

Integrating quality and environmental management as competitive business strategy for 21st century

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Today's business world changes due to public demands, technology and global competition. Customers are considering environmental values into their supplier(s) selection and are increasingly buying products with identifiable environmental attributes. Therefore, to have a competitive leverage, companies should implement both ISO 9000 and ISO 14000 concurrently. In addition to the comparative analysis of both ISO 9000 and ISO 14000, zero defects (ZD) and clean (green) production concepts are clarified in this paper. The analogy of the fundamental thoughts behind them are highlighted. A practical strategy for implementing quality and environmental management scheme that copes with 21st century considerations is explored, emphasizing on three main elements i.e. methodology, competitiveness, and change effect.

Total Quality Management (TQM)

Evolution of TQM concept

The way in which quality "process" of products/services of today has been achieved, has undergone a number of changes. These changes took place in six stages each of which took approximately 20 years to occur:

- 1 Operator control – (up to year 1900).
- 2 Foreman control – (1900-1920).
- 3 Inspector control – (1920-1940).
- 4 Statistical control – (1940-1960).
- 5 Quality assurance – (1960-1980).
- 6 Total quality management – (1980-now)

Total quality management means systematic determining, assuring, measuring and improving the quality of the company. Total quality management includes, among other things, the following:

- focus of product and service quality towards customer expectation;
- all of the company's departments are involved;
- development of both attitudes and systems;
- involvement of all managers and employees.

The benefits of working with total quality management in goal-directed way are the following main ones:

- more delighted customers;
- increased profitability;
- greater employees satisfaction.

For simplification, we shall give the four TQM absolutes in a table and we shall put along the conventional "good" or "wisdom" management for comparison. These are fundamental issues based on the philosophy of zero defects which are symbolic meaning for the prevention attitude. These definitions are essential for successful quality improvement program. It has to be agreed upon and well

understood by every body before starting any effort in such program (see Table I).

Historical perspective of ISO 9000

It is now realized that the evolution of quality assurance requirements (QA) developed between 1960-1980, when producers were expected to sell to customers not only products, but in addition, proof that the product has been properly made and tested.

It was the American Department of Defence which formulated the first principles of QA when it was considering the first nuclear submarine construction, adopted in 1965. In 1970 NASA developed its quality assurance requirements. In 1971 Canada published broilers and pressure vessels act. In 1972 UK published a guide to QA. The first requirements for the QA scheme for shiphull construction was introduced in 1974. There are many different regulations governing QA in Germany. In 1980 ISO published QA requirements for nuclear plants.

It can be seen from all the above the need for standardization of "QA" management as well, particularly after big buyers started to specify their own QA requirements in contracts and the suppliers complained that different QA requirements would increase cost more than quality. ISO had to set up a technical committee, ISO/TC 176, to deal with the subject. There were of course many issues to be resolved before ISO 9000 standards were issued in 1987 and the latest edition now issued in July, 1994. There are many suggestions for improving and expanding these standards. New Era for Total Quality Management already started all over the world not only in manufacturing industries but also in service industries as well.

Table I

Comparison of the four absolutes of management

No.	Element (absolute) of comparison	Conventional management	TQM
1	Definition of quality	Goodness	Conformance to requirements
2	System	Appraisal	Prevention
3	Measurements	Indexes or process level	Price of non-conformances
4	Performance standard	Accepted quality level	Zero defects

Comparison between ISO 9000 and total quality management

As for many standards passing through debate, review, negotiation, and consensus, ISO 9000 represents a least common denominator in its coverage of the quality management/assurance/system disciplines. It would be well for everyone to understand this clearly, together with the understanding that it is not a standard on total quality and to realize that the actual quality system that is optimum for a given enterprise or corporation may go well beyond the requirements, elements, and procedures of the ISO 9000 series. Many authors (quality experts) voice this caution, and some offer it as direct criticism. For example, in ISO 9000, where is quality cost analysis and applications other than as an element in ISO 90004-1? Where is top management involvement and leadership; that is, top management driven quality councils and quality as a business strategy encompassing planning, control, and improvement? Where is project-by-project improvement – pursued with revolutionary rates of improvement? Where is joy and pride in work and employee participation, involvement, and empowerment via project teams and quality circles? Where is variation reduction, statistical process control, and process capability (other than as generic references)? Where are production/inventory management systems such as just in time JIT? Where is the concept of single sourcing, long term cooperative supplier, product, and quality system assistance (rather than mere assessment) based on trust and experience? Where is innovation? Where is customer satisfaction? Where is Juran's trilogy? Where is Crosby's "Zero Defects" concept for quality improvement? Where are Deming's 14 points for management? The list can be extended if we elaborated more on the subject, but this is sufficient to show the shortages in ISO 9000 series. With consideration of these resources, the resultant quality system should be better, more dynamic, more comprehensive, more effective and more economical than that of ISO 9000 alone in its present form.

The author intentionally mentioned ISO 9000 chapter in some details because the same pitfalls are repeated when considering the ISO 14000 implementation by some companies, as "Just another rule imposed by the authorities and we have to comply with for certification only"! If it is so, it will not be of any help neither to the company nor to the global community worldwide. There must be a shifting of environmental management

from compliance state to company strategy to gain the real benefits behind its philosophy. This means dealing with ISO 14000 as sociotechnical issue and not only as a list of requirements to be fulfilled autonomously. Otherwise, this will not lead to sensible achievements in economy and environmental records.

Zero defects concept (ZD)

There are many approaches for implementing TQM in any business. However, zero defects (ZD) is considered the most straightforward one. There is a program consists of 14 steps to achieve this. It is proved successful all over the world for about 30 years now. It is not the objective of this paper to discuss this program or its techniques, but the fundamental thought behind it will be explained hereafter enabling the management of the 21st century to catch up with the near future domain.

People are conditioned to believe that error is inevitable. We not only accept error, we anticipate it. Whether we are designing systems, programming a computer, planning a project, assembling components, welding a steel construction, typing a letter, responding to telephone call or doing any service. It does not bother us to make a few errors. Some management plans for these errors to occur and talk about acceptable quality level (ACL). ACL is wrong, because it is an advance agreement before we start the job, that it will be produced imperfect. The correct way is to set zero defects as performance standard for any job.

The zero defects concept is based on the fact that mistakes are caused by two reasons: lack of knowledge and lack of attention. Lack of knowledge can be measured and corrected by training. But lack of attention is an attitude problem that must be changed by the individual. When presented with the challenge to do this, and the encouragement to attempt it, any person will respond enthusiastically and cooperate. We have to remember that zero defects is not a motivation method, it is performance standard. And it is not just for manufacturing people, but it is for service personnel as well. Some of the biggest improvement gains occur in the non manufacturing areas. The zero defects program for quality improvement must be personally directed by top management. People receive their standard from their leaders and perform to the requirements given to them. They must be told that your personal performance standard is zero defects.

Integrating environmental and quality management systems

Evolution of total quality environmental management (TQEM) and the development of ISO 14000 series.

In 1990, after a successful implementation of ISO 9000 standards for quality management, the International Organization for Standardization (ISO) instituted strategic advisory group for the environment (SAGE) to consider setting up a technical committee (TC) to develop similar standards for the protection of the environment. The need for such a standard was suggested by many businesses who, in order to facilitate free trade, wanted to incorporate environmental management in the implementation of ISO 9000. In early 1993, at the recommendation of SAGE, TC 207 was formed and bestowed with the responsibility of developing standards for the environmental management system (EMS). Currently, TC 207 has six subcommittees and one working group, developing 18 standards. The first of these standards ISO 14001 (environmental management system specification) was issued as an International Standard in September 1996. The ISO 14001 standard is based on British Standards Institute's BS 7750 (specification for environment management systems), to which many organizations in the UK are certified. Companies in many countries are now beginning to implement ISO 14001, some of these companies are already applying for certification. ISO 14004 (environmental management systems – guidelines) also issued in September 1996.

The ISO 9000 standards have been experiencing tremendous worldwide growth in certifications. In the Phase 1 revision, the standard was modified to be in compliance with the use of the standards. In the Phase 2 revision, there is a possibility that the three standards (ISO 9001, 9002, and 9003) may be combined into a single standard. Even the quality standards are becoming environment friendly, i.e. using less paper. There is a discussion regarding alternative registration schemes promoted by about 50 leading companies in the electronics industry. Under such a scheme, certain sections of the quality systems will be audited by a third party and the compliance will be self-certified. There are also studies to combine certification for both ISO 9000 and ISO 14000 series in the same time by the same certifier. Results of these researchs will be considered in the forthcoming issues of both series.

The ISO 14000 series

The ISO 14000 series comprises of 18 evolving generic standards. These standards are of two types: guidelines and specifications. The guidelines are descriptive documents that explain environmental management concepts, define key terms, and provide guidance on structuring a specific system for a particular process or business. The specifications are prescriptive documents to which prospective companies will be certified.

The following is a list of key environmental documents that are currently being developed:

- ISO 14010/11/12: Guideline for environmental auditing;
- ISO 14020/21/22/24: environmental labeling;
- ISO 14031: evaluation of the environmental performance of the management systems;
- ISO 14040/41/42/43: life-cycle assessment – principles and practices/inventory/impact/improvement;
- ISO 14060: guide for the inclusion of environmental aspects in product standards.

The ISO 14001 standard is the only document that includes specifications on EMS. It applies to the manufacturing and processing industries, but can also be implemented in service industries having environmental impacts such as construction and transportation.

The ISO 14001 standard has five major sections, as compared to 20 in the ISO 9001 standard. However, they cover more elements as will be seen from the comparison shown in next chapter. The five sections in the environmental standard are Environmental policy; Planning; Implementation and operation; Checking and corrective action; and Management review.

- 1 The environmental policy relates to the current and potential environmental impacts of the company's products and services, consumed material, pollution prevention, and waste reduction.
- 2 Planning includes identifying the controllable environmental aspects, legal requirements applicable to its operations, objectives and targets for various environmental aspects, and an environmental management program to achieve its objectives.
- 3 Implementation and operation includes the following: roles, responsibilities, and authorities of all employees reviewing performance of the environmental system; training, awareness, and competence; controlled documentation of core elements and reference to related environmental documents; operational control; and

- emergency preparedness for handling accidents.
- 4 Checking and corrective action includes monitoring and measurements for continuous improvement, tracking performance with its objectives and targets, calibration and maintenance of monitoring equipment, taking corrective or preventive action, keeping records, and EMS audits.
 - 5 Management review entails review of the EMS by management for its continuing suitability and effectiveness.

Comparative analysis of ISO 9001 and ISO 14001 requirements

Both standards have common as well as unique requirements (Table I). The common requirements are the ones that are operation-wide and more general in nature. The unique requirements identify differences based on technology, knowledge, etc.

Major differences between ISO 14000 and ISO 9000

Although ISO 9000 and ISO 14000 series has many similarities, they have several differences as well. We have to comprehend them to successfully implement both standards simultaneously.

- Knowledge of scientific and engineering methods: Most of the ISO 9001 requirements involve management and procedural work emphasizing conformance to the standard. On the other hand, some of the most significant components of the ISO 14001 standard involve scientific and engineering methodologies. For example, proactive techniques such as design for the environment, life-cycle analysis, pollution prevention, and material substitutions require a thorough knowledge of engineering design and how burdensome a company's products are on natural resources, energy requirements, and the environment.
- Liability and litigation: There are no civil or criminal penalties if nonconformances occur in the implementation of the ISO 9000 system whereas such penalties may be imposed by regulatory bodies or courts in some aspects of the EMS.
- Government regulations: A part of the environmental management may be regulated by various local or central governmental agencies. Such multi-supervision do not apply to quality.
- Ideological, political, and socio-economic issues: Environmental issues create

Table I

Usage of the Standards of Professional Practice issued by the Institute of Internal Auditors Inc.

ISO 14001		ISO 9001	
Common requirements (aligned numbers are comparative)			
4.1	Policy	4.4.1	Quality Policy
4.2.3	Objectives and targets	4.1.1	Quality Policy (includes objectives)
4.2.4	Environmental management program	4.2.3	Quality Planning
4.3.1	Structure and responsibilities	4.1.2	Organization
4.3.2	Training, awareness, and competence	4.18	Training
4.3.4	EMS documentation	4.2.1	General
4.3.5	Document control	4.5	Document and data control
4.3.6	Operational control	4.2.2	Quality system procedures
		4.6	Purchasing
		4.7	Control customer-supplied product
		4.9	Process control
4.4.1	Monitoring and measurement	4.10	Inspection and testing
4.4.2	Non-conformance and corrective and preventive action	4.13	Control of nonconforming product
4.4.3	Records	4.14	Corrective and preventive action
4.4.4	EMS audit	4.16	Control of quality records
4.5	Management review	4.17	Internal quality audits
		4.1.3	Management review
Unique requirements (Not comparative) regardless of alignment			
4.2.1	Environmental aspects	4.3	Contract review
4.2.2	Legal and other requirements	4.4	Design control
4.3.3	Communication	4.8	Product identification and traceability
4.3.7	Emergency preparedness and response	4.11	Control of inspection, and test equipment
		4.12	Inspection and test status
		4.15	Handling, storage, packaging, and delivery
		4.19	Servicing
		4.20	Statistical techniques

division and confrontation among people along ideological, political, and socio-economical lines. Such problems do not arise in quality management.

- Spectrum of stakeholders: in environmental management the variety of stakeholders is much wider than in the quality management. Stakeholders in the environmental area include manufacturers, employees, consumers, retailers, educators, newsmedia, environmental groups, and the government. Quality management, on the other hand, generally relates to manufacturers, employees, and consumers.
- Duration of effects: the effects and implications of implementing an EMS are realized over a much longer time period, sometimes decades, than those of quality management, which is within a relatively short warranty period of the company's products or services.

Implementation guidelines

To implement ISO 9000 and ISO 14000 systems one should review commonalities and differences between the two standards. Following is a step-by-step approach to implement both systems.

- 1 Obtain management commitment to comply to both standards based on the customers' expectations, international quality and environmental requirements, state of business, and strategic planning, and if applicable, government regulations.
- 2 Nominate ISO 9000 and ISO 14000 management representatives. If a qualified person is available it is better to combine these responsibilities. The management representatives shall review both standards and identify steps to implement the two systems.
- 3 Consolidate multiple common steps into a single step so it addresses elements of both the systems. Some of the common elements are: Policy; Document control; Corrective and preventive actions; Internal audits; Process control; and Monitoring and measurement.
- 4 Establish a target date for getting ready for certification audits. This will allow company to plan various activities to implement the two systems. It is recommended that each system has its own target date which allows implementation of ISO 9000 preceding the EMS. By no means, it should imply that unless one has complied with the ISO 9000 system, one should not pursue ISO 14000 implementation.
- 5 Form a steering committee to lead the implementation effort.
- 6 Conduct baseline assessments of quality and environmental systems. It is recommended that the assessments be done separately using the two applicable standards (this is a precautionary measure until the regulatory body(ies) officially issue a combined requirements for both ISO 9000 and ISO 14000)!? The assessments will identify nonconformances to the applicable standards.
- 7 Develop an integrated implementation plan with a schedule and assigned responsibilities. The plan shall address noncompliances identified in the baseline assessments. The plan should also include a list of documents to be developed for implementing quality and environmental management systems.
- 8 Provide training to key members for understanding the requirements, the certification process, and documentation technique assuming that they are qualified quality and environmental professionals.
- 9 Develop an integrated quality and environmental management system (IQEMS) manual or a policy manual. The manual can be based on the ISO 9000 structure with integration of environmental requirements considering similarities and differences as discussed in earlier chapters. Any unique item can be added as an additional section in the manual.
- 10 Develop documentation for operations, quality, environmental, and management activities. The procedures must include critical items for verification and records to ensure continual compliance. The procedures must be reviewed and approved by authorized and qualified people. The procedures must also be in a language people can read.
- 11 Train affected employees on these procedures for effective implementation. Take care of the psychological side as well.
- 12 Select certifying body(ies) for conducting the ISO 9000 and ISO 14000 audits. Encourage the initiatives for combined audits. Schedule pre-assessment and certification audits for IQEMS. Integrated audits will be cost-effective for concerned parties; the company and the certifying body(ies).
- 13 Manage IQEMS pre-assessment. Take remedial actions and schedule certification audits.
- 14 Certification audits may have to be separate for ISO 9001(2) and ISO 14001 due to accreditation requirements on the certifier(s). The integrated audit process will evolve over time.
- 15 Ensure continual compliance through a regimented internal auditing process.

Triplet strategy for implementing ISO 9000/ISO 14000 concurrently

Permeable

There are many strategies that can be followed when implementing ISO 9000/ISO 14000 concurrently. But the intended competitive strategy which we are after is actually a philosophical change from compliance to business opportunity management style. This necessitates a paradigm shift from reactive to proactive way in handling matters i.e. from appraisal to preventive approach. This depends mainly on team work and employees empowerment. Therefore, before we explain the suggested triplet strategy details, we would like to draw the attention for three keys to success in making this change have to be carefully considered during implementation.

These are:

- 1 We must understand people; listening to them with empathy. We must step into their places to know what are their feelings.
- 2 We must communicate clearly with them the “WHY” and “WHEN”. We must give the facts and answer all questions for them.
- 3 The third key participation; we directly ask them to assist, to decide the best time or method and seek all ways that they no longer resist.

The triplet strategy three elements

The main three elements for combined ISO 9000/ISO 14000 implementation which are going to be explored here are;

- methodology;
- competitiveness; and
- change effect.

Methodology

The systematic approach for implementation can consider the following conditions of the two systems (ISO 9000 and ISO 14000):

- as independent stand-alone systems;
- systems that coexist side by side;
- integrated as one system.

These systems can be integrated effectively by focusing on the following three important considerations for both integration and implementation:

- 1 similarities between the systems and a shared central theme;
- 2 a common approach to implementation;
- 3 importance of organization-wide team involvement.

Competitiveness during implementation

There are several priorities for implementation of any quality and Environmental

management schemes. However, the smarter one is that which provides an added value to the company status so that it can benefit from any business opportunity that might arise during implementation.

This can be secured by the following:

- careful establishing of your starting position from environmental point of view;
- agree on your finishing status;
- determine when you have arrived, by selecting the proper measuring criteria for the previous two situations.

The opportunities of genuine integration and implementation come from:

- the drafting of suitable system procedures and work instructions required to ensure that the composite list of quality and environment is addressed;
- suitable training at all levels emphasizing the interdependence of the quality and environment elements;
- review of performance and system audit results and the implementation of required changes in policy, objectives, and systems, consequently.

Change effect on personnel

There is always personal resistance to any change, even though if that change is for the person's privilege. Resistance to change is natural phenomena. Therefore, we have to know how to manage this change for successful quality and environmental schemes implementation. The main reasons and symptoms for this resistance are:

- the negligence of the psychological effect of the change on the personnel, all of them; from base of the hierarchy up to the top management itself;
- the fear of change which is normal human-being reaction;
- the psychological pattern of change resistance follows typically seven stages:
 - immobilization
 - denial
 - anger
 - bargaining
 - depression
 - testing
 - acceptance.

To overcome this major implementation obstruction we have to comprehend the sociotechnical effect of change on both the organization and human behaviours by:

- recognizing the effect of the rate of change on personal security;
- share information and knowledge with all employees;
- include those affected by change in the design of the change process.

The clean (green) production

It is evident from all the above that environmental concern will regulate all the industrial activities in the 21st century. Actually this already started by introducing the clean (green) production by some thought leaders as can be seen from the following brief touch on the subject.

Early in 1996, the United Nations Environmental Program (UNEP) officially ratified the working group for cleaner production in food processing, in Queensland, Australia. The aim of the group is the food industry adoption of alternative business activities and to reduce the overall environmental impacts of the industry. This can take the form of regulatory, economic, educational and technical strategies to create compatible economic, social and environmental improvement. The clean (green) production dream becomes true! Priority of food industry over other industries from public interest point of view is obvious.

Clean production is a name for a series of activities that attack the formation of pollutants at the source, has been around since 1989. The concept is now emerging as a powerful tool to integrate the disciplines of quality and environmental management. We are becoming increasingly dissatisfied with simplistic answers to difficult environmental questions and are beginning to look for long term solutions that enhance economic development, environmental protection and customer satisfaction.

Clean production philosophies constitute one method to control the ecological impacts of people and technology to promote sustainable advantage. Generally clean production concept is to enhance the adoption on an industry-wide basis of more economically and ecologically efficient practices. It may mean the adoption of new technologies or new working practices, new management skills or new equipment.

Clean production philosophies will use any of a number of strategies to reduce the impact of our activities on the environment. Instead of introducing more command and control regulations, clean production attacks the source of pollution. It encourages companies and individuals to examine their environmentally relevant activities and ask the philosophical questions: Do we really need the product?; Do we really need it in this form?; and what alternatives exist?

Clean production aims to stimulate innovation in production systems through the development of radical technology. The principle is to push organizations to take life-cycle approach where material extraction, through manufacturing, distribution and transportation, use recycling and final disposal is designed in the product itself.

Conclusion and recommendation

Integration of environmental and total quality as a part of product management is helping companies reassess environmental performance as a contribution to productivity and innovation. This necessitates a paradigm shift in management from appraisal to prevention. Zero defects concept can be of great help in this regard for the 21st century, where clean (green) production discipline will prevail. Therefore, it is strongly recommended to exploit TQM expertise in environmental management to gain from its enormous power in transforming business from compliance to competitiveness.

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