4.1 DESCRIPTIVE STATISTICS OF RESPONDENTS' INFORMATION

A total of 125 valid questionnaires were received. The respondent organizations, by size, are as follows: 47 respondents (37.6%) are from small-sized construction firms, 30 respondents (24%) are from medium-sized construction firms and 48 respondents (38.4%) are from large-sized construction firms. Basically, there is no clear majority respondent, in terms of organization size, in this study.

Based on the categories of registration by CIDB Malaysia, this study classified the Malaysian construction firms' scope of business into Civil Engineering & Infrastructure, Building, Mechanical & Electrical, and others. Figure 4.1 shows that 59%, 49%, 23% and 22% of respondent firms are involved in the scope of Civil Engineering & Infrastructure, Building, Mechanical & Electrical, and others respectively. The Malaysian construction firms can be involved in more than one scope of business. Seventy six (60.8%) respondent firms are involved in only one scope of business. Thirty two (25.6%) respondent firms are involved in two scopes of business. Seventeen (13.6%) respondent firms are involved in 3 or more scopes of business.

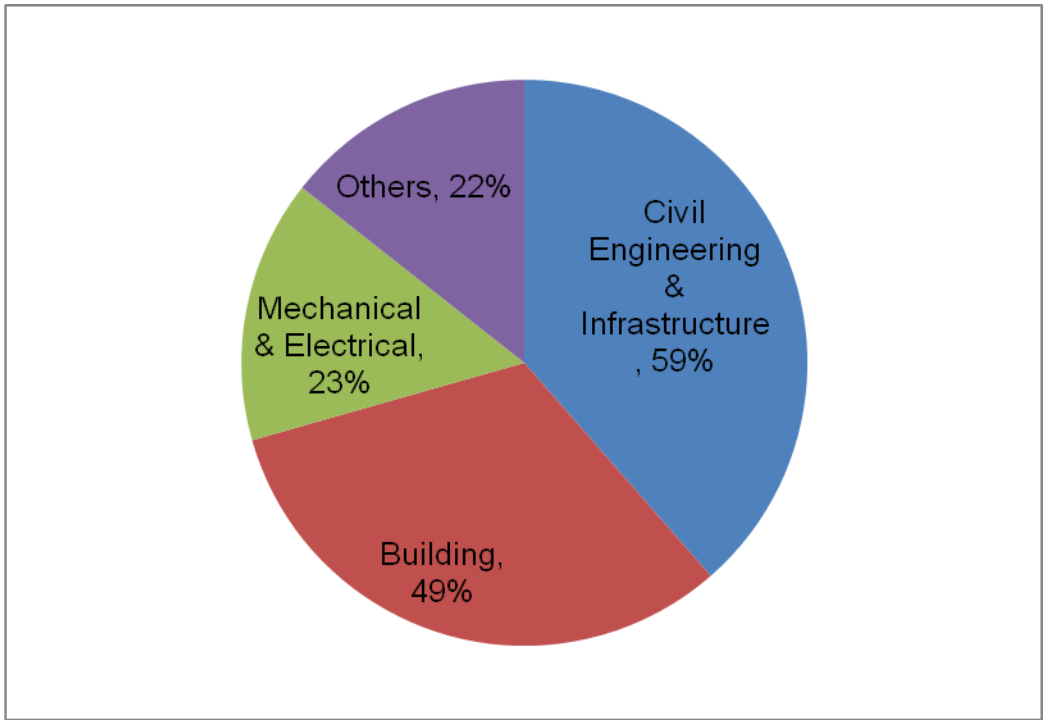

Figure 4.1 Percentage of Scope of Business Involved by Respondents

Most of the respondent firms (115 out of 125) are registered with CIDB Malaysia as Grade G7 contractors. There is no limit in the tendering capacity of Grade G7 contractor. A total of 23.5% of the respondent firms are in the construction business with less than or equivalent to 10 years and the rest are more than 10 years. However, from the statistic of length of ISO 9000 implementation, only 11.2% of the respondent firms fall into the category of more than 10 years. Seventy two percent of the respondent firms have been certified by ISO 9000 QMS for less than or equivalent to 5 years. This statistic shows that the majority of Malaysian construction firms obtained the ISO 9000 certification after CIDB Malaysia announced in 2006 that all registered Grade G7 construction firms must obtain the certificate of ISO 9000, with effect from 1 January 2009.

A total of 83 respondents are quality management representatives (QMRs) in their own construction firms. With the exception of 5 of them, the QMRs also hold other designations in their firms. Basically, 89.3% of the respondents are either QMR, manager or higher level personnel in their organizations. A total of 67.2% of the respondents have less than 5 years of ISO 9000 QMS experience and only 10.7% of respondents have more than 10 years of ISO 9000 QMS experience. This statistic shows that the regulation of CIDB Malaysia actually exposed more construction personnel to be involved in the implementation of ISO 9000 QMS.

4.2 DESCRIPTIVE STATISTIC OF MEASURE ITEMS

The mean value for all variables' measure items are presented in Table 4.1.

Table 4.1 Mean Value of Measure Items

Measure Items	**Mean**
Motivation For Certification (1 = Not important at all, 2 = Not important, 3 = Somewhat important, 4 = Important, 5 = Extremely important)	
a. Internal Motivation	
To improve the quality of work done	4.34
To reduce costs of operation	3.75
To increase efficiency and productivity in all areas of operation	4.26
b. External Motivation	
To meet local and overseas customers' demands	4.11
To improve corporate image and gain marketing advantage	4.38
To comply with government regulation (such as CIDB)	4.46
Implementation Effort of ISO 9000 QMS (1 = No effort, 2 = Little effort, 3 = Medium effort, 4 = High effort, 5 = Very high effort)	

Table 4.1 continued

Identification of quality aspects	3.95
Defining standard procedures	4.00
Documentation	4.22
Training	3.73
Capital Investment	3.39
Top management commitment	3.97
Employee involvement	4.10
Periodic internal audits	3.89
Following standard procedures	4.09
Implementation of corrective action	4.07
Organizational Performance (1 = No benefits, 2 = Minor benefits, 3 = Moderate benefits, 4 = Substantial benefits, 5 = Very substantial benefits)	
a. Operational Performance	
Reduction of costs of operation	3.16
Increase of efficiency and productivity in all areas of operation	3.68
Improvement of the quality of work done	3.94
Improvement of internal processes and procedures	4.01
Improvement of employee morale and motivation	3.49
Increase of on-time delivery to customers	3.76
Increase of customer satisfaction	3.97
b. Business Performance	
Increase of market share	3.19
Increase of organization's profit	3.27

Of all the motivations of ISO 9000 certification (1=not important at all, 5=extremely important), to comply with government regulation and to improve corporate image and gain marketing advantage are ranked the highest (4.46)

and the second highest (4.38) mean value in terms of importance. To reduce costs of operation has the lowest mean value (3.75) in terms of importance.

In the perceived input effort levels for all ISO 9000 implementation's items (1=no effort, 5=very high effort), the three highest mean value are documentation (4.22), employee involvement (4.10) and following standard procedure (4.09). Capital investment has the lowest mean value (3.39) in terms of implementation effort.

In the perceived benefit levels for all the performances (1=no benefits, 5=very substantial benefits), the improvement of internal processes and procedure has the highest mean value (4.01) and reduction of costs of operation has the lowest mean value (3.16). It is also important to find that the two measure items of business performance, increase of market share and increase of organization's profit, are ranked the second (3.19) and third (3.27) lowest mean value for the perceived benefit levels.

4.3 CONSTRUCT VALIDITY AND RELIABILITY

Three principle component factor analyses were performed for examining the construct validity of the measure items of each variable. Firstly, the principle component factor analysis was conducted for the measure items of motivation for certification which includes two variable constructs, internal motivation and external motivation. Secondly, the principle component factor analysis was conducted for the measure items of implementation effort of ISO 9000 QMS. Thirdly, the principle component factor analysis was conducted for the

measure items of organizational performance which also includes two variable constructs, operational performance and business performance.

The results of the Bartlett test of sphericity and Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy for each factor analysis, as shown in Table 4.2, show that all the measure items of each variable have the factorability (KMO>0.6, Barlett test's Sig.<0.05) (Coakes *et al*, 2010). Therefore, none of the measure items of each variable were excluded for factor analysis.

Table 4.2 Bartlett test of sphericity and Kaiser-Meyer-Olkin

Variables	**KMO**	**Bartlett test (Sig)**
Motivation for Certification (internal and external motivation)	0.77	0.00
Implementation effort of ISO 9000 QMS	0.90	0.00
Organizational Performance (operational and business performance)	0.90	0.00

Using varimax rotation, all the measure items of the internal motivation for certification, external motivation for certification, implementation effort of ISO 9000 QMS and business performance show component loadings of more than 0.5. Thus, the measures of these four variables have good construct validity. All the measure items for these four variables were included in the next reliability tests.

However, only five out of seven measure items of the operational performance show component loadings of more than 0.5. The two measure items, namely reduction of costs of operation and improvement of employee morale and motivation, show component loadings of less than 0.5. These two measure items were excluded in the reliability test in order to have good construct validity for the measure of operational performance.

All the component loadings of the measure items, which were included in the reliability tests of all the variables, are presented in Table 4.3.

Table 4.3 Construct Validity (Component Loading) and Reliability Test

Variables	**Measure Items**	**Component Loading**	**Cronbach's Alpha**
Internal Motivation			0.83
	To improve the quality of work done	0.84	
	To reduce costs of operation	0.85	
	To increase efficiency and productivity in all areas of operation	0.87	
External Motivation			0.67
	To meet local and overseas customers' demands	0.70	
	To improve corporate image and gain marketing advantage	0.78	
	To comply with government regulation (such as CIDB)	0.79	
Implementation Effort of ISO 9000 QMS			0.92

Table 4.3 continued

	Identification of quality aspects	0.75	
	Defining standard procedures	0.76	
	Documentation	0.69	
	Training	0.75	
	Capital Investment	0.74	
	Top management commitment	0.81	
	Employee involvement	0.74	
	Periodic internal audits	0.82	
	Following standard procedures	0.79	
	Implementation of corrective action	0.74	
Operational Performance			0.90
	Increase of efficiency and productivity in all areas of operation	0.84	
	Improvement of the quality of work done	0.81	
	Improvement of internal processes and procedures	0.82	
	Increase of on-time delivery to customers	0.59	
	Increase of customer satisfaction	0.56	
Business Performance			0.85
	Increase of market share	0.89	
	Increase of organization's profit	0.85	

From the results of the inter-item consistency reliability tests as shown in Table 4.3, all the Cronbach's Alpha of each variable are more than 0.6. Thus, all the variables have good inter-item consistency reliability (Cortina, 1993; cited by Prajogo, 2011).

After the construct validity and reliability tests, the composite scores of each variable were developed by averaging the scores of their measure items which passed the construct validity and reliability tests (Prajogo, 2011). In addition, the composite score of motivation for certification was also developed by averaging the scores of those measure items of both internal and external motivation, which passed the construct validity and reliability tests. The composite score of organizational performance was also developed by averaging the scores of those measure items of both operational and business performance, which passed the construct validity and reliability tests. All the composite scores were used for the next analysis of measures.

4.4 DESCRIPTIVE STATISTICS OF VARIABLES

The descriptive statistics, including the mean, skewness and kurtosis, of the composite scores of each variable are presented in Table 4.4.

Table 4.4 Descriptive Statistics of Variables

Variables	Mean	Skewness	Kurtosis
Motivation for Certification	4.22	-0.68	1.07
a. Internal Motivation (1 = Not important at all, 5 = Extremely important)	4.12	-0.85	0.76
b. External Motivation (1 = Not important at all, 5 = Extremely important)	4.32	-0.82	1.00
Implementation effort of ISO 9000 QMS (1 = No effort, 5 = Very high effort)	3.94	-0.32	0.06
Organizational Performance	3.69	-0.34	0.47
a. Operational Performance (1 = No benefits, 5 = Very substantial benefits)	3.87	-0.53	0.93
b. Business Performance (1 = No benefits, 5 = Very substantial benefits)	3.23	-0.20	-0.27

A variable is considered to have a normal distribution if the absolute value of skewness is less than 3 and kurtosis value is less than 7 (Curran, West & Finch, 1996; cited by Prajogo, 2011). From the results as shown in Table 4.4, all the variables have a normal distribution.

The mean value for internal motivation and external motivation are 4.12 and 4.32 respectively (1=not important at all, 5=extremely important). The results of paired t-test as shown in Table 4.5 show that there is a significant difference between the level of external motivation and level of internal motivation (t=3.10 at p<0.05). Therefore, for Malaysian construction firms, the

level of external motivation for ISO 9000 certification is significantly higher than the level of internal motivation for ISO 9000 certification.

Table 4.5 Results of t-tests

Variable 1 (Mean)	**Variable 2 (Mean)**	**t**	***p***
External Motivation (4.32)	Internal Motivation (4.12)	3.10	0.004
Operational performance (3.87)	Business performance (3.32)	10.02	0.000

The mean value for the operational performance and business performance are 3.87 and 3.32 respectively (1=no benefits, 5=very substantial benefits). The results of paired t-test as shown in Table 4.5 show that there is a significant difference between the perceived benefit levels of operational performance and business performance (t=10.02 at $p<0.05$). Therefore, for the benefits that can be gained from ISO 9000 certification, Malaysian construction firms perceived higher benefit levels for the operational performance than for the business performance.

The mean value for the implementation effort of ISO 9000 QMS is 3.94 (3=medium effort, 4=high effort). This result shows that Malaysian construction firms generally put in reasonably high effort to obtain or maintain ISO 9000 certification because the mean value (3.94) is very close to 4 (high effort). The mean value of the implementation effort of ISO 9000 QMS for each respondent firm range from 2.10 to 5.00.

Bi-variate correlation analysis was also performed for all the variables and the results are presented in Table 4.6.

Table 4.6 Correlations

	Internal Motivation	External Motivation	Implementation effort of ISO 9000 QMS	Operational Performance	Business Performance
Internal Motivation	1	0.37**	0.52**	0.62**	0.48**
External Motivation	0.37**	1	0.42**	0.44**	0.40**
Implementation Effort of ISO 9000 QMS	0.52**	0.42**	1	0.63**	0.47**
Operational Performance	0.62**	0.44**	0.63**	1	0.67**
Business Performance	0.48**	0.40**	0.47**	0.67**	1

** Correlation is significant (p<0.01)

All the correlation coefficients are positive and significant ranging from 0.3 to 0.7. According to Zikmund (2002), these results show that all the variables have only low to moderate correlations with each other. There is no multicollinearity problem among the variables because all the correlation coefficients are less than 0.8 (Kennedy, 1985; cited by Naser *et al*, 2004). The correlation (r=0.52 at p<0.01) between internal motivation and implementation effort of ISO 9000 QMS is higher than the correlation (r=0.42 at p<0.01) between external motivation and implementation effort of ISO 9000 QMS. This shows that compared to external motivation, internal motivation has stronger correlational relationship with ISO 9000 implementation effort. The correlation (r=0.37 at p<0.01) between internal motivation and external

motivation also shows that both types of motivation for certification can motivate the respondents' firms together to implement ISO 9000 QMS (Prajogo, 2011). On the other hand, the correlation (r=0.63 at p <0.01) between operational performance and implementation effort of ISO 9000 QMS is higher than the correlation (r=0.47 at p<0.01) between business performance and implementation effort of ISO 9000 QMS. This shows that compared to business performance, the operational performance has a stronger correlational relationship with the implementation effort of ISO 9000 QMS. The correlation (r=0.67 at p <0.01) between operational performance and business performance also shows that both performances can be achieved together by implementing ISO 9000 QMS.

The correlations can only show the association between both variables, but not the causation (Cavan *et al*, 2001; Zikmund, 2002). For the purpose of examining the causation among the variables, a series of regression analyses were conducted.

4.5 TESTING OF HYPOTHESES H1a, H1b, H2a AND H2b – REGRESSION ANALYSIS

All the causal effects between the independent and dependent variables stated in hypotheses H1a, H1b, H2a and H2b were tested using regression model 1 to 3. The results of the regression model 1 to 3 are presented in Table 4.7.

Table 4.7 Results of regression model 1- 3

Model	**Independent Variable**	**Dependent Variable**	**R^2**	**F**	**Beta**	**t**
1 (H1a) (H1b)	Internal Motivation, External Motivation	Implementation Effort of ISO 9000 QMS	0.34	30.68 (p<0.01)	0.42 0.27	5.34 (p<0.01) 3.36 (p<0.01)
2 (H2a)	Implementation Effort of ISO 9000 QMS	Operational Performance	0.39	78.95 (p<0.01)	0.63	8.89 (p<0.01)
3 (H2b)	Implementation Effort of ISO 9000 QMS	Business Performance	0.22	34.41 (p<0.01)	0.47	5.87 (p<0.01)

First, the F-values in the three regression models are at the significance level (p) less than 0.01. Thus, these three regression models are considered to be highly significant regression models. Furthermore, the results show that all the direct effects from the independent variables to dependent variables in the three regression models are highly significant because all the standardized Beta-values are at the significance level (p) less than 0.01. Thus, all the hypotheses H1a, H1b, H2a and H2b are supported. Both internal motivation (Beta=0.42 at p<0.01) and external motivation (Beta=0.27 at p<0.01) also have a positive and significant effect on the implementation effort of ISO 9000 QMS. On the other hand, the implementation effort of ISO 9000 QMS has a positive and significant effect on the operational performance (Beta=0.63 at p<0.01). The implementation effort of ISO 9000 QMS also has a positive and significant effect on the business performance (Beta=0.47 at p<0.01).

From the values of the standardized Beta coefficient of the two independent variables in regression model 1 as presented in Table 4.7, it can be found that internal motivation (Beta=0.42) has a higher direct effect on the

implementation effort of ISO 9000 QMS than external motivation (Beta=0.27). From the values of the standardized Beta coefficient of independent variables in regression model 2 and 3 as presented in Table 4.7, it can be found that the implementation effort of ISO 9000 QMS has a higher direct effect on the operational performance (Beta=0.63) than on the business performance (Beta=0.47) of the respondents' firms.

4.6 TESTING OF HYPOTHESIS H3 - MEDIATING EFFECT

Based on Figure 3.1, three testing steps using regression analysis and calculation of mediating effect's z score were performed for examining the mediating effect of implementation effort of ISO 9000 QMS. The results are shown in Table 4.8.

Table 4.8 Results of three mediating effect testing steps and z score calculation

Testing Steps using regression	Variables	B	SE	Beta
Step 1 IV ⟶ DV	IV: Motivation For Certification DV: Organizational Performance	0.88	0.09	0.66 at $p<0.01$
Step 2 IV ⟶ MV	IV: Motivation For Certification MV: Implementation Effort of ISO 9000 QMS	0.66 (a)	0.08 (sa)	0.58 at $p<0.01$
Step 3 IV ↘ DV MV ↗	IV: Motivation For Certification MV: Implementation effort of ISO 9000 QMS DV: Organizational Performance	0.61 0.41 (b)	0.10 0.09 (sb)	0.46 at $p<0.01$ 0.35 at $p<0.01$
Z score calculation	$Z=\frac{ab}{\sqrt{b^2sa^2+a^2sb^2+sa^2sb^2}}$ $=0.66x0.41/(0.41^2 0.08^2 + 0.66^2 0.09^2 + .08^2 0.09^2)^{0.5}$ $=3.95 > 1.96$			

IV:Independent Variable, DV:Dependent Variable, MV:Mediating Variable, B:Unstandardized Regression Coefficient, SE:Standard Error of B, Beta:Standardized Regression Coefficient.

Result of testing as in step 1 (Table 4.8) using regression shows that motivation for certification has a significant effect on the organizational

performance. The result of testing as in step 2 (Table 4.8) using regression shows that motivation for certification has a significant effect on the implementation effort of ISO 9000 QMS. The result of testing as in step 3 (Table 4.8) using multiple regression shows that motivation for certification and implementation effort of ISO 9000 QMS have significant effect on the organizational performance. Unstandardized regression coefficient of motivation for certification (B=0.61) in step 3 is less than the unstandardized regression coefficient of motivation for certification (B=0.88) in step 1. Z score of mediating effect is 3.95 and greater than 1.96. All the results of the three testing steps and the magnitude of mediating effect's z score meet the requirement of partial mediating effect. Thus, the implementation effort of ISO 9000 QMS has a partial mediating effect on the relationship between motivation for certification and organizational performance.

4.7 TESTING OF HYPOTHESES H4 and H5 - MODERATING EFFECT

Regression model 4 (hierarchical regression) was used for testing the moderating effects of the organization size on the relationship between the motivation for certification and the implementation effort of ISO 9000 QMS. The regression model 5 (hierarchical regression) was used for testing the moderating effects of the length of ISO 9000 implementation on the relationship between the implementation effort of ISO 9000 QMS and the organizational performance. Table 4.9 and 4.10 show the results of regression model 4 and 5.

Table 4.9 Result of regression model 4 (hierarchical regression)

Model 4	Standardized Coefficients		
	Beta	t	Sig.
Step 1			
Motivation for Certfication	0.58	7.82	0.000
Step 2			
Motivation for Certification	0.57	7.57	0.000
SizeMedium	0.01	0.11	0.912
SizeLarge	0.02	0.22	0.830
Step 3			
Motivation for Certification	0.57	7.43	0.000
SizeMedium	0.02	0.27	0.787
SizeLarge	0.02	0.28	0.783
ZSizeMedium X ZMotivation	0.09	1.01	0.314
ZSizeLarge X ZMotivation	0.04	0.41	0.681

Dependent Variable: Implementation Effort of ISO 9000 QMS
Interaction Effect Variable: ZSizeMedium X Zmotivation,
ZSizeLarge X ZMotivation

Table 4.10 Result of regression model 5 (hierarchical regression)

Model 5	Standardized Coefficients		
	Beta	t	Sig.
Step 1			
Implementation effort of ISO 9000 QMS	0.62	8.70	0.000
Step 2			
Implementation effort of ISO 9000 QMS	0.61	8.38	0.000
Length of ISO 9000 Implementation	0.04	0.61	0.543
Step 3			
Implementation effort of ISO 9000 QMS	0.61	8.35	0.000
Length of ISO 9000 Implementation	0.04	0.56	0.579
ZImplementation effort of ISO 9000 QMS X ZLength of ISO 9000 Implementation	0.16	0.22	0.825

Dependant Variable: Organizational Performance
Interaction Effect Variable: ZImplementation effort of ISO 9000 QMS X ZLength of ISO 9000 Implementation

The result of regression model 4 as presented in Table 4.9 shows that the organization size has no significant moderating effect (Beta=0.09 at $p>0.05$ and Beta=0.04 at $p>0.05$) on the relationship between the motivation for certification and the implementation effort of ISO 9000 QMS. The result of regression model 5 as presented in Table 4.10 shows that the length of ISO 9000 implementation has no significant moderating effects (Beta=0.16 at

p>0.05) on the relationship between the implementation effort of ISO 9000 QMS and the organizational performance. Thus both hypotheses H4 and H5 are rejected.

4.8 SUMMARY OF RESEARCH RESULTS

From the mean value of the composite scores of each variable and the scores of all the measure items, the following are found:-

1) The top three most important motivations for Malaysian construction firms to gain ISO 9000 certification are to comply with government regulation (such as CIDB) (mean=4.46), to improve corporate image and gain marketing advantage (mean=4.38) and to improve the quality of work done (mean=4.34). The least important motivation is to reduce the costs of operation (mean=3.75).
2) The mean value of external motivation for certification (4.32) is higher than the mean value of internal motivation for certification (4.12). The T-test result shows that there is a significant difference between the levels of internal motivation for certification and external motivation for certification (t=3.10 at *p*<0.05).
3) The top three performance improvements gained by Malaysian construction firms from ISO 9000 implementation are improvement of internal processes and procedure (mean=4.01), increase of customer satisfaction (mean=3.97) and improvement of the quality of work done (mean=3.94). The two measure items of business performance, increase of market share and increase of organization's profit, are

ranked the second (3.19) and third (3.27) lowest mean value for the performance improvement.

4) In each of the measure items for the implementation effort of ISO 9000 QMS, the respondent firms put the most effort in documentation (mean=4.22) and least effort in capital investment (mean=3.39). The overall mean value of implementation effort of ISO 9000 QMS for all the respondent firms is 3.94 (3=medium effort, 4=high effort). The mean value of the implementation effort of ISO 9000 QMS for each respondent firm range from 2.10 to 5.00.
5) The respondents perceived higher benefit levels can be gained by ISO 9000 implementation in operational performance (mean=3.87) than in business performance (mean=3.23). The T-test result shows that there is a significant difference between the perceived benefit levels of operational performance and business performance (t=10.02 at $p<0.05$).

From the correlation and regression analysis, the results are summarized as follows:-

1) There is a highly significant and positive relationship between the internal motivation for certification and the implementation effort of ISO 9000 QMS (r=0.52 at $p<0.01$, Beta=0.42 at $p<0.01$). Hypothesis H1a is supported.
2) There is a highly significant and positive relationship between the external motivation for certification and the implementation effort of ISO

9000 QMS (r=0.42 at $p<0.01$, Beta=0.27 at $p<0.01$). Hypothesis H1b is supported.

3) From the difference of Beta coefficients, it can be found that the internal motivation for certification (Beta=0.42) has a higher direct effect on the implementation effort of ISO 9000 QMS, compared to external motivation for certification (Beta=0.27).
4) Since both internal motivation for certification and external motivation for certification were found to have a positive relationship with the implementation effort of ISO 9000 QMS (H1a and H1b), the motivation for certification has a positive relationship with the implementation effort of ISO 9000 QMS. Hypothesis H1 is supported.
5) There is a highly significant and positive relationship between the implementation effort of ISO 9000 QMS and the operational performance (r=0.63 at $p<0.01$, Beta=0.63 at $p<0.01$). Hypothesis H2a is supported.
6) There is a highly significant positive relationship between the implementation effort of ISO 9000 QMS and the business performance (r=0.47 at $p<0.01$, Beta=0.47 at $p<0.01$). Hypothesis H2b is supported.
7) From the difference of Beta coefficients, it can be found that the implementation effort of ISO 9000 QMS has a higher direct effect on the operational performance (Beta=0.63) than on the business performance (Beta=0.47).
8) Since the implementation effort of ISO 9000 QMS has a positive relationship with both operational and business performance (H2a and H2b), the implementation effort of ISO 9000 QMS has a positive

relationship with the organizational performance. Hypothesis H2 is supported.

9) The implementation effort of ISO 9000 QMS has partial mediating effect on the relationship between motivation for certification and organizational performance. Hypothesis H3 is supported.

10) The organization size has no moderating effect (Beta=0.09 at $p>0.05$ and Beta=0.04 at $p>0.05$) on the relationship between the motivation for certification and the implementation effort of ISO 9000 QMS. Hypothesis H4 is rejected.

11) The length of ISO 9000 implementation has no moderating effect (Beta=0.16 at $p>0.05$) on the relationship between the implementation effort of ISO 9000 QMS and the organizational performance. Hypothesis H5 is rejected.