The yin and yang of quality systems evaluation

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Abstract
This paper highlights the need for an integrated, more innovative approach to the evaluation of quality management systems to focus organisations on future business improvement. A questionnaire instrument is identified, which seeks to combine the key elements of ISO 9000 and total quality management and hence both the hard and soft issues relative to quality. This instrument has been applied in Saudi Arabia, a somewhat restrictive environment in which to conduct research and collect company data, and some useful pointers for the future have been identified.

Introduction

How can we begin to quantify the yin and the yang of quality systems evaluation? We know that system without passion is lifeless and that passion without system is chaos. How do we bring the two together in harmony and promote therefore the evaluation of both? In health care management terms, the yin and yang could be regarded as the hard systems framework with associated medical and clinical audit on the one hand and on the other the people aspects of service provision, the willingness and motivation of staff at all levels of the organisation to do that little bit more to ensure the system as a whole keeps running smoothly. This can be extrapolated in more general quality management terms to be the quality system and the total quality culture in organizations.

Lessons have to be learned from past experience of both ISO 9000 and total quality management (TQM). The language and terminology of ISO standards have created barriers and the scope of their content has been too restricted, not clearly addressing key stakeholders, such as customers and staff. Although the 2000 version of ISO has gone some way towards addressing these constraints, there is still a need to encourage companies to go beyond ISO. We need to move from compliance and "auditability" towards sustainable business improvement. Definitions of TQM have varied and caused confusion as a result. Some clarity has emerged from consideration of the tools and techniques of TQM but concentration on these mechanistic aspects has tended to marginalize many of the important people and behavioural issues.

Quality systems and TQM have developed to a point where it is now more likely for them to be integrated than conflicting with each other. As a result, the evaluation of organizational performance needs to undergo a similar development process. In terms of TQM, there are models such as the European Foundation for Quality Management (EFQM) business excellence model which provide a clear framework for evaluation and self-assessment. Such a model focuses on process evaluation where an ISO 9000 quality management system forms part of the process section of the framework, alongside maybe use of Servqual and quality function deployment in business processes. The EFQM model is, however, very broad in scope, an over-arching framework that covers a number of criteria, such as "impact on society", which may be difficult for some organizations to evaluate.

What is proposed in this paper is an evaluative tool which concentrates specifically on the evaluation of the quality management system and certain key elements of TQM in an organisation. It was designed for use in the Saudi Arabian manufacturing sector, where previous research of this type had not been undertaken. As there are inevitable constraints associated with such an industrial environment, it was important to focus any evaluation of organizational performance on what was strictly relevant and collect the data in an efficient, effective way. It is hoped that this tool might be useful in future similar evaluative research.

The Saudi Arabian environment

As a developing country, Saudi Arabia is relatively new to the industrialized world. After the great increase in the oil prices in the 1970s and the subsequent accumulation of wealth, the country began to implement ambitious industrial policies. At that time, the private sector had neither the capital nor the technical capabilities to establish large, mechanized factories. The Saudi government therefore became involved in the support of

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industry in a number of ways, consequently playing a crucial role in its development. The government provided huge industrial loans and technical assistance, as well as issuing encouragement policies, such as tax exemptions, giving priority to national products in purchasing and imposing taxes on imported goods. The strategic approach was based on increasing the industrial contribution to the national economy, achieving diversification of industry and, most importantly, employment of Saudi nationals.

Saudi industry has encountered a number of problems. Lack of diversification has resulted from an over-concentration on petrochemical products with output representing more than 60 per cent of national industrial income in general and increasing global competition putting pressure on the world petrochemical market. There has also been an over-reliance on foreign technology, a lack of advanced techniques and experience in industrial marketing and a lack of database and information centres to serve the country's industries. Furthermore, small industries have been unable to benefit from the governmental incentives offered to larger projects and there has been the danger of some industrial projects being established out of personal desire rather than based on sound feasibility studies. Finally, the majority of private sector employees have not been Saudi nationals, with a figure of 92 per cent of foreign workers mentioned by Al-Dakheil (1994), though industries with joint government ownership have tended to employ a higher percentage of Saudi nationals, such as 67 per cent. It also became clear as a result of the evaluative research conducted that the Saudi Arabian standards organisation (SASO) was a fledgling organisation in need of considerable development and the Saudi government needed to provide more direct support for quality management development.

Research methodology

The research population consisted of the quality managers of all ISO 9000 registered firms across a range of manufacturing sectors in Saudi Arabia, a total of 140 firms. The survey instrument was distributed and collected by the researcher to ensure a reasonable response rate. An initial response rate of 69.3 per cent was obtained, with a final 60 per cent of usable responses, representing a total of 83 firms.

Bearing in mind the advice of Rummel and Ballaine (1963), the questionnaire instrument was long enough to cover the essential elements of the research but not too long so as to be overly time consuming for respondents. Three attributes were observed in the design of the instrument: focus on the topic; questions of appropriate length to convey the meaning; clear and simple questions (Alreck and Settle 1995). Closed questions were used to provide standardised data for statistical analysis with a greater chance of being more reliable and consistent over time. Babbie (1998) also praises closed-ended questions but suggests they be comprehensive and include all possible alternatives. Bourque and Fiedler (1995) prefer such questions because respondents may be unwilling to write answers and therefore lose interest. In this particular case, the quality managers were busy people willing to give only a certain amount of their time to the research and for whom confidentiality of data collected was of paramount importance.

The questions themselves were designed on the basis of the literature relating to ISO 9000 and TQM (Gill and Johnson, 1997) and on previous studies into ISO 9000 and TQM. A five point Likert scale was used where appropriate, enabling the application of tests to measure difference and correlation, such as the Mann Whitney test, the Sign test and the Kruskal Wallis test and the standard techniques of item analysis, factor analysis and reliability analysis. Three types of scale were used: the ratio or interval scale, the nominal scale and the ordinal scale. Three question types were used: behavioural, attitudinal and classification questions. Behavioural type questions were used whenever the frequency of doing something required investigation, as in the case of the questions investigating quality system elements. The attitudinal type of question was used extensively to investigate the extent of agreement/disagreement of respondents regarding certain issues. Classification questions provided general information, such as type of industrial activity, company ownership and export category.

The questionnaire instrument

The questionnaire consisted of a total of 63 items, either statements or questions depending on the context. Where relevant, a five point Lickert scale was used from either "strongly agree" to "strongly disagree" for statements and from "always" to "never" for frequency of occurrence questions.

Questions 1-6
These questions were designed to find out the company name, its manufacturing sector, number of employees, number of employees performing major quality-related functions and whether these employees were Saudi or non-Saudi nationals, type of company ownership and percentage of sales exported.

Questions 7-10
This part of the questionnaire related to TQM practices. Question seven asked about frequency of developing, communicating, training for and measuring of cultural change values and beliefs. Question eight was assessing extent of management commitment to resourcing, driving and reviewing quality improvements. Questions nine and ten sought detail on meeting customer requirements and measuring customer satisfaction.

Questions 11-16
Question 11 was asking for detail on product identification during manufacture and questions 12 to 16 all related to inspection and testing from method to establish inspection status, inspection methods of products at different stages of the manufacturing process to types of inspection and testing equipment.

Questions 17-18
These two questions followed on from inspection and testing by asking about ways of dealing with non-conforming products in terms of identification, segregation, rework and rejection.

Questions 19-27
This set of questions took the evaluation of TQM further. Question 19 asked which types of teams existed to deal with quality matters whilst question 20 focused on employee involvement and empowerment by asking if employees were encouraged to inspect their own quality, were given the necessary resources, training and technical assistance to solve quality-related problems and whether senior management encouraged, rewarded and implemented employee suggestions. The next two questions asked about extent of use of quantitative and qualitative tools and techniques for quality and the different types of training offered. Questions 23 and 24 related to the use of benchmarking and the specific types of benchmarking chosen, whilst questions 25 and 26 focused on relationships with suppliers and methods of supplier evaluation. Finally in this section, question 27 asked for frequency of use of a variety of tools to measure the overall performance of the organization.

Questions 28-33
These questions introduced the issue of ISO 9000 registration by asking about treatment of quality records in terms of ease of storage, access, maintenance and disposal followed by three basic questions about the specific standard to which the firm was registered, for how long the firm had been registered and how long the registration process had been. Question 32 then focused on top management attitudes and commitment to ISO 9000 and question 33 gave the opportunity to rank the importance of 19 different motives for achieving ISO 9000 registration.

Questions 34-38
These questions related to the choice of registration agency, beginning with questions about the selection of SASO or an alternative registration agency, moving on to the reasons for choosing a foreign agency over SASO and a ranking of the importance of nine factors that would potentially influence that choice. Question 38 asked what sort of evaluation of the registration agency was carried out prior to a choice being made.

Questions 39-47
This section of the questionnaire related to the implementation of ISO 9000. Question 39 asked which procedures were undertaken prior to implementation to establish a rationale for proceeding and question 40 asked approximately how much was spent on the different implementation stages. Question 41 asked for a cost/benefit evaluation of implementation and registration and questions 42 and 43 focused on attitude to and extent of satisfaction with the registration agency. Questions 44-46 asked whether registration had been achieved after the first or subsequent audits, about duration of the registration certificate and frequency of surveillance visits respectively. Finally question 47 asked about approach to assessment and responsibility for implementation.

Questions 48-54
These questions covered a number of general issues relating to ISO 9000, beginning with types of training specific to ISO 9000 received and from which provider. Questions 50 and 51 related to types of documentation and an assessment of how the quality manual was produced. Question 52 then sought a frank opinion of the quality manual, giving eight options to choose from. Question 53 provided seven statements regarding the management of supplier relationships under the ISO 9000 registration scheme and question 54 asked whether or not external consultancy had

been used and whether or not the registration agency had acted as external consultants.

Question 55-57

These questions provided links between ISO 9000 and TQM. Questions 55 and 56 asked if a TQM programme was in place as well as ISO 9000 registration and about comparative satisfaction with ISO and TQM. Question 57 gave 15 alternatives to choose from and rank in importance of their respective contribution to the implementation of ISO 9000. These factors included a mix of ISO and TQM-related issues.

Questions 58-63

This final section of the questionnaire was seeing reflective evaluation and future intentions from respondents. Question 58 provided 20 benefits to rank in terms of their relative effectiveness post ISO implementation and question 59 provided seven statements regarding overall evaluation of and satisfaction with ISO 9000. Question 60 was seeking a frank opinion on the ISO 9000 implementation process and offered ten statements for consideration. Questions 61 and 62 asked about actions since receiving the ISO 9000 certificate and any intentions, including the potential implementation of other standards or TQM. The final question 63 simply asked for an evaluation of the performance of SASO.

The questionnaire was presented either in its English form or in the translated Arabic version, depending on respondent preference.

Some research findings

Once again, there is not the time or space to include all the findings, which were many and detailed. Findings emerged regarding people issues, customer focus, product issues, quality improvement tools, quality culture and performance measurement. Top management commitment was high though some managers did not review quality progress. The use of steering committees was high, with cross-functional teams used to the least extent, perhaps implying some lack of co-ordination in quality issues. Line workers were given the authority and resources to deal with quality problems and the most commonly used training programmes were in process improvement, leadership, team building and defect prevention. Use of training was highly variable among the firms involved in the study.

As for customer focus, the study showed that customer complaints, returns and feedback from salespeople were most commonly used. The most important criteria for evaluating suppliers was credible, timely delivery, followed by quality of products. However, some firms evaluated their suppliers subjectively and many did not rely on fewer suppliers. With regard to product identification, traceability, segregation, inspection and testing, there was a satisfactory level of compliance, manual methods still being much more widely preferred to computerization.

The study also yielded information regarding the use of qualitative quality improvement tools, SPC and benchmarking. The simpler qualitative tools were the most often used, such as task lists, flow charts and brainstorming, whilst the more sophisticated tools were used rarely. In SPC, the most commonly used tools were sampling inspection control charts with, once more, little if any use of the advanced SPC techniques. Benchmarking was used by approximately half of the ISO 9000 registered firms studied, the majority of those firms benchmarking against the products of others.

The fostering of a quality culture was found to be relatively high, however some firms did not measure and report results and others did not provide incentives for the same purpose. The most commonly used techniques for measuring organizational performance were feedback from customers, followed by audit results and quality failure costs. Up to half of the companies did not use more advanced performance measurement tools, such as financial accounts, SPC, costs of warranty and product liability.

Comparison between TQM and non-TQM firms revealed enhanced performance by TQM firms in most items relating to the quality system. The Mann-Whitney test and the Pearson chi-square test showed up significant differences in favour of the TQM firms with regard to some aspects of training, relations with suppliers, qualitative tools, SPC, quality culture and performance measurement. This outcome is perhaps rather unsurprising.

Findings relating to ISO 9000 implementation revealed that the impetus came largely from senior managers, whose commitment to ISO was significantly higher than to quality in general. The most important motives for implementing ISO were improving the efficiency of the quality system, maintaining market share and meeting the requirements of customers and suppliers. There was a significant positive correlation between the two marketing motives of being internationally competitive and having a presence in Europe and extent

of exporting undertaken by the company. Many firms did not plan well for ISO implementation and in some there was also a lack of specific training for ISO. The most significant factors in helping implementation were top management commitment followed by a well-structured system of procedures and then the contribution of internal auditors. The most significant problems were seen as the need to change the existing system, resistance to change by employees and a lack of understanding of ISO by all departments.

Findings regarding registration included choice of agency on the basis of reputation and image followed by knowledge of the industry and previous experience in Saudi. Small firms tended to use subjective judgement more than did large firms, with more than a third of all companies not checking agencies' internal operations, fees or long-term financial capabilities. More than 80 per cent of the registered companies surveyed had been audited by British agencies, with the British being dominant in terms of both training and auditing. A total of 88 per cent of the companies achieved registration at the first audit and the remainder in the second, with smaller organizations being more likely to pass on the first audit. More than half had achieved registration in less than a year and 41 per cent in two years. When asked about problems, respondents mentioned high fees, the difficulty of choosing the right registration agency and the complicated nature of the auditing procedures. Overall, though, levels of satisfaction with the registration agency were relatively high.

Costs and benefits of ISO were also evaluated. It was found that internal costs represented approximately 67 per cent of total costs, followed by consultancy fees making up 21 per cent and registration fees 12 per cent. As one would expect, the costs of implementation were lower for the smaller companies. Comparing costs and benefits, the majority of respondents were very positive, with the most significant returns being an increase in quality awareness, an improvement in quality system efficiency and an improvement in customer service. Using ISO as a promotional tool was also regarded as a major benefit to the companies.

Taking an overall view of ISO, the majority of respondents seemed satisfied, larger firms more so and therefore more likely to recommend registration to others. Many, however, were of the opinion that ISO did not guarantee the manufacture of a good quality product and also regarded ISO as insufficient in establishing a quality system without the implementation of TQM. It was encouraging to note that respondents were planning to implement ISO 14000 in a number of cases and some were considering implementation of TQM but no one was planning to halt registration. On a less encouraging note, however, the role of SASO and the Saudi Arabian government had been minimal in promoting and furthering developments in ISO implementation and auditing, which will have to change if an increased interest in quality management is to be fostered in the years ahead.

In terms of ISO 9000 implementation, the findings from research in other countries are comparable with the findings from this study. Such countries were Belgium (Vloeberghs and Bellens, 1996), Thailand (Krasachol *et al.*, 1998), Turkey (Erel and Ghosh, 1997), the UK (Buttle, 1997; Taylor, 1995; Taylor and Meegan, 1997), Greece (Stathori, 1994), Malaysia (Idris *et al.*, 1996), Western Australia (Brown and Van der Wiele, 1995), India (Acharya and Ray, 2000) and Sweden (Carlsson and Carlsson, 1996). This study revealed that, in general terms, its findings were close to those from other countries, developed and less developed alike, thereby contributing to the validation of those previous studies.

Conclusion

This study was the first of its kind to be carried out in Saudi Arabia and adds a new piece to the global jigsaw of ISO 9000 implementation experiences. The research instrument goes beyond ISO to TQM and therefore adds something over and above previous studies of its kind. The questionnaire was constructed with careful attention to the relevant literature and the practical aspects of ISO and TQM. It was well received and yielded a wealth of information, only some of which has been revealed here. The study investigates all quality system elements and ISO implementation from beginning to end.

As there has been some confusion in the past about adopting a TQM approach and its relevance to ISO 9000, this study aims to shed some light on the differences between ISO registered firms which have implemented TQM as well and those which have not. It has been shown where are the benefits to be gained and which are the key issues of importance on which firms should focus attention if they wish to achieve real business gains. The study also aims to anticipate the latest version of ISO 9000 (2000) and encourage organizations to consider

quality management standards in the broader context of business improvement and corporate culture. It is therefore to be hoped that this tool goes some way towards bridging the gap between ISO 9000 audit and self-assessment using the EFQM model.

Particularly for the less developed countries, it is important to avoid the obstacles and complexities associated with ISO 9000 and TQM implementation encountered in the past. This tool is reasonably comprehensive, integrated, relevant and fairly easy to apply. Clearly its application has been a first pioneering effort and no doubt it will need to be refined in the future. It would be worthwhile applying it in other geographical locations and in the service sector. Only time will tell.

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