

INCREASING AND SUSTAINING
PERFORMANCE THROUGH AN INTEGRATED
QUALITY STRATEGY

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Abstract

Many organisations have found it difficult to implement an effective quality management strategy. One of the prime reasons for this is that organisations do not have credible evidence in terms of which quality management practices contribute to organisational performance, and why and how they contribute to this performance. This generally causes misunderstandings and disagreements about expected benefits. A review of the literature revealed a major gap in research in this area of quality/operations management. The purpose of this study was to test the strength of the relationship of different quality-based strategy types with several parameters of organisational performance. Based on a cross-sectional study of manufacturing firms in Australia and New Zealand, the paper tests several hypotheses involving ISO 9000, TQM and organisational performance. Four strategy types are developed as part of a Quality Management Strategy Grid. The central finding is that an Integrated Quality Strategy involving TQM and ISO 9000 certification is the most effective competitive strategy in terms of sustaining organisational performance, particularly for large firms (100 or more employees). The findings of this study have significant implications for practicing managers. The Quality Management Strategy Grid can be used by managers to formulate future strategic action for continuous improvement.

Keywords: integrated strategy; organisational performance, ISO 9000 certification, Total Quality Management; Continuous Improvement

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INTRODUCTION

Higher requirements for improved quality of products and services have led to three important changes in international business over the last decade. These changes include:

- The growing recognition of the strategic importance of Total Quality Management (TQM) philosophy and methods.
- A major push by organisations worldwide to seek certification to the ISO 9000 quality standards.
- The growing recognition and application of National Quality Awards such as the Malcolm Baldrige National Quality Award (MBNQA), the Australian Quality Award (AQA), and the European Quality Award (EQA).

Although there are many cases where the above quality strategies have been successfully applied, there is still considerable confusion, frustration and uncertainty surrounding the applied role and business value of TQM and ISO 9000 certification. For example, many managers believe that gaining certification to the ISO 9000 standards is synonymous with adopting the TQM philosophy or winning a quality award.¹ Anecdotal evidence and the limited number of empirical studies in the literature suggest considerable variability in the performance of TQM, ranging from unprecedented successes to abandonment of TQM, and even bankruptcy.

The purpose of this study, therefore, is to address the gaps and contradictions in the literature. This was achieved by investigating the relationships between TQM and ISO 9000 certification with organisational performance and covaried for company size. Four strategy types are developed as part of a Quality Management Strategy Grid. The central finding is that an Integrated Quality Strategy involving both ISO 9000 and TQM is the most effective strategy in terms of sustaining organisational performance, particularly in large firms. The findings of this study have significant implications for practicing managers. The Quality Management Strategy Grid can be used by managers to formulate future strategic action for continuous improvement

LITERATURE REVIEW

Research into quality management has advanced significantly over the last fifteen years. For example, in the last three years, influential media such as the Harvard Business Review, the Journal of Operations Management, and the Strategic Management Journal, commenced publishing articles on TQM. More recently, researchers have begun empirical verification on answering the simple questions: "*What works?*" and "*How it works?*" Research which complies with generally-accepted standards of methodological rigour was conducted by Sluti (1992); Powell (1995); Flynn et al. (1995); Forker (1996); Terziovski et al. (1997). These researchers conducted empirical studies in order to test the relationship between quality management practice and organisational performance. The empirical evidence suggests that TQM brings increased quality and productivity, along with improved customer and employee satisfaction.

¹ (Terziovski, M, Samson, D. and Dow, D., "The Business Value of Quality Management Systems Certification: Evidence from Australia and New Zealand", Journal of Operations Management, Vol.15, No.1, february,1997, pp.1-18).

Powell (1995) draws on the resource view of the firm (Juran, 1988; Schmidt & Finnigan, 1992; Spechler, 1991) to examine TQM as a potential source of sustainable competitive advantage. Under the resource view, success derives from economically valuable resources that other firms cannot imitate, and for which no equivalent substitute exists. Powell asks: "Is TQM such a resource?" In order to answer this question, Powell (1995) studied 54 firms, of which 39 were TQM firms. The findings suggest that most features generally associated with TQM, such as quality training, process improvement, and benchmarking, do not generally produce advantage, but that certain tacit, behavioural, imperfectly imitable features can produce advantage. Powell concluded that these tacit resources, and not TQM tools and techniques, drive TQM success. Furthermore, organisations that acquire them can outperform competitors with or without the accompanying TQM ideology. The researcher acknowledged the relatively small sample size employed in the study as a potential limitation of the findings. A recent empirical study by Forker (1996) confirms Powell's findings. The study examined the contribution of quality to business performance and concluded that quality helps a firm to gain a competitive advantage by delivering goods to the marketplace that meet customer needs. The results of the study have shown that quality dimensions are also highly correlated with business performance. The quality variables that were related to the greatest number of marketing and financial performance measures (design quality/design innovation and product improvement), were also the attributes with the most diffuse functional responsibility among marketing, product design and development, and manufacturing.

Confusion Between TQM and ISO 9000

Although there is growing awareness that a well-designed and well-executed TQM process is one of the most effective routes to increased product and service quality, productivity and profitability, many organisations are still mired in 'quality confusion.' For example, many CEOs have misperceived the idea that gaining certification to ISO 9000 quality standards is the same as becoming a quality organisation (Reimann & Hertz, 1994; Binney, 1992). Despite thousands of articles in the business and trade press, TQM and ISO 9000 remain hazy and ambiguous concepts. Indeed, the meaning of the term quality itself is still being debated. Due to this ambiguity, people's reactions to TQM vary as a function of their own beliefs and experiences. TQM is seen by some as an extension of scientific management, by others in terms of systems theory, and by still others as an altogether new paradigm for management. Much of the debate about TQM has focused on its 'success rate' which many would suggest is mixed.

Although the quality confusion is acknowledged in the literature and the business world, the research that has been carried out to date does not demystify the confusion by determining whether organisations implementing TQM efforts and/or seeking ISO 9000 certification have improved their organisational performance. This lack of evidence is a critical gap in what is known about becoming a TQM organisation. Another major gap in knowledge is how various organisations have implemented TQM and ISO 9000 certification and have become 'best practice' TQM organisations. Therefore, any future research should focus on the TQM/ISO 9000 certification relationship and its impact on organisational performance.

TQM Model - Independent Variables

A TQM model was developed consisting of 40 independent variables (items). The 40 items were selected from the AMC Data Base in accordance with their factor loadings obtained from Principal Components Factor Analysis (Saraph, 1987; Hair, et. al., 1992). The 40 items of the TQM model loaded on a single TQM factor. Each item had a factor loading greater than 0.3. This supports construct validity of the model. Content validity is supported by comparing the 40 items of the model with models from the literature, for example the TQM practices identified by the GAO Study (1991). Each item in the TQM model was measured by using a 5 point Likert type scale. The internal consistency of the TQM model was checked by using Reliability Analysis. This indicates the extent to which the items in the model are related to each other. Internal consistency was estimated using a reliability coefficient Cronbach alpha; values range among 0 and 1.0 (Nunnally, 1978). Typically, these coefficients should be among 0.7 to 0.9 (Van de Ven & Feny, 1979). The internal consistency of the TQM model has a Cronbach alpha of 0.8. Therefore, the 40 items of

the TQM model were accepted as having good interrelationship between them indicating that our TQM model is reliable.

Organisational Performance - Dependent Variables

Organisational performance is characterised by fourteen dependent variables that were selected from the AMC survey. These variables range from objective business performance measures such as percentage growth in sales, to subjective estimates given by site managers concerning employee morale.

These dependent variables are the basis upon which we demonstrate the impact of TQM and ISO 9000 practice on organisational performance. We have chosen these particular dependent variables based on the nomenclature from the GAO Study (1991).

RESEARCH HYPOTHESES

There seems to be consensus in the literature that ISO 9000 certification is a potential path to TQM (Binney, 1992; Brown, 1995; Allan, 1993; Bredrup, 1995). However, there are differing views on the implementation sequence. According to Binney (1992), companies should begin their quality journey by understanding the principles and concepts of both TQM and ISO 9000 certification. Consequently, companies should consider the role of quality in their organisational philosophy and business strategy before they embark on certification or TQM or both. However, there is very little empirical data that supports this theory. Therefore, the following hypotheses have been articulated in order to demystify the confusion that exists in the literature on the TQM/ISO 9000 certification relationship.

H1: TQM has a significant and positive impact on organisational performance.

H2: The strength of the relationship between TQM and organisational performance is weakened when covaried for company size.

Several studies claim that ISO 9000 certification does have an effect on organisational performance (AMC Study, 1994; Hoyle (1994) argues that gaining certification to ISO 9000 is only a beginning to the process of creating a TQM culture. The quality system provides a mechanism with which to bring about systematic improvement but implemented outside the TQM framework, ISO 9000 certification does not improve performance. The debate on the effectiveness of ISO 9000 certification is not well resolved due to methodological problems and lack of statistical rigour of the research that has been completed to date. This study aims to partially fill this gap by providing a statistically rigorous analysis of the relationship between ISO 9000 certification and organisational performance.

H3: ISO 9000 has a significant and positive impact on organisational performance.

H4: The strength of the relationship between ISO 9000 certification and organisational performance is weakened when covaried for company size.

METHODOLOGY

Our analysis uses data obtained by the AMC Study (1994). The purpose of the AMC study was to investigate the extent of best practice adoption by Australian and New Zealand manufacturing firms and its impact on organisational performance. The AMC developed a framework and questionnaire based on the literature. The questionnaire was developed in accordance with evaluation criteria of major international quality awards: Malcolm Baldrige National Quality Award; the Australian Quality Award and the European Quality Award. The AMC sent questionnaires to 3000 Australian and 1000 New Zealand manufacturing sites. The selection of the sites was at random. A total of 962 Australian sites and 379 New Zealand sites responded to the questionnaire, which was filled out by the most senior manufacturing executive at the site. This represents response rates of 32 and 38 per cent respectively. In both countries, stratification of the

sample was on the basis of twelve industry codes (ASIC and NZSIC) and three company size categories. These categories are; 'small' (20- 49 employees), 'medium' (50-99 employees) and 'large' (100 or more employees).

DATA ANALYSIS AND RESULTS

Multivariate Analysis of Variance (MANOVA) and Multivariate Analyses of Covariance (MANCOVA) are used in order to assess group differences across the fourteen multiple dependent variables simultaneously. According to Hair et al. (1992), the Pillais criterion or Wilk's lambda are the best statistical measures to assess whether an overall significant difference is found between groups. Good approximations for significance were obtained from Wilk's lambda that was transformed into an F statistic. From this analysis we found that the smaller the value of the significance of F (p-value), the greater the implied significant difference between TQM and non-TQM groups (Table 1). The multivariate analysis results indicate that there is a significant difference between TQM and non-TQM organisations. Based on these initial findings, we conduct separate univariate tests of ANOVA and ANCOVA in order to address individual issues for each dependent variable of organisational performance.

Analysis of Variance (ANOVA) and Analysis of Covariance (ANCOVA)

Analysis of variance, ANOVA, (Table 2) was used to test hypothesis H1 and H3. Furthermore, analysis of covariance was applied to test Hypotheses H2, and H4 by accounting for and removing the influence of company size. Company size, as measured by the natural logarithm of the number of full time employees, was used as a covariate. Powell (1995) reports findings from an empirical study of TQM's performance consequences. The study found that even though larger firms were more likely to adopt TQM than smaller firms, the correlation between company size and TQM was suggesting that company size may impede successful TQM implementation. This is supported by Fisher (1993) who conducted a study of Australian Quality Council member companies (n=49) in order to test the perceptions of CEOs on the link between TQM and organisational performance. Fisher found that the nature of the TQM approach adopted varied considerably according to company size. Fisher found that 88 per cent of the smaller companies (up to 100 employees) adapted a standard approach to TQM, generally offered by consultants and had an immediate expectation of TQM benefits to be gained. On the other hand, 94 per cent of the larger companies (more than 500 employees) developed their own approach to TQM and had a reasonable expectation in terms of benefits to be gained. Fisher stated: "*The small companies expected benefits sooner, but they were generally disappointed.*"

Fisher speculates that the larger and more established companies reported their achievement of TQM benefits later than the small companies. The reason for this, according to Fisher, is that CEOs of these companies have a more mature appreciation of the TQM philosophy. Therefore, the large companies are more likely to believe in the 'quality is free' philosophy, whereas small companies would still be preoccupied with the Acceptable Quality Level (AQL) concept. This concept has been based on the premise that improving quality beyond an economic conformance level is economically suboptimal. AQL systems, therefore, are philosophically inconsistent with 'quality is free' and 'zero defects' notions (Crosby, 1979; Juran, 1988).

The second critical test is the relationship between the selected covariate and the independent variable: the certification status of the firm. In an experimental setting, these two variables should be completely independent of each other. However, these analyses concern a non-experimental situation where subjects cannot be randomly assigned. Rooney (1991) argues that the ISO 9000 standards are generally designed to address the needs of large organisations with existing systems. Small companies would have to outlay significant amounts of cash in order to comply. This would have a direct impact on cashflow and hence the bottom-line. The inclusion of the covariate, the natural logarithm of firm size is a highly significant predictor of the dependent variables and should remove considerable unexplained variance. Due to the observed relationship between firm size and ISO 9000 certification status, the analysis will slightly understate the magnitude of any differences in the dependent variables between the groups. While causality

can never be determined by a cross-sectional survey, there is sufficient evidence that the differences in firm size between groups pre-date the adoption of ISO 9000 certification, and are not the result of certification. Therefore, the covariate company size provides a conservative test of the efficacy of ISO 9000 certification.

Testing of Hypothesis H1

Our principal high-level finding is that TQM is significantly related to a variety of performance measures (Table 2), is consistent with many anecdotal experiences and empirical studies (GAO Study 1991; Powell, 1995; Sluti, 1992). Therefore, hypothesis H1 is supported for six of the fourteen organisational performance variables: customer satisfaction, employee morale, delivery in full on time, productivity, cashflow, and sales growth. The other eight hypotheses are rejected.

Testing Hypotheses H2

The strength of the relationship between TQM and defect rates and TQM and warranty costs changed from insignificantly negative to significantly negative when the relationship between TQM and organisational performance outcomes was covaried for company size. Therefore, hypothesis, H2 is supported.

Testing Hypothesis H3

A simple analysis of variance shows (Table 4) that ISO 9000 certification has a significantly positive relationship with only one of the thirteen dependent variables: cash flow, $F(1,856)=5.89$, $p=0.01$ (one-tailed). Therefore, the hypothesis relating ISO 9000 certification, H3 (viii), to cashflow is supported. This indicates that there is a significant positive difference between certified and non-certified companies in cashflow. The hypotheses for all twelve of the remaining dependent variables, H3 (i - vii, ix - xiii), are rejected. ISO 9000 certification has positive, but non-significant relationship with productivity, $F(1,856)=0.24$, $p=0.31$; and export growth, $F(1,856)=0.40$, $p=0.26$. Therefore, these two hypotheses are rejected. ISO 9000 certification exhibits a significant relationship with: cost of quality, $F(1,856)=6.71$, $p=0.01$ (two-tailed); and innovation of new products, $F(1,856)=13.07$, $p=0.00$ (two-tailed), but in the opposite direction to the one predicted. Certified firms have a significantly higher average cost of quality and a lower level of new products than non-certified firms. The relationship between ISO 9000 certification and the remaining eight dependent variables is shown to be negative and non-significant. This indicates that there are no significant differences between certified and non-certified companies in customer satisfaction, employee morale, delivery in full on time; defect rates, warranty costs, employee growth, market share growth, and sales growth.

Testing Hypothesis H4

When the effect of company size was removed, the positive significance of ISO 9000 certification on cashflow (found when an ANOVA was performed on the raw data, weakens considerably, though it is still statistically significant ($p<.05$). Therefore, the 'cashflow' hypothesis is still accepted. The remaining twelve hypotheses in the ANCOVA are still rejected due to insignificant p-values, and/or the negative direction of the certified mean. Therefore, hypothesis, H4 is supported (Table 5).

Discussion of Results

Our results show that TQM does have a significant and positive effect on business performance, operational performance, employee relations and customer satisfaction. The relationship weakened for defect rates and warranty costs when it was covaried for company size. These findings are consistent with some of the literature (GAO Study, 1991; Garvin, 1988). It is important to keep in mind that the findings are a statistical association only. The results do not guarantee that TQM will definitely produce superior profitability nor that improved returns can only be obtained by those organisations with higher quality of products and services. There are organisations that achieve good returns without TQM. On the other hand there are TQM organisations that have not achieved a good profit record (Powell, 1995). Furthermore, we found that ISO 9000 certification is not significantly related to a variety of organisational performance measures, is

consistent with many anecdotal experiences. However, it should be considered that from a random-sample cross-sectional study, it is reasonable to conclude that the presence or absence of ISO 9000 certification is a poor predictor/indicator of organisational performance and indeed of quality (as measured by defect rates and warranty costs) and other key measures such as 'delivery in full on time'. We therefore conclude that on average, ISO 9000 does not have a significantly positive effect on organisational performance. We know from practice that ISO 9000 certification has been used with positive effect by a number of firms, but there was essentially no significant difference across certified and non-certified firms in our large random sample, indicating the lack of a significant overall or average effect. The findings of this study are in accord with leading edge practices such as in the automotive industry, which is presently moving its requirements from ISO 9000 certification or similar standards to a much broader basis, of which ISO 9000 certification is but one component (Automotive Industry Report, 1995). For example, the TQM strategy focuses a firm on continuously improving all its activities, including its management processes in order to increase its customer's level of satisfaction. The main purpose of the ISO 9000 quality standards was to formalise those processes. A statement made by the SEPSU Policy Study (1994, p.16) supports the above findings:

"Companies that use quality standards as a substitute for developing their own overall quality management strategy are likely to find themselves short-changed. The most positive experiences with ISO 9000 are reported by those companies that use it as a starting point for, or an early input to, their own strategies."

Integrated Quality Strategy Grid

Based on the research findings of this study, four quality-based strategy types are articulated. These are represented as a development of the Integrated Quality Strategy Grid in Fig. 1.

Strategy Type 1- Proactive Pursuit of ISO 9000, Non-TQM

An organisation commits to a Type 1 strategy when it proactively seeks ISO 9000 certification in a non-TQM environment. This strategy is likely to produce short term organisational gains due to the novelty and enthusiasm of becoming certified. Brown & van der Wiele (1996) conclude that making people think about quality or improving systems prepares the way for further progress in improving quality. However, organisational performance would not be sustainable due to the lack of a TQM culture.

Strategy Type 2 - Reactive Pursuit of ISO 9000 , Non-TQM

An organisation commits to a Type 2 strategy when it gains certification to ISO 9000 standards as a result of customer pressure or government purchasing policy. There are many organisations in the Australian manufacturing industry that fall in this category. Hypotheses H3 and H4 confirmed that the relationship between ISO 9000 certification and organisational performance is not significantly positive for the manufacturing industry in Australia and New Zealand. Organisations should avoid this strategy whilst aiming for a Type 4 Integrated Quality Strategy.

Strategy Type 3 - Non- ISO 9000, Proactive Pursuit of TQM

An organisation commits to a Type 3 strategy when it adopts TQM before attempting ISO 9000 certification. These organisations typically believe that creating a TQM culture is a necessary precursor to seeking ISO 9000 certification, and that ISO 9000 is not a major contributor to organisational performance for large and small firms. These organisations are unlikely to implement a Quality Assurance system as an important part of an integrated quality strategy and therefore not necessarily seek certification to the ISO 9000 standards.

Strategy Type 4 - Proactive Pursuit of TQM and ISO 9000 Certification

An organisation commits to a Type 4 strategy when it adopts TQM first and then ISO 9000 certification. Managers in these organisations usually make up their mind that both TQM and ISO 9000 certification are required to create a best practice TQM organisation. The qualitative and quantitative research findings

support this view. In order to maximise organisational performance, the quality system certified to ISO 9000 would provide tangible operational benefits and provide the foundation upon which a continuous improvement quality culture could be built. Organisations adopting a Type 4 strategy would typically have had TQM in place for 2 to 3 years prior to seeking certification to ISO 9000.

IMPLICATION OF FINDINGS

The major beneficiaries of the research findings are potentially managers at all levels of the organisation who are faced with the 'quality confusion.' This confusion can be demystified if managers base their understanding of TQM and ISO 9000 certification standards on empirical rather than anecdotal data, and formulate and implement a Type 4 strategy (Fig. 1). The most significant implication for managers that has emerged from the study is the conclusion that managers in manufacturing firms should place more emphasis on TQM practices and less emphasis on ISO 9000 certification when aiming to use TQM as an organisational change strategy.

Fig 1. Quality Management Strategy Grid

Conformance

<p>TYPE 1 - PROACTIVE ISO 9000 STRATEGY</p> <ul style="list-style-type: none"> ■ ISO 9000 CERTIFICATION ■ NO TQM ■ PERFORMANCE NOT SUSTAINABLE 	<p>TYPE 4 - INTEGRATED QUALITY STRATEGY</p> <ul style="list-style-type: none"> ■ TQM AND ISO 9000 CERTIFICATION ■ PERFORMANCE SUSTAINABLE
<p>TYPE 2 - REACTIVE ISO 9000 STRATEGY</p> <ul style="list-style-type: none"> ■ LOW PERFORMANCE 	<p>TYPE 3 - TQM STRATEGY</p> <ul style="list-style-type: none"> ■ TQM IN PLACE ■ NO ISO 9000 CERTIFICATION

Performance

ISO 9000

TQM

LIMITATIONS OF THE STUDY

Although the study is one of the largest, most comprehensive studies in this field, it does suffer from limitations, and these give rise to a number of suggestions for future research. The study does not provide conclusive evidence that ISO 9000 certification systems or other quality systems are ineffective. Indeed there are numerous manufacturers which have benefited from ISO 9000 certification, as well as those which have not. The principal difference lies in whether ISO 9000 certification is considered as part of a broader 'total quality' initiative. This study only dealt with the manufacturing industry and was cross-sectional in nature. The results presented in this study are drawn from one industry at one point in time. Generalising the results to other industries should be done with caution. This study, therefore, aims to motivate further research of the strategic importance of TQM and ISO 9000 certification with special emphasis on the link between quality strategies and organisational performance.

CONCLUSION

We conclude that TQM has a significant and positive relationship with most of the dimensions of organisational performance. The relationship weakened for defect rates and warranty costs when it was covaried for company size. We conclude that company size impedes the implementation of TQM. Larger companies tend to gain greater benefits from TQM than smaller firms. These findings are consistent with some of the literature (Fisher, 1994; GAO Study, 1991). Overall, the findings show that a typical manufacturing organisation is more likely to achieve high organisational performance with TQM than without TQM.

Furthermore, the study concludes that ISO 9000 certification does not have a significant and positive relationship with organisational performance. The relationship further weakened when it was covaried for company size. We conclude that company size impedes the implementation of ISO 9000. Larger companies tend to gain greater benefits from ISO 9000 than smaller firms (Type 1 strategy; proactive pursuit of ISO 9000 certification). The principal motivation to pursue ISO 9000 certification in small firms was found to come from the customers. In this case the main benefit of ISO 9000 certification was the ability of the certificate to open doors that were previously closed or which would close if ISO 9000 certification was not achieved by a supplier. The findings of this study are in agreement with several other studies (Allan, 1993; Binney, 1992; Brown, 1994; Hoyle, 1994).

Considering the results of this study we conclude that ISO 9000 certification would contribute to organisational performance if a climate of change is created based on the TQM philosophy and methods (Type 4 Strategy in Figure 1). The central finding, therefore, is that an Integrated Quality Strategy involving both ISO 9000 certification and TQM is the most effective competitive strategy in terms of sustaining organisational performance. The findings of this study have significant implications for practicing managers. The Quality Management Strategy Grid can be used by managers to formulate future strategic action for continuous improvement and assist managers in understanding the relative importance of TQM and ISO 9000 certification in increasing and sustaining organisational performance.

APPENDIX

TABLE 1- MULTIVARIATE ANALYSIS - MANOVA AND MANCOVA

RESULTS ANALYSIS PROCEDURE	UNIVARIATE F TESTS F (d.f.) = f value d.f. = Degrees of freedom	SIGNIFICANCE OF F (p)
MANOVA	F(14,1007) = 6.197	p= 0.000
MANCOVA (Cov: Company Size)	F(14,1006) = 6.938	p= 0.000
MANCOVA (Cov: Industry Type)	F(14,1003) = 6.144	p= 0.000
MANCOVA (Cov: ISO Certification)	F(14,840) = 4.648	p= 0.000

TABLE 2 - ANALYSIS OF VARIANCE (ANOVA) OF DEPENDENT VARIABLE ON TQM

Statistical Analysis Dependent Variable	Variable	TQM MEAN	ANOVA of Dependent Variable on Total Quality Management		NULL HYPOTHESES H0=0
			F	Sig.F	
Customer Satisfact.	po7a	positive	20.446	0.000	Reject
Employee Morale.	po7c	positive	44.062	0.000	Reject
Cost of Quality	po8c	negative	0.297	0.586	Support
Delivery in full	po8j	positive	16.700	0.000	Reject
Defect rates	po8a	negative	1.737	0.188	Support
Warranty costs	po8b	negative	1.464	0.227	Support
Productivity	po7d	positive	52.489	0.000	Reject
Cashflow	po7c	positive	18.756	0.000	Reject
Employee Growth	pln-emp	positive	2.147	0.143	Support
Market Share Growth	ln-mshg	positive	0.056	0.814	Support
Sales Growth	ln-salg	positive	4.351	0.037	Reject
Export Growth	ln-expg	positive	1.128	0.288	Support
Innovation (new prod)	percts	positive	3.142	0.077	Support
Organisational Perf.	orgperf.	positive	42.887	0.000	Reject

TABLE 3: ANALYSIS OF COVARIANCE (ANCOVA)

Statistical Analysis Dependent Variable	Variable	TQM MEAN	ANCOVA OF DEP. VARIABLE ON TQM		
			Company Size F	Sig.F	NULL HYPOTHESIS HO
Customer Satisfact.	po7a	positive	32.42	0.000	Reject
Employee Morale.	po7c	positive	56.77	0.000	Reject
Cost of Quality	po8c	negative	2.134	0.144	Supp.
Delivery in full	po8j	positive	21.306	0.000	Reject
Defect rates	po8a	negative	5.297	0.022	Supp.
Warranty costs	po8b	negative	4.143	0.042	Supp.
Productivity	po7d	positive	51.771	0.000	Reject
Cashflow	po7c	positive	14.876	0.000	Reject
Employee Growth	pln-emp	positive	3.654	0.056	Reject
Market Share Growth	ln-mshg	positive	0.411	0.522	Supp.
Sales Growth	ln-salg	positive	6.752	0.009	Reject
Export Growth	ln-expg	positive	1.024	0.312	Supp.
Innovation (new prod)	percts	positive	2.879	0.090	Reject
Organisational Perf.	orgperf.	positive	64.802	0.000	Reject

TABLE 4 - ANALYSIS OF VARIANCE (ANOVA) OF DEPENDENT VARIABLE ON ISO 90000

Statistical Analysis Dependent Variable	Variable	CERTI MEAN	ANOVA of Dependent Variable on ISO 9000 Certification F(d.f)=F value		"ISO 9000 has a significant & positive impact on org. perf."
			F	Sig.F	
Customer Satisfact.	po7a	negative	F(1,856)=1.24	p=0.07	Reject
Employee Morale.	po7c	negative	F(1,856)=1.16	p=0.86	Reject
Cost of Quality	po8c	negative	F(1,856)=6.71	p=0.99	Reject
Delivery in full	po8j	negative	F(1,856)=0.09	p=0.62	Reject
Defect rates	po8a	negative	F(1,856)=2.90	p=0.96	Reject
Warranty costs	po8b	negative	F(1,856)=0.06	p=0.60	Reject
Productivity	po7d	positive	F(1,856)=0.24	p=0.31	Reject
Cashflow	po7c	positive	F(1,856)=5.89	p=0.01	ACCEPT
Employee Growth	pln-emp	negative	F(1,856)=3.67	p=0.97	Reject
Market Share Growth	ln-mshg	negative	F(1,856)=3.49	p=0.97	Reject
Sales Growth	ln-salg	negative	F(1,856)=2.26	p=0.93	Reject
Export Growth	ln-expg	positive	F(1,856)=0.40	p=0.26	Reject
Innovation (new prod)	percts	negative	F(1,856)=13.07	p=0.99	Reject

**TABLE 5- ANALYSIS OF COVARIANCE (ANCOVA) OF DEPENDENT VARIABLE
ON ISO 90000**

Statistical Analysis Dependent Variable	Variable	CERTI MEAN	ANCOVA of Dependent Variable on ISO 9000 Certification Covariate: Co. Size			Company size affects the relationship between ISO 9000 and org. perf. Hypothesis H4
			F	F(d.f)=F value	p	
Customer Satisfact.	po7a	negative	F(1,851)=0.28		p=0.70	Reject
Employee Morale.	po7c	negative	F(1,851)=0.72		p=0.61	Reject
Cost of Quality	po8c	negative	F(1,851)=1.36		p=0.88	Reject
Delivery in full	po8j	negative	F(1,851)=0.18		p=0.67	Reject
Defect rates	po8a	negative	F(1,851)=0.11		p=0.63	Reject
Warranty costs	po8b	negative	F(1,851)=1.82		p=0.91	Reject
Productivity	po7d	positive	F(1,851)=0.06		p=0.40	Reject
Cashflow	po7c	positive	F(1,851)=2.89		p=0.04	ACCEPT
Employee Growth	pln-emp	negative	F(1,851)=1.42		p=0.88	Reject
Market Share Growth	ln-mshg	negative	F(1,851)=1.29		p=0.87	Reject
Sales Growth	ln-salg	negative	F(1,851)=0.34		p=0.72	Reject
Export Growth	ln-expg	positive	F(1,851)=0.25		p=0.31	Reject
Innovation (new prod)	percts	negative	F(1,856)=15.09		p=0.99	Reject

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