

Integrating *ISO 9001* Quality Management System and *ISO 14001* Environmental Management System for Contractors

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Abstract: Previous studies between *ISO 14001: 1996* Environmental Management Standard and the old *ISO 9001: 1994* Quality Assurance Standard have found compatible requirements that warrant their integration. This study examines the compatibility of the revised *ISO 9001: 2000* Quality Management Standard with *ISO 14001: 1996* for the purpose of integration. A survey of 96 construction firms was conducted for those who were considering or were already *ISO 14001: 1996* certified. Findings on the possibility/difficulty and benefits/costs of integration between *ISO 14001: 1996* and *ISO 9001: 2000* were obtained. Industry concerns relating to potential problems and implementation challenges were discussed. The study concludes that the revised *ISO 9001: 2000* serves as an opportune platform for construction firms to consider certification to *ISO 14000: 1996* through an integration exercise.

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Introduction

The revised *ISO 9001: 2000* Quality Management Standard adopted more consistent terminology that makes it more compatible with other management systems such as *ISO 14001: 1996* for environmental management. The primary aim in making *ISO 9001: 2000* compatible with other management systems is to encourage organizations to implement various fragmented management systems as an integrated management system.

Over the past few years, advocates of the environmental management system (EMS) have proposed its implementation together with an organization's existing quality management system (QMS) to leverage on cost savings. The integrative platform proposed was based on the then *ISO 9001: 1994* and existing *ISO 14001: 1996*.

The recent development of such management standards in a compatible manner allows synergy to be achieved by integrating various management systems within one single operating management system. Although the theoretical concerns arising from the integration of QMS and EMS have been considered by Technical Committee TC 176 of the Geneva based International

Organization for Standardization (ISO) for the revised *ISO 9001: 2000*, it remains unclear how the new revision would affect its actual implementation. In the construction industry, such an integrated management system is still not commonly used. The aim of this study is to evaluate the revised *ISO 9001: 2000* for implementing an integrated management system and the challenges faced by contractors. The study considers if the revised *ISO 9001: 2000* should be leveraged by contractors to implement an integrated management system to embrace *ISO 14001: 1996*.

Brief Review of ISO Standards

The revised *ISO 9001: 2000* revision is based on the following eight quality management principles: (1) Customer focused organizations, (2) Leadership, (3) Involvement of people, (4) Process approach, (5) Systems approach to management, (6) Continual improvement, (7) Factual approach to decision making, and (8) Mutually beneficial supplier relationships (PSB 2000).

Based on these eight guiding principles, the 20 elements of the old *ISO 9001: 1994* were revised into the following five main management requirements: (1) Quality management system, (2) Management responsibility, (3) Resource management, (4) Product realization, and (5) Measurement, analysis and improvement.

Arising from these five main management requirements, *ISO 9001: 2000* also requires attention to be paid to top management commitment; process approach to system; process measurement and management; customer satisfaction monitoring; and continual improvement (PSB 2000). *ISO 9001: 2000* also places a stronger emphasis on the quality management function of the organization as distinct from quality assurance and quality control activities.

The *ISO 14000* series consist of five standards: Environmental management systems, environmental auditing, environmental la-

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beling, environmental performance evaluation and life cycle assessment. *ISO 14001: 1996*, an environmental management standard against which an organization can be audited on a voluntary basis, is applicable to different organizations in diverse geographical, cultural and social conditions. The other standards in the *ISO 14000* series provide guidelines which either support the implementation of an EMS or the analysis of product characteristics. None of these other standards need to be implemented. *ISO 14001: 1996* provides a structured management system to enable construction firms to achieve benefits that would enhance the organization's image and credibility (Tan et al. 1998).

The major elements and requirements of *ISO 9001: 2000* are

1. Quality management system: General requirements and documentation requirements;
2. Management responsibility: Management commitment, customer focus, quality policy, planning, responsibility, authority and communication, and management review;
3. Resource management: Provision of resources, human resources, infrastructure, and work environment;
4. Product realization: Planning of product realization, customer related processes, design and development, purchasing, production and service provision, control of monitoring and measuring devices; and
5. Measurement, analysis and improvement: General, monitoring and measurement, control of nonconforming product, analysis of data, and improvement.

The major elements and requirements of *ISO 14001: 1996* are

1. Environmental policy;
2. Planning;
3. Environmental aspects: Legal and other requirements, objectives and targets, and environmental management programs;
4. Implementation and operation: Structure and responsibility, training, awareness and competence, communication, EMS documentation, document control, operational control, and emergency preparedness and response; and
5. Checking and corrective action: Monitoring and measurement, nonconformance and corrective and preventive action, records, audit, and management review.

Integration Issues

ISO 9001: 2000 and *ISO 14001: 1996* are so intertwined that integration is almost inevitable. Together, they provide a framework to help organizations achieve quality and environmental requirements. Hence, procedures that weave the two systems together should be implemented. Such integrated management systems were recognized (Wilkinson and Dale 1999) and applied by Low and Sua (2000) and Low and Chin (2003) for integrating safety issues with *ISO 9001* QMS. Along these lines, Karapetrovic and Willborn (1998) have examined the integration of QMS and EMS. Aboulmaga (1998) observed that the old *ISO 9001: 1994* and *ISO 14001: 1996* have common requirements that warrant their integration. The common requirements identified were those that are more operation-wide and general in nature. Aboulmaga (1998) however noted that the following requirements are unique only to *ISO 14001: 1996*: Environmental aspects; emergency preparedness and response; legal and other requirements; and communication.

Although some major differences exist between *ISO 9001: 1994* and *ISO 14001: 1996* (Aboulmaga 1998), the revision of the former in 2000 provided a good opportunity for organizations to reorganize and adopt the "methodology" and "intent" of concur-

rently establishing EMS and QMS (Karapetrovic and Willborn 1998). The major benefits arising from an integrated systems approach include: improved technology development and transfer; improved joint operational performance; improved internal management methods and cross functional teamwork; higher staff motivation and lower inter-functional conflicts; multiple audits reduced and streamlined; enhanced confidence of customers and positive market/commodity image; and reduced costs and more efficient reengineering (Karapetrovic and Willborn 1998).

From a comparison made between the elements of *ISO 9001: 2000* and *ISO 14001: 1996* presented previously, it is clear that integration is feasible as there appears to be common elements which serve similar purposes in the two standards. However, although it appears feasible to integrate *ISO 9001: 2000* with *ISO 14001: 1996*, it is unclear if such integration would be received positively in the construction industry. The next section of this paper sets out to examine the current status of the construction industry in terms of certification to *ISO 14001: 1996* and the attitude of the industry towards an integrated QMS and EMS.

Research Methodology

Construction firms were registered with the Building and Construction Authority's Central Registry of Public Sector Contractors in one of eight financial categories in Singapore. These ranged from G1 (the smallest) to G8 (the largest) financial category. A total of 215 G6 to G8 construction firms were listed in the Registry which formed the sampling frame for a postal survey. It was announced by the Singapore government in June 1994 that *ISO 9000* certification would be a prerequisite for contractors bidding for public sector construction works in July 1999, and that this requirement would be mandatory for G6 to G8 contractors. Hence, the postal survey was limited to G6 to G8 *ISO 9000* certified contractors.

Following a pilot test, the postal survey was conducted. Ninety-nine G6 to G8 contractors responded to the survey. The questionnaire for this study was sent to quality managers in these firms. Out of these 99 responses, one firm indicated that it was unable to participate in the survey because of its busy schedule. Another two responses were discarded because the firms provided contradicting replies. A total of 96 valid responses were eventually used in the analysis.

Findings: Stage 1

Eighty-eight respondents (92%) were not certified to *ISO 14001: 1996* requirements. Out of these 88 respondents, only 35 (40%) indicated that they would consider implementing *ISO 14001: 1996* in their organizations. Out of the eight respondents who indicated that they have implemented *ISO 14001: 1996*, seven reported that they have implemented it as an integrated system. The remaining one respondent reported that a standalone *ISO 14001: 1996* EMS was implemented in the organization. Out of the 35 respondents who indicated that they would consider implementing *ISO 14001: 1996*, 30 (86%) pointed out that they would consider implementing it as an integrated system; four (11%) would consider implementing it as a standalone system; and the remaining one (3%) respondent was undecided. These findings appear to suggest that the implementation of *ISO 14001: 1996* was still at an infancy stage in the construction industry.

Findings: Stage 2

The second part of the survey was addressed by respondents who have already implemented (eight respondents) *ISO 14001: 1996* or were considering implementing it (35 respondents).

(1) Possibility of integration: The respondents were first asked to indicate the possibility as well as the degree of difficulties in integrating *ISO 14001: 1996* elements with *ISO 9001: 2000* requirements. This question required the respondents to provide a "yes/no" answer to the possibility of integrating *ISO 14001: 1996* elements with *ISO 9001: 2000* requirements. It also required the respondents to indicate the degree of difficulties in integrating on a scale from 1 to 5, which denote "easy" and "difficult," respectively. The results relating to the possibility of integrating the elements of *ISO 14001: 1996* with *ISO 9001: 2000* are presented below in decreasing order of possibility:

- Structure and responsibility (82%);
- Training, awareness and competence (82%);
- Communication (82%);
- EMS documentation (82%);
- Document control (82%);
- Nonconformance and corrective and preventive action (82%);
- Audit (82%);
- Management review (82%);
- Environmental policy (79%);
- Operational control (79%);
- Monitoring and measurement (79%);
- Records (79%);
- Objectives and targets (76%);
- Planning (73%);
- Legal and other requirements (73%);
- Environmental management programs (73%);
- Checking and corrective action (73%);
- Implementation and operation (70%);
- Environmental aspects (67%);
- Emergency preparedness and response (67%).

It should be noted that 33 of the 43 respondents who were already certified or were considering certification to *ISO 14001: 1996*, replied in the second part of the survey. The respondents were generally positive of integrating most of the elements of *ISO 14001: 1996* with *ISO 9001: 2000* requirements. The seven elements with the lowest positive responses were environmental aspects (67%), emergency preparedness and response (67%), implementation and operation (70%), planning (73%), legal and other requirements (73%), environmental management programs (73%), and checking and corrective action (73%). The comparatively lower responses for these elements suggest that the requirements which they represent are peculiar only to *ISO 14001: 1996*.

(2) Difficulties in integration: The results relating to the difficulties of integrating the elements of *ISO 14001: 1996* with *ISO 9001: 2000* are presented below in decreasing order of the mean (in parentheses) of the responses:

- Emergency preparedness and response (3.42);
- Environmental management programs (3.39);
- Checking and corrective action (3.30);
- Environmental aspects (3.06);
- Planning (3.03);
- Operational control (3.03);

- Implementation and operation (3.00);
- Legal and other requirements (2.94);
- Monitoring and measurement (2.90);
- Environmental policy (2.72);
- Objectives and targets (2.72);
- Nonconformance and corrective and preventive action (2.72);
- Communication (2.65);
- EMS documentation (2.65);
- Records (2.63);
- Audit (2.50);
- Structure and responsibility (2.41);
- Management review (2.41);
- Training, awareness and competence (2.35);
- Document control (2.29).

It should be noted that the responses for each of these elements exceeded 30, which form a suitable sample size. The mean for the responses to each element was computed to provide an indication of the overall response to each element on a 1 to 5 Likert scale (i.e., 1=easy and 5=difficult).

The following elements which have a mean greater than 3 suggest that these may be difficult to integrate: Emergency preparedness and response (3.42), environmental management programs (3.39), and checking and corrective action (3.30). Because their nature is peculiar only to *ISO 14001: 1996*, these three elements may be perceived by some respondents to be difficult for integration.

In addition, the following elements have a mean which is close to the neutral value of 3: Environmental aspects (3.06), planning (3.03), operational control (3.03), implementation and operation (3.00), legal and other requirements (2.94), and monitoring and measurement (2.90). The neutral responses to these six elements were not unexpected because at the time of the survey, the revised *ISO 9001: 2000* was still relatively new to the construction industry.

(3) Benefits of an integrated system: The respondents were also asked about the benefits that can accrue from an integrated system. This question requires the respondents to indicate the extent to which they agree with these benefits on a scale from 1 to 5, which denote "strongly disagree" and "strongly agree," respectively. The results are presented below in descending order of the mean (in parentheses):

- Multiple audits reduced and streamlined (3.85);
- Enhance confidence of customers and positive market/commodity image (3.85);
- More comprehensive involvement of all interested parties, each party will have to be aware of the larger scope of their work, i.e., how both quality and safety issues affect the management efficiency of the company as a whole (3.79);
- Achieve synergy from the development of the integrated system where the achievement of a combined system is more than the sum of the achievement of each system implemented individually (3.70);
- Improve internal management methods and cross functional team work (3.67);
- Towards establishing an integrated and optimal performance management system (3.61);
- Common resources result in better utilization, efficiency and no duplication of efforts (3.61);
- Higher staff motivation and lower inter-functional conflicts (3.61);

- Improve joint operational performance in which both systems are improved together (3.55);
- Harmonization and unified problem solving (3.52);
- Adopting the integration exercise as the foundation for integrating other systems such as buildability, just-in-time and quality function deployment (3.39); and
- Encourage technology development and transfer (3.12).

The results show that all the benefits of an integrated QMS and EMS have a mean greater than the neutral value of 3. The two benefits which received the lowest mean were: Integration exercise being able to encourage technology development and transfer (3.12), and adopting the integration exercise as the foundation for integrating with other systems such as buildability, just-in-time and quality function deployment (3.39). These two results could be because the integration of QMS and EMS was still a relatively new concept in the construction industry. Hence, the benefits to be derived from integration may not yet be clear to the respondents.

- (4) Costs of an integrated system: Last, the respondents were asked about their perceptions of costs arising from an integrated system. This again requires the respondents to indicate their views on a scale from 1 to 5, which denote strongly disagree and strongly agree, respectively. The results are presented below in descending order of the mean (in parentheses):

- More time and resources to develop this integrated system (3.55);
- Reduced costs and more efficient re-engineering (3.39);
- Costlier as greater expertise and higher level of competency in quality management systems are required (3.33);
- Less certification, staff and consulting costs (3.24);
- Higher costs in both management and training (3.18).

On the issue of costs, the findings seem to suggest that an integrated management system may result in additional costs as well as reduction in costs in different areas of management. Nevertheless, top management should appreciate that the resources were being utilized fully when two management systems are managed under a single integrated system.

Conclusion

The findings suggested that an integration of *ISO 9001: 2000* and *ISO 14001: 1996* is generally possible except for those elements peculiar to *ISO 14001* (namely environmental aspects, emergency preparedness and response, and environmental management program). The poor responses on the possibility of integrating the two elements of “environmental aspects” and “emergency preparedness and response” reflected some concern regarding them. This could be due to a lack of understanding on the part of the respondents on environmental issues and the type of emergency responses required pertaining to construction activities among companies in Singapore. Unlike other countries, construction work in Singapore does not involve frequent development of many hectares of virgin land which require mandatory environmental impact assessment to be conducted prior to approval being given by the relevant building authorities.

A few reasons could be put forward to explain the perceived difficulties in integrating *ISO 14001: 1996* elements such as “environmental management programs” and “emergency prepared-

ness and response.” First, these elements involved procedures which are interlinked with quality, occupational health and safety issues. This means that both broad and sufficient knowledge is required among the respondents involved. It is not an easy task for quality practitioners to be familiar with all the other environmental, occupational health and safety legislation. Second, effective implementation of these elements would involve company-wide staff participation to a large extent. The respondents may be concerned with the problems associated with re-learning and taking on new methods of working for staff affected by the integration exercise. Third, the respondents may also be concerned because some of the requirements in an EMS are new to a QMS.

As far as the benefits are concerned, the findings highlighted less positive responses in the two statements: “Adopt the integration exercise as the foundation for integrating other systems such as buildability, just-in-time and quality function deployment” and “encourage technology development and transfer.” Respondents whose companies were still working toward *ISO 14001: 1996* certifications contributed to the less positive responses as they were still unsure of their organizational progress to be able to comment confidently on these benefits. Where the issue of additional/reduced costs is concerned, it appears that there could be other concerns which a construction firm would need to take into account when considering an integration exercise of this nature.

It is also worth mentioning that the management of two or more different systems under one single umbrella may be a cause for concern. This is because it may be difficult to find someone who is proficient and possesses the necessary knowledge in all the different areas of quality, environment (and possibly, safety) to handle such an integrated system.

The international *ISO 9001* and *ISO 14001* standards are applicable in all countries. The interpretation of their requirements is unlikely to be different in the United States, Europe, or Asia. Contractors also operate within a fairly similar environment and constraints in the construction industry in different countries. Hence, although the survey for this paper was conducted in Singapore, its findings as well as lessons would also be equally applicable for the United States as well as other countries when addressing the issue of integrating QMS and EMS in the construction industry.

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