

A Typology of Approaches to ISO Certification and TQM

by

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Abstract:

This paper reports on research which explores the links between quality assurance, or certification of the quality system according to the ISO 9000 (AS 3900) series and the broader approach of Total Quality Management. The first part of the paper outlines a typology of approaches to introducing TQM and ISO. Some organisations see ISO 9000 as an end in itself while others consider it to be the first step towards TQM. Others may have TQM firmly in place prior to embarking on certification. The second part of the paper applies the typology to data from a questionnaire survey of Western Australian organisations with ISO 9000 certification. Empirical support for several of the groups in the typology is found in this analysis.

Keywords:

CERTIFICATION; ISO 9000; TOTAL QUALITY MANAGEMENT; MANAGING CHANGE.

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1. Introduction

The quest for certification to the ISO 9000 quality standards is a relatively recent growth phenomenon throughout the world. A large number of organisations are also moving down the TQM path. Limited research is available which examines a number of questions concerning ISO certification, such as the reasons for seeking certification, the types of benefits which might result and in particular, the links with TQM.

This paper examines the links between quality assurance, or certification of the quality system according to the ISO 9000 (AS 3900) series and the broader approach of Total Quality Management. Based on an exploratory survey of approaches to quality in 15 organisations several alternative options which may be used to pursue ISO 9000 and TQM are identified. These typology's are then analysed using data from a questionnaire survey of Western Australian organisations, some with ISO 9000 and no TQM and some with both.

2. ISO 9000, TQM and the Linkages

The International Organisation for Standardisation (ISO) developed the ISO 9000 series in the mid 80's and these standards are now accepted internationally as an approach to quality systems. In general, the standards describe a number of issues on which the quality system of an organisation can be assessed by an external party (a certification institute, which itself has been accredited by a National Accreditation Body), and if the quality system conforms to these (minimum) standards than a certificate can be issued and formal registration takes place which indicates that the quality system meets the requirements of the ISO 9000 series. An ISO certificate does not guarantee that the processes or the products are of the highest quality, it only states that there is a system in place which provides confidence that the organisation will be consistent in their management processes. Because of the need to describe procedures and to keep track of non-compliances, ISO is often seen as a bureaucratic process involving manuals and record keeping.

The ISO 9000 series cover three standards for which external certification is possible (ISO 9001, ISO 9002 and ISO 9003, differing in the scope of activities within the organisation for which certification is claimed, see table 1). The ISO 9000 standard is a guideline for helping to choose one of the three standards. ISO 9004 provides the background and philosophy behind quality systems and can be a good starting point to develop an organisation's quality system. A specific version of the ISO 9004 guidelines have been developed for services. ISO 9004 places the quality system in the perspective of Total Quality Management (TQM).

To describe TQM is much more difficult than outlining the prescriptive ISO standards. TQM is more or less a philosophy which includes a package of concepts. Examination of the papers and books on TQM highlight a few principles (continuous improvement, customer orientation, involvement of employees, involvement of suppliers, data driven, process orientation) which form the core concepts, and a large variety of instruments and organisational arrangements (such as, quality improvement teams, quality management self-assessment, quality function deployment, quality policy deployment, and many others) to develop TQM activities and to give the core concepts meaning in the practical situation. Furthermore several techniques (like the seven statistical tools, t h e s e v e n n e w

management tools, design of experiments) have been developed to be used in these activities.

Table 1
The ISO 9000 Series

ISO 9000	A guideline for the selection & use of quality management & quality assurance standards.
ISO 9001	A model for the assurance of quality systems for design & development, production, installation, & servicing.
ISO 9002	A model for the assurance of quality systems for production & installation.
ISO 9003	A model for the assurance of quality systems for final inspection & test.
ISO 9004	Guidelines for quality management & quality system elements.

The philosophy of TQM is dynamic, based on continuous improvement and change and usually aims at the highest quality in processes, products and services. It has much to do with culture and the attitudes and behaviour of everyone in the organisation, trying to make use of knowledge of employees as much as possible. table 2 gives a comparison between ISO and TQM.

The relationship between ISO and TQM can be illustrated by placing ISO in the perspective of the award models (eg, the Australian Quality Awards model, the Malcolm Baldrige National Quality Award model, the European Quality Award model). The overlap between the ISO criteria and the criteria of these award models covers mostly the *Processes* category of the award models. From the viewpoint of ISO, processes have to be described in procedures and defects have to be handled in a way also described in a procedure. The TQM view of processes is much more focused on understanding them and reasons for variations. Developing 'profound knowledge' as was the message of Deming (1986).

Thus, ISO and TQM have different goals and different perspectives. Generally speaking, ISO 9000 is part of the total quality concept and may or may not be seen as a pre-requisite for broader issues of quality. There are also different reasons why companies seek one or both of these.

Table 2
Differences Between ISO and TQM

ISO 9000 Certification	TQM Approach
Standardisation of activities	Continuous improvement
Audits to ensure compliance	Self-assessment to find opportunities for improvement
Statistical tools as techniques	Statistical tools to understand variation in processes
Bureaucratic because of written down procedures & quality manual	Culture orientation & high involvement of people
Responsibility of quality (assurance) manager	Responsibility & role of top management
Conformity to specifications	Customer satisfaction & customer enlightenment
ISO certification gives a concrete goal	A never ending TQM journey
Internal orientation on processes	Orientation on organisation & relations within & outside the organisation
Focusing on quality goals based on internal capabilities	Focusing on goals based on external benchmarks

3. Relevant Literature and Previous Research

A number of papers have been written on the link between ISO and TQM. Most of these reflect personal opinions of quality managers or consultants or are based on a certification project in a specific company. Most research has been done in Europe and especially in the United Kingdom. This is probably understandable since the ISO standards are based on the BS 5750 standards which were already in place in the UK in 1979, which explains why the number of certified companies in the UK is rather high.

There seems to be no general agreement on several points. Some are supporting the idea of starting with ISO as the first step towards TQM (Bradley 1994), others don't believe in this approach and prefer to focus only on TQM (Binney 1992). Others are convinced that TQM activities will more or less automatically follow after ISO (Sheard 1992), or be forced by the regular external audits that will take place after certification (Sakofsky 1994). The ISO certification has also been more critically viewed as *a* path to TQM and not *the* path (Corrigan 1994).

Research by Taylor (1993) in Northern Ireland shows strong linkages between TQM and quality assurance. For example, he found that 33% of organisations who had introduced ISO 9000 also had TQM in place and of those who didn't, 43% were either planning to introduce TQM or were considering it. On the other hand, 42% of organisations with TQM were planning to introduce ISO 9000. Studies of the benefits of quality assurance are limited. Taylor's survey of organisations with ISO 9000 in Northern Ireland found respondents somewhat

reluctant to measure and quantify the benefits of certification. He attributed this to the fact that they were driven to certification largely by external forces. Of those who did, some felt that it had cost more than the realised benefits, while those who had been certified for some time considered that it had saved money.

A survey of 1500 organisations in Scotland was conducted by Durham University Business School (Witcher 1993) in 1993, producing 650 useable responses. Of the respondents 80% had achieved certification or were aiming for it. The main reasons for becoming certified for organisations without TQM were: customer demands and the need to improve organisational performance. For organisations with TQM the main reason had been TQM itself. A very high rate of TQM adoption (65% in place or started) was found in the sample.

Lloyds Register Quality Assurance (1994) commissioned a survey in the United Kingdom to determine why organisations obtain quality management system registration, what effect it has had on their business (both internal and external), and the future of ISO 9000. The study was conducted by Research International, and based on interviews with 400 quality managers and senior managers. One of the main conclusions of the study was that 'Like a fine wine, the benefits of ISO 9000 registration improve with age'. The majority of the respondents saw ISO 9000 as a complement to TQM, found the results exceeding their expectations, defined it as a valuable public relations and marketing tool, and mentioned an increase in the ability to bid for contracts. A large minority of the respondents found increased market share, thought that the certification has helped to go into international markets and now had fewer customer audits. Only a very few respondents were negative about the increase in paperwork and the costs involved with certification. Also the majority of respondents of smaller firms have defined ISO certification as beneficial.

A total of 647 organisations participated in the research of Vanguard Consulting Ltd (1994). From this research the conclusion was that organisations which reported success with BS 5750 implementation went about it with broader purposes than those which took it for reasons of obligation (customers demanding it) and opportunism (to gain market share). In this sample, the majority of the respondents were more critical about the standards and the available knowledge (with managers as well with consultants) to implement a quality system according to the standards.

While some limited research has been done on the relationship between TQM and ISO certification the findings do not show any consistent patterns and the UK may not be representative of developments elsewhere because of the large number of companies already registered there.

4. The Research Project

The research project reported here aimed to explore the linkages between ISO and TQM in an Australian context. The questions were:

- Do organisations proceed with TQM after ISO?
- Was TQM already in place before ISO, and how does this influence the decision to implement ISO?
- What comparisons can be made with those organisations who sought accreditation either with or without TQM already in place?
- To what extent are TQM and ISO seen and used as complementary?

The research was conducted in two stages. In the first stage, interviews with either the general manager or quality (assurance) manager, a questionnaire and examination of company materials where available was used to explore and examine how organisations approached ISO 9000 and TQM.

The sample for the first stage consisted of organisations which have been certified to ISO 9001 or ISO 9002 for at least one year. This was considered necessary because the enthusiasm of reaching the goal of certification itself would influence the response and on the other hand results and effects from certification will generally take some time to materialise. A small number of organisations were selected from the list of all certified organisations in Western Australia, which included over 500 organisations (Department of Commerce and Trade 1994).

One subgroup was selected at random from the list with the following restrictions: these organisations had to be located in the Perth metropolitan area, have been certified for at least one year and were not known by us for having in place ongoing TQM activities. This created a subgroup of ten companies.

Another subgroup was selected by using the list of companies who had received NIES 'TQM-How To' funding. To this list we added organisations in this area which were known for having in place broader TQM activities. These organisations were again checked with the certification list of over 500 to see if certification had been received and had been in place for at least one year. This created a second subgroup of ten organisations.

The 20 selected companies were approached by telephone and 15 organisations agreed to participate in the project within the time limits that were in place. The nature of the organisations involved in this project are listed in table 3.

Based on the results of the first stage, the questionnaire was modified for the second stage, and sent out in 1994 to all 500 certified companies in Western Australia. The response on this survey was 32%, which gave us 160 complete responses. The questions in the questionnaire were focused on: the reasons to seek certification, realised improvements from certification, disappointments with ISO certification, and questions on the relation between ISO and TQM and TQM activities before, during or after the ISO certification. This stage allowed a more detailed statistical analysis of the factors related to the link between ISO and TQM.

Several limitations to this type of survey need to be borne in mind. Firstly, the respondents were self reporting on their own quality management activities. In line with the earlier discussion concerning terminology, some ambiguity may exist in the minds of the respondents which might influence responses, although most would be able to differentiate between ISO and TQM.

Secondly, the survey only considers the views of those organisations who have achieved ISO 9000 certification. There are many who have implemented some form of TQM and may not have found the need to go for QA.

Table 3
Interview Sample

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1. Alcoa of Australia Limited (ALCOA)
 2. Australian Pacific Airconditioning Manufacturing (APAC)
 3. Barclay Mowlem Resource Engineering Group (BMRE)
 4. BHP Kwinana Wire Mill & Waratah Wire Products (BWP)
 5. BHP Reinforcing Products (BRP)
 6. Boral Concrete, Resources WA Limited (BCR)
 7. Commonwealth Industrial Gases Limited (CIG)
 8. CSR Gyprock Bradford (CSRG)
 9. Gromark Packaging Pty Ltd (GP)
 10. Main Roads Western Australia (MRSW)
 11. Solahart Hardie Energy Products Pty Ltd (SHEP)
 12. Telecom Australia, Corporate & Government Quality Group (TCG)
 13. Total Fastener Co. (TFC)
 14. Water Authority of Western Australia (WA)
 15. Wood & Grieve Engineers (WGE)
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5. Approaches to ISO and the Relationship to TQM

From the sample of 15 organisations it was difficult to identify a standard approach to ISO and TQM. Most had different approaches: the organisations differed of course in size, product, processes, type of industry, type of customers, etc, but there were also many other differences between these 15 organisations including; starting from different quality maturity levels, seeking ISO certification for different reasons, working to certification with different aspirations and perceiving benefits after certification in many different ways. Nevertheless, for discussion purposes, three broad approaches have been identified, namely; ISO certification first, ISO and TQM simultaneously and TQM first. Features of each are outlined below. There are also organisations who have TQM but choose not to seek ISO 9000 certification and are not considered here.

5.1 ISO Certification First

Three approaches used by organisations who pursue ISO certification before TQM can be identified here. Organisations may see themselves as being forced to pursue ISO and decide to either not proceed any further or secondly they may proceed to TQM following certification. A third option is that an organisation may willingly pursue ISO and ultimately develop TQM. Features of each approach are outlined below.

Minimalists (Forced ISO, No TQM) These organisations are unlikely to have had TQM in place prior to ISO 9000 and are unlikely to move to a TQM approach as a consequence of gaining certification. Features of organisations in this group include:

- considered that they are forced to become certified, either by Government policies or customers;
- find few benefits from certification and consider it to be a costly exercise;
- often use outside consultants to assist in preparation for certification;
- limited involvement of employees at all levels during the development of procedures and manuals;
- usually smaller organisations;
- the quality system is usually seen as the responsibility of the QA manager;
- employees will not believe in and make use of the system.

Converts (Forced ISO, and TQM) These are initially sceptical about certification, and usually feel forced to become certified, but in the process of doing so have found beneficial outcomes, mainly of an internal nature such as making people think about quality or improving systems. Many find that the process of involving employees in the ISO process prepares the way for further progress down the quality maturity path. They, like the cynics, are unlikely to have had TQM prior to moving down the ISO 9000 path. Characteristics of this approach to ISO and TQM are:

- the goal of the organisation is to develop a useful and workable quality system;
- employees are involved in developing the procedures and work instructions;
- attention is given to make employees aware of the importance of the system and how to use the system;
- a positive perception of the benefits for the organisation of a quality system;
- usually feel pressure from external sources to get ISO 9000;
- because employees have been involved in developing the system, it will be easier to maintain it and make it work;
- there is still a chance that the system will degenerate and the organisation will fall back to the old way of working;
- may go for ISO 9000 with the view that an external audit related to ISO could stimulate the adoption of the system internally.

Committed/Wider View of Quality (Voluntary ISO and TQM) These organisations embark on ISO 9000 because they see it as a means of improving business operations and efficiency rather than being purely market driven. Others see QA as an essential first step in moving into TQM. Features may include:

- have some aspects of a quality system in place prior to seeking certification, for example, in a department;
- see ISO certification as a small part of the total quality drive;
- don't see ISO 9000 as a major contributor to business success. It is not seen as a recipe for customer satisfaction or expanding market shares;
- often formulating and documenting good practices already in existence;
- rely on internal people to develop manuals, etc.

5.2 *Simultaneous ISO and TQM*

The committed group as described above may also fall into this category if they embark on both QA and TQM simultaneously. Another alternative might be to embark on both ISO certification and TQM at the same time but for different reasons.

Organisations in this group may have only recently discovered the potential benefits of both ISO and TQM and have made a decision that both are required to advance the quality drive. They consider that one without the other will not maximise benefits and that pursuing ISO provides a more tangible, measurable and external measure of quality systems while TQM provides support for a more general approach to quality by developing an organisational culture.

5.3 *TQM First*

Organisations falling into this category typically have commenced TQM some time ago, for example, at least three years ago, before ISO had become such a significant issue. In the past few years they have been put under pressure to gain ISO certification either because their customers are demanding it, they are seeking to enter markets where it is required (eg, government contracts) or they are expecting their suppliers to be certified. The latter situation is perhaps more frequently seen in governmental organisations and public agencies who have moved to a purchasing policy which requires suppliers to be certified. Features of these organisations may include:

- public sector organisations;
- larger private organisations;
- may be considering applying for a quality award;
- only parts of the organisation may be certified;
- may operate in overseas markets;
- have generally had TQM in place for three or more years.

5.4 *Testing the Typology on the Western Australian Database*

The approaches to ISO and TQM identified above were tested on the responses to a questionnaire survey sent to a sample of 500 certified companies in Western Australia. The response rate to this was 32%. To analyse the significant differences in the responses on the survey questions, factor-analysis was used to reduce the number of variables and to create stronger patterns in the responses. Thereafter criteria were defined to separate the different samples according to the types as defined earlier. Then, a *t*-test was used to find differences within the sample. The results have to be compared with the hypotheses which were formulated (as features) for the different types.

Factor Analysis For all the questions with multiple items for which the respondent was asked to score on a five point scale from 1 to 5, factor analysis has been used. The Kaiser-Meyer-Olkin test, and Bartlett's test for sphericity has been used to determine if the correlational matrix was suitable for factor analysis. These tests confirmed the use of the correlational matrix as appropriate for factor analysis except on two questions of the questionnaire (see table 4). If factor analysis was not appropriate, then the separate items have been used for further analysis.

The number of factors has been defined based on the eigenvalues (> 1.0) in conjunction with the scree-test. Thereafter reliability tests were carried out to see if the factors exhibit internal consistency. The factor analysis gave the factors summarised in table 4.

Criteria Used in Creating Subgroups

Three questions in the questionnaire are important in creating subgroups related to the typology developed. These questions are:

1. Did you have TQM before seeking certification? (No/Yes)
2. Did you seek certification and embark on TQM at the same time? (No/Yes)
3. After certification, did you continue the quality journey with TQM activities? (No/Yes)

Respondents with 'No' on all three questions are defined as Type 1 [Minimalists (forced ISO, no TQM)]. Respondents with 'Yes' on the second question are defined as Type 4 (Simultaneous ISO and TQM). Respondents with 'Yes' on the first question are defined as Type 5 (TQM first, then ISO).

Respondents who answered question 1 and question 2 both with 'No' and question 3 with 'Yes' together form a cluster of Type 2 and Type 3. To split this cluster we used the question related to the reasons to seek certification. The factor covering 'external reasons' is used as the measure to create two subgroups. Those respondents with a mean value for the 'external reasons' factor above the mean for the entire cluster create the subgroup Type 2 [Converts (forced ISO, then TQM)]. Another subgroup with a mean value for the 'external reasons' factor below the mean value for the cluster create Type 3 [Committed (Voluntary ISO, then TQM)].

In this way the total sample could be divided in the five subgroups related to the typology as described earlier. In table 5 the frequencies for the subgroups are summarised.

Table 4
Results of the Factor Analyses

	KMO	Bartlett	Alpha	Mean	Std. Dev	N
• Reasons to seek certification:						
KMO–test/Bartlett’s sphericity significance	0.80	0.00				
Factor 1 (8 items covering internal reasons)			0.87	3.03	0.92	139
Factor 2 (5 items covering external reasons)			0.54	3.62	0.75	144
• Reasons to choose certification institute:						
KMO–test/Bartlett’s significance	0.44	0.00				
No factor solution is created						
• To what extent have improvements been realised from certification:						
KMO–test/Bartlett’s significance	0.90	0.00				
Factor 1 (4 items covering efficiency)			0.90	3.05	1.03	155
Factor 2 (8 items covering awareness & motivation)			0.91	3.48	0.79	142
Factor 3 (4 items covering org. control & structuring)			0.79	3.40	0.79	151
Factor 4 (2 items covering ‘stay in business’, ‘not excluded from tenders’)			0.64	3.10	1.18	153
Factor 5 (4 items covering ‘staff retention’, ‘public relations’, ‘reduction in customer audits’, & ‘maintain quality system’)			0.64	2.66	0.80	139
• To what extent have there been disappointments:						
KMO–test/Bartlett’s significance	0.78	0.00				
Factor 1 (5 items covering ‘ISO difficulties’)			0.78	3.05	0.91	151
Factor 2 (4 items covering ‘ISO results’)			0.59	2.87	0.84	138
• To what extent do you agree with statements regarding the relation between ISO & TQM:						
KMO–test/Bartlett’s significance	0.52	0.00				
No factor solution is created						
• To what extent have improvements been realised during the recent three years (scale 1 to 3):						
KMO–test/Bartlett’s significance	0.85	0.00				
Factor 1 (7 items covering internal efficiency & effectiveness)			0.80	2.45	0.38	139
Factor 2 (9 items covering human resources)			0.79	2.42	0.33	137
Factor 3 (5 items covering financial issues & market share)			0.85	2.38	0.45	136

Table 5
Frequencies for the Subgroups

	Sample Size	Percentage
Type 1 (Minimalists)	79	49%
Type 2 (Converts)	14	9%
Type 3 (Committed)	13	8%
Type 4 (Simultaneous ISO & TQM)	21	13%
Type 5 (TQM first, then ISO)	22	14%
Missing	11	7%
Total sample	160	100%

Groups can be distinguished with 49% of respondents in the sample for which their company can be defined as Type-1 (minimalists). In these companies ISO has been sought because of external pressure and generally no TQM activity will follow certification. For these companies ISO is just the certificate on the wall. Because the other types have much smaller samples, a *t*-test has been carried out to see if differences can be found between the minimalist (Type-1) on the one hand and on the other hand all the other types where TQM is either an issue before, during or after certification.

t-Tests

The *t*-test shows if the mean values on variables are significantly different between two groups in the sample. The two groups for which the *t*-test was performed are:

- companies where only ISO is an issue and no TQM activities take place before, during or after certification [Type-1, the minimalists (number of respondents 79)];
- companies where TQM activities are taking place before, during or after certification [Type-2, Type-3, Type-4 and Type-5, all together (number of respondents 70)].

All differences are summarised below in table 6 for which the significance level is < 0.05 .

Table 6
Significant Differences Between *ISO Only* Companies
and *ISO and TQM* Companies

Variables/Factors	Mean Values		
	Type 1	Type 2, 3, 4, 5	Two-tailed <i>p</i> -value
• Reasons to seek certification (high score is very important reason):			
Factor 1 (internal reasons)	2.86	3.21	0.027
• To what extent have there been disappointments (high score is strongly disappointed):			
Factor 1 ('ISO difficulties')	3.20	2.88	0.043
Factor 2 ('ISO results')	3.08	2.62	0.002
• Agreement with the following statements (high score is totally agree):			
ISO & TQM are complementary	3.50	3.96	0.008
It is best to start with ISO & later TQM	3.90	3.33	0.012
It is best to start with TQM & later ISO	1.96	2.48	0.021
It is best to start ISO & TQM simultaneous	2.06	2.45	0.046
• Number of employees (scale 1–9)	1.88	2.64	0.002
• Annual sales turnover (scale 1–6)	4.20	4.80	0.003

From table 6 a number of significant differences are found in our sample between the *ISO only* and the *ISO and TQM* companies.

It is clear that the smaller companies belong more often to the first type, the minimalists, where the focus is only on the ISO certificate and not on TQM activities. Understandably, there is a significant difference in number of employees as well as in the annual sales turnover.

Secondly, as might be expected, the minimalist companies are more often pressured by external reasons to seek ISO certification. These reasons in order of importance are: to maintain/increase market share; to be considered for tenders; to stay in business; to gain market benefits; and to anticipate customer requirements in the future.

Thirdly, the minimalists are more disappointed with the results of certification: no increase in business as expected is found, no reduction in customers audits, questionnaires for customers still have to be filled in, and some customers who said they required ISO still use suppliers which don't meet that requirement. The minimalists are also disappointed by the difficulties in getting the certificate: considerable paperwork, high costs involved in developing the quality system, the standard was difficult to interpret, and they found difficulties with regard to the consistency of assessors.

Fourthly, minimalists score significantly lower on the statement that ISO and TQM are complementary. However the score is still relatively high (3.50 on a five point scale from 1 to 5) which might reflect the general opinion that ISO is linked to TQM. The score for the minimalists on the statement that it is best to start with ISO and later on embark on TQM is even significantly higher than for the rest of the sample, however this does not reflect the activities in such companies after

certification. Companies where TQM activities are present have a strong opinion that ISO and TQM are complementary and that it is best to start with TQM or at least start TQM and ISO at the same time.

Scheffé-test To further examine all five types the Scheffé-test has been used as a more stringent test on significant differences between the types of organisations from our typology dealing with ISO certification. The results from this test are summarised in table 7.

Table 7
Significant Differences Between the Five Types Based on Scheffé-Test

Variables/Factors	Means					Significance ¹
	Type -1	Type -2	Type -3	Type -4	Type -5	
• Reasons to seek certification (high score is very important reason):						
Factor 2 (external reasons)	3.65	4.18	2.86	3.56	3.62	1-3; 2-3
• To what extent have there been disappointments (high score is strongly disappointed):						
Factor 2 ('ISO results')	3.08	3.01	2.20	2.59	2.61	1-3
• Agreement with the following statements (high score is totally agree):						
ISO cert. good first step towards TQM	4.01	4.28	3.92	4.17	2.73	1-5; 2-5; 3-5; 4-5
It is best to start with ISO & later TQM	3.90	4.14	4.00	3.23	2.36	1-5; 2-5; 3-5
It is best to start with TQM & later ISO	1.96	2.00	1.92	2.06	3.57	1-5; 2-5; 3-5; 4-5
It is best to start with ISO & TQM simultaneous	2.06	2.14	2.00	3.12	2.42	1-4
• Has the organisation been registered to ISO (9001=1, 9002=3, 9003=3):						
Total organisation	1.89	1.91	1.42	2.07	1.76	1-3; 3-4
• Number of employees (scale 1-9)	1.88	1.64	3.30	2.66	2.86	1-3
• Annual sales turnover (scale 1-6)	4.20	4.27	5.00	4.60	5.20	1-5

Note: 1. Significance level $p < 0.05$.

Some conclusions can be drawn from table 7. First of all the significant differences which are found are somewhat mixed. One of the reasons might be that the sample size is too small and the number of responses for each of the types too low. Another reason might be related to the typology itself and the problems in defining TQM.

The differences found show that external reasons to seek certification are not only important for the minimalists, but also for companies which started with TQM activities or where TQM and ISO have been started at the same time. It may be that those with TQM well in place are forced to seek ISO to enter particular markets or seek contracts as suppliers where it is required.

Another significant difference is that companies which were forced to get the ISO certification are much more disappointed about the results of certification. The lesser the pressure from outside to seek certification, the lesser the disappointment there is with the results of certification. Of course this result relates to association and not to causation.

Type-5 companies are really convinced that TQM is more important than ISO certification and that it is best to start with TQM and later on embark on ISO if there is a good reason to do that.

Companies of Type-3 (voluntary start with ISO and continuation with TQM activities after certification) focus relatively more on the ISO-9001 guidelines than companies of the other types. These companies seem to seek ISO certification voluntarily and don't take the easiest way, but focus on the broadest norms of the ISO-9000 series.

6. Conclusions

This paper reported research which explored some of the linkages between two quality concepts, namely, ISO 9000 (or QA) and TQM. Whilst not mutually exclusive, many organisations tend to see them as separate entities and pursue them for different reasons. Others consider them as different elements of a broader view of quality. Several possible approaches which organisations might adopt in implementing these were proposed and then tested using data obtained from a survey of Western Australian organisations who had achieved ISO certification.

The following possible approaches to ISO 9000 and TQM were considered:

- Implementing ISO 9000 before TQM either as:
 - forced ISO, no TQM (minimalist approach);
 - forced ISO, then TQM (converts);
 - voluntary ISO, then TQM (committed);
- Simultaneous implementation of ISO and TQM;
- Implementing TQM first, then ISO.

The data supports the notion that organisations might adopt different approaches to TQM and QA although the clearest distinctions which can be made are those between organisations who seek only ISO 9000 and those who take a broader perspective on quality such as TQM. Due to small sample sizes for some types, full statistical analyses on all five types was limited and somewhat inconclusive. Given that this is an observational study where associations rather than causalities are being reported, further research may unearth further linkages between some of the variables identified here.

At one end of the quality spectrum are organisations which can be labelled as minimalists. This was the largest sub-group identified with about half of the survey respondents fitting into this and may be partly attributed to the fact that the sample was derived from a list of ISO certified companies. On the whole, these organisations are generally smaller and feel more pressured from external sources to seek ISO 9000. These also feel disappointed with the outcomes of certification, which they consider have not met their expectations and have found the process of gaining certification to be a costly exercise.

At the other end are those who are committed to quality and are likely to have both ISO and TQM. They are driven more by an internal desire to improve quality and performance. They may also feel compelled to implement ISO 9000 because of external pressures but are not expecting major benefits from it. Most in this group are large public or private sector organisations.

There is also a third group who whilst they feel compelled to seek ISO 9000 certification for various external pressures actually experience internal benefits from it. In particular, where employees have been actively involved in the process, the general level of quality awareness is raised. This then makes it easier to pursue further quality initiatives such as TQM. Furthermore, the quality system is a working system since it has been largely developed by employees rather than outsiders.

What seems to be clear is that many companies are forced to seek ISO certification and have to a large extent experienced disappointments with the results of certification. However, nearly 50% of the companies surveyed either had some TQM activities before certification, introduced it simultaneously during the development of the ISO system, or after certification. This augers well for quality in general. Furthermore, many report ISO as being a useful start for introducing broader quality concepts in the organisation.

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