

Quality Management and Competitive Performance - An empirical evident of impact of ISO 9000 in Vietnamese manufacturing companies

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Abstract

Manufacturing companies in developing countries, irrespective of size or sector, often use ISO 9000 certificate as a route to world-class status. Based on the results of an investigation by interview and questionnaire survey for various manufacturing companies in Vietnam, this paper is aimed to show the present situation of ISO 9000 implementation and performance measurement in those companies. Firstly, we examine the development of ISO 9000 implementation and its relationship with quality performance. The ISO 9000 implementation strategy and the conformance to the standards are discussed in detail. Secondly, we investigate the current situation of performance measurement system and analyze the relationship between ISO 9000 implementation and changes in performance measurement. The regression models are estimated to evaluate the contribution of ISO 9000 to improving company performance and performance measurement system. The study found out that ISO 9000 has a positive impact on quality performance and the structure of performance measurement system. Finally, the recommendations for further deployment of ISO 9000 are discussed. ISO 9000 could be used not only as one of quality management and improvement tools but also as a framework for performance measurement.

Keyword: ISO 9000, Quality Management, Performance Measurement, Vietnam

1. Introduction

In the recent years, the business competitiveness has been changed dramatically. Companies began to lose market share to overseas competitors who were able to provide higher-quality products with lower costs and more variety. To regain a competitive edge companies not only shifted their strategic priorities from low-cost production to quality, flexibility, short lead time and dependable delivery, but also implemented new technologies and philosophies of production management such as computer integrated manufacturing (CIM), flexible manufacturing systems (FMS), just in time (JIT), optimized production technology (OPT) and total quality management (TQM)...In this circumstance, the implementation of quality management system is becoming more and more critical for enhancing competitiveness.

The ISO 9000 implementation has been accepted worldwide as a useful first step towards Total Quality Management (TQM) and since it's establish in 1987 until now, the number of organizational that has been certified is growing continuously. The implementation of ISO 9000 is a critical organizational change that requires a transformation in the organization's processes, strategic priorities, and culture, among others. This study examines the current situation of ISO 9000 implementation and its impacts on quality performance and performance measurement system. This study can be very useful to organization, especially the manufacturers in developing country,

which attempt to identify factor of management system in order to improve competitiveness.

2. Research objectives

The research is aimed to study the present situation of ISO 9000 implementation and performance measurement in manufacturing companies in Vietnam. The research is focusing in on the relationship between the implementation of ISO 9000 quality management system standard and company's performance measurement in order to find out the critical factor for implementation of performance measurement in the industry. The main issues of research are

To examine the influence of ISO 9000 implementation to quality performance, and to examine the influence of ISO 9000 implementation to performance measurement. The aim of research is to find out the change in utilization of performance measurement and the trend of selecting measures after implementing ISO 9000.

3. Background literature

3.1 ISO 9000 Standard

The term *ISO 9000* refers to a set of quality management standards. ISO 9000 version 2000 consists of 4 standards with the main one is ISO 9001:2000. About 500 000 organization in over 140 countries have already adopted ISO 9000 because it help organizations achieve standards of quality that are recognized and respected throughout the world [11]. The ISO 9000 standards are based on eight quality management principles listed below:

Customer focus: Organizations depend on their customers and therefore should understand current and future customer needs, should meet customer requirements and strive to exceed customer expectations.

Leadership: Leaders establish unity of purpose and direction of the organization. They should create and maintain the internal environment in which people can become fully involved in achieving the organization's objectives.

Involvement of people: People at all levels are the essence of an organization and their full involvement enables their abilities to be used for the organization's benefit.

Process approach: A desired result is achieved more efficiently when activities and related resources are managed as a process.

System approach: Identifying, understanding and managing interrelated processes as a system contributes to the organization's effectiveness and efficiency in achieving its objectives.

Continual improvement: Continual improvement of the organization's overall performance should be a permanent objective of the organization.

Factual approach to decision making: Effective decisions are based on the analysis of data and information.

Mutually beneficial supplier relationships: An organization and its suppliers are interdependent and a mutually beneficial relationship enhances the ability of both to create value.

Implementing ISO 9000 helps organizations to manage their processes with quality. Without quality system, organizations cannot achieve a world-class standard of quality. The structure of ISO 9001 reflects Plan-Do-Check-Action Deming cycle. The ISO 9001:2000 standard consists of 4 sets of systematic requirement like “Management responsibility”, “Resource management”, “Product realization”, “Monitoring, analysis and improvement” as describe in Figure 1 [8].

The clauses of “Management responsibility” require company to set up, deploy and maintain a set of quality objectives that in line with company strategy and quality policies (5.2&5.3&5.4). Company has to stipulate the roles and responsibility for each function (5.5). The Quality Management Responsibility (5.5) function also has been emphasized as an important factor for quality management system.

The clause of “Resource management” refers to the requirement about education and training for employee (6.2) in order to improve their awareness and skills. It also mentions about ensuring working environment (6.3).

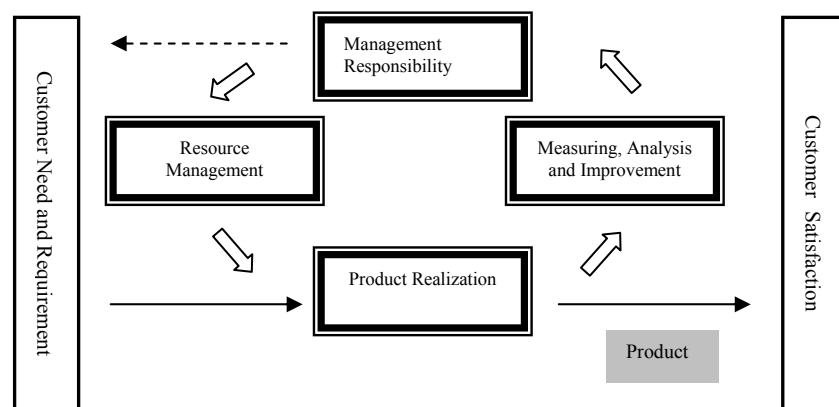


Figure 1: The model of ISO 9001:2000 Quality Management System

The clauses of “Product realization” give strong emphasis in control production and operation processes: the realization processes (7.1), customer communication including the identification of customer requirements (7.2.1); design and/or development changes (7.3.7); identification of regulatory and legal requirements (7.3.2.d); the criteria for selection and periodic evaluation of suppliers (7.4.1); validation of processes (7.5.5).

The clauses of “Monitoring, analysis and improvement” focus in measurement of organization performance (both product and process). It includes Internal audit (8.2.2), Control of nonconformity (8.3), Measuring and monitoring of processes (8.2.3 & 8.2.4),

the planning for continual improvement of the quality management system (8.5.1), Corrective and preventive action (8.5.2 & 8.5.3).

3.2 Performance Measurement

In business, performance measurement is a series of tools, methods, activities and system used to evaluate company performance.

The target of business is to satisfy their customers with greater efficiency and effectiveness than their competitors. The measurement of business performance is used in both perspectives of performance: efficiency and effectiveness. The term of effectiveness refers to the extent to which customer requirements are met, while efficiency is a measure of how economically the firm's resources are utilized when providing a given level of customer satisfaction. In brief, the basic concepts can be summarized as followed [1]:

Performance measurement can be defined as the process of quantifying the efficiency and effectiveness of action

A *performance measure* can be defined as a metric used to quantify the efficiency and/or effectiveness of an action

A *performance measurement system* can be defined as the set of metrics used to quantify both the efficiency and effectiveness of actions

The performance measure in production could be listed as follows:

Quality-based measure: product conformance, features, reliability, perceived quality, serviceability, technical durability

Time-based measure: manufacturing lead time, deliver lead time, due-date performance, frequency of delivery

Cost-based measure: production cost, service cost, value added, and selling price

Flexibility based measure: new product introduction, deliverability, volume, resource mix

The development of performance measurement can be divided into 2 phases. The first phase began in the late 1880s and went through the 1980s. In this phase the emphasis was on financial measures such as profit, return on investment and productivity. One of the well-know methods was formulated by Du Pont (1903) measure return on investment and used to access both the efficiency of each business unit [2].

The second phase started in the late 1980s as a result of changes in the world market. Neely *et al* (1992) indicated the most changes in business performance measure as

- ✓ The changing nature of work (reducing of labor cost)

- ✓ Increasing competition (company must be differentiated with competitor)
- ✓ National and international awards (requires company to complete self assessment)
- ✓ Changing organizational roles (humane resource management and development play more active role in business performance)
- ✓ Changing external demands (company must be opened to the public)
- ✓ The role of information technology [1].

The changes revealed that traditional performance measures have many limitations and the development of new performance measurement systems is required for success [1]. McNair *et al.* (1990) developed a conceptual model, which they called the Performance Pyramid.

Table 1: Difference between Traditional and New Performance Measures - Ghalayini and Noble (1996) [1]

Traditional performance measures	Non-traditional performance measures
Based on outdated traditional accounting system	Based on company strategy
Mainly financial measures	Mainly non-financial measures
Intended for middle and high managers	Intended for all employees
Lagging metrics (weekly or monthly)	On-time metrics (hourly, or daily)
Lead to employee frustration	Lead to employee satisfaction
Neglected at the shop-floor	Frequently used at the shop-floor
Have a fixed format	Have no fixed format (depends on needs)
Do not vary between locations	Vary between locations
Do not change over time	Change over time as the need change
Intended mainly for monitoring performance	Intended to improve performance
Not applicable for new advances technology and method JIT, TQM, CIM, FMS, etc.	Applicable for new advances technology and method JIT, TQM, CIM, FMS, etc.
Ignoring continuous improvement	Help in achieving continuous improvement

Fitzgerald *et al* (1991) developed a framework of performance measurement with two basic types, one is relating with result (competitiveness and financial performance) and the other is relating with determinant of the result (quality, flexibility, resource utilization, innovation) [5].

Leaving the traditional performance measure, Kaplan and Norton (1992) developed the new balanced, multi-dimension method which is aim to create a true system of performance measurement which links the company's long-term strategy with its day-to-day operations [7]. In the Kaplan and Norton model of the Balanced Scorecard, measures are different perspectives reflecting the important dimension of the company's business. The following four perspectives are used in the model:

Financial perspective: Reflects the financial return to the owners (How do we look to our shareholders?)

Customer perspective: Reflects how customers view our business (How do our customers see us?)

Business-process perspective: Reflects what we must be good at (What must we excel at?)

The innovation and learning perspective: Reflects how we are to do continue and develop (How can we continue to improve and create value?)

To sum up this section, it is interesting to notice the difference between the traditional and new performance measures as described by Ghalayini and Noble (1996) in Table 1[1].

4. Research Framework

The main target of ISO 9000 is to help company to set up and maintain a quality-oriented management system. Implementing ISO 9000, company needs to develop and maintain quality policy, quality objectives in all appropriate level and many operational documented procedures require company to settle down a system and mechanism to tracking company performance [10]. The measuring, testing, auditing activities have been carried out to ensure the effectiveness and efficiency of the system. To obtain and maintain ISO 9000 certificate, an organization's quality system must be measured against the requirements of the ISO 9001:2000 standards by itself or by a certification body. In this circumstance, the research examines the change of quality performance and performance measurement after implementing ISO 9000. There were many researches about the benefit and effectiveness of ISO 9000 implementation. Yann [12] tried to evaluate ISO 9000 implementation by evaluating 6 main impacts in quality management system. Clare [3] used 17 indexes to evaluate the benefit of ISO 9000 certification. This research consider ISO 9000 implementation as a conformance of 4 main managerial requirements, name "Management Responsibility", "Resource Management", "Product Realization", "Measuring, analysis and improvement". Those 4 parts are 4 main components of ISO 9001:2000 quality management system that describe in Figure 1.

The first issue of this research is to investigate relationship between ISO 9000 implementation and company performance in term of improvement of quality performance. Neely et al. [2] summarized quality-based performance in a set of 10 measures concerning fixture, duration...In this research the measure for quality performance is defined by 5 criteria like incoming quality, in-process quality, final product quality, on-time delivery, solving customer complaint. They are the most measures that are widely used in the manufacturing companies as indicators of quality performance of production activities.

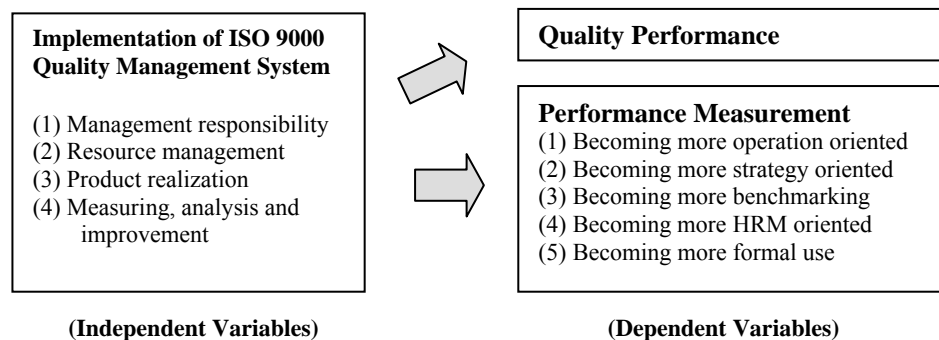


Figure 2: Research Framework

The second issue of this research is to investigate relationship between ISO 9000 implementation and the change in utilization of performance measurement. Performance measurement can be defined as the process of quantifying the efficiency and effectiveness of action [2]. De Tony *et al.* summarized the general utilization of performance measurement in 3 categories such as planning, controlling and coordination activity; control, evaluation and involvement of humane resources; benchmarking [5]. In this research, the change in utilization of performance measurement is assumed that after ISO 9000 implementation, performance measurement is becoming

- More support the planning, controlling, and coordinating the operational activities (such as quality management, supply chain management, production management, inventory control...). This change can be named as “Becoming more operation oriented”.
- Delivered from strategy, long term plan and it supports the strategic deployment and enhancing the competitiveness. This change can be named as “Becoming more strategy oriented”.
- More support the Benchmarking process. This change can be named as “Becoming more Benchmarking oriented”.
- More supporting the planning, controlling, and coordinating of Human Resource Management. This change can be named as “Becoming more HRM oriented”.
- More standardized, periodically carried out, frequently updated and feed backed to the employee. This change can be named as “Becoming more formal deployment”.

5. Questionnaire and Data Collection

The questionnaire was formulated after a comprehensive review of the literature of general management control and performance measurement. The purpose was to draft a questionnaire that would cover many of the central issues relating business performance.

The survey consists of three parts referring relationship between quality management and performance measurement.

Firstly, we examine the influence of ISO 9000 implementation on company quality performance. The companies provide the information concerning “Self evaluated status of ISO 9000 implementation based on results of certification audit, surveillance audits, and internal audits”. Ranking in 5 point-scales from “Not complied with ISO 9001:2000 standard at all” (1) to “Fully complied with ISO 9001:2000 standard”(5). Next, the companies have been asked about “How the implementation of ISO 9000 did give the improvement to quality performance”. The index for quality performance can be broken down into 5 indexes as incoming quality, in-process quality, final product quality, on-time delivery, solving customer complaint. The ranking in 5 point-scales from “Not improved at all” (1) to “Strongly improved” (5).

Secondly, the survey is to examine the influence of ISO 9000 implementation on performance measurement. The influence of ISO 9000 on performance measurement system is considered in possible five impacts concerning with the change in utilization of performance measurement. The company had been asked about the “Change in utilization of performance measurement after implementing ISO 9000”. Ranking is in 5 point-scales from “Strongly disagreed” (1) to “Strongly agreed” (5).

Thirdly, the survey examines the change in utilization of performance measurement after ISO 9000 implementation. A set of 32 measures, which has been formulated based Balanced Scorecard approach, has been examined to know the real application of performance measure in companies. The company had been asked about the frequency of use for each measure before and after ISO 9000. Ranking is in 5 point-scales from “Not used at all” (1) to “Most frequently used” (5). The questionnaire is expected to be answered by top managers of companies.

Regarding the economy development and situation of transition period to market oriented economy, Vietnam cases have been adopted in order to get the data supporting the survey. The target group of this survey is Vietnam manufacturing industries that has been already implemented and certified ISO 9000 standard in the past 5 year. The ISO 9000 standards have been first introduced in Vietnam in 1995. By December of 2004, there were nearly 2000 Vietnam companies already certified ISO 9000 [11]. Among of them 90% is manufacturing companies.

The questionnaire has been delivered to 400 manufacturing companies in Vietnam. With the supporting from Vietnam Productivity Center (VPC), the questionnaire has dispatched in December of 2004, and there were 148 feedbacks with the response rate at 37%. Finally, 125 responses have been considered in this study. The demographics of respondent companies can be described in Table 2. About 15% of responses were answered by top managers (executive director, president), 82% were answered by Quality Management Representative (member of Board of Director).

Table 2: Demographics of Respondents

Classify by type of production			Number	%			
Mechanical manufacturing (machinery, motorcycle, automobile)			32	25.6			
Electronic manufacturing (home appliance, IT, telecommunication devices)			35	28			
Chemical manufacturing (plastic, construction material, gas)			23	18.4			
Textile and Garment			18	14.4			
Food processing (livestock, seafood, liquor)			17	13.6			
Classify by ownership		Number	%	Classify by company size		Number	%
State owned		43	34.4	Under 100 employees		12	9.6
Private		47	37.6	Between 100-500 employees		61	48.8
Joint-venture		21	16.8	Between 500-1000 employees		33	26.4
Foreigner investment		14	11.2	Above 1000 employees		19	15.2

6. ISO 9000 and Quality Performance

6.1 Development of ISO 9000 Implementation in Vietnam

The quality management system started introduced in Vietnam since 1995. Since the year 1999, along with the development of Vietnam industry and the integration to the global economy, number of ISO 9000 certificates that awarding to the industry is continuously increased. By end 2004, it is estimated that around 2000 companies already certified ISO 9000 by local and international certification bodies. Because of the requirements of customers and markets, the local manufacturers and service providers have to implement ISO 9000 for better product quality and matching customer requirement.

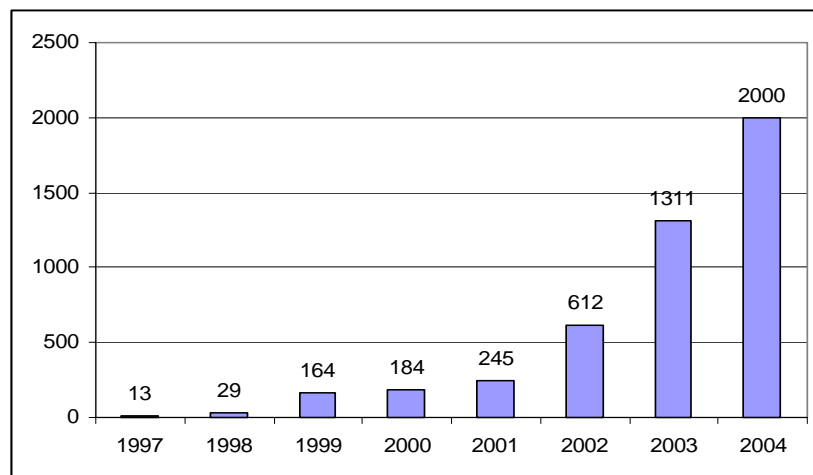


Figure 3: Development of ISO 9000 certificates in Vietnam (Source: 13rd.survey ISO [1])

ISO 9000 certificate is around 10 to 12 months with the most time is spending for developing quality procedures. The typical process of implementing ISO 9000 is described in the figure 4. Generally, companies take from 4 to 6 months for writing operational procedures and quality manual. In practice, this quality management system document has been established normally three or four months before certification audit.

Around 10-15% of workforce is participating in ISO 9000 project and around 95% of middle manager has been trained for ISO 9000 awareness and methodology.

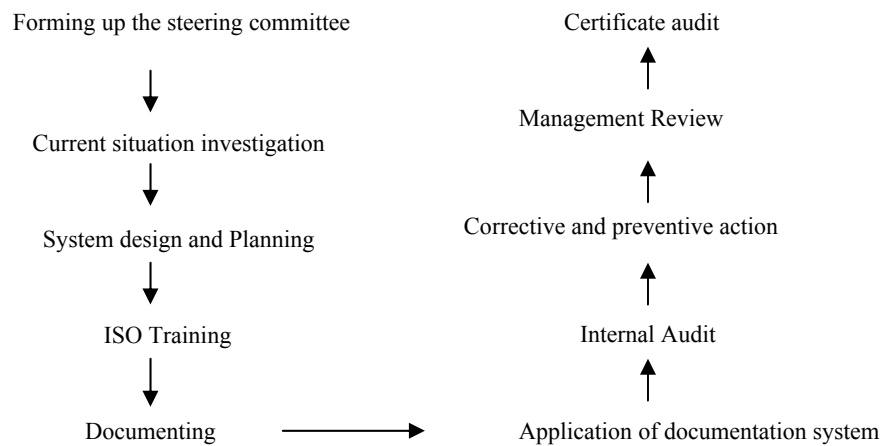


Figure 4: Typical steps of ISO 9000 implementation

In order to quantitative assessment the situation of ISO 9000 implementation in the industries, this research tries to utilize the scale to measure the conformance to ISO 9000 requirements. The status of ISO 9000 implementation can be presented by breaking down four main elements of ISO 9000 quality management system (Figure 1). ISO 9000 can be itemized in to fifteen indexes that are delivered from the requirement of ISO 9001:2000 standard as follows:

Management responsibility consists of three indexes: Quality planning (QPL), Responsibility and authority (RAA) and Quality Management Representative (QMR).

Resource management consists of two indexes: Education and training (EAT) and Working environment and safety (WES).

Product realization consists of six indexes: Contract review (CRV), Design control (DCL), Product standardization (PST), Supplier control (SCL), Process control (PCL), Storage and handling (SAH).

Measuring, analysis and improvement consist of four indexes: Measuring and monitoring (MAM), Nonconformity control (NCC), Analysis of data (AOD) and Improvement (IMP). Totally, fifteen indexes can present for situation of implementing ISO 9000.

Table 3: Implementation of ISO 9000 and Quality Performance

	ISO 9000 Implementation (5 point scale)													Quality performance (5 point scale)							
	Management responsibility			Resource management			Product realization					Measuring, Analysis and Improvement									
	QPL	RAA	QMR	EAT	WES	CRV	DCL	PST	SCL	PCL	SAH	MAM	NCC	AOD	IMP	ICQ	IPQ	FPQ	OTD	SCC	
	\bar{X}	3.94	4.31	3.61	4.05	3.53	4.20	3.86	4.31	4.09	4.3	3.57	4.1	4.38	3.54	3.45	3.64	4.26	4.37	4.33	4.61
	S	0.52	0.51	0.58	0.55	0.5	0.4	0.52	0.55	0.68	0.53	0.54	0.38	0.56	0.55	0.53	0.48	0.44	0.48	0.52	0.49
Mechanical	\bar{X}	3.90	4.29	3.74	4.00	3.48	4.16	3.87	4.26	4.13	4.29	3.55	4.06	4.42	3.55	3.48	3.61	4.19	4.32	4.26	4.61
	S	0.40	0.53	0.51	0.52	0.51	0.37	0.50	0.58	0.67	0.46	0.57	0.36	0.50	0.57	0.51	0.50	0.40	0.48	0.51	0.50
Electronic	\bar{X}	3.92	4.33	3.64	4.00	3.47	4.22	3.83	4.28	4.17	4.31	3.56	4.11	4.39	3.58	3.47	3.61	4.25	4.36	4.31	4.64
	S	0.55	0.53	0.59	0.53	0.51	0.42	0.51	0.61	0.65	0.52	0.56	0.40	0.49	0.55	0.51	0.49	0.44	0.49	0.52	0.49
Chemical	\bar{X}	3.96	4.22	3.61	4.00	3.48	4.17	4.00	4.30	4.17	4.26	3.52	4.04	4.26	3.57	3.43	3.65	4.17	4.39	4.30	4.61
	S	0.37	0.52	0.50	0.43	0.51	0.39	0.43	0.47	0.72	0.54	0.51	0.37	0.62	0.59	0.51	0.49	0.39	0.50	0.47	0.50
Textile and Garment	\bar{X}	3.78	4.50	3.56	4.11	3.56	4.22	3.61	4.39	4.22	4.39	3.50	4.11	4.28	3.61	3.50	3.56	4.39	4.39	4.39	4.72
	S	0.65	0.51	0.62	0.76	0.51	0.43	0.61	0.50	0.55	0.50	0.62	0.32	0.67	0.50	0.51	0.51	0.50	0.50	0.61	0.46
Food processing	\bar{X}	4.18	4.24	3.35	4.24	3.76	4.24	3.94	4.41	3.59	4.29	3.76	4.24	4.53	3.35	3.29	3.82	4.41	4.41	4.47	4.41
	S	0.64	0.44	0.70	0.56	0.44	0.44	0.56	0.51	0.71	0.69	0.44	0.44	0.62	0.49	0.69	0.39	0.51	0.51	0.51	0.51
Foreigner	\bar{X}	4.07	4.21	3.93	4.00	3.50	4.14	4.14	4.36	4.36	4.29	3.71	4.00	4.50	3.57	3.57	3.86	4.21	4.43	4.36	4.71
	S	0.27	0.43	0.27	0.00	0.52	0.36	0.36	0.50	0.63	0.47	0.47	0.39	0.52	0.65	0.51	0.36	0.43	0.51	0.50	0.47
Joint Venture	\bar{X}	4.00	4.38	3.71	4.05	3.57	4.29	3.81	4.29	4.19	4.33	3.67	4.14	4.43	3.67	3.52	3.76	4.38	4.33	4.33	4.67
	S	0.45	0.50	0.56	0.50	0.51	0.46	0.51	0.64	0.51	0.58	0.58	0.36	0.51	0.48	0.51	0.44	0.50	0.48	0.48	0.48
State owned	\bar{X}	3.86	4.30	3.56	4.00	3.47	4.19	3.81	4.33	4.12	4.28	3.47	4.09	4.23	3.56	3.42	3.53	4.19	4.35	4.26	4.58
	S	0.52	0.56	0.59	0.58	0.50	0.39	0.50	0.52	0.70	0.50	0.55	0.37	0.57	0.55	0.50	0.50	0.39	0.48	0.54	0.50
Private	\bar{X}	3.94	4.32	3.51	4.11	3.57	4.19	3.83	4.30	3.94	4.32	3.57	4.13	4.45	3.47	3.40	3.62	4.30	4.38	4.38	4.57
	S	0.60	0.52	0.62	0.63	0.50	0.40	0.56	0.55	0.73	0.56	0.54	0.40	0.58	0.55	0.58	0.49	0.46	0.49	0.53	0.50

Gathering from the survey, Table 3 reflects the conformance to ISO 9000 requirements classify by industries and business ownership. Comparing with ISO 9000 requirement, the most complied and implemented are “Responsibility and authority (RAA)”, “Product standardization (PCL)”, “Process control (PCL)”. The least complied indexes are “Working environment and safety (WES)”, “Storage and handling (SAH)”, “Improvement (IMP)” and “Analyzing of data (AOD)”.

For in-dept analysis, we can classify the survey responses by production type and ownership. It is interesting to note that in all 5 groups, the conformance to ISO 9000 is generally obtained, in term of “Responsibility and authority (RAA)”, “Product standardization (PST)”. Using a huge quantity of employee, the textile & garment and food processing companies get the significant conformances about the “Education and Training (EAT)” and “Product standardization (PST)”. However, some lacks of conformance are also identified. For example, chemical industry got lower score in term of “Working environment and safety (WES)”, the control measures to supplier (SCL) of food processing companies is not sufficient. The textile & garment production got high score in process control (PCL) but less score in Design control (DCL) and Quality planning (QPL).

Classifying the respondent by business ownership, the degrees of conformances to ISO 9000 are almost the same in 4 sectors: foreigner, joint venture, and state owned and private industries. However, in term of “Quality planning (QPL)”, “Design control

(DCL)” and “Supplier control (SCL)”, the foreigner-invested industries get a bit higher score than local industries. Despite of rather short business development history, the private sector shows its potential capability to strengthen its competitiveness by its conformance to ISO 9000, especially in term of “Process control (PCL)” and “Education and Training (EAT)”.

6.2 The influence of ISO 9000 Implementation on Quality Performance

As mentioned early, the situation of ISO 9000 can be presented by fifteen measure extracting from requirement of ISO 9001:2000 standard. In this research, the evaluation of quality performance is composed from five indexes like Incoming quality (ICQ), In-process quality (IPQ), Final product quality (FPQ), On-time delivery (OTD), Solving customer complaint (SCC).

The relationship between ISO 9000 implementation and quality performance could be evaluated by regression model with quality performance (Y_0) is dependent variable. The quality performance can be considered as a compositor of five popular indicators for manufactures: incoming quality, in-process quality, final product quality, on-time delivery, and solving customer complaint. The independent variables are fifteen indexes of ISO 9000 requirement that mentioned above

$$Y_0 = \alpha_0 + \beta_0 \text{QLP} + \beta_1 \text{RAA} + \beta_2 \text{QMR} + \beta_3 \text{EAT} + \beta_4 \text{WES} + \beta_5 \text{CRV} + \beta_6 \text{DLC} + \beta_7 \text{PST} + \beta_8 \text{SLC} + \beta_9 \text{PCL} + \beta_{10} \text{SAH} + \beta_{11} \text{MAM} + \beta_{12} \text{NCC} + \beta_{13} \text{AOD} + \beta_{14} \text{IMP} \quad (1)$$

The total number of observations is 125 and the significant level of testing is set 95%. Testing for significance of the multiple regression models, the obtained F-value (with 15 and 110 degree of freedom) is 51. Because $F=51$ is larger than $F(15,110) = 1.83$, the conclusion is that at least one of fifteen independent variables is related to quality performance.

For each multiple regression coefficient, its estimate and t-value are showed in Table 4 with insignificant coefficients presented in italic. The conclusion is that there are significant between each independent variables (except DCL, PCL, SAH) and quality performance

6.3 ISO 9000 Implementation, Quality Performance and Extension to TQM

During the survey, the companies have been asked if (1) they had post-ISO 9000 plan and already deployed actions towards TQM (such as Quality Control Cycle QCC, Japanese 5S, Kaizen, Suggestion scheme, Statistical Process Control...) or (2) just would like stay at ISO 9000 certification and have no plan or action for extension to TQM. The respondents show that there were 90 companies responded for first option and 35 companies responded for second option. The first group can be named as “Extension to TQM group” and second group can be named as “No-extension to TQM group”.

The Table 5 shows the situation of ISO 9000 implementation and quality performance of the companies dividing by their decision in extension to TQM.

In term of conformance to ISO 9000, data (with one way ANOVA test) show that the significant difference between two groups is not so large. They obtained almost the same conformance to ISO 9000 requirement. Comparing mean, the companies that extent to TQM have bit higher score about “Quality planning (QPL)”, “Quality Management Representative (QMR)”, “Education and Training (EAT)” and “Analysis of data (AOD)”.

Regarding quality performance, the “Extension to TQM group” also has higher score in “Final product quality (FPQ)”, “Ontime delivery (OTD)” and “Solving customer complaint (SCC)”. Based on gathered data, we can conclude that the positive achievement in implementing ISO 9000 might be a motivation for further extension to TQM

7. ISO 9000 Implementation and Performance Measurement

7.1 The change in Utilization of Performance Measurement after ISO 9000 Implementation

The result of survey shows that almost changes in practice of performance measurement after ISO 9000 implementation are positive (Table 6). Among the predicted changes, the most positive change is “Becoming more operation oriented”, “Becoming more formal deployment”, the least change is “Becoming more HRM oriented”.

7.2 The influence of ISO 9000 on Utilization of Performance Measurement

The relationship between ISO 9000 implementation and performance measurement is evaluated by developing five regression models, which describe five possible impacts of ISO 9000 implementation upon utilization of performance measurement:

$$Y_1 = \alpha_1 + \delta_0 \text{ QLP} + \delta_1 \text{ RAA} + \delta_2 \text{ QMR} + \delta_3 \text{ EAT} + \delta_4 \text{ WES} + \delta_5 \text{ CRV} + \delta_6 \beta_6 \text{ DLC} + \delta_7 \text{ PST} + \delta_8 \text{ SCL} + \delta_9 \text{ PCL} + \delta_{10} \text{ ASH} + \delta_{11} \text{ MAM} + \delta_{12} \text{ NCC} + \delta_{13} \text{ AOD} + \delta_{14} \text{ IMP} \quad (2)$$

$$Y_2 = \alpha_2 + \gamma_0 \text{ QLP} + \gamma_1 \text{ RAA} + \gamma_2 \text{ QMR} + \gamma_3 \text{ EAT} + \gamma_4 \text{ WES} + \gamma_5 \text{ CRV} + \gamma_6 \text{ DLC} + \gamma_7 \text{ PST} + \gamma_8 \text{ SCL} + \gamma_9 \text{ PCL} + \gamma_{10} \text{ ASH} + \gamma_{11} \text{ MAM} + \gamma_{12} \text{ NCC} + \gamma_{13} \text{ AOD} + \gamma_{14} \text{ IMP} \quad (3)$$

$$Y_3 = \alpha_3 + \Omega_0 \text{ QLP} + \Omega_1 \text{ RAA} + \Omega_2 \text{ QMR} + \Omega_3 \text{ EAT} + \Omega_4 \text{ WES} + \Omega_5 \text{ CRV} + \Omega_6 \text{ DLC} + \Omega_7 \text{ PST} + \Omega_8 \text{ SCL} + \Omega_9 \text{ PCL} + \Omega_{10} \text{ ASH} + \Omega_{11} \text{ MAM} + \Omega_{12} \text{ NCC} + \Omega_{13} \text{ AOD} + \Omega_{14} \text{ IMP} \quad (4)$$

$$Y_4 = \alpha_4 + \varepsilon_0 \text{ QLP} + \varepsilon_1 \text{ RAA} + \varepsilon_2 \text{ QMR} + \varepsilon_3 \text{ EAT} + \varepsilon_4 \text{ WES} + \varepsilon_5 \text{ CRV} + \varepsilon_6 \text{ DLC} + \varepsilon_7 \text{ PST} + \varepsilon_8 \text{ SCL} + \varepsilon_9 \text{ PCL} + \varepsilon_{10} \text{ ASH} + \varepsilon_{11} \text{ MAM} + \varepsilon_{12} \text{ NCC} + \varepsilon_{13} \text{ AOD} + \varepsilon_{14} \text{ IMP} \quad (5)$$

$$Y_5 = \alpha_5 + \phi_0 \text{ QLP} + \phi_1 \text{ RAA} + \phi_2 \text{ QMR} + \phi_3 \text{ EAT} + \phi_4 \text{ WES} + \phi_5 \text{ CRV} + \phi_6 \text{ DLC} + \phi_7 \text{ PST} + \phi_8 \text{ SCL} + \phi_9 \text{ PCL} + \phi_{10} \text{ ASH} + \phi_{11} \text{ MAM} + \phi_{12} \text{ NCC} + \phi_{13} \text{ AOD} + \phi_{14} \text{ IMP} \quad (6)$$

Testing for significance of multiple regression model (F test), the result is showed in Table 8, the obtained F-values of all the five models (with 15 and 110 degree of freedom) is more than F (15,120)=1.83, then we can conclude that at least one of the independent variables is related to each of five possible changes in utilization of performance measurement.

Table 4: Testing Relationship between ISO 9000, Quality Performance and Change in Utilization of Performance Measurement

	Y ₀		Y ₁		Y ₂		Y ₃		Y ₄		Y ₅	
Adjusted R square	0.86		0.54		0.49		0.30		0.37		0.58	
F	50.10		10.60		9.10		4.60		5.90		12.40	
	Coefficient	t	Coefficient	t	Coefficient	t	Coefficient	t	Coefficient	t	Coefficient	t
QPL	0.21	4.43	-0.23	-2.35	0.32	3.48	0.33	2.96	0.25	2.08	0.20	2.29
RAA	0.11	2.12	<i>-0.18</i>	<i>-1.66</i>	<i>0.06</i>	<i>0.62</i>	<i>-0.01</i>	<i>-0.09</i>	0.27	2.00	<i>0.06</i>	<i>0.58</i>
QMR	0.15	3.49	<i>0.07</i>	<i>0.79</i>	<i>0.12</i>	<i>1.54</i>	<i>0.03</i>	<i>0.33</i>	<i>0.15</i>	<i>1.46</i>	0.19	2.57
EAT	0.12	2.57	<i>0.17</i>	<i>1.84</i>	<i>0.04</i>	<i>0.53</i>	<i>0.02</i>	<i>0.24</i>	0.31	2.85	0.20	2.46
WES	0.12	2.89	<i>-0.09</i>	<i>-0.97</i>	<i>0.02</i>	<i>0.26</i>	<i>-0.18</i>	<i>-1.85</i>	0.27	2.49	<i>0.07</i>	<i>0.92</i>
CRV	0.10	2.62	<i>0.16</i>	<i>1.44</i>	<i>0.13</i>	<i>1.27</i>	<i>0.13</i>	<i>1.08</i>	<i>0.05</i>	<i>0.40</i>	<i>0.15</i>	<i>1.53</i>
DCL	<i>0.04</i>	<i>1.02</i>	<i>0.10</i>	<i>1.23</i>	<i>-0.03</i>	<i>-0.39</i>	<i>-0.06</i>	<i>-0.64</i>	<i>-0.17</i>	<i>-1.70</i>	<i>-0.08</i>	<i>-1.03</i>
PST	0.11	2.34	<i>0.13</i>	<i>1.34</i>	<i>0.00</i>	<i>-0.04</i>	<i>-0.12</i>	<i>-1.12</i>	0.21	1.78	<i>0.09</i>	<i>1.02</i>
SCL	0.13	3.41	<i>0.03</i>	<i>0.53</i>	<i>0.05</i>	<i>0.93</i>	<i>0.06</i>	<i>0.95</i>	<i>-0.07</i>	<i>-0.93</i>	<i>0.01</i>	<i>0.16</i>
PCL	<i>0.06</i>	<i>1.34</i>	0.24	2.69	<i>0.06</i>	<i>0.70</i>	<i>0.10</i>	<i>1.01</i>	<i>-0.18</i>	<i>-1.69</i>	<i>-0.07</i>	<i>-0.85</i>
SAH	<i>0.05</i>	<i>1.33</i>	0.20	2.46	<i>0.03</i>	<i>0.46</i>	<i>0.16</i>	<i>1.75</i>	0.02	0.16	<i>0.00</i>	<i>0.06</i>
MAM	0.09	2.57	0.12	<i>1.14</i>	<i>0.16</i>	<i>1.66</i>	<i>0.07</i>	<i>0.62</i>	<i>0.00</i>	<i>-0.04</i>	<i>0.17</i>	<i>1.85</i>
NCC	0.13	2.38	0.31	2.86	<i>0.02</i>	<i>0.23</i>	<i>0.09</i>	<i>0.78</i>	<i>-0.04</i>	<i>-0.28</i>	<i>0.09</i>	<i>0.96</i>
AOD	0.09	2.14	0.14	<i>1.66</i>	0.18	2.41	<i>0.16</i>	<i>1.70</i>	<i>-0.11</i>	<i>-1.12</i>	<i>0.14</i>	<i>1.90</i>
IMP	0.16	3.78	0.25	2.79	0.19	2.31	<i>0.18</i>	<i>1.81</i>	<i>0.13</i>	<i>1.22</i>	0.23	2.86

Table 5: ISO 9000 Implementation, Quality Performance and Extension to TQM

Group	ISO 9000 Implementation (5 point scale)														Quality performance (5 point scale)						
	QPL	RAA	QMR	EAT	WES	CRV	DCL	PST	SCL	PCL	SAH	MAM	NCC	AOD	IMP	ICQ	IPQ	FPQ	OTD	SCC	
(1) Extension to TQM	\bar{X}	4.00	4.30	3.69	4.12	3.58	4.21	3.91	4.34	4.13	4.29	3.57	4.09	4.42	3.61	3.46	3.68	4.30	4.43	4.40	4.69
	S	0.42	0.48	0.59	0.52	<i>0.50</i>	<i>0.41</i>	<i>0.53</i>	<i>0.56</i>	<i>0.67</i>	<i>0.55</i>	<i>0.50</i>	<i>0.39</i>	<i>0.58</i>	<i>0.53</i>	<i>0.54</i>	<i>0.47</i>	<i>0.46</i>	0.50	0.56	0.47
(2) No-extension TQM	\bar{X}	3.77	4.34	3.40	3.86	<i>3.40</i>	<i>4.17</i>	<i>3.71</i>	<i>4.23</i>	<i>3.97</i>	<i>4.34</i>	<i>3.57</i>	<i>4.14</i>	<i>4.26</i>	<i>3.37</i>	<i>3.43</i>	<i>3.54</i>	<i>4.17</i>	4.20	4.14	4.40
	S	0.69	<i>0.59</i>	0.50	0.60	<i>0.50</i>	<i>0.38</i>	<i>0.46</i>	<i>0.49</i>	<i>0.71</i>	<i>0.48</i>	<i>0.65</i>	<i>0.36</i>	<i>0.51</i>	<i>0.55</i>	<i>0.50</i>	<i>0.51</i>	<i>0.38</i>	0.41	0.36	0.50

ANOVA test with all p<0.05
Index with no significant difference is presented in italic

For each multiple regression coefficient, its estimate and t-value are showed in Table 4 with insignificant coefficients presented in italic. The final relationship between ISO 9000 implementation and changes in utilization of performance measurement shows in Table 7. The most influential factor of ISO 9000 is “Quality planning (QPL)”. The implementation of ISO 9000 requirements such as “Quality planning (QPL)”, “Analysis of Data (AOD)”, and “Improvement (IMP)” make company’s performance

measurement becomes more strategy oriented. . Also, requirements about quality planning make companies the opportunity to benchmark with others partner and competitors.

Table 6: Change in Utilization of Performance Measurement

Change in utilization of performance measurement	Meaning of change	Degree of change
Becoming more operation oriented (Y ₁)	Performance measurement is supporting the planning, controlling, coordinating the operational activities	4.39
Becoming more strategy oriented (Y ₂)	Performance measurement is delivered from strategy, long term plan and it supports the strategic deployment and enhancing the competitiveness	4.02
Becoming more benchmarking oriented (Y ₃)	Performance measurement is supporting the benchmarking process	3.88
Becoming more HRM oriented (Y ₄)	Performance measurement is supporting the planning, controlling, coordinating of Human Resource Management	3.66
Becoming more formal deployment (Y ₅)	Performance measurement is more standardized, periodically carried out, frequently updated and feed back to the employee	4.11

5 points scale [1]:“Strongly disagreed”, [5]:“Strongly agreed”

Requirements of Resource Management (EAT and WES) is giving the impact in change for “Becoming more HRM oriented”. Finally, the closed loop of “Quality planning (QPL)”, “Education and Training (EAT)”, “Improvement by corrective and preventive action (IMP)” under leadership of Quality Management Representative, is make performance measurement system becomes more formal. Means, performance measurement is more standardized, periodically carried out, frequently updated and feed back to the employee.

Testing for the correlation coefficients between dependent variables shows that there are no negative relationships between dependent variables.

Table 7: Relationships between ISO 9000 & quality performance and between ISO 9000 & Change in Utilization of Performance Measurement

	QPL	RAA	QMR	EAT	WES	CRV	DCL	PST	SPL	PCL	SAH	MAM	NCC	AOD	IMP
Quality performance	+	+	+	+	+	+		+	+			+	+	+	+
Performance measure becoming more operation oriented	-										+	+		+	+
Performance measure becoming more strategy oriented	+													+	+
Performance measure becoming more benchmarking oriented	+														
Performance measure becoming more HRM oriented	+	+		+	+										
Performance measure becoming more formal deployment	+		+	+											+

7.3 Changing in Structure of Performance Measures

A set of Balanced Scorecard-based 32 performance measures has been examined in order to know the main changes in the structure of performance measures after ISO 9000 implementation. The result shows that structure of performance measurement almost changed after ISO 9000 implementation (see Table 8). Conducting the ANOVA help us to realize that there is no significant change in seven measures such as “Revenue (RE)”, “Profitability (PR)”, “Economic value Added (VA)”, “Product cycle time (CT)”, “Resource utilization (RU)”, “Labor Productivity (LP)” and “Time to market (TM)”.

Up to ISO 9000, performance measurement was mostly based on financial measures. Company frequently used the traditional measures for tracking the business performance like “Production cost (PC)”, “Revenue (RE)” and “Profitability (PR)”, “Market share (MS)” which almost reflect the short-term performance.

After ISO 9000 implementation, obtaining customer satisfaction became the goal of business, then, the measures relating customer perspectives are more frequently selected, such as “Solving customer complaint (SCC)” and “Customer satisfaction (CS)”. Quality is also became essential issue of business. The companies now started to focus on customer satisfaction by providing better product quality. They’re some new measure like “On-time delivery (OTD)”, “Product innovation (PI)” became the popular indexes of business.

Table 8: Changing in Performance Measurement Structure

Index of performance measure	Aggregate				“Extent to TQM group”				“No extent to TQM group”			
	Before ISO 9000		After ISO 90000		Before ISO 9000		After ISO 90000		Before ISO 9000		After ISO 90000	
	\bar{X}	s	\bar{X}	s	\bar{X}	s	\bar{X}	s	\bar{X}	s	\bar{X}	s
Customer perspective												
Market share (MS)***	4.27	0.44	4.18	0.39	4.28	0.45	4.18	0.38	4.26	0.44	4.20	0.41
Solving customer complaint (SC)*	2.47	0.50	4.06	0.65	2.47	0.50	4.06	0.64	2.49	0.51	4.06	0.68
Company image (CI)*	2.51	0.50	2.7	0.90	2.52	0.50	2.64	0.97	2.49	0.51	2.68	0.69
Customer satisfaction (CS)*	3.04	0.69	3.94	0.65	3.06	0.68	3.94	0.64	3.0	0.73	3.94	0.68
Advertising effectiveness (AE)*	2.27	0.84	4.05	0.69	2.27	0.86	4.02	0.69	2.29	0.83	4.11	0.72
Financial perspective												
Production cost (PC)***	4.73	0.44	4.82	0.39	4.72	0.45	4.82	0.38	4.74	0.44	4.80	0.41
Inventory turnover (IT)*	4.7	0.46	4.82	0.39	4.68	0.47	4.82	0.38	4.74	0.44	4.80	0.41
Revenue (RE)*	4.98	0.13	4.98	0.13	5.0	0	5.0	0	4.94	0.24	4.94	0.24
Profitability (PR)*	4.98	0.13	4.99	0.09	5.0	0	5.0	0	4.94	0.24	4.97	0.17
Return of investment (ROI)*	2.53	0.5	3.58	0.49	2.53	0.5	3.59	0.49	2.51	0.51	3.54	0.51
Cash –flow (CF)*	1.78	0.41	2.16	0.73	1.8	0.4	2.09	0.73	1.74	0.44	2.34	0.73
Economic value Added (VA)*	2.22	0.83	2.37	0.93	2.19	0.83	2.28	0.92	2.29	0.83	2.60	0.91
Productivity (PY)**	1.73	0.44	1.91	0.68	1.72	0.45	1.86	0.66	1.74	0.44	2.06	0.73
Internal business perspective												
Incoming part quality (IQ)*	4.47	0.50	4.73	0.54	4.47	0.50	4.82	0.38	4.49	0.51	4.49	0.78
In process quality (PQ)**	4.26	0.44	4.59	0.49	4.26	0.44	4.61	0.49	4.26	0.44	4.54	0.51
Final product quality (FQ)*	4.98	0.13	4.93	0.34	5.0	0	5.0	0	4.94	0.24	4.74	0.61
After sale service (AS)*	3.73	0.84	4.82	0.38	3.71	0.85	4.82	0.38	3.37	0.84	4.83	0.38
Product reliability (RY)*	4.51	0.50	4.76	0.43	4.52	0.50	4.77	0.43	4.49	0.51	4.74	0.44
Product lead time (PLT)*	3.51	0.50	4.42	0.49	3.52	0.50	4.41	0.49	3.49	0.51	4.46	0.51
Product cycle time (CT)*	2.53	0.50	2.58	0.49	2.53	0.50	2.59	0.49	2.51	0.51	2.54	0.51
On-time delivery (OTD)*	3.78	0.83	4.54	0.50	3.81	0.83	4.53	0.50	3.71	0.83	4.57	0.50
Product innovation (PI)*	3.51	0.50	4.36	0.48	2.52	0.50	4.36	0.48	3.49	0.51	4.37	0.49
Resource utilization (RU)*	1.78	0.83	1.92	0.89	1.79	0.83	1.93	0.90	1.77	0.84	1.89	0.90
Volume flexibility (VF)***	2.00	0.72	2.21	0.73	1.99	0.73	2.23	0.74	2.03	0.71	2.14	0.73
Innovation and grow perspective												
Development of employee skill (DE)*	2.46	1.08	3.46	1.11	2.69	1.06	4.02	0.58	1.86	0.91	2.03	0.82
Employee involvement (EI)*	1.26	0.44	2.82	0.98	1.26	0.44	3.11	0.92	1.26	0.44	2.09	0.78
Knowledge sharing (KS)***	1.74	0.44	1.63	0.48	1.73	0.44	1.64	0.48	1.77	0.43	1.6	0.50
Labor Productivity (LP)*	3.53	0.50	3.46	0.63	3.53	0.50	3.59	0.49	3.51	0.51	3.11	0.80
Technology ability (TA)*	2.97	0.71	3.11	0.77	2.98	0.73	3.23	0.74	2.94	0.68	2.8	0.80
New product introduction (NI)**	3.29	0.69	3.42	0.74	3.48	0.50	3.59	0.49	2.8	0.87	3.0	1.06
RD innovation (RD)*	2.85	1.01	3.29	0.70	2.87	1.03	3.41	0.49	2.8	0.99	2.97	1.01
Time to market (TM)*	3.03	0.69	2.94	0.65	3.07	0.68	2.94	0.64	2.94	0.73	2.94	0.68

5 point scale: 1: “Not used at all”, 5: “Most frequently used”

The performance measure with no significant change is presented in italic

□*: p < 0.001, □** : p < 0.01 , □*** < 0.05

The data in Table 8 show that, after ISO 9000, the structure of performance measures became more complex with more focusing in customer aspects while maintains critical utilization of financial measures. Because ISO 9000 requires company to control operation and production process, companies selected some measures

reflecting about the internal business processes with some measures such as “Product lead time (PLT)” and “On-time delivery (OTD)”. In term of innovation and grow issues, before ISO 9000, companies randomly used measures innovation capability and human resource development. After ISO 9000 implementation, with requirement of ISO 9001 standard (ISO 9001:2000, Chapter 6 – Resource management) companies frequently used the measures about “Development of employee skill (DE) ” and “Employee involvement (EI)”. It is important to note that some important indexes concerning the flexibility like “Volume flexibility (VF)”, “Resource utilization (RU)” measures are rarely used in the company. In dept analysis the change in structure of performance measurement after ISO 9000, the companies can be classified by their decision to extent to TQM. Data in Table 8 shows that the trend and structure of performance measurement is almost the same in both groups. ISO 9000 gave impacts in both groups and make they become more frequently measure customer aspect. We can realize that, the “Extension to TQM group” measures their workforce’s capability, involvement and development more frequent. It means that, following TQM philosophy, companies created quality-minded in their employee by educating the awareness and developing the skills. This long-term approach requires companies to periodically evaluate the achievement of humane resource management.

The data in Table 8 also shows that the custom of using performance measure among the companies is similar. They are using almost the same set of measure over the time. There are some measures has been used almost the time, but some measures rarely used. There is the lack of utilization of measures relating productivity, innovation capability, and value added analysis. It seems that the selection of performance measure is mainly intended for monitoring performance and not firmly intended to improve performance.

8. Findings and Discussion

ISO 9000 implementation is not only a certification gaining process but also really a continuous improvement process. The PDCA management cycle of ISO 9000 requires companies to set-up, maintain and improve the management activities leading to match customer requirements [9]. The result of this research show that with the implementation of ISO 9000, the quality management system is strengthened with more effectiveness in responsibility and authority, product standardization and process control. The research found out that almost factor of ISO 9000 requirement help companies in Vietnam to improve quality performance, especially the internal process quality.

Implementing ISO 9000 also helps companies to improve the management system. One of influence of ISO 9000 is the change of performance measurement process. With the implementation of ISO 9000 requirements, the utilization of performance measurement is becoming more supporting the management system. Because of ISO 9000 structure consist of requirements concerning with quality planning, setting up the measurable objectives in all levels of organization, concerning with measuring, auditing, analyzing the performance also with correction and prevention, then the use of performance

measurement is becoming changed to support operational activities, strategy deployment, benchmarking, human resource management activities.

Because of ISO 9000 implementation requires the company to establish the documented system including operational procedure and data recording, also the company follows the PDCA philosophy in management activities, then, performance measurement is carried out more formal, meaning that, it is more standardized, periodically carried out, frequently updated and feed back to the employee. The result of survey shows that among the ISO 9000 standard requirements, quality planning plays critical role in term of setting up and maintaining the management system. The implementing ISO 9000 is a catalyst for promoting TQM. The companies, which obtain the high conformance and quality performance, trend to extent their management system to TQM. ISO 9000 implementation gave the significant change in performance measure. After implementing ISO 9000, company is keeping the utilization of traditional performance measure with more quality and customer satisfaction oriented.

The structure of performance measure is also getting more balancing; shifting from unique utilization of the finance and customer measures to utilization of indexes regarding about internal processes, learning and innovation aspects. The extension to TQM is also give impact in changing utilization of performance measure. The companies started to use non-financial measure that reflecting humane aspects.

9. Conclusion

Standardization of product and production is irreversible trend of global economy. Majority of developed and developing countries have adopted ISO 9000 as the national quality system standards. In addition, ISO 9000 could be a vehicle for implementing TQM [10].

Implementing ISO 9000 is a critical organizational change that requires a transformation in the organization's, processes, strategic priorities, and culture, among others. This study examines the result of ISO 9000 implementation and its impacts to quality performance and performance measurement system. This study can be very useful to organization, especially the manufacturers in developing country, which attempt to identify factor of management system in order to improve competitiveness. Based on this empirical study, managers can exploit ISO 9000 as framework for by using the finding relationships and interdependencies between factors to assess and improve the quality performance.

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Appendix

Survey in Quality Management and Performance Measurement in Manufacturing Companies

1 General Information

- a. Company Name
- b. Address
- c. Type of production
 - Mechanical manufacturing (machinery, motorcycle, automobile)
 - Electronic manufacturing (home appliance, IT, telecommunication devices)
 - Chemical manufacturing (plastic, construction material, gas)
 - Textile and Garment
 - Food processing (livestock, seafood, liquor)
- d. Type of ownership
 - State owned
 - Private
 - Join-venture
 - Foreign investment
- e. Work force
 - Under 100 employees
 - Under 100 employees
 - Between 500-1000 employees
 - Above 1000 employees

2. Quality Management System Information

- a. Date of ISO 9000 certification
- b. Scope of ISO 9000 certification
- c. Action after ISO 9000 certification
 - Have post-ISO 9000 plan and already deployed activities towards TQM implementation (such as QCC, 5S...)
 - Stay at ISO 9000 certification and have no plan for extension to TQM

3. Situation of Quality Management System and Quality Performance after ISO 9000 Implementation

3.1 Evaluating ISO 9000 Implementation

Please give self- evaluated status of ISO 9000 implementation based on results of certification audit, surveillance audits, and internal audits. Ranking in 5 point-scales from “Not complied with ISO 9001:2000 standard at all” (1) to “Fully complied with ISO 9001:2000 standard”(5)

ISO 9000 implementation	Status of implementation				
Management responsibility					
3.1 Quality planning	1	2	3	4	5
3.2 Function and responsibility	1	2	3	4	5
3.3 Management responsibility/ leadership	1	2	3	4	5
Resource management					
3.4 Education and training	1	2	3	4	5
3.5 Work environment, infrastructure and safety	1	2	3	4	5
Product Realization					
3.6 Customer information management	1	2	3	4	5
3.7 Design control	1	2	3	4	5
3.8 Product Standardization					
3.9 Supplier control	1	2	3	4	5
3.10 Process control	1	2	3	4	5
3.11 Storage and handling	1	2	3	4	5
Measuring, Analysis and Improvement					
3.12 Inspection and testing	1	2	3	4	5
3.13 Nonconformity control	1	2	3	4	5
3.14 Internal quality audit	1	2	3	4	5
3.15 Quality improvement	1	2	3	4	5

3.2 Evaluating Quality Performance after ISO 9000 Implementation

Please indicate how the implementation of ISO 9000 impacted the improvement to quality performance (based on the results of contract performance, production, quality statistic and internal audit). The ranking in 5 point-scales from “Not improved at all” (1) to “Strongly improved” (5).

Quality Performance indexes	Current situation				
3.16 Incoming quality	1	2	3	4	5
3.17 In-process quality	1	2	3	4	5
3.18 Final product quality	1	2	3	4	5
3.19 In time delivery	1	2	3	4	5
3.20 Solving customer complaint	1	2	3	4	5

4. Change in Using of Performance Measurement after ISO 9000 Implementation

This part is referring to the objectives of performance measurement and process of carrying out performance measurement. Based on management information, please evaluate the change of utilization of performance measure after implementing ISO 9000 referring 5 followings possible impacts.

Ranking is in 5 point-scales from “Strongly disagreed” (1) to “Strongly agreed” (5)

Change in use of performance measurement after ISO 9000	Score				
1. Performance measurement is supporting the planning, controlling, and coordinating the operational activities (such as quality management, supply chain management, production management, inventory control...)	1	2	3	4	5
2. Performance measurement is delivered strategy, long term plan and it supports the strategic deployment and enhancing the competitiveness	1	2	3	4	5
3. Performance measurement is supporting the benchmarking process	1	2	3	4	5
4. Performance measurement is supporting the planning, controlling, coordinating of Human Resource Management	1	2	3	4	5
5. Performance measurement is more standardized, periodically carried out, frequently updated and feed back to the employee	1	2	3	4	5

5. Change in Use of Selecting Performance Measures after ISO 9000 Implementation

Please indicate the frequency of use of performance measures before and after ISO 9000 implementation.

1: “Not used at all”, 3: “Sometimes used”, 5: “Most frequently used”.

Index of performance measure	Before ISO 9000					After ISO 9000				
Market share	1	2	3	4	5	1	2	3	4	5
Rate of solving customer complaint,	1	2	3	4	5	1	2	3	4	5
Company image,	1	2	3	4	5	1	2	3	4	5
Customer satisfaction	1	2	3	4	5	1	2	3	4	5
Advertising effectiveness	1	2	3	4	5	1	2	3	4	5
Production cost	1	2	3	4	5	1	2	3	4	5
Inventory turnover	1	2	3	4	5	1	2	3	4	5
Revenue	1	2	3	4	5	1	2	3	4	5
Profitability	1	2	3	4	5	1	2	3	4	5
Return of investment ROI	1	2	3	4	5	1	2	3	4	5
Cash –flow	1	2	3	4	5	1	2	3	4	5
Economic value Added EVA	1	2	3	4	5	1	2	3	4	5
Productivity	1	2	3	4	5	1	2	3	4	5
Incoming part quality	1	2	3	4	5	1	2	3	4	5
In process quality	1	2	3	4	5	1	2	3	4	5
Final product quality	1	2	3	4	5	1	2	3	4	5

Customer complaint	1	2	3	4	5	1	2	3	4	5
Product reliability	1	2	3	4	5	1	2	3	4	5
Product lead time	1	2	3	4	5	1	2	3	4	5
Product cycle time	1	2	3	4	5	1	2	3	4	5
On-time delivery	1	2	3	4	5	1	2	3	4	5
Product innovation	1	2	3	4	5	1	2	3	4	5
Resource utilization	1	2	3	4	5	1	2	3	4	5
Volume flexibility	1	2	3	4	5	1	2	3	4	5
Development of employee skill	1	2	3	4	5	1	2	3	4	5
Employee involvement	1	2	3	4	5	1	2	3	4	5
Knowledge sharing	1	2	3	4	5	1	2	3	4	5
Productivity	1	2	3	4	5	1	2	3	4	5
Technology ability	1	2	3	4	5	1	2	3	4	5
New product introduction	1	2	3	4	5	1	2	3	4	5
RD innovation	1	2	3	4	5	1	2	3	4	5
Time to market	1	2	3	4	5	1	2	3	4	5