

A QUALITY MANAGEMENT TRAINING SYSTEM ON ISO STANDARDS FOR ENHANCING COMPETITIVENESS OF SMES

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Abstract: The purpose of this paper is to introduce and discuss the benefits of on-line training, in quality control and quality management, as a support for professionals and managers of SMES (Small and Medium Enterprises), to contribute to the improvement of the activities and of business performance objectives of their organizations. This kind of training includes topics on: managing quality, quality process, auditing, total quality, ISO standards, mistake proofing, and more. The paper describes the expected benefits according with the preliminary results of an European project aiming to create and validate an on-line system in the field of quality management and to provide an effective training on quality in the SMES. The international standards that are covered by the project are: ISO 9001 (quality management system), ISO 14001 (environment management system) and HACCP (Hazard Analysis and Control of the Critical Points). Others users could be also students, disadvantaged people and all people who show interest in the quality management systems.

1 INTRODUCTION

Some authors consider as a first example of quality control the one carried on, about 3000 B.C, during the construction of the Tower of Babel, when this activity was described as one of the responsibilities of the craftsman, i.e. of the person who actually created the product. On the other side, more recently, from the beginning of the industrial revolution, the quality control was moved as a responsibility of a specific person, the one who controls the working process, i.e. the process leader. Thus the relation between producer and surveyor, as well as the one between clients and suppliers, is not changed and this separation of responsibility still exists. The first informal methods for quality control have been developed during the industrialization period, but their relevance strongly increased during the First World War, needing a new approach for improving in a short time the quantity and quality of war products. After, in the period between the two

World Wars, several quality sampling approaches were developed, as well as the introduction of statistical analysis in quality control and monitoring. In the period after the Second World War the industrial manufacturing costs strongly increased and lead to reduced profits. Quality was moved to the prevention of defects, before or during the production process, being more effective in the expenditure and leading to considerable savings. Thus the idea for quality assurance appeared. The keyword is now "prevention" instead of "finding" defects. Various recent studies have shown that when an organization starts a quality assurance process, this process does not imply only procedural issues, but there are also two key underlying features to generate valuable results: the way in which quality principles are adopted and the journey to run the certifying process. Others studies in the literature, as the ones analyzing the experiences of the introduction of ISO standards in SMES, discuss the need of having a training process for workers.

This learning need is related to the aims of the organizational structure rearrangement, and to the improvement and documentation of the business processes. People involved in these processes should investigate, explicit the new working procedures and the documents, apply them. During this procedure, several overlapping and voids are frequently found in different activities and the search for their solutions results in a discovery of new knowledge and in taking into account previous experiences. The analysis of these processes introduces new ways of learning (Mertens and Leonard, 1996). Training companies and institutions can, therefore, take advantage of the generated knowledge and reapply it in order to promote learning. Learning approaches such as “learned lessons” or “best practices” shape what is known as “knowledge generated in the working processes” (Peluffo et al., 2002). The analysis and continuous improvement of these processes offer an extraordinary opportunity to learn and to make explicit the knowledge that is usually applied. The above approach could be exemplified in the activities composing the processes of enrolment, registration, evaluation, didactic and material development. The analysis and improvement of these processes allow the development of new capacities as the ones that today are used in the design of training workshops, training and evaluation contents, etc. In terms of knowledge management, documentation activity is a process of knowledge codification and in this activity “the abuse of codification can reduce the learning spaces and produce in the long term stagnation in the evolution of the organization” (Villavicencio, 2002). The documentation of such processes that support the accumulation and generation of knowledge has a strong relation with the codification done during the quality certification processes. The relevant knowledge is collected and written in quality manuals according with established procedures. In particular a quality policy is necessary to provide a clear strategy for the vocational training process, to be used by the persons in charge of quality management and also to distribute the responsibilities of each process. Recently, quality management has been accepted, by many national and international organizations, as a main approach for providing accurate and reliable description and implementation of clients’ requirements in all aspects. All published standards describe the list of activities the organizations should do in order to achieve their specific objectives. The set of standards ISO 9000 are international standards concerning quality management systems. An

increasing number of clients recently require goods or services suppliers’ to accept exactly defined quality approaches as mandatory in order to demonstrate their possibilities.

2 QUALITY MANAGEMENT AND NEED OF QUALITY MANAGEMENT SYSTEMS

The international standard ISO 9000:2000 defines quality as: “The possibility of combination of inherent characteristic of product, system or process to meet the requirements of customers and other interested parties. The product becomes a result from a system of actions, which use resources for transforming of input elements into output ones”. The term “quality” could be combined with adjectives such as bad, good or excellent. Quality could be defined as:

- conformity with client’s requirements - the characteristics of products (or services) need to be the closest is possible with the declared or suggested clients’ requirements;
- conformity with client’s specifications - the production process is organized, operated and controlled in such a way that obtained products and/or services correspond to the specifications;
- availability - the product or service is available only if the conditions for its conformity with requirements and specifications are satisfied.

ISO 9000:2000 defines the term quality management as: “Coordinated actions for management and control of an organization concerning quality”. Management and control concerning quality includes the definition of a quality policy and of quality objectives, the planning, the quality control, the quality assurance, and the quality improvements. In other words an organization should have a working system providing: effective operations control and eliminating the nonconformities of all stages of economic activity. The major approach to quality assurance is to create awareness for prevention of potential problems in a way that these problems are predicted and eliminated before they evolve. This is a totally different and more complex approach in comparison with the traditional quality control, where the service is accepted as satisfactory when the final product do not have defects. The main requirements for quality assurance are: management devoted to the idea of quality; defined quality objectives; documented quality management system; effective surveys of the quality management

system; developing of a company culture and of an appropriate staff training; economy of resources and time; reduced quantities of nonconforming products. The problems, connected to quality, are the impossibility to meet the expectations/requirements and the impossibility to execute the delivery terms in time. Incapable management and the deliverers do not fulfill their obligations because what should have been done was not explained to the person in charge of the action. The executor was familiar with the necessary actions to be taken, but has not performed them in the appropriate way. In order to solve their problems connected to quality, SMEs should realize and implement a quality management system, which assures that the activity has been performed in the proper way (ISO 9000 - Fundamentals and Vocabulary). The QMS is useful to control all the activities executed and the quality achievement. It should include: clear goals; an effective organization structure; specified responsibilities; defined procedures and processes, included the requirements for staff training; specified criteria and standards. The effectiveness of quality management depends on the system and the procedures as well as the culture of each employee (Tuttle, 1993). It is absolutely necessary that all employees realize the importance of achieving the required quality and quality achievement should not sustain the tendency to the reduction of production costs. Because of the limited effectiveness of other methods, organizations more and more often are applying principles of quality assurance when solving different problems concerning quality. Customers want to be sure that quality could be achieved, will be achieved and had been achieved in the past. More and more of them appreciate if they have good QMS and if they give them the possibility to evaluate it by an independent organization.

3 QUALITY ASSURANCE AND MANAGEMENT STYLE FOR SMALL ORGANIZATIONS

The goals of quality assurance standards are to formulate such the implementation of a management system will constantly assure the quality required. By deciding to implement a quality system in conformity with the series ISO 9000 standards, the managers should to adopt a formalized management style. The ISO 9000 standards are formulated to be applied in all spheres of production and services, and in any situation. Standards are not medical

prescription which should be performed literally, but they rather define what should be done by the management. In the realization of a QMS, every organization should understand its main requirements and principles in conformity with ISO 9000. The result of what has been done is reflected on the quality manual of the organization. Quality represents a strategic philosophy of enterprise management in the actual globalization, based on the overall commitment of management and employees, towards customer satisfaction and a continuous improvement of products, services and management (Hand and Plowman, 1992). The series of ISO 9000 standards on QMS can effectively facilitate them in achieving that objective. The customers demand products with characteristics, which satisfy the needs and expectations. A QMS allows to analyze customers' requirements, define the processes, which contribute to the production of a good, to be acceptable for the customer, and keep the processes in control. A QMS gives to the organization and its customers the awareness that it is in condition to offer products, which meet the requirements. The quality policy and the objectives should be determined in order to give terms of reference for the organization management (Oakland, 1992). Both of them determine the hypothetical results and help the organization to implement the resources for the achievement of these results. The quality policy gives the framework for the establishment and review of the quality objectives. The quality objectives must be consistent with the quality policy and the engagement to continual improvement and their accomplishment must be measurable. The quality objectives achievement could have a positive effect on the product quality, on the operative effectiveness and the financial results and thus, on the satisfaction and trust of the parties interested. An atmosphere in which people are motivated and QMS functions effectively could be created through the management. The quality management principles should be taught to: establish quality policy and objectives of the organization; assure that the appropriate processes have been implemented to meet the customers' requirements and to achieve the quality objectives; assure that the effective QMS has been implemented; compare better the results achieved and the quality objectives. The methods of the QMS are based on the main business organization principles and approaches. They allow to identify strong and weak points of the organization; consist of requirements for evaluation and continual improvement.

4 TRAINING ON QUALITY ASPECTS AND ITS BENEFITS

With tight budgets and the international competitiveness increasing, SMEs are looking for additional ways to create and sustain organizational knowledge. The continuous training, related to the aspects of quality management, it is fundamental because this field is subject to several shifts and implementations related to procedural aspects and legislative changes. Such situation mostly interests the SMEs, in how much very often managed by people with a reduced knowledge in this field. Absurdly, such subjects don't perceive the added value that a good QMS can introduce to their activities. In fact they often consider it, as expensive rules that stiffen their organizations. In this field it is important, therefore, not only an initial training, to awaken employees to adopt methodologies for the achievement of quality, but it is necessary to make available instruments to make possible a process of continuous training for an effective management of the competences. This implicates that won't be more necessary, above all for the SMEs, to periodically remain without collaborators or workers, because busy for the training activity and often in geographically far-away places. At the same time, simply using own personal computer, employees will be facilitated, and perhaps induced to learn and know the main quality principles. Thanks to these technologies, it is possible to acquire knowledge in small doses (divided in more parts linked among them, usable in few minutes). This activity don't reduce productivity of the workers because they stay on the place of job. With the rapid increase in corporate of high-speed Internet connections and a younger workforce that has grown up using computers, e-learning has become a very cost effective and efficient training method. This modality allows people to explore interactive simulations and test various scenarios on the screen, making the training much more realistic and understandable than typical classroom training. These repeatable simulations provide also privacy for the learner, so that a person can feel free to repeat sections and to try different simulations. E-learning has become a very effective training method that can reduce costs and improve the effectiveness of training courses. It is not a panacea, and it will never replace traditional training methods in all situations, but it is another way to produce sustained learning, and most organizations should have it included in their training activities. Many benefits can be identified for the business:

- significant reduction of costs associated with teacher fees and materials;
- reduction of learning time and amount of time in which employees are away from their jobs;
- short videos or exercises allow to verify if a learner has reached the objectives of a lesson;
- a user's progress can be monitored by a supervisor.

And others for the learner:

- advanced learners can skip the known contents;
- beginners may determine their progress, eliminating frustration;
- lessons build upon one another and may be taken in any order;
- anytime-anywhere learning can greatly increase knowledge retention;
- learners can view or print a single page with quick start job aids that give step-by-step procedures or graphic workflow charts illustrating tasks to be performed.

It can be very expensive for companies to bring their subject matter experts into the classroom, especially when it requires multiple training sessions and an high frequency training schedule. In fact, when the courses are properly chosen, there is a good possibility that they will offer a considerable cost-savings over traditional learning methods and produce equal or greater learning results. One very large IT company has saved some \$200 million per year on the cost of training its employees worldwide by switching to web-based education for the most widely needed and time-critical courses. Another large firm saved close to \$80 million by providing the majority of their new hire training into neatly packaged and highly interactive on-line courses. These large savings are produced by greatly reducing travel costs, less time off from work for the new employees, better deployment of time for the subject matter experts and these savings were achieved without the loss of any effectiveness in the training, as the training scores were as high, if not higher, in over 90% of the workers (Omnex, 2006).

5 VIRTUOSE: A QUALITY MANAGEMENT TRAINING SYSTEM

The project "Virtual Online system for Education on quality" under "Leonardo da Vinci" program (Pilot Project BG/04/B/F/PP-166024), is addressed towards Vocational and Educational Training in the field of quality management systems (QMS).

“Leonardo da Vinci” is a program which aims at implementing the policy of European Union in the field of professional training, using the trans-national collaboration and experience for improving the quality, encouraging the innovations and disseminating good professional practices and systems in Europe. The aim of the project is to create a web-based system and an off-line version of it (on DVD-Rom) in the field of QMS development and implementation, to provide effective training on quality and to facilitate the training of the SMEs workers. The actual international standards included in the project are: ISO 9001:2000 (quality management system), ISO 14001 (environment management system) and HACCP (Hazard Analysis and Control of the Critical Points). The project is coordinated by the Bulgarian ECQ (European Center for Quality) in collaboration with others main institutions of European Union as: “TÜV - Hellenic Certification Register” - Greece; “Bulgarian Industrial Association” - Bulgaria; “Institute for Postgraduate Studies” at University of National and World Economy - Bulgaria; “Center of Research on Information systems” of the LUISS University - Italy. The system is available in four languages - English, Italian, Greece and Bulgarian. The direct beneficiaries of the project are professionals, decision-makers and managers of SMEs of the partner countries, but it is also possible that students, disadvantaged people and all people who show interest in the quality management systems may find it useful. The project includes the development of a software product which will provide an efficient QMS training system and will meet the needs of SMEs for professional education of their staff. The training covers the following international standards: ISO 9001:2000, ISO 14001:1996 and HACCP. In addition to traditional text contents for self-education and self-evaluation, the project gives the support of a “virtual teacher” to present the whole contents to the trainees. The purpose of creating such a “virtual teacher” is to combine distance and traditional training and thus to be useful for different kinds of users. This defines the system as an innovative form of vocational and educational training. The on-line method of VIRTUOSE system eliminates the conventional approaches with real attendance and gives equal rights and opportunities to both men and women, without discrimination by race or social status. The development of such flexible training system is an innovative learning methodology, which is suitable for both business-oriented people and people with limited time for increasing their competence in this specific field.

6 FEATURES AND ADVANTAGES

The system provides some functionalities for the web-based administration of courses and learners. All important features can be accessed with a standard web-browser. The platform accepts every learning material created with standard authoring software or in textual version. An advantage is that the system virtually supports any kind of course material that can be run on a web-server. It provides a specific flexibility, essential in today’s training activities. Actually the homepage gives the possibility to gain access to the three standards: ISO 9001:2000, ISO 14001 and HACCP.

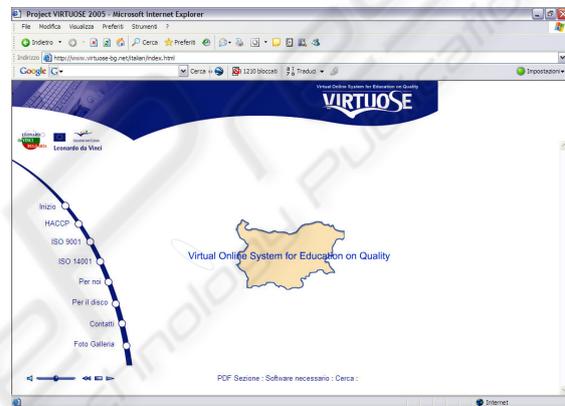


Figure 1: The VIRTUOSE homepage.

There is, besides, a section with the description of the platform and the contacts of the partners of the project. VIRTUOSE offers an innovative approach to the training activities. A virtual teacher reads the contents, thus distance training is combined with the traditional courses made locally (blended learning).



Figure 2: A virtual teacher takes a lecture on ISO 9001 standard.

In the section ISO 9001, there is a textual part, with the optional possibility of an audio version. The system includes a QMS training and self-evaluation modules for ten selected industrial sectors:

- chemical and pharmaceuticals industry;
- machine engineering;
- oil and mining;
- agriculture;
- food processing;
- wood processing and furniture;
- textile;
- tourism;
- IT and electronics;
- construction and building.

It is possible to view or download: a training manual, a quality manual, various quality models and forms with instructions and suggestions. Besides, at the end of every section, there is an evaluation area with multi-choice test and assessment forms.

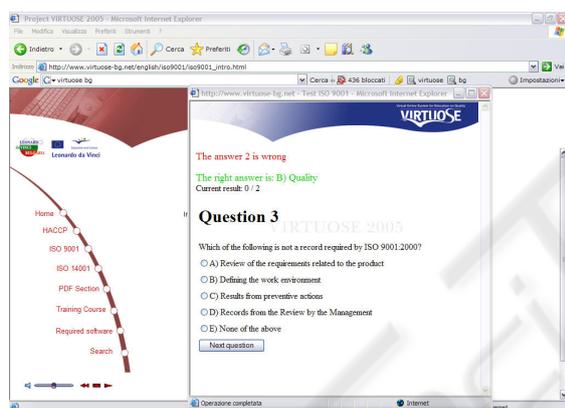


Figure 3: An evaluation test.

This on-line training system on quality control and quality management can help professionals and managers of SMEs to contribute to the improvement of the activities and to the business performance objectives of their organizations. This kind of training includes topics on: managing quality, auditing, total quality, ISO standards, quality process, mistake proofing, and more. The platform can be divided into four distinct modules:

- the personal information of learners;
- an easy-to-use administration section for the tutor or the teacher;
- a download page for course contents and the off-line navigation;
- an additional module to access to periodic release of new contents.

Data are encrypted (SSL encryption) and it is possible to check the points that employees received

during their individual evaluation test. Each course includes several components which can be showed or downloaded separately. Course components are audio-lectures, scripts in Html and Pdf format files, assignments and their solutions, exercises with multimedia elements, etc. The learners can select the components they wish to obtain from the list and download them. The system decompresses the incoming components and stores them on the local hard disk. Furthermore, there is a table of contents that can be used to navigate through the different courses. The platform offers extremely flexible teaching schedule appropriate for busy people with limited time for training. During the realization of the assigned activities, several workshops took place in the project partner countries: Bulgaria, Greece and Italy. The purpose of the workshops was to introduce the requirements and the benefits for the beneficiaries. The participants in the workshops received detailed information about the implementation of the standards mentioned, the advantages from implementing ISO, the issues and problems concerning the implementation of HACCP. The participants had also the opportunity to ask questions to consultants and professionals on quality, concerning the implementation of a standardization process.

7 CONCLUSIONS

Studies on the process of information technology acquisition (Davis et al, 1994) clearly show that these systems go through several evolutionary stages. During this development the priority in order to succeed doesn't seem to be tied only to the acquisition process, but mainly to the paths of learning and organizational change. Experience suggests that these paths should be designed and carefully managed in order to allow the acquisition and effective use of ICT applications by the users and the whole enterprise. The scheme followed in the courses proposed by the system, for the implementation of an effective QMS, consists of the following basic steps:

- a quick introduction to ISO 9000 standards;
- a general review of the components of the ISO 9000 standards;
- a model for the realization and implementation of an effective quality assurance system;
- the realization of a proper organization structure and the responsibilities allocation.

The traditional methodology for the training, in fact, results incomplete to furnish a suitable medium in

the professional training field, because of dynamic and continuous changes in the ICT sector and the increasing demand of knowledge more and more in the quality field (Casalino, D'Atri et al., 2005). VIRTUOSE can contribute to the success of the SMEs. The strategy is based on the creation of a system for the training that meets the distance learning with the traditional benefits; therefore the two different methodologies are integrated. In fact, on one side the distance statement is a comfortable method for the training of a vast entourage of people within the QMS but, on the other hand a lot of people doesn't believe in the effectiveness of such method of statement because of the lack of a teacher that mostly involves the trainees. To get round such problem, VIRTUOSE assures a "virtual teacher" that speaks slowly, with a clear voice and a perfect intonation. Therefore VIRTUOSE proposes an innovative approach for the training with the virtual teacher that holds the lessons, so that the distance training is combined with a similar direct contact. VIRTUOSE also offers auto-evaluation forms through which the learners can verify the acquired knowledge level. Such forms at the end of every subject, allow the worker to immediately verify the acquired knowledge through the portal or by tutor e-mail. He will personally contact the single employees to assist them during the training period. The current research project, that we are completing, includes the analysis of some indicators and specific key aspects that regard the current situation and implementation of quality management culture in the European SMEs. These are:

- what is the current situation of quality aspects dissemination through on-line courses?
- what kind of technical training and assistance are they giving?
- how are the standards models of quality such as ISO or EFQM (European Foundation for Quality Management) used and applied?
- what role can have national agencies or institutions, as the universities, on the diffusion of quality culture or the implementation of quality models for SMEs through both traditional and web-based learning?
- how organizational and cultural specificities affect quality implementation?

The importance of quality management is increasing for the reason that lack of quality control and assurance systems, lack of accreditation and certification procedures, poor conformity marks, are still extremely diffused. Such impediments are considered as major potential and unnecessary technical barriers to trade, especially concerning

international competitiveness and globalization. It is important to underline that European SMEs have to meet the challenges of globalization and the new knowledge-driven economy.

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