that it is reasonable to use the **seven basic quality tools** for this improvement model. Therefore, it is very useful to study the relationships between the seven steps and the seven tools. A suggested solution can be seen in **Fig.14**.

The application of these relationships can be done in case of a home work relating to time management based on the results of P.M. Courtney's paper[1]. The outlines of this home work is given in **Fig.15**.

First of all the student determines 12+13 activities for home and office management, he or she gives the goal (target) value of daily time period for each activity (**goal statement: time reduction**). After it a random time checklist is generated as a daily scorekeeping method for recording how much time the student spent completing various tasks during the day (**the experiment design, see: Fig.16**). Using this method 25 daily observations are generated during 40 days (**data collection: 1000 data**). A frequency analysis is made (**data processing**) and a frequency table summarizes the obtained results (**see: Fig.17 for home time management and Fig.18 for office time management**). The frequency analysis is completed with **a Pareto chart** for ranking each one of these tasks to determine the vital few non-value added tasks the student performed during the day (**evaluation, see** :**Fig.19**). Detecting causes and root causes for tasks taking a lot of time exceeding the target value during the experiment, solutions are developed to reduce the time period. Implementing the solution 10 days observation is carried out and **an individual control chart** is used to **check the effectiveness of improvement**. In case of TV watching time, an individual control chart monitoring the progress made eliminating time spent in this area can be seen in **Fig.20**. In **Fig.21** a brief summary is given about the goal, the problem and the solutions of time management.

6. Integrated use of quality and financial metrics

In order to explain the importance of the economic aspects of quality improvement to the students, a home work is given to them: justify the economic advantage of a new measuring equipment purchase for the senior management. Use financial metrics based on P.J. Sherman's paper[2] to justify the cost of quality improvement for management!

A detailed description of home work is given about the metrics and methods **(Fig.22)** discussed in this paper as follows:

Imagine you are a quality manager who is presenting the analysis and findings of a critical operational issue or proposed improvement project to senior management. He feels confident because you've thoroughly measured and analyzed the data.

a) Your presentation shall include **several statistical and quality metrics**, such as the mean, standard deviation, sigma level, percentage nonconforming, defect rates, defects per million opportunities (DPMO) and process capability. To your disappointment, you notice eyes starting to glaze over and heads bobbing. Some of the senior managers are text messaging, while others are talking. What happened? What went wrong?

b) In short, you were not speaking the language of management, which is the language of money. Your quality metrics did not include the key financial metrics—such as revenues, costs, savings, margins, operating leverage, return on investment (ROI), payback period and break-even analysis—that resonate with senior management.

c) Your first step in building the business case for an improvement project is **to capture all the associated costs**, which can be grouped into categories, such as labour, technology, supplies and facilities.

d) You have to classify the costs as **fixed costs (FC) and variable costs (VC**). **Fixed costs** do not vary with the level of output. They are also known as indirect costs because they are not directly attributed to the production of goods or services sold by a company. An example of a fixed cost is the salaries associated with sales, marketing, administration and R&D. These salaries are set and would be incurred even if the firm temporarily suspended production. Other fixed costs include rent, utilities and associated overhead. **Variable costs** increase as output increases. Variable costs are also known as direct costs company. For this reason, these costs vary based on overall quantity produced. Variable costs typically include direct labour, direct materials and overtime.

e) You have to make **an income statement**. The income statement shows managers and investors whether the company made or lost money during a certain period. An income statement, also called a profit and loss statement, is a company's financial statement that indicates how revenue is transformed into net income.

f) You have to calculate **operational savings**. Savings can be grouped into the following major categories:

- **Cost reduction:** expense or capital savings.
- **Cost avoidance:** cost prevention.
- **Labor productivity:** time savings

g) You have to show projected savings to management is through a **project savings waterfall chart (Fig.23).** The orange bar indicates the start cost, the green bars represent savings, the yellow bars illustrate costs added to operation (new equipment, training), finally the black bar gives remaining net cost after implementing the improvement.

h) You have to determine **ROI (Return On Investment)** is a performance measurement used to evaluate the efficiency of an investment. The return is measured over time and is usually stated as an annualized rate or an average rate of return per year. ROI is calculated by dividing the net financial benefit (savings or incremental revenue) by the cost of an investment.

i) You have to present total costs(TC) is with their relationship to total revenue(TR). The point at which total costs (TC) equal total revenue (TR) is called break-even. This can be expressed as TC = TR. Fig. **Fig.24** shows an example for the **break-even analysis**.

j) You have to calculate **operating leverage** is the trade-off between fixed costs and variable costs, and it measures how revenue growth translates into growth in operating income (revenue less total costs). **The degree of operating leverage (DOL)** is defined as the percentage change in operating income that results from a given percentage change in sales. This can be expressed as:

$$\mathrm{DOL} = \frac{\text{sales} - \text{variable cost}}{\text{sales} - \text{variable cost} - \text{fixed cost}}$$

Another way of evaluating the proposed project is to calculate the **total cost break-even point in number of units between the two alternatives**. This can be expressed as:

$$FC_{PMO} + VC_{PMO} = FC_{FMO} + VC_{FMO}$$

The simple financial calculations that allow the quality manager to perform basic cost analysis can be used in almost any business scenario and will allow the senior management to make better decisions.

7. Integrated quality approach

Finally let us consider that the progress of quality system management towards to organization excellence and sustained success can be illustrated with the quality bridge over a wide river (such as Danube) connecting these two sides of the quality field (as a Danube bridge connects the two sides (Pest and Buda) of Budapest) (**Fig.25**).

References

[1] Patrick M. Courtney: Time Management Using Quality Tools, Quality Progress, 2005 August

[2] Peter J. Sherman and James G. Vono: All Ears, Quality Progress 2009 July