



Relationship of ISO 9001:2000 quality system certification with operational and business performance

A survey in Australia and New Zealand-based manufacturing and service companies

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Abstract

Purpose – This research paper aims to explore the relationship between ISO 9000 certification and organisational performance by developing an ISO 9000 relationship model.

Design/methodology/approach – A survey instrument was used for quantitative data collection based on a global survey in collaboration with the Anderson School of Business, UCLA. All items were measured on a five point modified Likert scale. The data were analysed statistically by means of Statistical Package for Social Scientists. Factor analysis was performed. Multiple regressions was used to test the hypotheses. Both validity and reliability of the measures were checked in order to reduce measurement error.

Findings – The results show a positive and significant relationship between certification practices (implementation, organisational commitment and planning) with operational performance. However, the relationship between these practices with business performance was found to be positive but not significant of the variables we studied, organisational commitment to certification was found to be most strongly related to operational and business performance.

Practical implications – The success of implementing ISO 9000 certification would be increased (operational and business performance) if it is well planned and implemented when the philosophical quality aspects of the organisation are coupled with employee training, periodic audits, corrective action and commitment at all levels of the organisation.

Originality/value – This paper's unique contribution to the literature is the rigorous research and analysis which statistically identify the best predictors for successful ISO 9000 implementation. The results demystify the confusion and contradictions which exist in the literature on the efficacy of ISO 9000 certification.

Keywords ISO 9000 series, Manufacturing industries, Service operations, Performance management, Australia, New Zealand

Paper type Research paper



1. Introduction

This paper contributes to our understanding of an important practical problem, namely the effectiveness and validity of ISO 9000 quality management systems, in explaining key factors in their implementation and achievement of business success. The wide acceptance of ISO 9000 has led to considerable interest in the research

literature (Boiral, 2003; Briscoe *et al.*, 2005; Gingele *et al.*, 2002). However, there are some conflicting findings on the bottom-line effects of ISO 9000 certification and the practices which lead to successful implementation. For example, Batchelor (1992) found that the benefits of certification were mainly procedural efficiency and error rate, but not related to increase in market share, staff motivation, or cost. Allan (1993) and Brown (1994) found that managers went back to “fire fighting” after ISO 9000 certification. Other studies questioned top management’s commitment and whether the certification process was necessary (Larson, 1977), considering the requirements of cost, time, paper work and customer needs. On the other hand, Highlands (1995) and Elmuti (1996) claimed that productivity, quality of product, and quality of work life improved due to ISO 9000 certification. In a major recent study published in *Management Science*, Corbett *et al.* (2005) clearly found a relationship between ISO certification and improved financial performance.

Several other studies have shown that implementing ISO 9001 does not appear to have led to improved financial performance of organisations (Aarts and Vos, 2001; Carr *et al.*, 1997; Lima *et al.*, 2000, Rahman, 2001). For example, Terziovski *et al.* (1997) found that ISO 9000 certification does not have a significantly positive relationship with organisational performance in either the presence or absence of a TQM environment. The principal motivation to pursue ISO 9000 certification was found to come from the customer. However, ISO 9000 certification can contribute to organisational performance if a climate of change is created. Where ISO 9000 certification is implemented effectively, it may act as a foundation on which to build a quality organisation. The study suggested that additional research is required in order to examine how this could be achieved.

In the last decade the ISO 9000 series quality system standards themselves have undergone considerable improvement. Whilst the aim of these latest ISO 9000 series standard remains to provide confidence that products and services conform established requirements, the new ISO 9001 standard has a clear objective to develop broader and deeper business excellence. Furthermore, organisations have gained more experience in implementing ISO 9001 quality management systems in the last decade. As a result, the key questions that have emerged from the literature review are:

- Does ISO 9000 certification have a significant and positive effect on organisational performance?
- What are the best predictors of organisational performance?

This study will address gaps in the literature by exploring the relationship between ISO 9000 certification and organisational performance. We explore the effects of ISO 9000 certification on two elements of organisational performance (operational and business). This paper’s unique contribution to the literature is the rigorous research and analysis which statistically identify best predictors for successful ISO 9001 implementation. The results demystify the confusion and contradictions that exist in the literature on the efficacy of ISO 9000 certification.

2. Literature review

This section narrates the important contributions of paper appeared in the direction of ISO 9000 certification under two main contents.

2.1 The motivation for implementing ISO 9000

The motivation for ISO 9000 implementation is often claimed to be a significant factor for business success. Empirical evidence shows that the motivation for undertaking ISO 9000 certification is often external reasons (such as, marketing advantages, customer expectation and competitive pressures), instead of internal reasons (such as improving the quality of products and services (Breka, 1994; Ho, 1994; LRQA, 1993). However, more recent research indicates that manager's motivation for seeking ISO 9000 certification has shifted significantly from external to internal reasons. For example, market related reasons for certification do not rank high as motivators to gain ISO 9000 certification (Breka, 1994; Feng, 2000; Gotzamani and Tsiotras, 2001). Companies which seek ISO 9000 certification for external reasons are likely to fail or gain fewer benefits because of their narrow focus. On the other hand, companies that seek certification to improve their quality of products and services tend to gain greater benefits from the ISO certification process.

2.2 Approaches for implementing ISO 9001

ISO 9001 is not intended as a detailed prescription for how quality is to be achieved, but rather as what needs to be done in a generic sense. In other words, gaining ISO 9000 certification does not guarantee quality of products and services, but rather it provides an assurance to customers that the organisation has conformed to an international standard (Brunsson *et al.*, 2000). Hence, rigorous research which statistically identifies best predictors for successful ISO 9001 implementation would add a significant contribution to the literature. The following key imperatives have been identified from the literature.

2.3 Planning

Many organisations especially small business fail to obtain full benefits from ISO 9000 certification because of an inadequate or outdated implementation plan (Mears and Voehl, 1995). The literature is consistent in finding that planning is considered to be vital in the successful implementation of ISO 9001 quality management system. Planning for ISO 9001 implementation involves preparation and development of a quality management system for an organisation (Briscoe *et al.*, 2005; Brown, 1993; Lamprecht, 1992; McTeer and Dale, 1995).

Furthermore, ISO 9000 certification requires a short-term plan for the implementation process and a long-term plan for sustaining the effort. These plans should be integrated into overall business planning to allow organisations to apply ISO management systems effectively (Rao *et al.*, 1997). This includes top management commitment, education and training, documentation and organized resources. McTeer and Dale (1995) indicates, that progress by a company toward ISO 9000 certification is only made when the demands of motivation, information, resource and planning come together.

2.4 Commitment

The ISO 9000 series standard refers specifically to the need for commitment from all organisational members at all stages of the process (ISO, 2000). The importance of organisational commitment is generally accepted by management theorists and practitioners. Meyer and Allen (1997) propose three factors of the employees' relations with the organisational commitment: affective, continuance and normative. Affective commitment refers to emotional attachment and involvement of individuals to organisation.

Continuance commitment is consideration of costs associated with leaving or the rewards for staying with the organisation. Normative commitment is associated with the feelings of obligation to remain in employment. Studies suggest that committed workers contribute to the organisation in more positive ways than less committed employees (Meyer and Allen, 1997).

Organisational commitment involves a range of people within the organisation such as top management, work unit employees and organisation itself. Many studies conclude that organisational commitment is related to valuable outcomes for both the employee and employer, such as increased employee morale, reduced stress and improved productivity (Mathieu and Zajac, 1990; Meyer and Allen, 1997; Mowday, 1998).

Brown and van der Wiele (1998) found that lack of commitment from employees and managers is the most frequently mentioned problem faced by Small to Medium Enterprises (SMEs) in implementing ISO certification. This view is supported by a number of studies (LRQA, 1993; Quazi and Padibjo, 1997; Weston, 1995). Convincing both managers and employees of the future benefits arising from certification and dealing with a general level of indifference was reported as being a major challenge. Brown and van der Wiele (1998) also found that training of employees and managers is one of the primary methods of dealing with problems faced by organisations during the development of quality management systems.

2.5 Implementing procedures

The challenges of implementing ISO 9000 certification have been previously studied. According to Zink (1994) and Briscoe *et al.* (2005) many SMEs have experienced considerable problems with the introduction, development and measurement of ISO 9001 quality management systems. Some studies found that SMEs have more difficulties in practising quality assurance due to the limited resources available to them and the significant costs required to maintain the level of documentation (Allen and Oakland, 1998; Dale and Duncalf, 1984). Lee and Palmer (1999) also noted that not only the difficult to keep documentation updated, but it is also a change to monitor employees' day-to-day adherence to the standards. Therefore, a large amount of managerial time and effort is required to maintain the ISO 9000 certification. These studies concluded that many SMEs do not realise the full strategic importance of quality. Although some SMEs experience disadvantages with ISO 9000 certification (Mendham *et al.*, 1994; Ollila, 1995), there is evidence from the literature that ISO 9001 quality systems have been successfully implemented in many SME sectors particularly manufacturing (Gotzamani and Tsiotras, 2001; Miller, 1993).

3. Theory and framework

A theoretical framework was developed based on the literature review (Brown and van der Wiele, 1998; Mears and Voehl, 1995; Meyer and Allen, 1997; Zink, 1994) and a survey instrument developed based on a global survey in collaboration with the Anderson School of Business, University of California, Los Angeles. The framework consists of three basic components:

- (1) planning for ISO 9000 certification;
- (2) organisational commitment; and
- (3) implementing procedures.

These components incorporate the views of respected practitioners and experts in the field such as Deming (1986) as well as best practice examples, indicating a number of critical factors for success.

Organisational performance is a recurrent theme in theory of management and is of significant interest to academics and practitioners (Venkatraman and Ramanujam, 1986). Factors such as employee satisfaction, customer satisfaction and business results are linked to the organisational performance construct (Hanna, 1998; Madu *et al.*, 1999).

Organisational performance was measured in the two dimensions for the purpose of this study, namely operational performance and business performance:

- (1) *Operational performance.* The performance related to organisations' internal operation, such as productivity, product quality and customer satisfactions.
- (2) *Business performance.* The enlarged domain of performance related to financial and marketing, such as sales growth, profitability and market share.

Based on literature review, the hypotheses will be tested on the strength of relationships between implementation of ISO 9001 quality management systems and organisational performance.

Within the theoretical framework we have identified independent and dependent variables in the relationship as shown in Figure 1. Several hypotheses have been articulated based on Figure 1 in an attempt to gain a greater understanding of the relationship between the implementation of ISO 9000 quality management systems, and organisational performance relating to planning, implementing procedures and organisational commitment. The following hypotheses will be tested in this study:

- H1.* There is a significant and positive relationship between implementing procedures of ISO 9000 certification and operational performance.
- H2.* There is a significant and positive relationship between implementing procedures of ISO 9000 certification and business performance.
- H3.* There is a significant and positive relationship between organisational commitment to implementing ISO 9000 certification and operational performance.
- H4.* There is a significant and positive relationship between organisational commitment to implementing ISO 9000 and business performance.

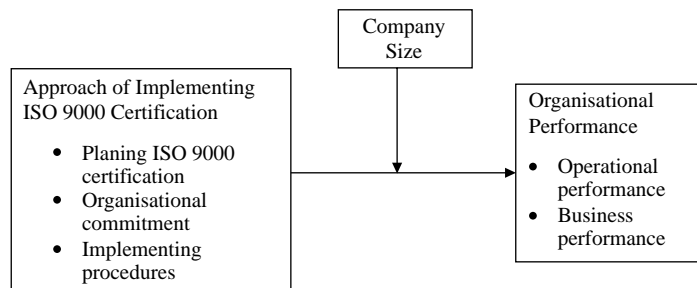


Figure 1.
ISO 9000 relationship
model

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- H5. There is a significant and positive relationship between planning for ISO 9000 certification and operational performance.
- H6. There is a significant and positive relationship between planning for ISO 9000 certification and business performance.
- H7. The relationship between implementation of ISO 9000 and organisational performance strengthens when covaried for company size.

4. Methodology

A survey instrument was used for quantitative data collection based on a global survey in collaboration with the Anderson School of Business, UCLA. All items were measured on a five point modified Likert scale. The questionnaire was specifically designed to seek responses from CEOs or the most senior personnel responsible for quality management systems at the site.

The data were analysed using the Statistical Package for Social Scientists (SPSS) for Windows version 10.0. Factor analysis was performed. Multiple regressions was used to test the hypotheses. Both validity and reliability of the measures were checked in order to reduce measurement error.

4.1 Samples

Survey instrument was posted to 3,000 randomly sampled ISO 9001: 2000 certified manufacturing and service organisations in Australia and New Zealand. About 613 valid replies were received yielding a response rate of 22 per cent after returns are factored out (Table I).

The majority of responses were from companies' managers and/or directors. Approximately, 48 per cent of the sample organisations had a quality manager responsible for ISO 9000 certification. It was also found that 30 per cent of organisations responsibility for ISO 9000 certification resided with either the CEO, managing director or general manager. Over 14 per cent of respondents were site or departmental managers, such as operation manager, finance/marketing manager and customer service manager. The category "other"- over 7 per cent, consisted of a range of roles such as business process improvement manager, national risk manager, knowledge manager, business excellence advisor, management consultant, audit administrator, company secretary, and owner.

4.2 Organisational size and type

Organisational size was measured both on the basis of number of employees and revenue. Organisations were classed as small, medium or large. In this study, analysis was conducted using small, medium and large size categories of 1-19 employees, 20-99 employees, and 100 + respectively. Participating organisations were requested to indicate the number of employees that were engaged at each site in Australia, New Zealand and worldwide.

Country	Mailed out	Return to sender	Sample size	Respondents	Response rate (per cent)
Australia	2,700	161	2,539	551	22
New Zealand	300	17	283	62	22

Table I.
Statistics on response

The frequency analysis revealed that approximately 74 per cent of ISO 9000 certified companies employed less than 100 people, 24 per cent of ISO certified companies employed between 100 and 499 employees and less than 5 per cent of certified sites employed more than 500 people. Furthermore, 40 per cent of respondents were from the service sector, 47 per cent from the manufacturing sector, the remainder of the respondent companies (around 13 per cent) were from other sectors (Figure 2).

4.3 *Validity and reliability*

Information about reliability and validity was necessary in order to determine whether the five categories of the relationship shown in Figure 1 were stable and accurate and whether they truly measure what they set out to measure.

4.3.1 *Validity.* According to Hair *et al.* (1995) validity is the degree to which a measure accurately represents what it is supposed to. Three types of validity were considered in this study: content, construct and criterion validity. These three are discussed below.

4.3.2 *Content validity.* A category is considered to have content validity if there is general agreement from the literature that the ISO 9001 standard has measurement items that cover all aspects of the variable being measured. Since, selection of the initial measurement items was based on extensive review of international theoretical and empirical-quality management literature, it was considered to have content validity.

4.3.3 *Construct validity.* A measure has construct validity if it measures the theoretical construct that it was designed to measure. The construct validity of each category was evaluated by using principal components factor analysis (Hair *et al.*, 1995). The results in Tables II and III show that all those items which had factor above 0.5. As such, they can be considered as demonstrating a high level of significance (Hair *et al.*, 1995). Factor analysis resulted in two dependent variable constructs and three independent variable constructs.

4.3.4 *Criterion validity.* Criterion validity is also known as predictive validity or external validity. It is concerned with the extent to which a particular measure predicts or relates to other measures. In this study, the criterion related validity of the ISO 9000 relationship model was determined by examining the multiple correlation coefficient computed for the three categories and a measure of organisational performance (Tables II-IV). This indicates that, the three categories have a reasonable degree of criterion-related validity when taken together.

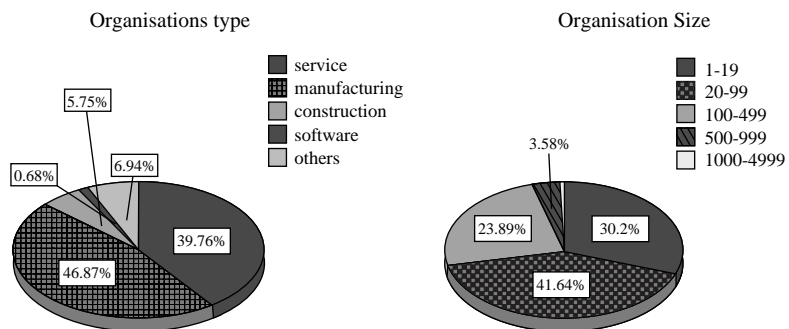


Figure 2. Organisational size and type

Independent variables	Factors loading	Reliability of revised construct (α)
Factor 1: implementing procedures		0.816
Periodic audits	0.719	
Following standard procedures	0.784	
Implementation of corrective action	0.731	
Factor 2: organisational commitment		0.747
Top management commitment	0.716	
Middle management commitment	0.698	
Worker's commitment	0.551	
Trades unions' commitment	0.548	
Factor 3: planning ISO 9000 certification		0.745
Identification of quality aspects	0.665	
Documentation	0.746	
Training	0.598	
Capital investment	0.559	
Defining standard procedures	0.697	

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Table II.
Factor analysis results:
independent variables

Dependent variables	Factor loading	Reliability of revised construct (α)
Factor 4: operational performance		0.874
Cost reduction	0.529	
Increased productivity	0.792	
Quality improvement	0.783	
Increased customer satisfaction	0.746	
Improved internal procedures	0.733	
Improved employee morale	0.590	
Factor 5: business performance		0.847
Increased market share	0.794	
Improved corporate image	0.644	
Improved competitive advantage	0.788	
Increased access to global markets	0.614	
Increased organisations' profits	0.706	

Table III.
Factor analysis results:
dependent variables

	Implementing procedures (F1)	Organisational commitment (F2)	Planning ISO certification (F3)	Operational performance (F4)	Business performance (F5)
F1	1.000				
F2	0.510*	1.000			
F3	0.515*	0.509*	1.000		
F4	0.319*	0.253*	0.283*	1.000	
F5	0.203*	0.238*	0.195*	0.669*	1.000

Table IV.
Correlation matrix of
independent and
dependent constructs

Notes: *Correlation is significant at the 0.01 level (one-tailed)

4.3.5 Reliability. Reliability is frequently defined as the degree of consistency of a measure. Internal consistency for the five factors of the ISO 9000 relationship model (three independent factors: planning for ISO certification, organisational commitment, implementing procedures; and two dependent factors: operational and business performance) was estimated using Chronbach's α , which ranges between the values 0.00 and 1.00 (Nunnally, 1978). Chronbach's coefficient α is recognised as a good direct measure of internal reliability. Using the SPSS for windows reliability test program, a scale with a Chronbach coefficient of $\alpha \geq 0.70$ is accepted as a reliable measure (Nunnally, 1978). The reliability values shown in Tables II and III generally meet or exceed prevailing standards of reliability for such survey instruments (Nunnally, 1978).

4.4 Checking model assumptions

Multivariate analysis was used to determine if the company size is related to organisations' business performance when the relationship is adjusted for the effort on implementing ISO 9001 quality management system. Three key assumptions must be met for the multivariate test procedures to be valid. They are: independence of observations, homogeneity of variances and normality of observations.

4.4.1 Independence of observations. According to Hair *et al.* (1995) the most serious violation occurs in the lack of independence amongst observations. A number of experimental and non-experimental situations exist in which independence can be violated. Since, our study is cross-sectional in nature and the individual respondents independently completed the surveys within a four-week period, a time-ordered effect is not in existence. The assumption that each predictor variable is independent was not violated.

4.4.2 Homogeneity of variances. The next assumption deals with the constancy of the residuals across values of the predictor variables. Homogeneity of variances assumes that the dependent variables exhibit equal variance across the range of predictor variables. If the variances in the two groups are different from each other, than adding the two together is not appropriate and will not yield an estimate of the common within-group variance. Therefore, the Levene test for homogeneity of the variance (Tabachnick and Fidell, 1996) was used to measure the equality of variances for a single variable or pair of variables. The result shows that, the significance level for Levene's test is greater than 0.05, indicating variances homogeneity.

4.4.3 Normality of observations. The most fundamental assumption in multivariate analysis is normality. According to Hair *et al.* (1995) both graphical analysis (normal probability plot) and a statistical test (Kolmogorov-Smirnov) of the normality can be used to assess the actual degree of departure from normality. Our graphical analysis results show that the lines representing the actual-data distribution closely follow the diagonal in the normal *Q-Q* plots, which suggests a normal distribution. The Kolmogorov-Smirnov test assesses the normality of the distribution of scores. It showed a non-significant result on our data ($p > 0.05$) which indicates normality.

5. Analysis of data

The data were subjected to three types of analyses. The details are briefly described in the following three subsections.

5.1 Factor analysis

Table II shows the factor and reliability analyses of the independent variables and Table III shows the factor and reliability analyses of the dependent variables. The regression analysis was used to calculate the independent and dependent variable constructs in order to determine the significance of the relationships involved. Table IV shows the bi-variate correlation coefficients of factors of ISO 9000 relationship model and their relationship with the organisational-business performance.

The results show that, the correlation coefficients in Table IV were generally above 0.2, which is significant and positive. This reflects, as would be expected, that organisations which are advanced in their practices on some factors tend generally to perform better than others.

5.2 Regression analysis

Table V shows the multiple regression of all three independent variables regressed on the two dependent variables. From this analysis, our intent was to test the hypotheses stated earlier and hence contribute to the knowledge about the relationship between the three key factors for implementing ISO 9000 certification and organisational performance.

Table V shows the main regression results. It is evident from the table that the independent factors have a greater explanatory power on operational performance (adjusted R^2 : 14.4 per cent) than business performance (adjusted R^2 : 7.4 per cent). Organisational commitment was strongly related to both operational performance and business performance.

5.3 Multivariate analysis

In order to test *H.7*, multivariate analysis of variance (MANOVA) and multivariate analysis of covariance (MANCOVA) were used to assess whether there are statistically significant difference among the groups on a linear combination of the dependent variables (Table VI).

There are a number of statistics techniques available for the analysis (e.g. Wilks λ , Pillai's trace, Hotelling's trace). One of the most commonly reported statistics is Wilks' λ (Hair *et al.*, 1995; Tabachnick and Fidell, 1996) recommends Wilks' λ for general use. However, if the data have problems such as small sample size, unequal N values, violation of assumptions, than Pillai's trace is more robust. Tukey's *post-hoc*

	β	t	p
<i>Factor 4 operational performance (as dependent variable):</i>			
$F = 27.779$ (sig. $F = 000$)			
Multiple $R = 0.386$, $R^2 = 0.149$, adjusted $R^2 = 0.144$			
Factor 1: implementing procedures	0.266	5.063	0.000
Factor 2: organisational commitment	0.227	5.521	0.000
Factor 3: planning ISO 9000 certification	0.225	4.737	0.000
<i>Factor 5 business performance (as dependent variable):</i>			
$F = 13.514$ (Sig. = $F = 000$)			
Multiple $R = 0.0283$, $R^2 = 0.080$, adjusted $R^2 = 0.074$			
Factor 1: implementing procedures	0.132	2.396	0.017
Factor 2: organisational commitment	0.146	2.692	0.007
Factor 3: planning ISO 9000 certification	0.083	1.677	0.094

Table V.
Summary of regression
analysis (coefficients)

Table VI.
Multivariate analysis:
MANOVA and
MANCOVA (company
size)

Multivariate effects	Multivariate F-tests $F(df) = F\text{-value}$	Significant of $F(p)$	$H7$: the relationship between implementation of ISO 9000 and organisational performance strengthens when covaried for company size
<i>Wilks' λ</i>			
MANOVA	$F(4,1084) = 5.459$	0.000	
MANCOVA	$F(4,910) = 2.722$	0.028	
<i>Pillai's trace</i>			
MANOVA	$F(4,1086) = 5.414$	0.000	
MANCOVA	$F(4,912) = 2.712$	0.029	
<i>Between subjects effects</i>			
Dependent variables			
<i>Operational performance</i>			
MANOVA	$F(2,543) = 8.945$	0.000	Accept
MANCOVA	$F(2,456) = 4.968$	0.007	Accept
<i>Business performance</i>			
MANOVA	$F(2,546) = 9.355$	0.000	Accept
MANCOVA	$F(2,546) = 3.740$	0.024	Accept

test was used in this study to identify significant differences among the three groups within the set of individual variables that were significant in the multivariate test.

6. Discussion of results and findings

With reference to Table V, 15 per cent of the variation in operational performance can be explained by our linear-regression model. The results show that, the three key factors: implementing procedures, organisational commitment and planning ISO 9000 certification are strongly associated to operational performance. Also from Table IV the observation of Pearson correlation coefficient for the relationships between the three key factors and organisations' operational performance are positive and significant. Hence, $H1$, $H3$ and $H5$ are accepted.

Table V also indicates that only 8 per cent of the variation in business performance can be explained by our linear-regression model, which is considered as low variation and this model is not as predicted model.

The results shown in Tables IV and V indicate that implementation of ISO 9000 certification construct maintain a positive and significant ($r = 0.203$; $t = 2.396$; $p < 0.01$) association with business performance. Therefore, $H2$ is accepted.

The regression analysis as shown in Table V indicates a significant association in the hypothesised direction between the organisational commitment and the business performance constructs ($t = 2.692$; $p = 0.007$). The Pearson correlation coefficient in Table IV also shows there is a small significant and positive relationship between organisational commitment and organisations' business performance ($r = 0.238$; $p < 0.01$). As a result, $H4$ is accepted.

The regression analysis presented in Table IV shows that the planning ISO 9000 certification and business performance construct resulted in a positive but not significant association between the variables ($t = 1.677$; $p = 0.094$), although the Pearson correlation coefficient for the relationship between the variables shows a low-significant level ($r = 0.195$; $p < 0.01$). Furthermore, the multiple R of 0.283 (significant at the 0.01 level) indicates a weak relationship in the hypothesised direction

where ($R^2 = 0.080$) planning ISO 9000 certification explains only 8 per cent of the variance in business performance. Thus, $H6$ is rejected.

The multivariate F -test shown in Table VI indicates that there is a significant association between organisation's size and organisational performance before and after adjustment for three independent factors (Wilks' λ test $p < 0.05$). Where $F(2,456) = 4.968$; $p = 0.007$ indicates that organisation's size has a significant relationship with operational performance, and $F(2,456) = 3.740$; $p = 0.024$ shows that company size has a significant relationship with business performance after adjustment for the effort on implementing ISO 9000 certification. Therefore, $H7$ is accepted.

Post-hoc analysis based on Tukey's HSD method showed that there is a statistically significant difference between medium and large size on operational and business performance ($p < 0.05$). No significant difference was found between medium and large companies on organisational performances. The mean difference indicates that large companies performed better than medium size companies, and medium-size companies performed better than small companies on organisational performances.

The result obtained from testing $H1$ and $H2$ indicate that implementing procedures has a significant and positive relationship with operational and business performance. Such a finding is consistent with a number of previous studies (Beattie and Sohal, 1999; Elmuti, 1996). These results also add to the research findings by (Feng, 2000) that Australian and New Zealand organisations tend to pursue ISO 9000 certification for both operational and marketing benefits.

On the basis of the results obtained from testing $H3$ and $H4$, it is reasonable to support the general view that organisational commitment is significantly associated to the effective implementation of any quality initiative (Oakland, 1989; Roth, 1989; Samson and Terziovski, 1999; Wickens, 1987).

Most of the literature on the relationship between commitment and organisational performance highly emphasises top management commitment (Ahire and O'Shaughnessy, 1998; Rayner and Porter, 1991; Taylor, 1995). Although top management commitment was not directly related to improvement of quality performance, it affects the implementation of other management practices in the organisations (Park *et al.*, 2001). However, workforce commitment is directly related to the quality of products. The results of this study are confirmed by literature findings that commitment by all levels in the organisation, particularly senior management, is a prerequisite to achieving organisational performance. This is also one of the critical success factors envisaged in ISO 9001:2000 (ISO, 2000).

Furthermore, in his study, O'Brien (1995) points out that in addition to any financial and operational benefits, there are additional benefits in implementing ISO 9001 quality system and planning for ISO 9000 certification. For example, the process commits management to think about its objectives for quality and encourages the organisation to review its processes, which may lead to the achievement of these objectives.

$H5$ and $H6$ test the relationships between planning for ISO 9000 certification and business performance. The results show that planning ISO 9000 certification has a significant positive relationship with operational performance. However, there is a positive, but not significant relationship between planning for ISO 9000 certification and business performance. This is consistent with findings by Terziovski *et al.* (1997), who found that the relationship between ISO 9000 and business performance is positive but not significant.

This study indicates that, the two critical success factors in the ISO 9000 implementation process are identifying the philosophical quality aspects of the organisation and employee training as part of the planning for ISO 9000 certification. This construct was found to have a significant and positive relationship with organisational performance. This result suggests that organisations need to focus on the clear identification of the quality philosophy in their organisation and provide training programs in various aspects of the ISO 9000 standard in order to increase the effectiveness to the bottom-line.

Identification of the organisation's quality philosophy provides a basis for companies to assess the achievement of the quality program with clear goals. The implication is that this leads companies towards business success. Extensive training should provide skills needed for individual workers to effectively implement productivity and quality initiatives (Briscoe *et al.*, 2005; McTeer and Dale, 1995). To be most effective, the training should be part of a long-term strategy. Although organisations usually do not directly gain any benefits in the period of planning for ISO 9000 certification, the potential benefits are clearly observed.

Company size is associated with organisational performance when the relationship is adjusted for the effect on implementing ISO 9000 certification. The larger and medium-size companies were found to perform better than small firms in both operational and business performance. This result may be due to large and medium-size companies tending to place stronger emphasis on having a strategic plan than do small firms. The implication, therefore, is that large and medium-sized companies commit more resources and achieve greater benefits from the ISO 9000 certification process, than small companies.

7. Conclusions

The central finding of our study is that ISO 9000 certification has a positive and significant effect on operational performance, but a positive weak effect on business performance. However, the weak positive relationship between planning for ISO 9000 certification and business performance is rather surprising. From this finding it is reasonable to conclude that ISO 9000 certification by itself does not lead to improvement in business performance.

Despite the fact that our study is based on a large sample size, it does suffer from limitations, and these give rise to a number of suggestions for further research. The internal validity of our variables is acceptably strong, but far from perfect. Further, empirical research on refining the constructs and their elements is warranted.

The research reported here is purely of a cross-sectional snapshot. We were unable to test and account for the lags between the existence of practices and performance changes. Therefore, in-depth case studies are needed which detail the impact of ISO 9001:2000 elements and improvement initiatives over time. This will help to enhance the question of "What works?" "Why it works?" and "How it works?"

7.1 Implications for managers

The main implication for practicing managers is the finding that success of implementing ISO 9001:2000 quality management systems would be increased (operational and business performance) if it is well planned and implemented when the philosophical quality aspects of the organisation are coupled with employee training, periodic audits, corrective action and commitment at all levels of the organisation.

The insignificant but positive relationship between planning for ISO 9000 certification and business performance is a clear signal that managers do not expect or report planning alone to have a direct impact on the bottom line. In practical terms planning is an important element that needs to be effectively integrated with a wider total quality philosophy coupled with commitment of resources.

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