ISO 9000 IMPLEMENTATION AND PERFORMANCE IMPROVEMENT IN VIETNAMESE MANUFACTURING COMPANIES

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INTRODUCTION

Standardization of product and production is irreversible trend of global economy. 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.

In recent years, Vietnam's economy has been taking ongoing efforts to integrate into the international economy ISO 9000 series were introduced in Vietnam during 1990s and has been widely implemented in manufacturing sector and service sector. The number of Vietnamese companies which obtained ISO 9000 certification had increased 431 folds from 13 certificated companies in 1997 to 7333 certificated companies in 2009 [27]. While the majority of managers and researchers agree that ISO 9000 implementation is necessary for quality management process, the impacts of ISO 9000 implementation on companies' performance in Vietnam are still the questions for academicians and quality management practitioners and need to be investigated.

To address this need, this study aims at examining the situation of ISO 9000 implementation in Vietnamese manufacturing companies and its relationship with quality performance and customer satisfaction in companies. Based on the data collected from 108 companies though a questionnaire survey in 2012, the authors investigate the changes in quality management practices and different performance dimensions before and after ISO 9000 implementation. The results of statistical results indicate that ISO 9000 implementation significantly improve various quality management practices and quality performance. This study contributes to quality management literature by highlight the significant contribution of ISO 9000 to performance of companies. In addition, the results of this study portray the quality management practices in Vietnamese companies. The next sections will summary the latest ISO 9000 literature and analytical framework of this study. Then the data collection and analysis will be explained. The last three sections show the main findings, implications, discussions, limitations, and conclusions.

LITERATURE REVIEW

In this section, we summaries the main framework of ISO 9000 from the perspective of quality management principles and summarized the latest literature on ISO 9000 studies. The empirical findings on contribution of ISO 9000 to business performance are summarized.

Benefits of ISO 9000

Since ISO 9000 has been first published in 1987 and became one of the most popular adopted quality management system in the world, the debate about ISO 9000's impacts on the organizational performances is still unclear.

Sampaio et al (2009) indicated in their exhaustive literature review research that there are external and internal benefits of ISO 9000 certification (most common benefit are summarized in Table 1 as following:

Table 1: Most commonly stated ISO 9001 certification benefits reported in the literature[18]

| External benefits | Internal benefits | | |
|--|--|--|--|
| Access to new markets | Productivity improvements | | |
| Corporate image improvement | Product defect rate decreases | | |
| Market share improvement | Quality awareness improvements | | |
| ISO 9000 certification as marketing tool | Definition of the personnel responsibilities | | |
| Customer relationship improvements | and obligations | | |
| Customer satisfaction | Delivery time improvements | | |
| Customer communication improvement | Internal organization improvements | | |
| | Nonconformities decrease | | |
| | Customers' complains decrease | | |
| | Internal communication improvements | | |
| | Product quality improvement | | |
| | Competitive advantage improvement | | |
| | Personnel motivation | | |

On the one hand, these above benefits have been proved as the result of ISO 9000 implementation by several researches [2] [3] [4] [5] [8] [9] [10] [11] [17] [20] [23] [26].

On the other hand, there are arguments that no proof of direct causation or not enough evidence to support such benefits of ISO 9000 [6] [7] [12] [13] [18] [22] [25].

ISO 9000's eight quality management principles

The ISO 9000 standards are based on eight quality management principles which are derived from the collective experience and knowledge of the international experts. They are listed in Table 2 as following:

| No. | Principle | Content | Key Benefits |
|-----|-----------------------|---|--|
| 1 | 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. | Increased revenue and market share obtained through flexible and fast responses to market opportunities Increased effectiveness in the use of the organization's resources to enhance customer satisfaction Improved customer loyalty leading to repeat business. |
| 2 | 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. | People will understand and be motivated towards the organization's goals and objectives Activities are evaluated, aligned and implemented in a unified way Miscommunication between levels of an organization will be minimized. |
| 3 | 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. | Motivated, committed and involved people within the organization Innovation and creativity in furthering the organization's objectives People being accountable for their own performance People eager to participate in and contribute to continual improvement. |
| 4 | Process approach | A desired result is achieved more efficiently when activities and related resources are managed as a process. | Lower costs and shorter cycle times through effective use of resources Improved, consistent and predictable results Focused and prioritized improvement opportunities. |
| 5 | System approach | Identifying, understanding and managing interrelated processes as a system contributes to the organization's effectiveness and efficiency in achieving its objectives. | Integration and alignment of the processes that will best achieve the desired results Ability to focus effort on the key processes Providing confidence to interested parties as to the consistency, effectiveness and efficiency of the organization. |

Table 2: ISO 9000's eight quality management principles

| No. | Principle | Content | Key Benefits |
|-----|--|---|---|
| 6 | Continual improvement | Continual improvement of the organization's overall performance should be a permanent objective of the organization. | Performance advantage through improved organizational capabilities Alignment of improvement activities at all levels to an organization's strategic intent Flexibility to react quickly to opportunities. |
| 7 | Factual approach to decision making | Effective decisions are based on the analysis of data and information. | Informed decisions An increased ability to demonstrate the effectiveness of past decisions through reference to factual records Increased ability to review, challenge and change opinions and decisions. |
| 8 | Mutually beneficial supplier relationships | An organization and its suppliers are interdependent and a mutually beneficial relationship enhances the ability of both to create value. | Increased ability to create value for both parties Flexibility and speed of joint responses to changing market or customer needs and expectations Optimization of costs and resources. |

Eight quality management principles can be used by company's managers to guide the implementation of ISO 9000 system in company toward improved performance. Each principle alone and together to ensure the benefits of ISO 9000 on company's performance.

Performance measurement

The performance measure in production could be listed as follows [1]:

- *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, selling price
- *Flexibility based measure*: new product introduction, deliverability, volume, resource mix

In the Kaplan and Norton model of the Balanced Scorecard four perspectives are used to measure the company's performance [14]:

• *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?)

Combine between the benefits of ISO 9000 in previous literature and the measurement of business's performance, the factors are chosen in this research to analyze performance of company include: Nonconformities (Defects), Delivery time and customer satisfaction.

The impacts of ISO 9000 implementation on quality performance and customer satisfaction

Many studies highlighted the expectations of improved quality management practices, quality performance improvement, and increased customer satisfaction from ISO 9000 implementation.

Romano [19] presented a longitudinal analysis by comparing the growth in different measures of performance six months before and after certification on a sample of 100 Italian companies. The performance measures were internal and external quality, quality costs and timing (cycle, manufacturing, punctuality in delivery etc.). The conclusions are that registered companies improve their internal quality and the reliability of the production process.

Buttle's survey [4] of 1,220 certified UK companies, which included 415 service sector firms, found that improving operations and marketing gains were claimed by most of the firms following ISO 9000 quality certification. Particularly, profit improvement is the most important benefit sought from certifications; ranked second and third most important are process improvements and marketing benefit (including gaining new customers, keeping existing customers, increasing market share, increasing growth in sales and improving customer satisfaction).

Leticia Santos and Carmen Escanciano [15] conducted an empirical study on the benefits of implementation of ISO 9000. The authors carried out survey on a sample of certificated companies in Spain. The empirical evidence indicated that the benefits attained by companies including benefits related to the human element and managerial procedures, the improvement in competitive position in the market, internal efficiency, and external benefits associated with increase in customer satisfaction are results of ISO certification.

Low Sui Pheng and Darren Wee [16] investigated the impact of ISO 9000 on building defects. The study was conducted in the organization and operations of main building contractor in Singapore. By focusing onto fundamental aspect of construction quality, the research result showed how ISO 9000 certification can affect the amount of defects occurring. It provided the relationship between each of ISO 9001 requirements, the causes of defects and the broad strategies needed to prevent the causes from occurring.

ANALYTICAL FRAMEWORK

The main objectives of this study are to investigate the relationship between ISO 9000 implementation and quality performance and customer satisfaction. The authors focus on four aspects of ISO 9000 implementation: training, supplier control, process control, documentation. The analytical framework is presented in Figure 1.



Figure 1: Analytical framework

Based on ISO9000 literature, four hypotheses are established as follows.

- Hypothesis 1: There is a significant change in quality management practices between before and after the ISO 9000 implementation in companies
- Hypothesis 2: There is a significant change in quality performance between before and after the ISO 9000 implementation in companies
- Hypothesis 3: ISO 9000 implementation positively impact on quality performance of companies
- Hypothesis 4: ISO 9000 implementation positively impact on customer satisfaction of companies

DATA MEASUREMENT AND COLLECTION

Questionnaire was designed in Vietnamese, and divided into three main parts:

- Part I: This part is designed to collect information about companies as well as constraints and motivations for them to implement ISO 9000.
- Part II: This part includes items asking participants about quality management practices of their companies in two periods before and after their companies implement ISO 9000. Question items are about Employee training, Supplier control,

Process control and Documentation level. This part use quantitative measurement for all question items as following:

- ✓ Employee training: The percentage of employees being trained about quality management
- ✓ Supplier control: The percentage of suppliers being examined, evaluated and re-evaluated before selected
- ✓ Process control: The percentage of processes which is controlled through statistic techniques and data analysis
- ✓ Documentation level: The percentage of processes which is documented
- Part III: This part comprises items asking participants about quality performance and customer satisfaction of their companies in two periods before and after ISO 9000 implementation. Question items are about incoming defect rate, final defect rate, after-sale defect (or customer return) rate, on time delivery, and customer satisfaction. This part use quantitative measurement for all question items as following:
 - ✓ Incoming defect: The average percentage of incoming defects per year
 - ✓ Final defect: The average percentage of final defects per year
 - ✓ After-sale defect: The average percentage of defects after sale (customer returns) per year
 - ✓ On time delivery: The average percentage of transactions/contracts completed on time per year
 - ✓ Customer satisfaction: The percentage of customer satisfy with companies' products

The questionnaire has been delivered to 350 manufacturing companies in Vietnam and there were 120 feedbacks with the response rate at 34.3%. Among them, 108 valid responses have been used to analyze in this study.

DATA ANALYSIS

Data description

Table 3: Demographics of companies

| Region | % | Number of staff | % | Certification Period | % |
|---------------------------|------|-----------------|-------|-----------------------------|------|
| North Vietnam | 20.4 | Less than 10 | 0 | Less than 2 years | 22.2 |
| Central Vietnam | 3.7 | 11 - 200 | 48.15 | 2-5 years | 47.2 |
| South Vietnam | 2.8 | 201 - 300 | 13.89 | 5 – 10 years | 26.9 |
| North and Central Vietnam | 20.4 | More than 300 | 30.55 | More than 10 years | 0.9 |
| All 3 regions in Vietnam | 24.1 | N/A | 7.41 | N/A | 2.8 |
| N/A | 28.7 | | | | |

The collected data includes the companies operating in different geographical position of Vietnam. Companies operating in all North, Central and South Vietnam present a major

proportion with 24.1%. The number of companies solely operating in North Vietnam or in North and Central Vietnam are also large proportion of equally 20.4%. The percentage of companies solely operating in just Central Vietnam or just South Vietnam is smaller with 3.7% and 2.8%, respectively.

Besides, companies are mostly small and medium enterprises with more than 50% of companies have 11-300 employees. The number of large companies with more than 300 staff also presents a large proportion of over 30%.

Moreover, approximately 50% of companies were ISO 9000 certificated in period from 2-5 years. The remaining companies have been certificated in period of less than 2 years or from 5-10 years.

| Difficulties | % |
|---|------|
| Management commitment | 22.2 |
| Lack of resources | 75 |
| Lack of knowledge about ISO 9000 requirements | 46.3 |
| Lack of training on quality and ISO 9000 | 42.6 |
| Internal resistance | 75 |
| Document and workload are beyond control | 51.9 |

Table 4: Difficulties for Vietnamese companies in implementing ISO 9000

Among six typical difficulties which companies have suffered when implementing ISO 9000. Internal resistance and Lack of resources (such as human resource, financial resource) are two difficulties challenging 75% of respondents. In addition, 51.9% faces problems with a huge volume of document and workload when they implement ISO 9000. Lacking of training on quality and knowledge about ISO 9000 requirements are also quite popular with more than 40% of companies have to cope with. Management commitment seems to be relatively high, so these difficulties is the least popular one for companies.

Table 5: Motivations for ISO 9000 impelementation

| Motivations | % |
|---------------------------------------|------|
| External motivation | 36.1 |
| Internal motivation | 45.4 |
| Both external and internal motivation | 15.7 |
| N/A | 2.8 |

When be asked about the motivation for ISO 9000 implementation, a major proportion with 45.4% of companies have internal motivation which primarily aims to improve the internal processes and product quality, enhance employees' knowledge and skills as well as the efficiency of whole organization. Meanwhile, 36.1% of companies align with external motivation which towards the improvement in companies' image and customer satisfaction as

well as the opportunities for new business and market expansion. Besides, a smaller percentage with 15.7% decided to implement ISO 9000 with both two above motivation.

Comparison in quality practices before and after ISO 9000 implementation

As Table 6 indicated, the largest difference in mean is presented by Documentation control practices with an increase from to 39.95% to 92.02% of processes which are documented. Supplier control and process control practices also show significant positively changes by a double. Suppliers which are examined, evaluated and re-evaluated before selected changed from 45.82% to 89.32%. Processes which are controlled through statistic techniques and data analysis increased from 38.29% to 77.5%. Employees training gets smaller change with the percentage of employees being trained about quality management before and after companies implement ISO 9000 accounts for 45.15% and 75.09%, respectively.

Table 6: Paired Samples Test in Quality Management Practices Before and After ISO9000 Implementation

| | Before ISO9000After ISO 9000ImplementationImplementation | | Paired Differences | | | | | | | | | | | | | | | | | | | | |
|---------------------|--|-------|--------------------|-------|-------|-------|------|-------|-------|-------|------|--|--|--|--|--|--|--|--|--------|---|--|--|
| | | | | | | | | | | | | | | | | | | | | 95% C. | I | | |
| | Mean | Std. | Mean | Std. | Mean | Std. | Mean | Lower | Upper | t | Sig. | | | | | | | | | | | | |
| Employee training | 45.15 | 25.32 | 75.09 | 27.80 | 29.17 | 18.34 | 1.81 | 25.59 | 32.76 | 16.15 | 0.00 | | | | | | | | | | | | |
| Process control | 38.29 | 26.12 | 77.50 | 24.25 | 38.56 | 23.48 | 2.35 | 33.90 | 43.22 | 16.42 | 0.00 | | | | | | | | | | | | |
| Documentation level | 39.95 | 25.42 | 92.02 | 14.63 | 52.11 | 26.47 | 2.62 | 46.91 | 57.31 | 19.88 | 0.00 | | | | | | | | | | | | |
| Supplier control | 45.82 | 25.50 | 89.32 | 15.40 | 43.13 | 22.46 | 2.22 | 38.72 | 47.54 | 19.39 | 0.00 | | | | | | | | | | | | |

In short, when making comparison between before and after ISO 9000 implementation, the result reveals a positive change in all quality practices with Sig. value of 0.000.

Comparison in quality performance before and after ISO 9000 implementation

Table 7: Paired Samples Test in Quality Performance Before and After ISO 9000 implementation

| | Before 9000 Implem | ISO entation | After I Implen | After ISO 9000 Implementation | | Paired Differences | | | | | Sig. (2- tailed) |
|------------------|--------------------------|-----------------|-------------------|----------------------------------|-------|--------------------|---------------|--|-------|-------|------------------------|
| | | | | | | | Std. Error | 95% Confidence Interval of the Difference | | | |
| | Mean | Std. | Mean | Std. | Mean | Std. | Mean | Lower | Upper | | |
| Incoming defects | 3.80 | 5.68 | 1.48 | 1.94 | -2.33 | 4.38 | 0.45 | -3.22 | -1.44 | -5.21 | 0.000 |
| Final defects | 3.85 | 4.85 | 1.63 | 2.31 | -2.21 | 3.10 | 0.31 | -2.83 | -1.58 | -7.02 | 0.000 |
| Customer returns | 1.84 | 2.80 | 0.93 | 1.05 | -0.89 | 2.57 | 0.26 | -1.41 | -0.37 | -3.40 | 0.000 |
| On time delivery | 71.39 | 18.10 | 87.84 | 16.33 | 15.68 | 11.92 | 1.22 | 13.26 | 18.11 | 12.82 | 0.000 |

Table 7 clearly shows a decrease in defect rates from both incoming materials, final products, and, after-sale products. Incoming defects and final defects, after the companies implement ISO 9000, decrease by more than half from approximately 3.8% to 1.5%. After-sale defects (customer returns) present smaller values in both two period of before and after ISO 9000 implementation, but also indicate a significant improvement with defect rate reduces from 1.84% to 0.93%. It is interesting that standard deviation values of these defect rates are quite high. This can be explained by the demographics of respondents; they are companies working in different field so that they have very different requirements about defect rates.

On time delivery which represents for the percentage of contracts/transactions complete on time get a rather good result as before the companies implement ISO 9000 with 71.39%. This percentage increases by one third to 87.84% after ISO 9000 implementation.

In short, when making comparison between before and after ISO 9000 implementation, the result reveals a positive change in all quality performance items with Sig. value of 0.000.

Impacts of ISO 9000 implementation on quality performance and customer satisfaction

Regression analysis is applied to evaluate the impacts of ISO 9000 implementation on each four quality performance items including Incoming defects, Final defects, After-sale defects (Or Customer returns), and On time Delivery. Respondents are companies operating in different fields, so changes in ISO 9000 implementation, quality performance and customer satisfaction are much different. Therefore, regression analysis is just conducted with current data to find out the current situation of ISO 9000 implementation and quality performance as well as customer satisfaction.

Impacts of ISO 9000 implementation on Incoming defects

Regression analysis is conducted with 4 independent variable namely (1) Employee training, (2) Supplier control, (3) Process control, (4) Documentation level and dependent variable namely Incoming defects.

Table 8: Regression Analysis on Relationship Between ISO 9000 Implementation and Incoming Defects)

| | | Adjusted R | |
|-------|----------|------------|------|
| R | R Square | Square | Sig. |
| 0.459 | 0.21 | 0.174 | .000 |

| | Unstandardized Coefficients | | Standardized Coefficients Sig. | | Collinearity Statistics | | |
|--------------------------|--------------------------------|------------|-----------------------------------|-------|----------------------------|-------|--|
| | В | Std. Error | Beta | | Tolerance | VIF | |
| (Constant) | 10.442 | 3.396 | | 0.003 | | | |
| Employee training (ET) | -0.017 | 0.019 | -0.088 | 0.365 | 0.967 | 1.034 | |
| Supplier control (SC) | -0.112 | 0.035 | -0.315 | 0.002 | 0.931 | 1.074 | |
| Process control (PC) | 0.083 | 0.023 | 0.363 | 0.001 | 0.869 | 1.151 | |
| Documentation level (DL) | -0.046 | 0.022 | -0.210 | 0.041 | 0.883 | 1.132 | |

Sig. value of .000 means that these 4 independent variables reliably predict the dependent variable. Adjusted R-square value is 0.174 which means that 17.4% of the variance in Incoming Defects can be explained by 4 variables of ISO implementation.

The result table shows that Employee training, Supplier control and Documentation level have negative relationship with Incoming defects. That means higher percentage of trained employees, higher percentage of suppliers being examined before selected and higher percentage of documented processes will lead to lower incoming defect rate. Process control reveals a positive relationship with incoming defect rate. This can be explain that with higher percentage of processes controlled through statistic techniques and data analysis, higher percentage of incoming defects will be found.

In addition, supplier control, process control and documentation level present a high impact on incoming defects and have a statistically significant relationship with incoming defect rate (Sig. < 0.05). Employee training, however, has the smallest coefficient value of -0.088 and Sig. value of 0.365 (> 0.05). Thus, employee training does not indicate strong impact on incoming defects and does not show a statistically significant relationship with incoming defect rate as 3 remaining ISO 9000 implementation items.

With coefficients presented in Table above, regression function is as following:

Incoming defects = 10.442 + (-0.088) ET + (-0.315) SC + 0.363 PC + (-0.21) DL

From the regression function, it can be seen that Process control has greatest influence on incoming defects with the highest coefficient value of 0.363. Besides, Supplier control also presents a strong impact on incoming defects with coefficient value of -0.315. Documentation level has a smaller coefficient value of -0.21.

Impacts of ISO 9000 implementation on Final defects

Regression analysis is conducted with 4 independent variable namely (1) Employee training, (2) Supplier control, (3) Process control, (4) Documentation level and dependent variable namely Final defects.

| Table 9: Regression analysis | s (ISO im | plementation a | ıd Final | Defects) |
|------------------------------|-----------|----------------|----------|------------------|
|------------------------------|-----------|----------------|----------|------------------|

| | | Adjusted R | |
|-------|----------|------------|------|
| R | R Square | Square | Sig. |
| 0.477 | 0.227 | 0.194 | .000 |

| | Unstandardi | zed Coefficients | Standardized Coefficients | Sig. | Collinearity Statistics | |
|--------------------------|-------------|------------------|------------------------------|-------|-------------------------|-------|
| | В | Std. Error | Beta | | Tolerance | VIF |
| (Constant) | 5.338 | 1.242 | | 0.000 | | |
| Employee training (ET) | -0.020 | 0.007 | -0.245 | 0.010 | 0.950 | 1.052 |
| Supplier control (SC) | -0.048 | 0.013 | -0.346 | 0.000 | 0.904 | 1.106 |
| Process control (PC) | 0.032 | 0.009 | 0.35 | 0.001 | 0.843 | 1.187 |
| Documentation level (DL) | -0.012 | 0.008 | -0.142 | 0.134 | 0.932 | 1.073 |

Sig. value of .000 means that these 4 independent variables reliably predict the dependent variable. Adjusted R-square value is 0.194 which means that 19.4% of the variance in Final Defects can be explained by 4 variables of ISO 9000 implementation.

Similar to result with incoming defect as above, Employee training, Supplier control and Documentation level indicates a negative relationship with Final defect rate while Process control reveals a positive relationship. Differently, Employee training, Supplier control and Process control present strong impacts on final defect rate with a statistically significant relationship (Sig. < 0.05) whereas Documentation level does not.

With coefficients presented in Table above, regression function is as following:

Final Defects = 5.338 + (-0.245) ET + (-0.346) SC + 0.35 PC + (-0.142) DL

It can be seen that Process control and Supplier control stress a strong impact on final defect with coefficient values of 0.35 and -0.346, respectively. Employee training also has relatively great influence on final defects with coefficient value of -0.245.

* Impacts of ISO 9000 implementation on After-sale defects (customer returns)

Regression analysis is conducted with 4 independent variable namely (1) Employee training, (2) Supplier control, (3) Process control, (4) Documentation level and dependent variable namely After-sale defects.

Table 10: Regression Analysis on Relationship Between (ISO Implementation and After-sale Defects)

| R | R Square | Adjusted R Square | Sig. |
|------|----------|----------------------|------|
| .520 | 0.270 | 0.240 | .000 |

| | Unstandar | dized Coefficients | Standardized Coefficients | Sig. | Collinearity Statistics | | |
|--------------------------|-----------|--------------------|------------------------------|-------|-------------------------|-------|--|
| | В | Std. Error | Beta | | Tolerance | VIF | |
| (Constant) | 4.294 | 0.692 | | 0.000 | | | |
| Employee training (ET) | -0.01 | 0.003 | -0.252 | 0.006 | 0.954 | 1.049 | |
| Supplier control (SC) | -0.013 | 0.006 | -0.198 | 0.038 | 0.848 | 1.179 | |
| Process control (PC) | -0.01 | 0.005 | -0.226 | 0.034 | 0.682 | 1.466 | |
| Documentation level (DL) | -0.007 | 0.008 | -0.102 | 0.347 | 0.651 | 1.535 | |

Sig. value of .000 means that these 4 independent variables reliably predict the dependent variable. Adjusted R-square value is 0.240 which means that these 4 ISO 9000 variables can explain 24% of the variance in After-sale defects.

Result table shows that 4 ISO 9000 items have negative relationship with After-sale defect. Employee training, Supplier control and Process control have a statistically significant relationship with Sig. value smaller than 0.05. Employee training has strongest impact on after-sale defect rate with coefficient of -0.252. Documentation level indicates impact on after-sale defect rate with coefficient of -0.102 but does not show a statistically significant relationship with Sig. value of 0.347 (greater than 0.05).

With coefficients presented in Table above, regression function is as following:

After-sale defects = 4.294 + (-0.252) ET + (-0.198) SC + (-0.226) PC + (-0.102) DL

Impacts of ISO 9000 implementation on On- time delivery

Regression analysis is conducted with 4 independent variable namely (1) Employee training, (2) Supplier control, (3) Process control, (4) Documentation level and dependent variable namely On time delivery.

 Table 11: Regression Analysis on Relationship Between ISO Implementation and On

 time delivery)

| R | R Square | Adjusted R Square | Sig. |
|------|----------|----------------------|------|
| .416 | 0.173 | 0.135 | .002 |

| | Unstandardized Coefficients | | Standardized Coefficients | Sig. | Collinearity Statistics | |
|--------------------------|--------------------------------|------------|------------------------------|-------|-------------------------|-------|
| | В | Std. Error | Beta | | Tolerance | VIF |
| (Constant) | 50.382 | 11.8 | | 0 | | |
| Employee training (ET) | 0.167 | 0.059 | 0.282 | 0.006 | 0.965 | 1.036 |
| Supplier control (SC) | 0.027 | 0.114 | 0.025 | 0.816 | 0.825 | 1.212 |
| Process control (PC) | 0.17 | 0.069 | 0.255 | 0.015 | 0.891 | 1.122 |
| Documentation level (DL) | 0.011 | 0.116 | 0.01 | 0.925 | 0.82 | 1.22 |

Sig. value of .002 means that these 4 independent variables reliably predict the dependent variable. Adjusted R-square value is 0.135 which means that these 4 ISO 9000 variables can explain 13.5% of the variance in On time delivery.

The result table shows that all 4 ISO 9000 items have positive relationship with On time delivery. Employee training and Process control have a statistically significant relationship with Sig. value smaller than 0.05 and stress strongest impact on On time delivery with coefficient of 0.282 and 0.255, respectively. The two remaining ISO 9000 items including Supplier control and Documentation level have smaller impact on On time delivery and do not show a statistically significant relationship with Sig. value greater than 0.05.

With coefficients presented in Table above, regression function is as following:

On time delivery = 50.382 + 0.282 ET + 0.025 SC + 0.255 PC + 0.01 DL

Impacts of ISO 9000 implementation on Customer satisfaction

Regression analysis is conducted with 4 independent variable namely (1) Employee training, (2) Supplier control, (3) Process control, (4) Documentation level and dependent variable namely Customer satisfaction.

| Table | 12: | Regression | Analysis | on | Relationship | between | ISO | Implementation | and |
|--------|-------|---------------|----------|----|--------------|---------|-----|----------------|-----|
| Custor | ner s | satisfaction) | | | | | | | |

| R | R Square | Adjusted R Square | Sig. |
|-------|----------|----------------------|------|
| 0.365 | 0.133 | 0.098 | .007 |

| | Unstandardized Coefficients | | Standardized Coefficients | Sig. | Collinearity Statistics | |
|--------------------------|--------------------------------|------------|------------------------------|-------|----------------------------|-------|
| | В | Std. Error | Beta | | Tolerance | VIF |
| (Constant) | 60.313 | 9.546 | | 0.000 | | |
| Employee training (ET) | 0.113 | 0.047 | 0.232 | 0.019 | 0.946 | 1.057 |
| Supplier control (SC) | 0.09 | 0.088 | 0.105 | 0.309 | 0.845 | 1.183 |
| Process control (PC) | 0.071 | 0.064 | 0.129 | 0.269 | 0.662 | 1.51 |
| Documentation level (DL) | 0.062 | 0.107 | 0.069 | 0.562 | 0.644 | 1.553 |

Sig. value of .007 means that these 4 independent variables reliably predict the dependent variable. Adjusted R-square value is 0.098 which means that 9.8% of the variance in Customer satisfaction can be explained by these 4 ISO 9000 variables.

As the regression result table indicates, all 4 ISO 9000 variables have positive relationship with customer satisfaction. Among them, Employee training expresses strongest impact on customer satisfaction with the highest coefficient of 0.232, and also shows a statistically significant relationship with dependent variable (Sig. value smaller than 0.05). The 3 remaining independent variables including Supplier control, Process control, and Documentation level present smaller impacts on customer satisfaction with coefficient values of 0.105, 0.129 and 0.069, respectively. However, these 3 variables do not have statistically significant relationship with customer satisfaction (Sig. value greater than 0.05).

With coefficients presented in Table above, regression function is as following:

Customer satisfaction = 60.313 + 0.232 ET + 0.105 SC + 0.129 PC + 0.069 DL

FINDINGS, IMPLICATIONS AND DISCUSSIONS

The fact shows that ISO 9000 implementation provides significant improvements in quality management practices in Vietnamese companies, especially in documentation control, process control and supplier control. Quality performance after implementing ISO 9000 also gains positive changes in term of defect reduction and on time delivery improvement. This finding is also supported by the research of Romano (2000).

Regression analysis indicates that ISO 9000 implementation has positive impacts on quality performance and customer satisfaction. Incoming defect rate and final defect rate are under the most significant impacts from supplier control and process control. After-sale defect rate and On time delivery strongly depend on employee training practices and process control. This impact is also highlighted in research of Low Sui Pheng and Darren Wee (2001), and supported by research of Leticia Santos and Carmen Escanciano (2002). Therefore, in order to effectively reduce the incoming and final defect rate, companies should firstly pay attention to these two quality management practices. When the companies want to reduce after-sale defect rate as well as increase on time transactions, they may firstly concentrate on improving employee training and process control practices.

Customer satisfaction normally depends on many different factors. In this study, 4 items of ISO 9000 implementation can reliably explain 9.8% the variation in customer satisfaction in which employee training presents the strongest impact. To improve customer satisfaction, companies should continuously pay attention to all quality management practices in order to improve all quality dimensions. This significant relationship between ISO 9000 implementation and customer satisfaction is also highlighted in research results from studies of Buttle's (1996), Leticia Santos and Carmen Escanciano (2002).

LIMITATIONS

One limitation of this study is that the number of valid responses is still limited with 108 companies which are uneven in term of operating field and geography. Moreover, the time to carry out survey, collect data and analyze data was limited. Therefore, it is difficult for results from these 108 companies to represent for ISO 9000 implementation situation in Vietnamese companies. In further research, observation results may be improved and better represent for Vietnamese companies if survey data is collected from larger sample with equal number of companies in different fields.

CONCLUSIONS

This study examines the change in quality management practices as well as the change in quality performance of Vietnamese companies before and after companies' implementation ISO 9000 standards. Then, the study provides evaluations about the impacts of quality management practices after companies implement ISO 9000 on quality performance and customer satisfaction. The result reveals clearly significant roles of ISO 9000 in companies' quality improvement. It is expected that this empirical result will create value added for managers and practitioners in exploiting the effectiveness of ISO 9000 implementation.

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