CHAPTER IV

RESULTS AND FINDINGS

4.1. Introduction

Chapter IV is enumerated as follows: The following section provides the profile of the respondents. The response rate is presented in the analysis of survey response results. The next section presents the screening of the data followed by quantitative data analysis using factor analyses (EFA and CFA), structural relations and mediation analysis (using SEM).

4.2 Descriptive Characteristics of Respondents

Table 4.1, Table 4.2, and Table 4.3 present summary of background informations about the respondents involved in this research. From 1,478 questionnaires obtained in the fieldwork of the research, it is found that 146 questionnaires were not usable due to the incomplete information. It respectively means that the data analyzed in this research was only obtained from 1,332 respondents from 140 SBUs.

Table 4.1
Descriptive Characteristics of Sample

Descriptive Characteristics of A Sample of 1,332 Respondents from 140 SBUs

AGE GROUP OF RESPONDENTS

RANGE OF AGE	FREQ	%
< 25 YEARS OLD	1	0.08
25-35 YEARS OLD	267	20.05
36-45 YEARS OLD	642	48.20
>45 YEARS OLD	400	30.03
NA	22	1.65
TOTAL	**1332**	**100.00**

SEX/GENDER OF RESPONDENT

GENDER	FREQ	%
Male	1141	85.66
Female	191	14.34
TOTAL	**1332**	**100.00**

EDUCATION

LEVEL OF EDUCATION	FREQ	%
HIGH SCHOOL	542	40.69
DIPLOMA	269	20.20
S1 (Bachelor Degree)	347	26.05
S2 (Master Degree)	159	11.94
S3 (Doctoral Degree)	15	1.13
TOTAL	**1332**	**100.00**

LEVEL OF MANAGEMENT

LEVEL OF MANAGEMENT	FREQ	%
High Level Management	354	26.58
Middle Level Management	447	34.56
Low Level Management	531	39.86
TOTAL	**1332**	**100.00**

WORK EXPERIENCE

RANGE OF YEARS	FREQ	%
< 5 YEARS	137	10.29
5-10 YEARS	258	19.37
11-15 YEARS	359	26.95
> 15 YEARS	545	40.92
NA	33	2.48
TOTAL	**1332**	**100.00**

TQM EXPERIENCE

RANGE OF YEARS	FREQ	%
< 5 YEARS	509	38.21
5-10 YEARS	521	39.11
11-15 YEARS	67	5.03
> 15 YEARS	23	1.73
NA	212	15.92
TOTAL	**1332**	**100.00**

IT EXPERIENCE

RANGE OF YEAR	FREQ	%
< 5 YEARS	115	8.63
5-10 YEARS	830	62.31
11-15 YEARS	102	7.66
> 15 YEARS	99	7.43
NA	186	14.96
TOTAL	**1332**	**100.00**

FREQUENCY OF USING IT (INTERNET)

USING IT (INTERNET)	FREQ	%
Never	5	0.38
Several Times per Week	37	2.78
Nearly Everyday	199	14.94
Everyday	1050	78.83
NA	41	3.08
TOTAL	**1332**	**100.00**

Table 4.2
Response Rate Based on Survey Method

NO	SURVEY METHOD	QUESTIONNAIRE DISTRIBUTED	QUESTIONNAIRE RECEIVED	UNSUITABLE QUESTIONNAIRE	USABLE QUESTIONNAIRE	RESPONSE RATE (%)
1	MAIL SURVEY	1000	302	72	230	24.78
2	INTERNET SURVEY	950	551	51	500	55.62
3	FACE TO FACE (STRUCTURED INTERVIEW)	850	625	23	602	72.79
	TOTAL	**2800**	**1478**	**146**	**1332**	**50.19**

Table 4.3
Response Rate Based on Type of the Company Contract System

NO	TYPE OF COMPANY	TOTAL COMPANY Participated	TOTAL SBU	QUESTIONNAIRE DISTRIBUTED	QUESTIONNAIRE RECEIVED	NUMBER OF USEABLE QUESTIONNAIRE	LEVEL OF MANAGEMENT HIGH	MIDDLE	LOW	UNSUITABLE OR NOT CONTACTABLE NUMBER OF SAMPLES	RESPONSE RATE (%)
1	State Own Company	2	38	760	411	370	100	124	146	41	51.46
2	PSC Onshore	15	32	640	354	325	72	104	149	29	54.19
3	PSC Offshore	9	23	460	226	201	63	66	72	25	46.21
4	JOB Onshore	10	20	400	222	199	55	71	73	23	52.79
5	JOB Offshore	10	20	400	191	171	43	64	64	20	45.00
6	TAC Onshore	2	5	100	47	42	14	11	17	5	44.21
7	TAC Offshore	1	2	40	27	24	7	7	10	3	64.86
	TOTAL	**49**	**140**	**2800**	**1478**	**1332**	**354**	**447**	**531**	**146**	**50.19**

Response Rate = {Number of useable questionnaires/ (Total samples-unsuitable or not contactable numbers of the samples)} x 100

4.3 Scale Purification

The first step in the statistics analysis (factor analysis process) is to explore the characteristics of the data since it is frequently useful to conducting normality and multicollinearity tests. Analysis itself lies on the subsets of the data and aims to make some conditional transformations of variable (Coakes *et al.*, 2003). These afterward could be achieved by using the normality and multicollinearity assumptions and practical considerations underlying the application of PAF and PC.

4.3.1 Assessing Univariate and Multivariate Normality

To assess univariate and multivariate normality it is often helpful to examine kurtosis, skewness, and outliers. An examination of the kurtosis and skewness statistics indicates that all items are reasonably normally distributed. This study shows that even when the cutoff for both univariate skewness and kurtosis are achieved for most of the variables in the data. The univariate skewness and kurtosis are within the acceptable ranges from –0.5 to +0.5; and -1.0 < kurtosis < 8.0. As seen in Table 4.4, only QMP1 shows slight departure from normality (the skewness is -0.693 or < -0.5; and the critical ratio is -2.830 or > $|1.96|$). The multivariate kurtosis is small and the multivariate normality can be achieved. From Table 4.4 it can be seen that the critical ratio of Mardia's multivariate kurtosis is 1.636 (below 1.96). The small Mardia's multivariate kurtosis (-4.9 < Mardia's kurtosis < 49.1) also implies that the sample has a multivariate normal distribution (Harlow, 1985).

Table 4.4
Descriptive Statistics: Skewness and Kurtosis

Variable	**Skewness**			**Kurtosis**		
	Statistic	**Std. Error**	**c.r.**	**Statistic**	**Std. Error**	**c.r.**
QMP1	-0.693	0.067	-2.830	0.173	0.134	0.353
QMP2	-0.105	0.067	-0.430	-0.173	0.134	-0.354
QMP3	-0.351	0.067	-1.435	0.490	0.134	1.000
QMP4	-0.432	0.067	-1.765	0.314	0.134	-0.641
QMP5	-0.227	0.067	-0.925	0.491	0.134	1.002
QMP6	-0.032	0.067	-0.129	-0.168	0.134	-0.342
WCC	-0.460	0.067	-1.878	-0.453	0.134	-0.925
OE	-0.024	0.067	-0.096	-0.845	0.134	-1.724
CNFP	-0.133	0.067	-0.542	0.709	0.134	1.446
CFP	0.231	0.067	-0.944	0.521	0.134	1.062
Multivariate normality (Mardia's multivariate kurtosis)				5.068		
Critical ratio of Mardia's multivariate kurtosis						1.636

Nevertheless, multivariate normality can also be tested by examining the distribution of standardized residuals (Diamantopoulos and Vrontos, 2010). Residuals in the context of SEM are residual covariances (Tabachnick and Fidell, 2001). According to Joreskog and

Sorbom (1989, p.32) residuals "…can be interpreted as standard normal deviate and considered 'large' if it exceeds the value of 2.58 in absolute value". In all of the structural models of the study, most z scores were below 2.58 (zWCC = 0.371; zOE = 0.756; zCNFP = 0.538; and zCFP = 0.379); hence it was safe to assume that multivariate normality appeared to generally exist. Outliers were not included in the sample.

4.3.2 Assessing Multicollinearity

Table 4.5 informs a descriptive statistic of the ten researches constructs (mean, and standard deviation within sample size are 1,332). The standard deviations indicate the closely individual values of respondent that are spread around their mean value. The bivariate correlations among the variables in Table 4.5 are generally less than 0.6 indicating the absence of multicollinearity. The results of the bivariate correlations among the ten constructs of the study also suggest that the nine independent variables are significantly correlated to each other, indicating that oil and companies in Indonesia commonly have implemented those practices holistically. The correlation between the independent and dependent variables also indicate strong relationships, but, interestingly, the strengths of the correlations vary across different variables (0.357-0.581). These provide a preliminary finding on the unique role of different critical factor of quality management practices in affecting company financial performance. Further diagnostics of the collinearity among the variables using variance inflation factors (VIFs) indicated very low VIFs for all the variables. Because each of the VIFs is substantially less than 10, there are few reasons to suspect multicollinearity among the variables (Frees, 1996; Neter *et al*., 1996 cited in Amoako-Gyampah and Acquaah, 2008).

However, prior to the factor analyses (EFA and CFA), the values of Anti-Image Correlation Matrix, Kaiser-Meyer-Olkin (KMO), and Bartlett's Test of Sphericity have to be referred to. These values test the appropriateness of using factor analyses. The values of anti-image correlation matrix and KMO are greater than 0.5 and 0.6 implying the presence of significant correlations among variables (constructs) and enabling the factor analysis (especially EFA) to produce distinct and valid factors (Hair *et al.*, 1998). EFA could be performed. Another inspection is on the Bartlett's test of sphericity value. A large and significant (p<0.000) value of Bartlett's test of sphericity indicates further support to the appropriateness of using factor analysis in the study (Hair *et al*., 1998).

Table 4.5
Descriptive Statistics of the Research Constructs

Variable (Construct)	VIF (<10)	Bivariate Correlation Matrix (<0.60)	Anti-Image Correlation Matrix (Diagonal Value) (>0.5)	Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (>0.6)	Bartlett's Test of Sphericity (Large and Significant)	Descriptive Statistics	
						Mean	Std. Dev
QMP1	2.573	0.576	0.912	0.848	40216.150; df 253 (significant, p<0.000)	2.6505	0.38894
QMP2	2.612	0.478	0.940	0.717		4.5009	0.52247
QMP3	3.170	0.394	0.956	0.690		3.0625	0.51570
QMP4	3.820	0.412	0.938	0.740		2.9103	0.43888
QMP5	1.890	0.510	0.966	0.912		2.6180	0.45208
QMP6	4.117	0.487	0.919	0.718		3.0917	0.46211
WCC	4.269	0.357	0.680	0.931	114895.300; df 8515 (significant, p<0.000)	3.0300	0.44000
OE	1.990	0.411	0.791	0.830	3105.893; df 10 (significant, p<0.000)	4.4722	0.70609
CNFP	1.812	0.541	0.678	0.712	1023.040; df 3 (significant, p<0.000)	2.7458	0.47757
CFP	2.108	0.581	0.832	0.864	3187.373; df 15 (significant, p<0.000)	2.7892	0.55167

4.4 Assessment of Measurement Model Fit

One hundred and thirty one (131) questionnaire items of TQM implementation in the oil and gas industry represented ten latent constructs for this study. After adjusting some reversed scores, items representing the constructs and dimensions were subjected to reliability and validity tests.

a. Reliability of Measures

The Cronbach's alpha of the measures is ranging from 0.7218 to 0.9661, which, according to DeVellis (1991), are respectable to be *very good*. Table 4.6 shows the reliability of the measures.

Table 4.6
Reliability Coefficients (Cronbach's Alpha) of the Constructs

Construct	**Number of Items in the Questionnaire**	**Number of Items Retained**	**Cronbach's Alpha**
QMP1	9	9	0.8770
QMP2	7	7	0.8641
QMP3	7	7	0.8044
QMP4	16	7	0.8918
QMP5	6	6	0.7855
QMP6	5	3	0.8097
WCC	6	6	0.9661
OE	5	5	0.7218
CNFP	6	6	0.8136
CFP	3	3	0.8912

Table 4.7 furthermore informs the number of items retained of the constructs (QMP1-6, WCC, OE, CNFP, and CFP).

Table 4.7
Number of Retained Items of the Constructs

Construct's Name	Construct Item Code	Sub Construct Item Code
Critical Factors of Quality Management Practices (QMP)	QMP1 QMP 2 QMP 3 QMP 4 QMP 5 QMP 6	qmp40,41,43,44, 45,46, 47,48,49 qmp22,23,24,25,26,27,33 qmp8,9,10,11,12,13,15 qmp1,2,3,4,5,6,7 qmp16,17,18,19,20,21 qmp30,31,32
World-class company practice (WCC)	WCC1 WCC2 WCC3 WCC4 WCC5 WCC6	Hayes-Wheelwright practices (hwp):51,52,53,54, 55, 56, 57, 58 Hayes-Wheelwright practices (hwp) : 59,60,61, 62,63,64,65, 66,67, 68,69,70 Hayes-Wheelwright practices (hwp): 71,72,73,74,75,76,78 Hayes-Wheelwright practices (hwp): 79,80,81,82,83,84,85,86,87, 88,89,90,91 Hayes-Wheelwright practices (hwp): 92,93,94,95,96,97,98,99,100, 101,102,103,104,105,106,107 Hayes-Wheelwright practices (hwp): 108,109,110,111,112,113, 114, 115,116,117
Operational Excellence practice (OE)	OE	OE1, OE2, OE3, OE4, OE5)
Company Non Financial Performance (CNFP)	CNFP1 CNFP2 CNFP3 CNFP4 CNFP5 CNFP6	**CNFP** (CNFP1, CNFP2, CNFP3, CNFP4, CNFP5, CNFP6)
Company Financial Performance (CFP)	CFP1 CFP2 CFP3	**CFP** (CFP1, CFP2, CFP3)

b. Validity of Measures

After the scales had reached the necessary levels of reliability, they were assessed for validity. Confirmatory factor analysis was to assess the validity of each scale, which consisted of the retained items or manifest indicators. All loadings (path coefficients or regression weights) from a latent construct to their corresponding manifest indicators were significant (critical ratio values > 1.96). For this reason, evidence of convergent validity is provided.

This study also assessed the discriminant validity of the latent constructs, which is the a degree to which two conceptually similar constructs are distinct. According to Anderson and Gerbing (1988), when the confidence interval of ± two standard errors around a correlation estimate between two factors (constructs) does not include the value 1, it could be an evidence of discriminant validity for the two constructs, none of the confidence intervals in this study includes one.

c. Construct Reliability (α)

The composite reliability of each latent construct (α) measures the internal consistency of the construct indicators, depicting degree to which they indicate the common latent (unobserved) construct. High reliability of measures provides the researcher a greater confidence that the individual indicators consistently measure the same measurements. The threshold value for acceptable reliability is 0.70 (see Table 4.8) (Hair *et al*., 1998).

d. Fixing the Error Terms and the Lambdas

Table 4.8 lists the reliability of the constructs, standardized estimates of lambda (factor loadings), and error terms. The lambdas (expected to be less than 1) and error terms (expected toward zero) provide unbiased and consistent estimators of all research constructs of the study. All Cronbach's coefficient alpha values are higher than the minimum requirements (≥ 0.70). Therefore, the measurement lambdas and errors pose some insignificant problems because they are absent in the dependent and explanatory variables (Gujarati and Porter, 2009). Therefore, this case is not a subject to measurement bias (Hair *et al*., 2006).

Table 4.8
Construct Reliability

Constructs	e	λ	Cronbach Alpha
QMP1	0.0186	0.3642	0.8770
QMP2	0.0371	0.4857	0.8641
QMP3	0.0520	0.4625	0.8044
QMP4	0.0210	0.4144	0.8918
QMP5	0.0438	0.4010	0.7855
QMP6	0.0410	0.4158	0.8097
WCC	0.0217	0.7866	0.9661
OE	0.1387	0.5999	0.7218
CNFP	0.0567	0.4976	0.8136
CFP	0.0248	0.4508	0.8912

e. An Assessment of Non Response Bias

It was made by using an extrapolation approach recommended by Armstrong (1979). Each individual questionnaire type (high, middle, and low level managers) was categorized by the time the completed questionnaire was received. Tests revealed that there were no significant differences between early responders (the first wave of responses; n = 442) and late responders (the second wave of responses; n = 890) on any constructs. As indicated by a CFI (the comparative fit index) of 0.950 for the research model, the multi group models represent an excellence fit to the data. As such, non-response bias is unlikely to be presented in this data (Morgan and Piercy, 1998).

4.5 Quantitative Data Analysis: Factor Analyses

4.5.1 Factor Analysis for QMPs

An exploratory principle in components factor analysis was conducted to determine whether the observed correlations among 50 items measuring QMM can be explained by the meaningful number of QMPs. Here, there are three basic steps in applying EFA: (1)

generating the correlation matrix among 50 items, (2) extracting the factors that account for as much variance as possible in the data, and (3) transforming or rotating the factors to make them more interpretable (Tamimi, 1995). The SPSS version 16.0 (Coakes *et al*., 2009), following this, was used in executing the above three steps. Only factors that accounted for variances greater than one (i.e., eigen values > 1) were extracted then. The rational behind this approach is that factors with a variance < 1 are not better than a single variable, since each variable was standardized and included a variance of 1 (Tamimi, 1995). Six factors were extracted that accounted for 56.188% (see Table 4.9) of the total variation in the observed variable.

Table 4.9 contains the factor pattern matrix containing the factor loading between each rotated factor and each variable. Factors with large coefficients (in absolute value) for variable are closely related to the variable. In particular, when the estimated factors are uncorrelated with each other (i.e., orthogonal), the factor loading are also the correlations between the factors and the variables (Tamimi, 1995).

Varimax rotation method, an algorithm that minimizes the number of variables having a high loading on the orthogonal factors, was used in transforming the variables in order to enhance their interpretability. To identify these factors, it was necessary to group the variables that have high loadings on the same factors. One strategy is to shorten (in ascending order) the matrix of factor loadings to make variables with high loadings on the same factor altogether appear. Thus, only the strong factor loadings (≥0.5 in absolute value, shown in bold), as depicted in Table 4.9, were considered to simplify the interpretation process.

Table 4.9
The Result of Exploratory Factor Analysis: QMPs

Items of Critical Factors of Quality Management Practices (QMP)	Component of QMP					
	QMP1	QMP2	QMP3	QMP4	QMP5	QMP6
X40	0.507					
X41	0.608					
X43	0.606					
X44	0.508					
X45	0.728					
X46	0.668					
X47	0.655					
X48	0.618					
X49	0.594					
X22		0.652				
X23		0.653				
X24		0.595				
X25		0.656				
X26		0.58				
X27		0.563				
X33		0.501				
X8			0.587			
X9			0.618			
X10			0.566			
X11			0.717			
X12			0.795			
X13			0.651			
X15			0.498			
X1				0.731		
X2				0.595		
X3				0.704		
X4				0.588		
X5				0.632		
X6				0.615		
X7				0.541		
X16					0.588	
X17					0.607	
X18					0.686	
X19					0.666	
X20					0.58	
X21					0.6	
X30						0.649
X31						0.706
X32						0.656
Cronbach Alpha	0.877	0.8641	0.8044	0.8918	0.7855	0.810

Total Variance Explained

Component	Initial Eigen values		
QMP1	19.234	38.467	38.467
QMP2	2.181	4.361	42.828
QMP3	1.975	4.95	46.778
QMP4	1.828	4.656	50.434
QMP5	1.557	4.114	54.548
QMP6	1.32	2.64	56.188

A thorough investigation of Table 4.9 indicates that six QMPs were meaningful and accounted for 56.188% of total variation among 50 items. Six QMPs may be interpreted respectively as quality improvement program, supervisory leadership, supplier involvement, top management commitment, training to improve products/services and cross functional team relationships among SBUs.

The terms that the researcher has provided to the extracted factors is certainly not the only possible way of interpreting them. For example, the extracted factor 1 "*quality improvement program*" resembles Deming's fifth principle "*constantly improving the system of production and service*". The extracted factor 2 "*supervisory leadership*" parallels Deming's seven principle "*instituting leadership*". The extracted factor 3 "*supplier involvement*" resembles Deming's fourth principle "*ending the practice of awarding business based on price tag alone*". The extracted factor 4 "*top management commitment*" resembles Deming's second principle "*adapting the new philosophy*". The extracted factor 5 "*Training to Improve Products/Services*" resembles Deming's 13th principle "*instituting education and self improveme*nt" and finally, the extracted factor 6 "*Cross Functional Team Relationships among SBUs*" paralleles the ninth principle "*breaking down*" barrier between departments. Interestingly, this extracted factor also closely resembles some of the factors that were developed by Saraph *et al*. (1989) and Tamimi (1995). For example, the extracted factor 1 parallels his third factor "*education and their first factor* "*role of divisional top management and quality policy.*"

It is interesting to note that the first factor "*quality improvement program*" accounted for 38.467% of total variation among six QMPs. Similarly factor 2 "*supervisory leadership*" and factor 4 "*top management commitment*" were also related to the concept of "*good management*". Thus, it means good management as reflected by factors 1, 2, and 4 accounted, cumulatively, for 46.864% of total variation. This clearly reinforces the importance of quality improvement program in creating the appropriate organizational culture and climate to improve quality conductively (Tamimi, 1995). Table 4.10 provides a list of meaningful six QMPs to help oil and gas companies to implement TQM.

Table 4.10
Items Strongly Loading on Extracted QMPs

(QMP1)	**Quality Improvement Program** X40: The quality of the working environment is good. X41: There is an adequate documentation on how to do the job. X43: Top management sets realistic goals for its employees. X44: There are programs to develop team work among employees. X45: There are programs to develop effective communications among employees. X46: There are programs to develop employees' conflict resolution skills. X47: There are programs to broaden employees' skills for future organizational needs X48: Top management takes action towards executing its quality improvement policies. X49: Top management makes its quality improvement policies visible to all employees
(QMP2)	**Supervisory Leadership** X22: Supervisors help their employees on the job. X23: Supervisors work to build the trust of their employees. X24: Supervisors lead in a way that is consistent with the aims of the organization. X25: Supervisors are viewed as coaches by their employees. X26: Employees express new ideas related to improving work method. X27: Employees seek their supervisors' assistant when they unsure of their tasks X33: Top management provides its workers with the methods/procedures
(QMP3)	**Supplier Involvement** X8: Suppliers use certain statistical quality control techniques. X9: Statistical control techniques are used to minimize a reliance on mass inspection. X10: Top management supports the belief that quality must be 'built into' the Product/service and not 'inspected into' it. X11: Suppliers selection is based on quality and price rather than price itself. X12: Suppliers are involved in the product/service development process. X13: Long-term relationships are developed with suppliers. X15: Customers' requirements are analyzed in the process of developing a product/service.

Continued

(QMP4)	**Top Management Commitment** X1: Top management makes long-term plans. X2: Top management provides for research and development. X3: Top management provides for new technology (EOR) X4: Top management promotes employee training/education. X5: Top management is committed to quality improvement as a way to increase profits. X6: Top management is committed to setting objectives for quality improvement. X7: Top management is committed to continuous quality enhancement as a primary goal.
(QMP5)	**Training to Improve Products/Services** X16: Customers' feedback is used to continually improve the product/service. X17: Top management assess its competitors in order to improve the product/service X18: Employees are trained in statistical improvement techniques. X19: Employees are trained in quality-related matters (such as Six Sigma). X20: Employees are trained in specific work-related skills. X21: Supervisors are trained in statistical improvement techniques.
(QMP6)	**Cross Functional Team Relationships among SBUs** X30: Different departments have compatible goals. X31: In the product/service design process there is teamwork among different departments or SBUs X32: There is good communication among different departments or SBUs.

Figure 4.1 shows the measurement model of six QMPs (as independent constructs) of the study (the result of EFA)—first-order factor model with fifteen unique covariances among six latent factors ($\varphi_{1.2}$-$\varphi_{1.6}$).

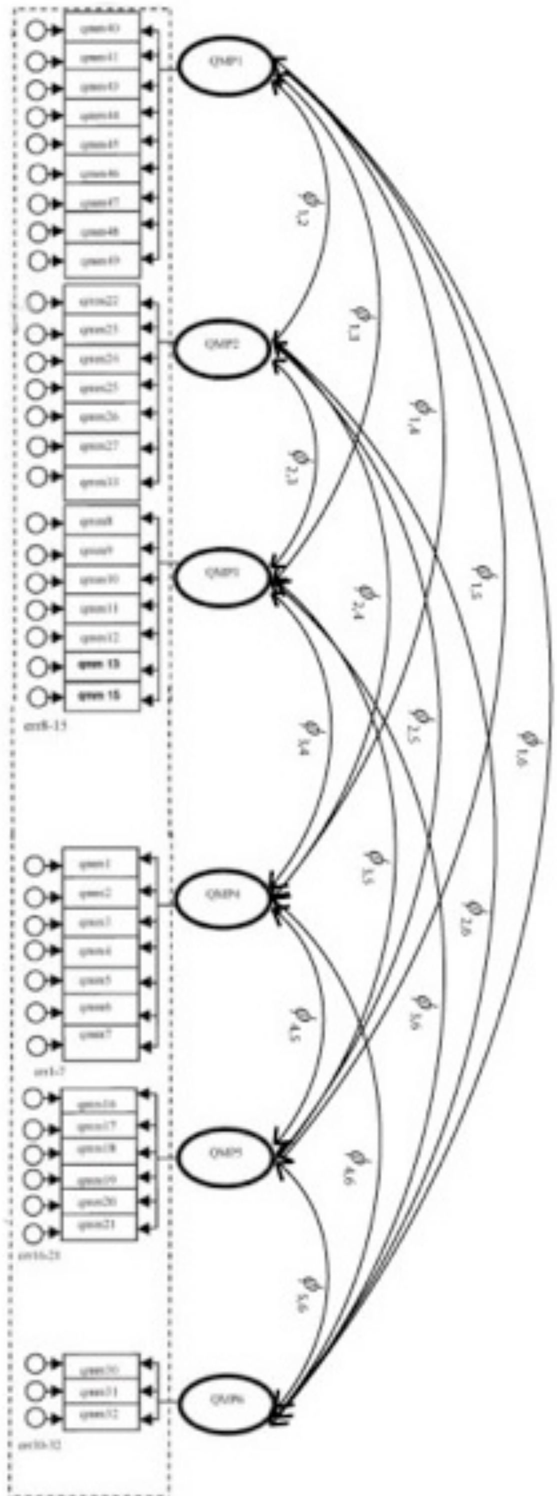


Figure 4.1
EFA Model of QMPs

Regarding the reliability and the validity of the measures, the researcher conducts a CFA for each of the six QMPs (QMP_{1-6}). Measurement models show high reliability and validity of the scales (see Table 4.11), since all the indexes are among the levels recommended by literature: Cronbach's alpha above 0.70, Scale Composite Reliability (SCR) indexes higher than 0.70; and CR above 1.96). CFA (Table 4.11) confirms, as learnt from EFA, the existence of six QMPs (QMP_{1-6}). H1 was accepted: fifty items related to TQM implementation could be extracetd (classified) into six QMPs.

Table 4.11
The Results of Reliability and Validity Analyses: QMPs

QMP Dimensions (the Critical Factors of QMP)	SCR	Number of Item	Cronbach's Alpha	Error	CR
QMP1	0.814	9	0.8770	ε_1: 0.177	11.358
QMP2	0.799	7	0.8641	ε_2: 0.294	16.643
QMP3	0.821	7	0.8044	ε_3: 0.366	14.731
QMP4	0.722	7	0.8918	ε_4: 0.217	12.429
QMP5	0.745	6	0.7855	ε_5: 0.302	12.960
QMP6	0.825	3	0.8097	ε_6: 0.263	14.975

4.5.2 Factor Analysis (A Second Order CFA) for WCC

Table 4.12 shows the reliability of six dimensions of the WCC construct computed by Cronbach's alpha, ranging from 0.794 to 0.858. The table also suggests an acceptable internal consistency, especially for the number of items given (Nunnally, 1978). The Cronbach's alpha for the overall scale is equal to 0.9661, which is above the satisfactory standard (≥0.75, Nunnally, 1978; Churchill, 1979).

Table 4.12 also shows the result of a second-order CFA of WCC confirming the existence of 6 dimensions in the WCC—workforce skills and capabilities (wcc_1), management technical competence (wcc_2), competing through quality (wcc_3), workforce participation (wcc_4), rebuilding manufacturing engineering (wcc_5), and incremental improvement approaches (wcc_6).

As displayed in Table 4.12, the existence of convergent validity is verified when the standardized regression weights are significant ($p<0.01$) and above 0.7 (Hair *et al*., 2006). The standardized regression weights were ranging from 0.558 to 0.851. Although by convention, 0.558 is below the ideal threshold level, Hair *et al.* (2006) allow for a minimum value of 0.5 as long as the overall fit of the model remains acceptable. The positive results related to the items' significance levels and the overall results of errors (<0.5) and the critical ratio (CR>1.96) reasonably confirmed the existence of convergent validity in each of the dimension of WCC.

Table 4.12
The Result of Reliability and Validity Analyses: WCC

WCC Dimensions	**Standardized Regression Weight**	**Number of Item**	**Cronbach's Alpha**	**Error**	**CR (>1.96)**
wcc1	0.769	8	0.8216	ε_1: 0.038	30.211
wcc2	0.851	12	0.7943	ε_2: 0.054	32.033
wcc3	0.668	8	0.8345	ε_3: 0.046	24.450
wcc4	0.797	13	0.8145	ε_4: 0.030	29.849
wcc5	0.770	17	0.8124	ε_5: 0.027	28.683
wcc6	0.558	10	0.8579	ε_6: 0.204	21.251
CR = 16.005; ε : 0.023					
WCC (Cronbach's Alpha) = 0.9661					

Figure 4.2 shows the measurement model of WCC of the study—a second-order factor model with two layers (layer 1: wcc_1, wcc_2, wcc_3, wcc_4, wcc_5, wcc_6; and layer 2: WCC).

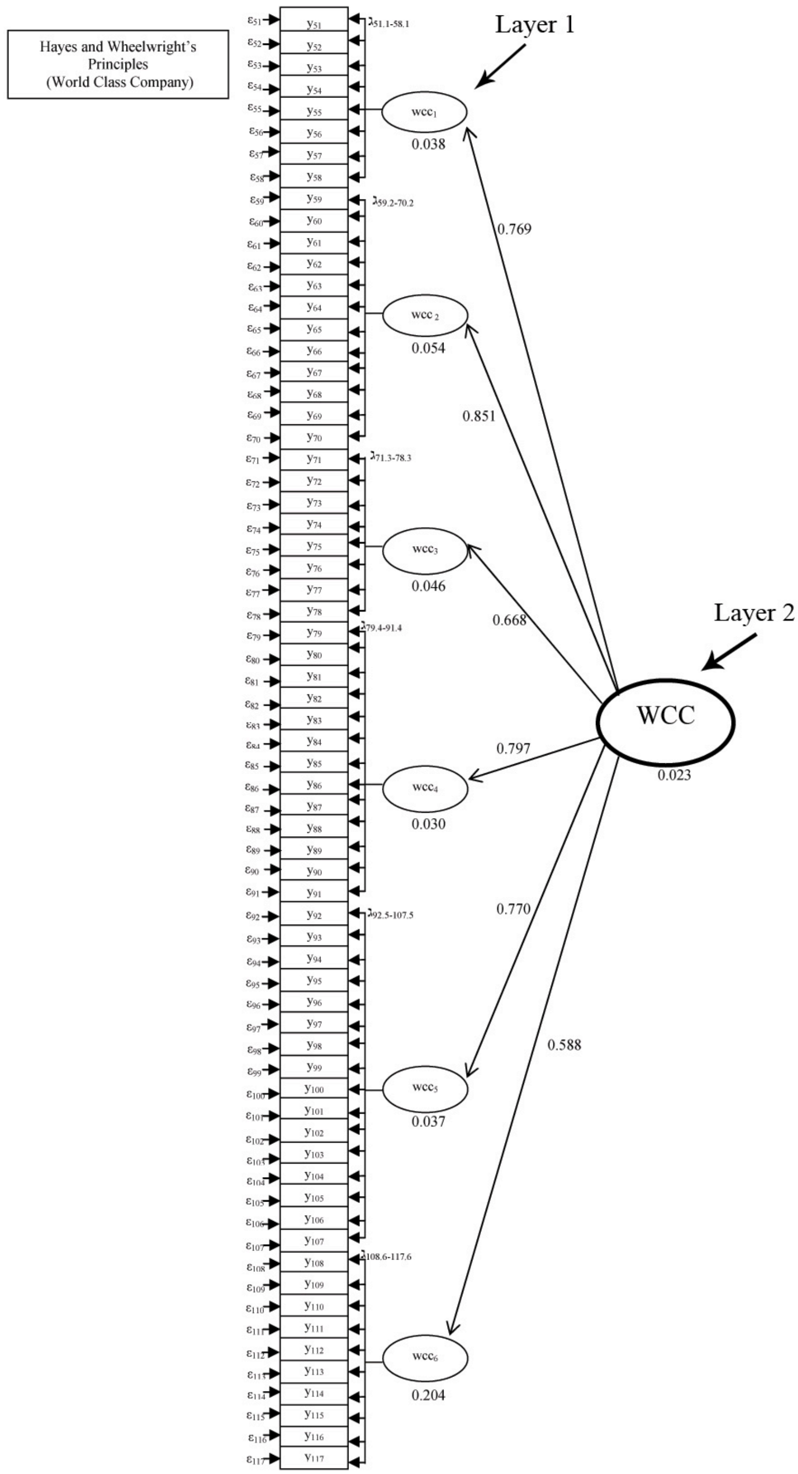


Figure 4.2
The Measurement Model of WCC

4.5.3 Factor Analysis (A First-Order CFA) for OE

From a first-order CFA for OE construct, it is found that five factors in OE dimensions show significant and positive impact on OE. A reliability of five dimensions of the OE construct computed by Cronbach's alpha, ranging from 0.851 to 0.907, suggesting an acceptable internal consistency (Nunnally, 1979) is clearly presented in Table 4.15. The Cronbach's alpha for the overall scale is equal to 0.7218, which is above the satisfactory standard (≥0.70, Nunnally, 1978; Churchill, 1979).

Table 4.13 shows the result of confirmatory factor analysis of OE about the existence of 5 dimensions in the OE construct—safety (oe_1), environment, (oe_2) health (oe_3), reliability (oe_4), and efficiency (oe_5).

Table 4.13
The Result of Reliability and Validity Analyses: OE

OE Dimensions	**Standardized Regression Weight**	**Error**	**CR (>1.96)**
oe1	0.769	ε_1: 0.038	30.211
oe2	0.851	ε_2: 0.054	32.033
oe3	0.668	ε_3: 0.046	24.450
oe4	0.797	ε_4: 0.030	29.849
oe5	0.770	ε_5: 0.027	28.683
CR = 19.859; ε : 0.049			
OE (Cronbach's Alpha) = 0.7218			

As displayed in Table 4.13, the existence of convergent validity is verified when the standardized regression weights are significant ($p<0.01$) and above 0.7 (Hair *et al.*, 2006). The standardized regression weights were ranging from 0.564 to 0.878. Although by convention, 0.554 is below the ideal threshold level, Hair *et al.* (2006) allow for a minimum value of 0.5 as long as the overall fit of the model remains acceptable. The positive results related to the items' significance levels and the overall results of errors (<0.5) and the critical ratio (CR>1.96) reasonably confirmed the existence of convergent validity in each of the dimension of OE.

Figure 4.3 shows the measurement model of the OE construct of the study – a first-order factor model: five items of oe_1, oe_2, oe_3, oe_4, oe_5 are being integrated into the overall measurement model (an overidentified model) for which a fit value of OE can be computed.

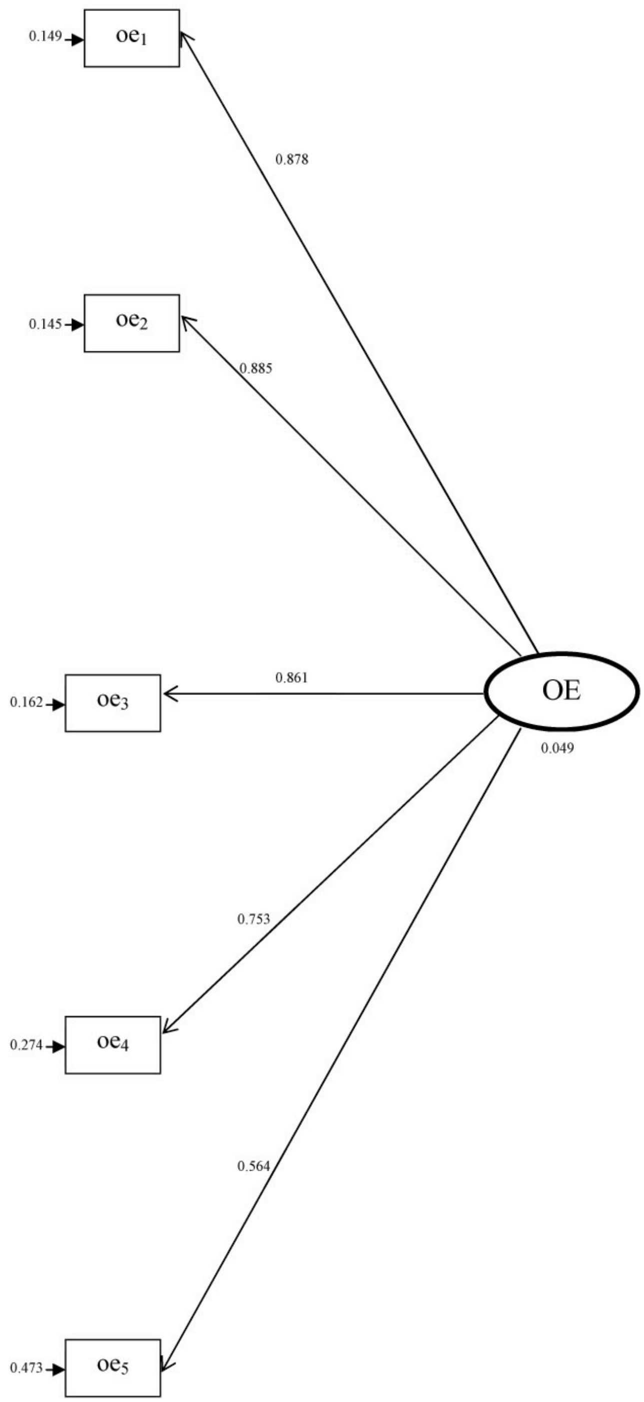


Figure 4.3
The Measurement Model of OE

4.5.4 Factor Analysis (A First-Order CFA) for CFP

In CFP construct, it is found that the result of a second-order CFA shows a significant and positive impact of the three factors on CFP. The reliability of three dimensions of the CFP construct computed by Cronbach's alpha, varied from 0.718 to 0.770 (Table 4.14), suggesting an acceptable internal consistency, especially for the number of item given (Nunnally, 1981). The Cronbach's alpha for the overall scale is equal to 0.8912 above the satisfactory standard (≥0.70, Nunnally, 1978; Churchill, 1979).

The existence of 3 items in the CFP constructs—financial performance (cfp_1), market performance (cfp_2), and operating cost (cfp_3)—was found as showed in Table 4.14 by CFA of CFP. The existence of convergent validity as displayed in Table 4.18 is verified when the standardized regression weights – ranging from 0.724 to 0.809 – are significant ($p<0.01$) and above 0.7 (Hair *et al.*, 2006). The positive results related to the items' significance levels and the overall results of errors (<0.5) and the critical ratio (CR>1.96) reasonably confirmed the existence of convergent validity in each of the dimension of CFP.

Table 4.14
The Result of Reliability and Validity Analyses: CFP

CFP Items	Standardized Regression Weight	Error	CR (>1.96)
cfp1	0.775	ε_1: 0.248	24.170
cfp2	0.809	ε_2: 0.194	24.148
cfp3	0.724	ε_3: 0.289	24.505
CR = 14.763; ε : 0.057			
CFP (Cronbach's Alpha) = 0.8912			

Figure 4.4 shows the measurement model of CFP construct of the study – afirst-order factor model: a three-item (cfp1, cfp2, cfp3), undimensional measurement model produces an overidentified model for which a fit value of CFP can be computed.

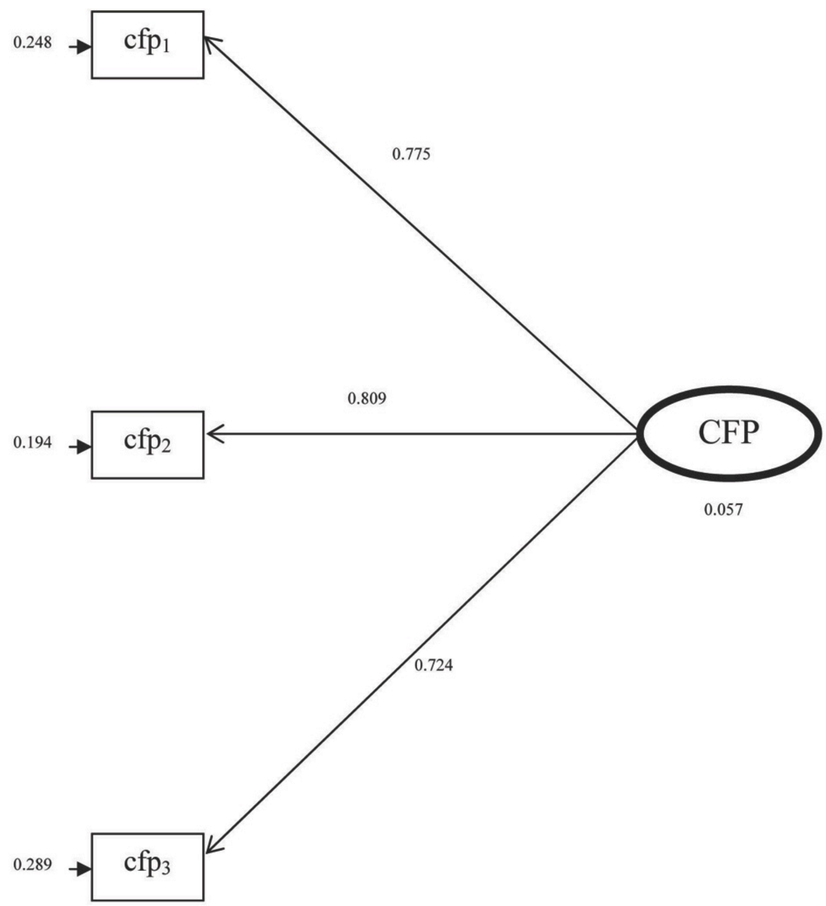


Figure 4.4
The Measurement Model of CFP

4.5.5 Factor Analysis (A First-Order CFA) for CNFP

The reliability of the six dimensions of the CNFP constructs (Table 4.15) – computed by Cronbach's alpha, and varied from 0.831 to 0.865 – recommended an acceptable internal consistency, especially for the number of items given (Nunnally, 1978). The Cronbach's alpha for the overall scale is equal to 0.8136, which above the satisfactory standard (≥0.70, Nunnally, 1978; Churchill, 1979).

Table 4.15 below shows the result of CFA of CNFP verifying the existence of 6 items in the company non financial construct—quality of product/service offerings ($cnfp_1$), delivery of product/service offerings ($cnfp_2$), variety of product/service offerings ($cnfp_3$), customer satisfaction ($cnfp_4$), employee satisfaction ($cnfp_5$), and community involvement ($cnfp_6$).

The existence of convergent validity in Table 4.15 is verified when the standardized regression weights are significant ($p<0.01$) and above 0.7 (Hair *et al*., 2006) ranging from 0.609 to 0.837. Although by convention, 0.609 and 0.686 are below the ideal threshold level, Hair *et al.* (2006) allow for a minimum value of 0.5 as long as the overall fit of the model remains acceptable. The positive results related to the significance levels of the items and the overall results of errors (<0.5) and the critical ratio (CR>1.96) reasonably confirmed the existence of convergent validity in each of the CNFP item.

Table 4.15
The Result of Reliability and Validity Analyses: CNFP

CNFP Items	Standardized Regression Weight	Error	CR (>1.96)
cnfp1	0.753	ε_1: 0.233	26.700
cnfp2	0.784	ε_2: 0.195	28.174
cnfp3	0.686	ε_3: 0.308	24.477
cnfp4	0.637	ε_4: 0.144	30.086
cnfp5	0.709	ε_5: 0.285	25.328
cnfp6	0.609	ε_6: 0.366	21.458
CR = 15.430; ε : 0.025			
CNFP (Cronbach's Alpha) = 0.8136			

Figure 4.5 shows the measurement model of CNFP construct of the study – a first-order factor model: an overidentified CFA model may result when six items (cnfp1, cnfp2,

cnfp3, cnfp4, cnfp5, cnfp6) are being integrated into the overall measurement model CNFP.

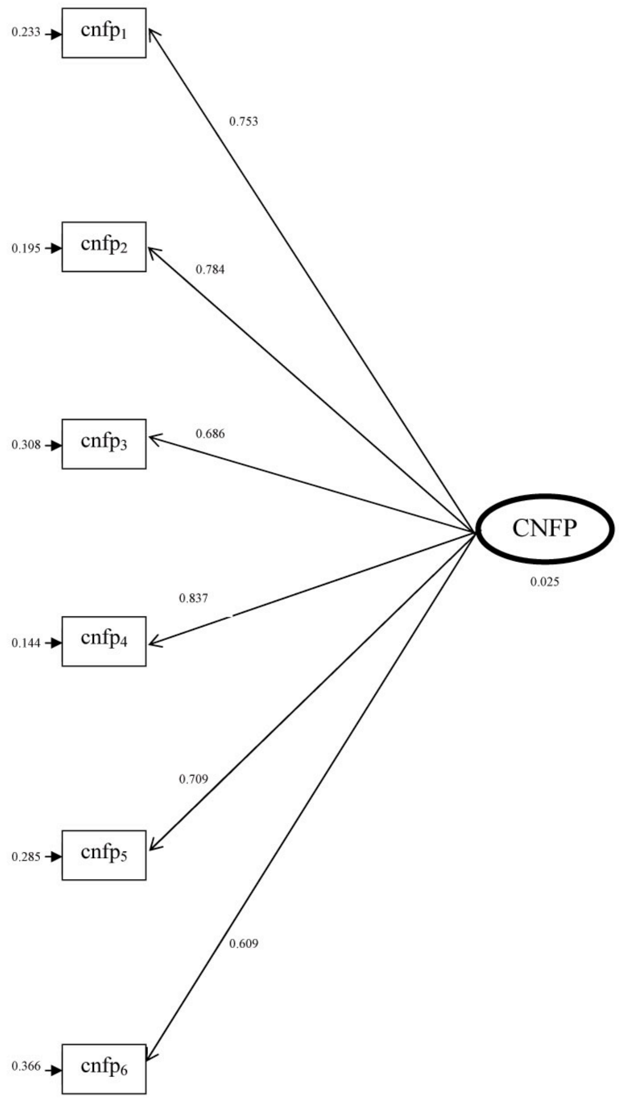


Figure 4.5
The Measurement Model of CNFP

4.5.6 Differences in Means

Table 4.16 displays construct means by levels of management commitment (top, middle, low—levels 1, 2, and 3). Although no hypotheses were proposed to mean-level differences, this study presents them for comparative purposes. In this study, a multiple informant sampling (a stratified random sampling) is used to ensure a balanced perception among 1,332 oil and gas managers. The sampling units were 354 top level managers (team managers), 447 middle level managers (team leaders), and 531 low level managers (team supervisors) at the SBUs level.

Results are based on two-tailed t-tests. In general, differences are found in that t-tests for equality of means across samples indicate some significant differences ($p \leq 0.05$) in quality improvement program (QMP1), supervisory leadership (QMP2), and supplier involvement (QMP3). T-tests also show some insignificant differences ($p > 0.05$) in top management commitment (QMP4), training to improve products or services (QMP5), cross-functional relationships (QMP6), WCC, OE, CNFP, and CFP.

The three levels of managers' abilities have a number of different perspectives in terms of technical aspects (quality improvement, supervisory leadership, and supplier involvement) but having the same perspective in terms of managerial aspects (top management commitment, training to improve products/services, crosss-functional relationships, WCC, OE, CNFP, and CFP) related to the TQM implementation. The results of insignificant differences in seven constructs of the study suggest that the three levels of managers have the same perspective in terms of seven constructs, indicating that oil and companies in Indonesia have been implementing TQM. Although the objective and subjective measures are not identical, the objective measures constituted a key element of the respondents' subjective assessments (Powell, 1995). Based on these justifications, no evidence supports the proposition in which responses to the questionnaire using Likert scales are biasing results.

Table 4.16
Differences in Means

Construct	Level of Managers' Abilities	N	Mean	Sig.
QMP1 (Quality Improvement)	Top (Level 1)	354	2.4400	0.003
	Middle (Level 2)	447	2.2210	
	Low (Level 1)	531	2.6505	
QMP2 (Supervisory Leadership)	Top (Level 1)	354	4.5009	0.002
	Middle (Level 2)	447	4.2120	
	Low (Level 1)	531	4.3220	
QMP3 (Supplier Involvement)	Top (Level 1)	354	2.8870	0.034
	Middle (Level 2)	447	2.7660	
	Low (Level 1)	531	3.0625	
QMP4 (Top Management Commitment)	Top (Level 1)	354	2.9103	0.450
	Middle (Level 2)	447	2.7700	
	Low (Level 1)	531	2.6610	
QMP5 (Training to Improve Product/Services)	Top (Level 1)	354	2.6322	0.625
	Middle (Level 2)	447	2.6270	
	Low (Level 1)	531	2.6014	
QMP6 (Cross-functional Relationship)	Top (Level 1)	354	4.1111	0.110
	Middle (Level 2)	447	4.2121	
	Low (Level 1)	531	3.0917	
WCC (World-Class Company Practice)	Top (Level 1)	354	3.0168	0.105
	Middle (Level 2)	447	2.9720	
	Low (Level 1)	531	2.8620	
OE (Operational Excellence Practice)	Top (Level 1)	354	4.4722	0.120
	Middle (Level 2)	447	4.4515	
	Low (Level 1)	531	4.4412	
CNFP (Company Non Financial Performance)	Top (Level 1)	354	2.7458	0.225
	Middle (Level 2)	447	2.6887	
	Low (Level 1)	531	2.6422	
CFP (Company Financial Performance)	Top (Level 1)	354	2.7892	0.851
	Middle (Level 2)	447	2.7606	
	Low (Level 1)	531	2.7212	

4.6 Structural Relationships Model: SEM

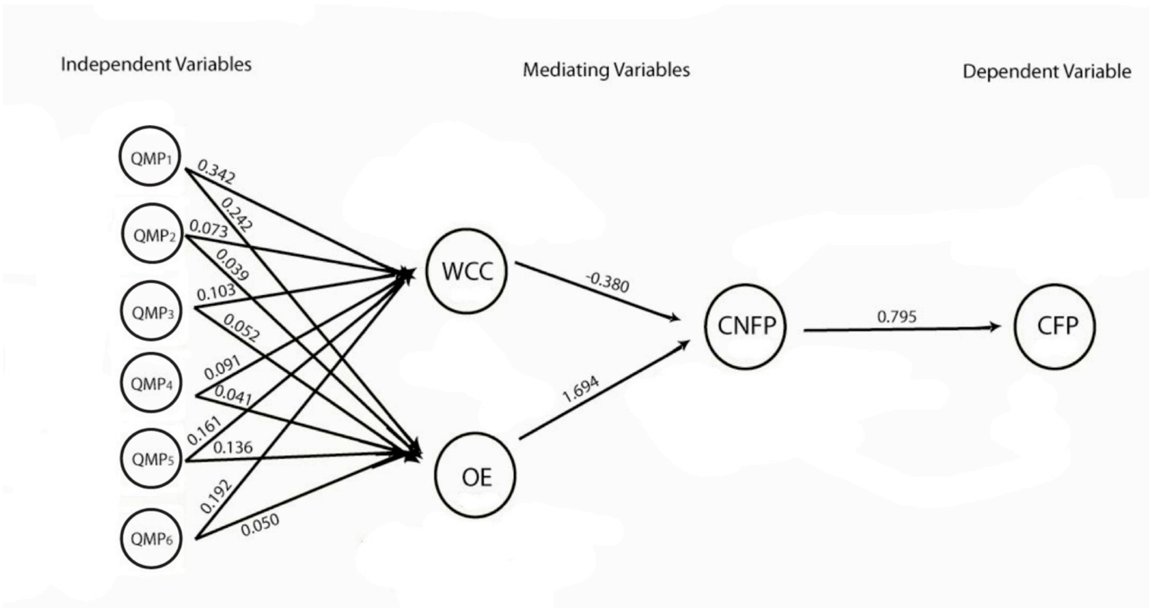
To test the hypotheses 2-6 (a set of hypothesized structural relations in the research model), the researcher used SEM as the sample size was relatively large. Typically, SEM is more appropriate when the sample size above 1,000. For the next stage of the research, SEM using AMOS was employed for examining the relationships among the ten researches constructs. All paths, by using SEM, can be estimated at once. Table 4.17 shows that the goodness-of-fit indexes for the saturated measurement model (the Initial Model) reflected a good model ($X^2/df = 1.705$, $p = 0.059$, GFI = 0.997, AGFI = 0.986, CFI = 0.999, RMR = 0.003, and RMSEA = 0.023). Values of 0.90 and above on the adjusted goodness-of-fit (AGFI) indexes are considered to be desirable, and values of 0.95 and above on the comparative fit index (CFI) are considered to be strong evidence of practical significance (Bentler and Chou, 1987). Standardized root-mean-squared residual (RMR) values and root-mean-squared error of approximation (RMSEA) values of 0.05 or less are also considered to be the indicators of good fit.

The paths from critical factor of QMP_2 (supervisory leadership); QMP_4 (top management commitment): and QMP_6 (cross-functional team relationship among SBUs) to OE, and WCC to CNFP have critical ratio (CR) less than 1.96. There were examples of parameters exhibiting unreasonable estimates (e.g. correlations greater than 1.0: OE to CNFP; and a negative correlation: WCC to CNFP). Therefore, the paths from QMP_2 to OE, QMP_4 to OE, QMP_6 to OE, and WCC to CNFP were gradually eliminated and the model was revised (see Table 4.17 and Figure 4.6).

Table 4.17
SEM Results (the Initial Model)

<table>
<tr><th>Hypotheses</th><th>Structural Relationship</th><th>Standardized Regression Weight</th><th>CR</th><th>Error (ε)</th><th>Residual (ζ)</th><th>Hypothesis supported</th></tr>
<tr><td>H2a</td><td>QMP1 → WCC</td><td>0.342</td><td>12.109</td><td rowspan="15">ε1 = 0.019;
ε2 = 0.037;
ε3 = 0.052;
ε4 = 0.021;
ε5 = 0.044;
ε6 = 0.041;
η1 = 0.038;
η2 = 0.139;
η3 = 0.057;
η4 = 0.025</td><td rowspan="15">ζ1 = 0.371;
ζ2 = 0.771;
ζ3 = 1.663;
ζ4 = 0.367</td><td>Yes</td></tr>
<tr><td>H2b</td><td>QMP2 → WCC</td><td>0.073</td><td>2.643</td><td>Yes</td></tr>
<tr><td>H2c</td><td>QMP3 → WCC</td><td>0.103</td><td>3.876</td><td>Yes</td></tr>
<tr><td>H2d</td><td>QMP4 → WCC</td><td>0.091</td><td>3.485</td><td>Yes</td></tr>
<tr><td>H2e</td><td>QMP5 → WCC</td><td>0.161</td><td>6.273</td><td>Yes</td></tr>
<tr><td>H2f</td><td>QMP6 → WCC</td><td>0.192</td><td>7.951</td><td>Yes</td></tr>
<tr><td>H3a</td><td>QMP1 → OE</td><td>0.242</td><td>7.290</td><td>Yes</td></tr>
<tr><td>H3b</td><td>QMP2 → OE</td><td>0.039</td><td>1.525</td><td>No</td></tr>
<tr><td>H3c</td><td>QMP3 → OE</td><td>0.052</td><td>2.080</td><td>Yes</td></tr>
<tr><td>H3d</td><td>QMP4 → OE</td><td>0.041</td><td>1.663</td><td>No</td></tr>
<tr><td>H3e</td><td>QMP5 → OE</td><td>0.136</td><td>4.486</td><td>Yes</td></tr>
<tr><td>H3f</td><td>QMP6 → OE</td><td>0.055</td><td>1.626</td><td>No</td></tr>
<tr><td>H4</td><td>WCC → CNFP</td><td>-0.380</td><td>-0.784</td><td>No</td></tr>
<tr><td>H5</td><td>OE → CNFP</td><td>1.694</td><td>2.048</td><td>Yes</td></tr>
<tr><td>H6</td><td>CNFP → CFP</td><td>0.795</td><td>33.274</td><td>Yes</td></tr>
<tr><th colspan="3">Goodness of Fit Measures</th><th colspan="2">Acceptable Parameter Level
(Hair et al., 1998 & 2006)</th><th colspan="2">Desirable Parameter Level (Hair et al., 1998 & 2006)</th></tr>
<tr><td colspan="2">Chi-Square Statistic (X^2)</td><td>20.465</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="2">Degree of Freedom (df)</td><td>12</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="2">Normed Chi-Square (X^2/df)</td><td>1.705</td><td colspan="2">1 < x < 5</td><td colspan="2">1 < x < 2</td></tr>
<tr><td colspan="2">X^2 p-value</td><td>0.059</td><td colspan="2">> 0.05</td><td colspan="2">> 0.15</td></tr>
<tr><td colspan="2">GFI</td><td>0.997</td><td colspan="2">Close to 1 is better</td><td colspan="2"></td></tr>
<tr><td colspan="2">AGFI</td><td>0.986</td><td colspan="2">> 0.90</td><td colspan="2"></td></tr>
<tr><td colspan="2">CFI</td><td>0.999</td><td colspan="2">Close to 1 is better</td><td colspan="2"></td></tr>
<tr><td colspan="2">RMR</td><td>0.003</td><td colspan="2">Close to 0 is better</td><td colspan="2"></td></tr>
<tr><td colspan="2">RMSEA</td><td>0.023</td><td colspan="2">< 0.10</td><td colspan="2">< 0.05</td></tr>
<tr><td colspan="2">ECVI</td><td>0.080</td><td colspan="2"></td><td colspan="2"></td></tr>
</table>

Figure 4.6 shows the initial model of the structural relations of TQM implementation model.



Note:
- $QMP_{1\text{-}6}$: Critical Factors of Quality Management Practices
- OE: Operational Excellence Practice
- WCC: World-class company practice
- CNFP: Company Non Financial Performance
- CFP: Company Financial Performance

Figure 4.6
Initial Model of the Structural Relations of TQM Implementation

Table 4.18 shows the revised (final) structural model. After eliminating the paths, QMP3 to OE, QMP6 to OE were iteratively used to determine whether the structural model fitted the data well. The criteria for assessing overall fit support a well-fitting model (X^2/df <2; GFI, AGFI, CFI > 0.95; RMR and RMSEA < 0.05; and p-value > 0.05). Sub Hypotheses H3cand H3f were not supported—QMP_3 and QMP_6 did not have a strong positive impact on OE. With some modifications, the results of the final model support sub hypotheses H3a, b, d, e (see Figure 4.7).

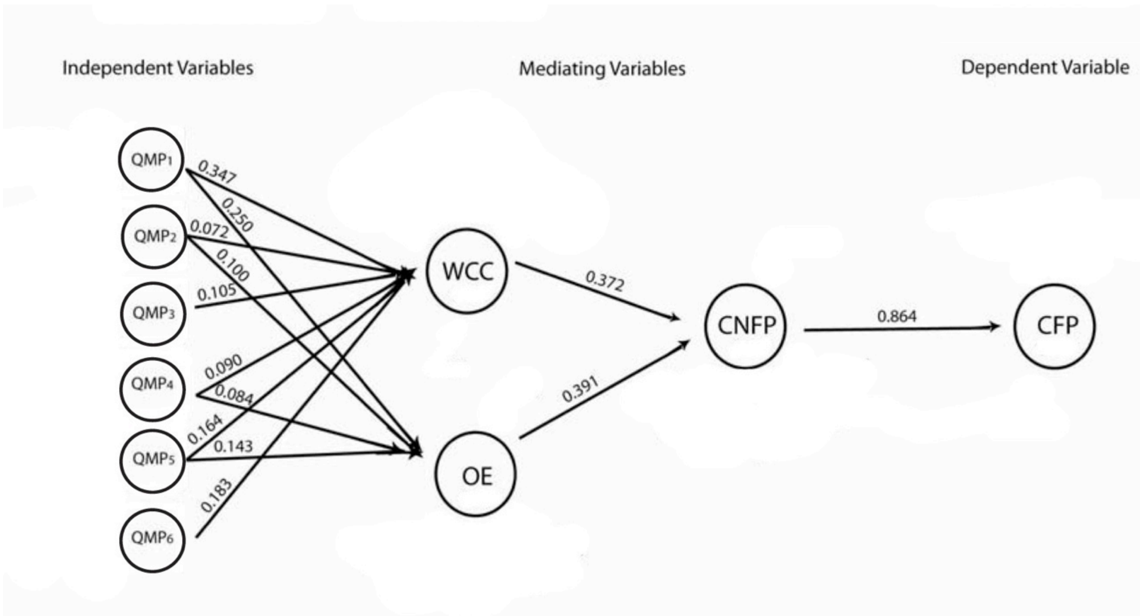
The revised (final) model surpasses the hypothesized model on all fit criteria, which confirms that the modifications were meaningful. There were no examples of parameters exhibiting the unreasonable estimates (e.g. there were no correlations greater than 1.0 and negative correlations). This result also provides several important insights into all the lower and smallest ECVI (Expected Cross-Validation Index) values from the initial model (ECVI = 0.080), and final causal model (ECVI = 0.079). According to Byrne (2001) the structural model having the smallest ECVI values exhibits the greatest potential for replication. In assessing the hypotheses for the structural model (Final Causal Model), the researcher compared its ECVI value of 0.079 with that of both the saturated model (ECVI = 0.075) and the independence model (ECVI = 3.065). Given the lower ECVI value for the hypothesized model, compared with both the independence and saturated models, the researcher concluded that it represents the best fit to the data.

Table 4.18
SEM Results (Revised Model/Final Causal Model)

Hypotheses	Structural Relationship	Standardized Regression Weight	CR	Error (ε)	Residual (ζ)	Hypothesis supported
H2a	QMP1 → WCC	0.347	12.328	ε1 = 0.019; ε2 = 0.037; ε3 = 0.052; ε4 = 0.021; ε5 = 0.044; ε6 = 0.041; η1 = 0.038; η2 = 0.139; η3 = 0.057; η4 = 0.025	ζ1 = 0.371; ζ2 = 0.756; ζ3 = 0.538; ζ4 = 0.379	Yes
H2b	QMP2 → WCC	0.072	2.626			Yes
H2c	QMP3 → WCC	0.105	4.118			Yes
H2d	QMP4 → WCC	0.090	3.449			Yes
H2e	QMP5 → WCC	0.164	6.424			Yes
H2f	QMP6 → WCC	0.183	7.889			Yes
H3a	QMP1 → OE	0.250	5.735			Yes
H3b	QMP2 → OE	0.100	2.310			Yes
H3d	QMP4 → OE	0.084	2.106			Yes
H3e	QMP5 → OE	0.143	3.641			Yes
H4	WCC → CNFP	0.372	11.407			Yes
H5	OE → CNFP	0.391	10.599			Yes
H6	CNFP → CFP	0.864	22.128			Yes

Goodness of Fit Measures		**Acceptable Parameter Level** (Hair *et al.*, 1998 & 2006)	**Desirable Parameter Level** (Hair *et al.*, 1998 & 2006)
Chi-Square Statistic (X^2)	22.608		
Degree of Freedom (df)	14		
Normed Chi-Square (X^2/df)	1.615	1 < x < 5	1 < x < 2
X^2 p-value	0.067	> 0.05	> 0.15
GFI	0.997	Close to 1 is better	
AGFI	0.987	> 0.90	
CFI	0.999	Close to 1 is better	
RMR	0.002	Close to 0 is better	
RMSEA	0.021	< 0.10	< 0.05
ECVI	0.079		

Figure 4.7 shows the revised (final) model of structural relations of TQM implementation model.



Note:

- QMP_{1-6}: Quality Management Practices
- OE: Operational Excellence Practice
- WCC: World-class company practice
- CNFP: Company Non Financial Performance
- CFP: Company Financial Performance

Figure 4.7
The Revised (Final) Model of the Structural Relations of TQM Implementation

The Revised (Final) Model of the Structural Relations of TQM Implementation has tested the hypotheses H2a-f, H3a-f, and H6. Hence, hypotheses 2a-f (H2a-f) and hypotheses 3a, b, d, e (H3a, b, d, e) were accepted. QMP1-6 have positive impact on WCC; and QMP1, 2, 4, 5 have positive impact on OE (QMP3 and QMP6 do not have positive impact on OE). Hypothesis 6 (H6) was also accepted; CNFP has a strong positive impact on CFP.

Table 4.19 shows the covariance and correlations estimate, standard error (SE), and CR of six QMPs (QMP_{1-6} as independent variables) related to the revised (final) model of structural relations of TQM implementation. Based on the CR values associated with these estimates reveal all to be statistically significant (as indicated by the critical ratio values >1.96). This finding is consistent with the theory of QMPs, as it relates to the structural relations of TQM implementation, and therefore there is no cause for concern (there is no possibility of measurement bias in the form of a nuisance factor (Byrne, 2001; Hair *et al*., 2006).

The bivariate correlations among the variables in Table 4.19 are generally less than 0.6 indicating the absence of multicollinearity. The results of the bivariate correlations among the six independent constructs of the study also suggest that the six independent variables are significantly correlated to each other, indicating that oil and companies in Indonesia commonly implemented those QMPs holistically. The strengths of the correlations vary across six independent variables (0.487-0.596). These provide a final finding on the unique role of different QMPs in affecting CFP through OE, WCC, and CNFP.

Table 4.19
Covariances/Correlations Estimate

Construct Covariances / Correlations	Covariances Estimate	Correlations Estimate	S.E.	C.R.
QMP1 <---------------------> QMP2	0.136	0.571	0.007	20.337
QMP1 <---------------------> QMP3	0.118	0.587	0.006	18.459
QMP2 <---------------------> QMP3	0.160	0.593	0.009	18.614
QMP1 <---------------------> QMP4	0.109	0.540	0.006	19.660
QMP2 <---------------------> QMP4	0.137	0.596	0.007	18.680
QMP3 <---------------------> QMP4	0.145	0.540	0.007	19.665
QMP1 <---------------------> QMP5	0.103	0.586	0.006	18.457
QMP2 <---------------------> QMP5	0.147	0.524	0.008	19.305
QMP3 <---------------------> QMP5	0.143	0.514	0.007	19.083
QMP4 <---------------------> QMP5	0.107	0.538	0.006	17.286
QMP1 <---------------------> QMP6	0.109	0.509	0.006	18.969
QMP2 <---------------------> QMP6	0.137	0.569	0.008	18.050
QMP3 <---------------------> QMP6	0.126	0.528	0.007	17.032
QMP4 <---------------------> QMP6	0.099	0.487	0.006	15.983
QMP5 <---------------------> QMP6	0.111	0.531	0.006	17.104
zWCC <--> zOE	0.200	0.378	0.020	10.163
zCFP <---> zCNFP	0.073	0.161	0.033	2.214
errOE <-------------------------------------> errCFP	0.024	0.266	0.008	3.065

With respect to hypotheses 2a-f and 3a-f, it was found that QMPs had a significant positive impact on CFP through WCC, OE, and CNFP. Therefore, a good deal of support has been provided to hypotheses 2a-f and 3a-f that WCC, OE, and CNFP mediated the impact of QMPs on CFP. Also, a good deal of support has been found that CNFP has a strong positive impact on CFP (hypothesis 6). Table 4.20 shows a complete model fit from the result of SEM (initial and final models of structural relations of TQM implementation).

Table 4.20
A Complete Model Fit (Initial and Final Models)

Goodness-of- Fit	Model Fit		Acceptable Parameter Level	
Statistics Test	Model I (Initial Model)	Model II (Final Model)	Model I (Initial Model)	Model II (Final Model)
I				
NPAR	43	41	Yes	Yes
CMIN	20.465	22.608	Yes	Yes
DF	12	14	Yes	Yes
X^2 p-value	0.059	0.067	Yes	Yes
CMIN/DF	1.705	1.615	Yes	Yes
II				
RMR	0.003	0.002	Yes	Yes
GFI	0.997	0.997	Yes	Yes
AGFI	0.986	0.987	Yes	Yes
PGFI	0.218	0.254	Yes	Yes
III				
NFI	0.997	0.997	Yes	Yes
RFI	0.990	0.990	Yes	Yes
IFI	0.999	0.999	Yes	Yes
TLI	0.996	0.996	Yes	Yes
CFI	0.999	0.999	Yes	Yes
IV				
PRATIO	0.266	0.311	Yes	Yes
PNFI	0.266	0.310	Yes	Yes
PCFI	0.266	0.311	Yes	Yes
V				
NCP	8.465	8.608	Yes	Yes
FMIN	0.015	0.017	Yes	Yes
FO (LO 90; H1 90)	0.006	0.006	Yes	Yes
VI				
RMSEA	0.023	0.021	Yes	Yes
PCLOSE	0.998	0.999	Yes	Yes
VII				
AIC	106.465	104.608	Yes	Yes
BCC	107.182	105.292	Yes	Yes
BIC	428.837	411.986	Yes	Yes
CAIC	327.826	358.580	Yes	Yes
ECVI	0.080	0.079	Yes	Yes
MECVI	0.081	0.079	Yes	Yes
VIII				
CN (HOELTER 0.05)	1168	1395	Yes	Yes
CN (HOELTER 0.01)	1706	1716	Yes	Yes

4.7 Decomposition of Effects in Path Analysis

To test hypotheses 4 and 5 (H4a-f and H5a-f), the researcher uses the decomposition of effects in path analysis to examine the total effect of QMP1-6 on CFP through two mediating variables (WCC and CNFP; OE and CNFP). Table 4.21 presents estimated coefficients of regression equations used to interpret the structural relations in TQM implementation in Figure 4.7.

Table 4.21
Coefficients of Variables
Based on the Final Model of the Structural Relations of TQM Implementation

Predetermined Variable	**Equation and Dependent Variable**			
	(1) WCC	**(2) OE**	**(3) CNFP**	**(4) CFP**
QMP_1	0.347	0.250	-	-
QMP_2	0.072	0.100	-	-
QMP_3	0.105	-	-	-
QMP_4	0.090	0.084	-	-
QMP_5	0.164	0.143	-	-
QMP_6	0.183	-	-	-
WCC	-	-	0.372	-
OE	-	-	0.391	-
CNFP	-	-	-	0.864

Table 4.22 illustrates the result of the decomposition of effects in path QMP1-6 → WCC → CNFP → CFP (H4a-f) and in path QMP1-6 → OE → CNFP → CFP (H5a-f). It is important to interpret patterns of direct and indirect causation in structural relations model (Figure 4.7). These results imply that H4a-f and H5a, b, d, e were accepted. Hence, WCC and CNFP partially mediate the impact of six QMPs (QMP1-6) on CFP. OE and CNFP partially mediate the impact of four QMPs (QMP1, 2, 4, 5) on CFP.

Table 4.22
Interpretations of Decomposition of Effects in Path Analysis

Dependent Variable	Predetermined Variable	Total Effect	Indirect Effects via			Direct Effect
			WCC	OE	CNFP	
WCC	QMP_1	0.347	-	-	-	0.347
	QMP_2	0.072	-	-	-	0.072
	QMP_3	0.105	-	-	-	0.105
	QMP_4	0.090	-	-	-	0.090
	QMP_5	0.164	-	-	-	0.164
	QMP_6	0.183	-	-	-	0.183
OE	QMP_1	0.250	-	-	-	0.250
	QMP_2	0.100	-	-	-	0.100
	QMP_3	-	-	-	-	-
	QMP_4	-	-	-	-	-
	QMP_5	0.143	-	-	-	0.143
	QMP_6	0.183	-	-	-	0.183
CNFP	QMP_1	0.227	0.129	0.098	-	0.000
	QMP_2	0.076	0.037	0.039	-	0.000
	QMP_3	0.039	0.039	-	-	0.000
	QMP_4	0.066	0.033	0.033	-	0.000
	QMP_5	0.177	0.061	0.056	-	0.000
	QMP_6	0.068	0.068	-	-	0.000
	WCC	0.372	-	-	-	0.372
	OE	0.391	-	-	-	0.391
CFP	QMP_1	0.196	-	-	0.196	0.000
	QMP_2	0.066	-	-	0.066	0.000
	QMP_3	0.034	-	-	0.034	0.000
	QMP_4	0.057	-	-	0.057	0.000
	QMP_5	0.101	-	-	0.101	0.000
	QMP_6	0.059	-	-	0.059	0.000
	CNFP	0.864	-	-	-	0.864

In order to understand how a particular mediating variable exercises its effect, the researcher decomposes the indirect effects into their constituent parts. To determine hypotheses 4 (H4a-f), for example, the result shows that QMP1 has the total effect of 0.227 on CNFP, of which 0.129 is transmitted via WCC; and QMP1 has an indirect effect of

0.196 on CFP through CNFP. There is no direct effect of QMP1 to CNFP and to CFP. The same ways that QMP2,3,4,5,6 have total effects of 0.076, 0.039, 0.066, 0.177, and 0.068 on CNFP, of which 0.037, 0.039, 0.033, 0.061, and 0.068 are transmitted via WCC; and QMP2,3,4,5,6 have indirect effects of 0.066, 0.034, 0.057, 0.101, 0.059 on CFP through CNFP There are no direct effects of QMP2,3,4,5,6 to CNFP and to CFP. These results imply that H4a-f were accepted—WCC and CNFP partially mediate the impact of QMP1,2,3,4,5,6 on CFP.

To determine hypotheses 5 (H5a-f), the results show that QMP1,2,4,5 have total effects of 0.227, 0.076, 0.066, and 0.177 0n CNFP, of which 0.098, 0.039, 0.033, and 0.056 are transmitted via OE; and QMP1,2,4,5 have indirect effects of 0.066, 0.034, 0.057, 0.101, 0.059 on CFP through CNFP. There are no direct effects of QMP1,2,4,5 to CNFP and to CFP. The results imply that H5a,b,d,e were supported—OE and CNFP partially mediate the impact of QMP1,2,4,5 on CFP. Hypotheses H5c,f were not supported—OE and CNFP do not mediate the impact of QMP3,6 on CFP.

4.8 Summary

Throughout this chapter, the overall statistical analyses (quantitative data analyses using SEM) were reviewed in detail. In addition, six critical factors of quality management practices, final structural equation model were identified and explained. Results obtained from the SEM, and decomposition of effects in path analysis suggest that the research model exhibits a quite satisfactory overall fit.

The next chapter (Chapter V) presents the discussion of the main findings from the research model. Further, the possible generalizations regarding the statistical findings are also described.