MEDIATION ANALYSIS USING THE HIERARCHICAL MULTIPLE REGRESSION TECHNIQUE
A Study of the Mediating Roles of World-Class Performance in Operations

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The changing environment in an organization is forcing the organization to find a plan of integrated management framework and adequate performance measurement. Failure to plan basically means planning failure for the business. Finding the critical factors of quality management practices (QMP), the mediating roles of the contextual factors of world-class performance in operations (i.e., world-class company practices or WCC, operational excellence practices or OE, company non-financial performance or CNFP), and the company financial performance would enable the company to facilitate the sustainability of TQM implementation model.

This empirical study aims to assess how TQM—a holistic management philosophy initially developed by W. Edward Deming, which integrates improvement strategy, management practices, and organizational performance—is specifically implemented in the oil and gas companies operating in Indonesia. Relevant literature on the TQM, the world-class performance in operations (world-class company and operational performance), the company performance (financial and non-financial perfor-

mances), and the amendments of the Law of the Republic of Indonesia concerning the oil and gas industry, and related research on how the oil and gas industry in Indonesia develops sustainable competitive advantage and sustainable development programs are reviewed in details in our study. The findings from data analysis provide evidence that there is a strong positive relationship between the critical factors of quality management practices and the company financial performance mediated by the three mediating variables, i.e., world-class company practices, operational excellence practices, and company non-financial performance.

Introduction

TQM implementation improves the business performance of an organization (e.g., an oil and gas company) if it is effectively implemented in an environment of "continuous improvement" (Jeanes 1990; Milakovich 1995; Kanji 1998; Suresh Chandar et al. 2003 cited in Saravanan and Rao 2007). The continuous improvements in all activities of the organization will lead to the achievement of global standards (Spenley 1994; Scheneider et al. 1996 cited in Saravanan and Rao 2007). The literature suggests that the effectiveness of TQM implementation would lead to better organizational performance as studies such as Powell (1995), Terziovski and Samson (1999), Zhang (2000), Hendricks and Singhal (2001), or Kaynak (2003) have confirmed. The basic conceptual foundation for this relationship is based on an assumption that TQM provides a superior value to customers by identifying their expressed and latent needs, responding to changing markets (the effectiveness), as well as improving the efficiency of the processes that produce the products or services (Reed et al. 1996; Anderson et al. 1994 in Bou-Llusar 2009).

The TQM implementation in the oil and gas industry in Indonesia has been considered the "hard" or technical and "soft" or social dimensions (Hakim 1996). Some successful TQM implementation criteria are "hard," i.e., objective, tangible, and measurable (company financial performance). These are related to financial performance, market performance, and operating costs. Hard criteria are relatively easy to gauge and to reach some degree of consensus. The "soft" success criteria refer to such aspects as the quality of product or service offer-

ings, the delivery of product or service offerings, the variety of product and service offerings, customer satisfaction, employee satisfaction, and community involvement (company non-financial performance). This dimension is subjective, subtle, and more difficult to evaluate (Leach 2005). The management of "hard" and "soft" aspects of TQM implementation cannot be performed in isolation. "Hard" and "soft" dimensions should be intertwined and mutually supporting each other. This holistic character is also extended to the expected results of a TQM initiative, since a balance between financial and non-financial performances is required when the oil and gas industry defines the TQM implementation (Bou-Llusar et al. 2009).

The oil and gas industry is selected for this study because it has been a leader in implementing progressive quality management systems in Indonesia. It has also been an engine of economic growth (Hakim 1996). The oil and gas businesses work in concert to provide energy (oil and gas) that drives human progress. The oil and gas industry in Indonesia utilizes a quality management system to maximize mature fields and discover new reservoirs, and also to fulfill the world's escalating demand for natural gas (Chevron Indonesia 2007). The journey to quality management implementation programs (quality management systems) requires engaged and committed leadership to provide a systematic framework that enables each SBU to be a world-class company (Indone-

sia Business Unit 2002). Quality management practices primarily purport to improve the quality of products (oil and gas) (Ahmad and Schroeder 2002). However, they are also expected to favorably impact other contextual management practices in the oil and gas industry in Indonesia (i.e., world-class company practices, operational excellence practices, and company performance). More specifically, the target sample is chosen across the five-digit SIC code within the oil and gas industry—petroleum refineries, natural gas refineries, products of petroleum refineries, lubricating oil, and processed lubricant oil (SIC 23201-23205). Establishments are primarily engaged in the oil and gas refineries and goods made of oil.

Oil and gas companies operating in Indonesia aim at developing and maintaining a harmonious relationship with their surrounding community as well as working hand in hand with the government in order to provide the greatest benefits to the community. Furthermore, they are committed to being responsible for their corporate social and environmental obligations by continuously conforming to the principle of an environmentally sustainable development. In the oil and gas industry, all activities must be conducted in an economical, social and environmental responsibility (the principle of sustainability).

An oil and gas company, as an organization dealing with the processing of natural resources, realizes that operations in an extremely sensitive

area to the environment and social issues may affect the environmental sustainability and the surrounding community development. It is understandable since most of the materials used or products processed by the company are flammable, combustible, and toxic, which could easily engender accidents, fire, explosions and environment pollution. To control the potential negative impacts of its operations, the *quality management system*—as an integrated system—must be learned and implemented (Pertamina 2005).

The quality management system (QMS) provides a continuous process improvement (quality management practices). It emphasizes defect prevention, the reductions in variation and waste in the supply-chain and from service providers or demand-chain (operational excellence practices), and the incorporation of the world-class standards/requirements to the international oil and gas industry (world-class company practices) (API 2003). As a pioneer of the QMS implementation in the oil and gas industry in Indonesia, Chevron was incorporated with the requirements of QMS for design, development production, installation and services of products. To assist the users, the requirements of QMS are followed by several specific guidance and supplementary requirements for its implementation within the oil and gas industry (Chevron Indonesia 2007).

In this study, the researchers try to understand the interaction between six critical factors of quality management practices (QMP1-6—QMP1: Quality Improvement Program, QMP2: Supervisory Leadership, QMP3: Supplier Involvement, QMP4: Top Management Commitment, QMP5: Training to Improve Products/Services, and QMP6: Cross-Functional Team among SBUs) and company financial performance (CFP) through the mediating effect of world-class performance in operations (world-class company practices or WCC, operational excellence practices or OE, and company non-financial performance or CNFP). The primary objective of this study is to offer new empirical evidence on the form and strength of the mediating role of world-class performance in operations in the structural relations among QMP1-6, WCC, OE, CNFP, and CFP in the oil and gas business units that have adopted the TQM. Theoretical supports for the constructs used in this study primarily come from the total quality management and strategic operations disciplines.

Research Questions

This study is focused on a set of structural relations among variables for the whole model. To assess how structural relations for the whole model of the study (a comprehensive TQM implementation model) is actually practiced in the oil and gas industry in Indonesia, two types of research questions are addressed with mediation analysis using the hierarchical multiple regression technique:

1. How do world-class company practices and company non-financial

performance mediate the impacts of six critical factors of quality management practices on company financial performance?

2. How do operational excellence practices and company non-financial performance mediate the impacts of six critical factors of quality management practices on company financial performance?

Research Methodology

Surveys are conducted at several selected oil and gas companies whose types of oil and contractor companies are specifically chosen from the *Directorate General of Oil and Gas of the Republic of Indonesia*. The primary objectives of these surveys are to develop a structural relation model including the interrelationships among the research constructs and to analyze the relations among the research constructs (QMPs, WCC, OE, CNFP, and CFP) which are both substantively meaningful and statistically well fitting.

A sample of 140 *Strategic Business Units* (SBU) within 49 oil and gas contractor companies participate in this study. The surveys were conducted for nine months and couriered by the researchers for analysis through traditional postal questionnaire surveys and internet or e-mailed questionnaire/web surveys, to distribute and complete the questionnaires directly at a single point in time (a cross-sectional study). A multiple informant sampling (stratified random sampling) unit was harnessed to ensure a balanced view of the rela-

tionships among the research constructs, and to collect data from the most informed respondents in the different levels of management (top, middle, and low level management).

2,800 questionnaires were distributed to the participating oil and gas companies in a qualified sample of 140 SBUs. An initial sample of 200 SBUs operating in Indonesia was drawn at random from the directory of Directorate General of Oil and Gas, Department of Energy and Mineral Resources, Republic of Indonesia. Each SBU was contacted by telephone and e-mail to assure that individuals with primary responsibilities for the three levels of management were identifiable. The effort to reach 12 SBUs was unsuccessful because of incorrect contact details. Furthermore, 48 SBUs were either unable or unwilling to identify individual managers with the required responsibilities. Each qualified sample of 140 SBUs received 20 questionnaires (through mail, e-mail, or face-to-face survey).

Out of the 1,478 questionnaires obtained in the fieldwork, 146 questionnaires were not usable due to incomplete information. Accordingly, a total of 1,332 individual usable questionnaires were returned, thereby qualified for analysis, representing an effective response rate of 50.19 percent. Of these, 354 were from top level managers, 447 from middle level managers, and 531 from low level managers. Data were coded and entered into computer using SPSS. The SPSS is utilized to analyze the data. For the

quantitative analysis of data, general descriptive and advanced statistics including the *hierarchical multiple regression* are conducted.

Mediation Analysis

Wright and Geroy (2001) argue that world-class performance in operations is derived from a complex set of interacting practices between a world-class company and operational excellence—the contextual factors of the oil and gas company. The term "world-class company practices" is used since the firms are associated with outstanding performance in the global business environment. Parker (1999) defines operational excellence as systematic management of safety, environment, health, reliability, and efficiency (SEHRE) while achieving a world-class standard. Implementing the world-class company and operational excellence practices require quality management practices (Parker 1999). The leveraging of world-class performance in operations (world-class company and operational excellence practices), including the leveraging of company non-financial performance, results in a reduction in overall costs, thus allowing the firm to become more price competitive and to gain sustainable competitive advantage (Reed et al. 2000). A firm which is capable of minimizing overall costs is able to efficiently provide customers with its market offerings, thereby maximizing returns to the firm. As mentioned previously, company non-financial performance is a leading indicator of company financial performance (Ittner and Larcker 1998).

According to Hakim (1996), in the oil and gas industry, companies should handle hazardous fluids and gases through a variety of processes. Considerations of personnel safety and security, environmental protection, and business continuity require a high level of operational integrity. Specific guidance on operational integration practices across the industry's total value-chain (upstream and downstream) contains a valuable new technical specification, which aims at developing QMS for continual process improvements (quality management practices), emphasizing defect prevention and the reduction in variation and waste in the supply-chain and from service providers or demand-chain (operational excellence practices), and incorporating the world-class standards/requirements to the international oil and gas industry (world-class company practices) (API 2003).

This view is substantiated by the explanation of Antill and Arnott (2002), "It has been argued that operational integration increases a company's ability to gain access to information across the industry's total value-chain, making it easier to assess both internal and external opportunities. A fully integrated chain might also give rise to greater opportunities for cost saving and may enable a company to optimize its capacity in all areas of operations. However, one good reason to justify operational integration is to strengthen the firm's sustainable competitive ad-

vantage. Indeed, it is for this reason the oil and gas industry has historically had the urge to integrate" (Antill and Arnott 2002: 5).

The ultimate goal of implementing operational integration in the oil and gas industry is to obtain worldwide acceptance by building integration among quality management practices, operational excellence practices, world-class company practices, and company performance—non financial and financial (API 2003). By so doing, the researchers conjecture positive relationships between critical factors of quality management practices and company financial performance through the mediating variables (partial mediation) of world-class company practices, operational excellence practices, and company non-financial performance.

Following the above discussion, this study posits two hypotheses:

H1a-f: *World-class company practices (WCC) and company non-financial performance (CNFP) partially mediate the impacts of critical factors of quality management practices (QMP1-6) on company financial performance (CFP).*

H2a-f: *Operational excellence practices (OE), and company non-financial performance (CNFP) partially mediate the impacts of critical factors of quality management practices (QMP1-6) on company financial performance (CFP).*

Hierarchical Multiple Regression

The researchers conduct the hierarchical multiple regression analysis to examine whether world-class company practices (WCC or m_1), operational excellence practices (OE or m_2), and company non-financial performance (CNFP or m_3) partially mediate the impacts of critical factors of quality management practices (QMP1-6 or x_{1-6}) on company financial performance (CFP or y). The analysis requires that four regressions be estimated. *First*, the dependent variable (y) must be predictable by the independent variables (x). *Second*, the dependent variable must be predictable by the independent variables and the mediator 1 (m_1) and the mediator 2 (m_2). *Third*, the dependent variable must be predictable by the independent variables and the mediator 3 (m_3). *Fourth*, the dependent variable must be predictable by the combined independent variables and three mediators (Baron and Kenny 1986). If mediation occurs, the mediators shall be significant in the fourth equation (partially or fully mediated). If the mediators are not significant in the fourth equation, that means no mediation prevails. Figure 1 depicts the multiple regression mediation analysis of the study (the research model). A mediating effect is created when a third variable/construct intervenes between two other related constructs (Hair et al. 2006).

Figure 1 describes the three possibilities of mediation analysis (no mediation, partially mediated, or fully medi-

Figure 1. **Research Model: Mediation Model**
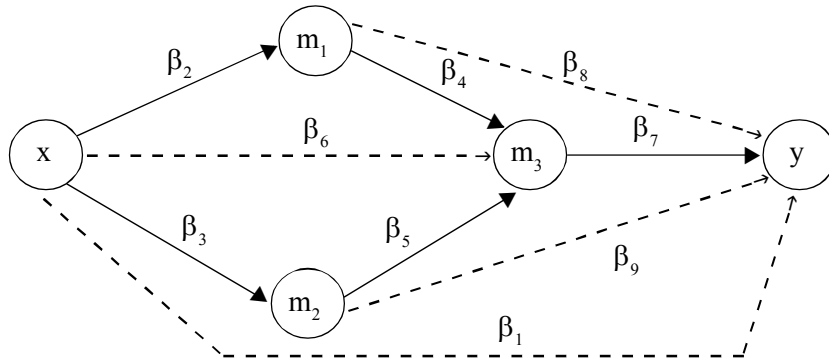
x   : Independent Variables
m_1, m_2, m_3: Mediating Variables
y: Dependent (Outcome) Variables
$\beta_1 - \beta_9$: Regression Coefficient (Standardized Coefficient Beta)

Sources: Baron and Kenny (1986) with some modifications

ated). Because relationships are not always clear, a series of steps can be followed to evaluate mediation (the hierarchical multiple regression analysis). Using the above mediation diagram; the steps are as follows (Hair et al. 2006, 2010):

Check to see that x is related to y or there is a significant correlation.

$$y = \beta_1 x \rightarrow \beta_1 \text{ should be significant} \dots\dots\dots(1)$$

$$y = \beta_2 x + \beta_8 m_1;$$
$$m_2 = \beta_3 x + \beta_9 m_2$$
β_2 and β_3 should be significant; if β_2 and β_3 are not significant, the equation indicates no mediation
$$\dots\dots\dots\dots\dots\dots(2)$$

$$y = \beta_6 x + \beta_7 m_3;$$
β_6 should be significant, if β_6 is not significant, the equation means no mediation $\dots\dots\dots\dots\dots(3)$

$$y = \beta_2 x_+ \beta_4 m_1 {}_+ \beta_7 m_3, \text{ and}$$
$$y = \beta_3 x_+ \beta_5 m_2 {}_+ \beta_7 m_3 \rightarrow \beta_2 \text{ and } \beta_3$$
should be significant $\dots\dots\dots(4)$

- If b_1 (Equation 1) is not significant, the equation means fully mediated; if b_1 is significant, the equation means partially mediated.
- If b_1 is reduced but remains significant when m_1, m_2, and m_3 are included as additional predictors, then partial mediations are supported.
- If b_1 is reduced to a point where they are not significantly different from 0

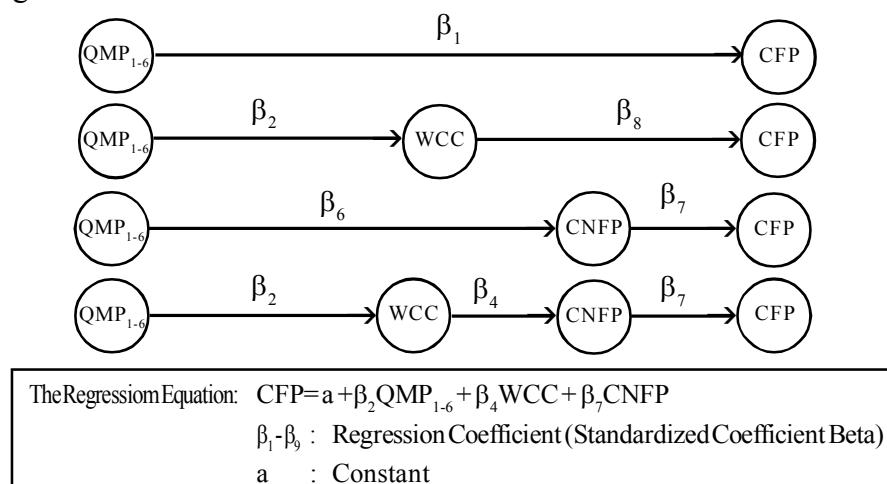after m_1, m_2 and m_3 are included as mediating constructs, then full mediations are supported.

Partial mediation is an effect when a relationship between a predictor and an outcome is reduced but remains significant when a mediator is also entered as an additional predictor.

Full mediation exists if a relationship between a predictor and an outcome variable becomes insignificant after a mediator is entered as an additional mediator (Hair et al. 2006).

If b_2 and b_3 are not significant, the equation indicates no mediation. If b_1, the relationship between x and y, remains significant and unchanged once m_1 and m_2 are included in the model as additional predictors, then mediation is not supported (Aiken and West 1991; Bryk and Raudenbush 1992; Elliot and Judith 1996, and Hair et al. 2006).

Predicated on the first and the second hypotheses of this study, the mediation models are depicted in Figure 2 and Figure 3.

Figure 2. **Mediation Model H1a-f**

The Regressiom Equation: $CFP = a + \beta_2 QMP_{1-6} + \beta_4 WCC + \beta_7 CNFP$

β_1-β_9 :   Regression Coefficient (Standardized Coefficient Beta)

a   :   Constant

Note:

QMP_{1-6} : Independent Variables (Critical Factors of Quality Management Practices)

WCC, CNFP : Mediating Variables (Operational Excellence Practice and Company Non Financial Performance)

CFP   : Dependent Variable (Company Financial Performance)

Figure 3. **Mediation Model H2a-f**
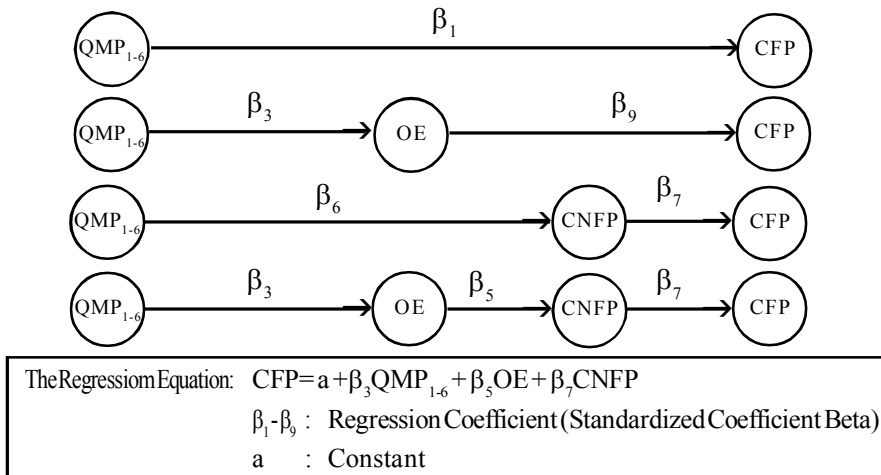
Note:

QMP$_{1-6}$: Independent Variables (Critical Factors of Quality Management Practices)

OE, CNFP : Mediating Variables (Operational Excellence Practice and Company Non Financial Performance)

CFP : Dependent Variable (Company Financial Performance)

Data Analysis

In assessing H_1 and H_2 (a set of hypotheses H$_{1a-f}$ and H$_{2a-f}$), the hierarchical multiple regression technique is used to examine whether the mediating variables (world-class company practices WCC, operational excellence practices OE, and company non-financial performance CNFP) partially mediate the effects of independent variables (critical factors of quality management practices QMP$_{1-6}$) on the dependent variable (company financial performance CFP). Some figures in this data analysis are presented to pro-

vide the empirical findings of the hierarchical multiple regressions, the equations/mediating variables, and the changes in R^2.

Table 1 summarizes the results of hierarchical multiple regression (mediation) analysis. The results exhibit that OE and CNFP are the partial mediators between QMP1 and CFP, or QMP4 and CFP, or QMP1-6 and CFP. In addition, the equations indicate that OE and CNFP are not the mediators between QMP2,3,5,6 and CFP. We also find that WCC and CNFP do not mediate the association between QMP$_{1-6}$ and CFP.

Table 1. **The Results of Hierarchical Multiple Regression**

1a $CFP = 0.297 + 0.019\ QMP_1 + 0.109\ WCC + 0.605\ CNFP$
 (0.002) (0.504) (0.000) (0.000)
 (Insignificant)

2a $CFP = 0.349 + 0.046\ QMP_1 + 0.167\ OE + 0.572\ CNFP$
 (0.000) (0.043) (0.000) (0.000)
 Significant

1b $CFP = 0.300 + 0.008\ QMP_2 + 0.117\ WCC + 0.606\ CNFP$
 (0.002) (0.765) (0.000) (0.000)
 (Insignificant)

2b $CFP = 0.378 + 0.029\ QMP_2 + 0.171\ OE + 0.580\ CNFP$
 (0.000) (0.178) (0.000) (0.000)
 (Insignificant)

1c $CFP = 0.318 - 0.023\ QMP_3 + 0.134\ WCC + 0.608\ CNFP$
 (0.001) (0.364) (0.000) (0.000)
 (Insignificant)

2c $CFP = 0.418 + 0.014\ QMP_3 + 0.175\ OE + 0.584\ CNFP$
 (0.000) (0.523) (0.000) (0.000)
 (Insignificant)

1d $CFP = 0.270 + 0.038\ QMP_4 + 0.100\ WCC + 0.606\ CNFP$
 (0.006) (0.125) (0.000) (0.000)
 (Insignificant)

2d $CFP = 0.323 + 0.052\ QMP_4 + 0.166\ OE + 0.575\ CNFP$
 (0.000) (0.015) (0.000) (0.000)
 Significant

1e $CFP = 0.316 - 0.028\ QMP_5 + 0.137\ WCC + 0.609\ CNFP$
 (0.001) (0.273) (0.000) (0.000)
 (Insignificant)

2e $CFP = 0.434 + 0.006\ QMP_5 + 0.176\ OE + 0.585\ CNFP$
 (0.000) (0.778) (0.000) (0.000)
 (Insignificant)

1f $CFP = 0.295 + 0.013\ QMP_6 + 0.114\ WCC + 0.607\ CNFP$
 (0.002) (0.615) (0.000) (0.000)
 (Insignificant)

Continued from Table 1

2f   CFP = 0.348   +   0.040 QMP_6 +   0.170 OE   +   0.578 CNFP
               (0.000)   (0.062)   (0.000)   (0.000)
                           (Insignificant)

1a-f   CFP = 0.301   +   0.006 QMP   +   0.117 WCC   +   0.606 CNFP
               (0.002)   (0.855)   (0.000)   (0.000)
                           (Insignificant)

2a-f   CFP = 0.335   +   0.041 QMP   +   0.167 OE   +   0.574 CNFP
               (0.000)   (0.070)   (0.000)   (0.000)
                         Significant

H_{2a}: *OE practice and CNFP partially mediate the impact of quality improvement program (QMP_1) on CFP.*

Figure 4. **The Hierarchical Multiple Regression 2a**

$$CFP = 0.349 + 0.046\,QMP_1 + 0.167\,OE + 0.572\,CNFP$$
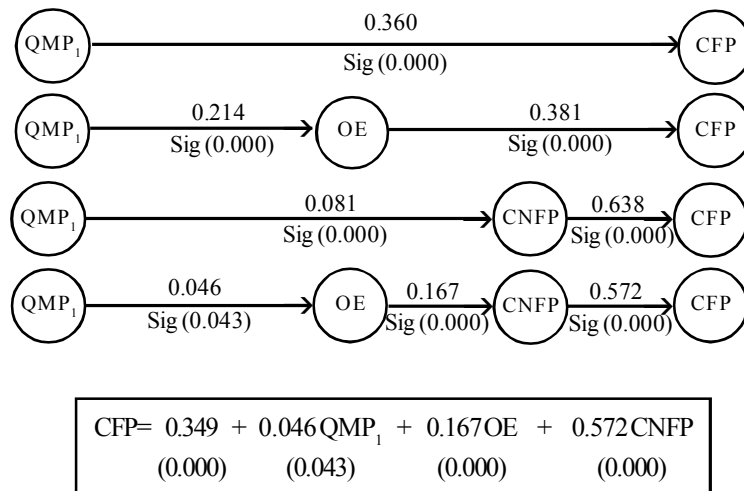$$(0.000) \qquad (0.043) \qquad\quad (0.000) \qquad\quad (0.000)$$

Figure 4 shows the results of sub-hypothesis H_{2a}. *First*, a significant effect of the independent variable (QMP1) on the dependent variable (CFP) is clearly evident from the regression. The inclusion of the mediating variable OE in the *second step* of the regression of CFP on QMP_1 reveals a substantial change. *Third*, the regression of CFP on QMP_1 through the mediating variable CNFP likewise shows a significant effect through CNFP. The significant effects of the mediators (OE and CNFP) on the relationship between QMP_1 and CFP are also found in the *fourth step* of regression analysis. As all conditions are fulfilled, the mediation is in fact present.

The hypothesis H_{2a} is therefore substantiated. The mediating variables (OE and CNFP) mediate the relation between the independent variable QMP1 and the dependent variable CFP. We also find evidence that partial mediation is prevalent since the effect of the independent variable QMP_1 is smaller when the mediating variables (OE and CNFP) are included into the equation.

A summary in Table 2 indicates that *the first step* explains 45.4 percent of the variance in company financial performance, $F(1, 1330) = 1,104.569$, $p = 0.000$, Durbin Watson = 1.707. As expected, the majority of the variance explained in CFP could be attributed to QMP_1. Results from *the second step* of the regressions reveal that through the presence of mediating variables,

Table 2. **The Result of R² Change 2a**

Model	R	R-Square	Adj. R-Square	Srd. Error of the Estimate	R-Square Change	F-Change	df1	df2	Sig. F-Change	Durbin Watson
1	0.674a	0.454	0.453	0.40790	0.454	1104.569	1	1330	0.000	
2	0.691b	0.478	0.477	0.39899	0.024	61.080	1	1329	0.000	
3	0.692c	0.479	0.458	0.39853	0.002	4.115	1	1328	0.043	1.707

a. Predictors: (Constant), CNFP
b. Predictors: (Constant), CNFP, OE
c. Predictors: (Constant), CNFP, OE, QMP1
d. Dependent Variable: CFP

Figure 5. **The Hierarchical Multiple Regression 2d**

$$CFP = 0.323 + 0.052\,QMP_4 + 0.166\,OE + 0.572\,CFP$$
$$(0.000) \quad (0.015) \quad (0.000) \quad (0.000)$$
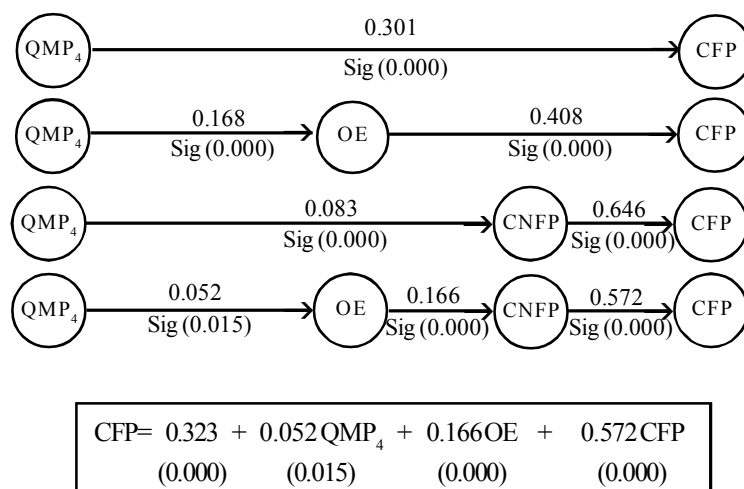
the amount of variance explained in CFP increases by approximately 2.4 percent, $F(1, 1329)= 61.080, p=0.000$. Thus, mediators positively predict CFP. The independent variable and the mediating variables in *the third step* clearly increase the amount of variance explained in CFP by 0.2 percent, F (1, 1328)= 4.115, p =0.043. Therefore, mediation does occur in the third equation. Hence, the evidence supports the conjecture that the mediators (OE and CNFP) mediate the relationship between QMP_1 and CFP.

H_{2d}: *Operation excellence practices (OE) and company non-financial performance (CNFP) partially mediate the impact of top management commitment (QMP_4) on company financial performance (CFP).*

Figure 5 shows the analysis results of sub-hypothesis H_{2d}. *First*, the regression of the dependent variable CFP on the independent variable (top management commitment or QMP_4) yields a significant effect. *Second*, the regression of CFP on QMP_4 through the mediating variable OE produces a significant effect through OE. *Third*, the regression of CFP on QMP_4 through the mediating variable CNFP shows a significant effect through CNFP. *Fourth*, the result of regressing the dependent variable CFP on both the independent variable QMP_4 and the mediating variables OE and CNFP shows significant impacts of the mediators (OE and CNFP) on the relationship between QMP_4 and CFP. Accordingly, mediation is present since all four conditions are met. The hypothesis H_{2d} is hence confirmed. Operational excellence practices (OE) and company non-financial performance (CNFP) mediate the relation between top management commitment (QMP_4) and company financial performance (CFP). Moreover, partial mediation is demonstrated as the effect of independent variable (top management commitment) turns out to be smaller when the mediating variable are included into the equation.

Table 3. **The Result of R² Change 2a-f**

Model	R	R-Square	Adj. R-Square	Srd. Error of the Estimate	Change Statistic					
					R-Square Change	F-Change	df1	df2	Sig. F-Change	Durbin Watson
1	0.674a	0.454	0.453	0.40790	0.454	1104.569	1	1330	0.000	
2	0.691b	0.478	0.477	0.39899	0.024	61.080	1	1329	0.000	
3	0.693c	0.480	0.479	0.39826	0.002	5.926	1	1328	0.015	1.718

a. Predictors: (Constant), CNFP

b. Predictors: (Constant), CNFP, OE

c. Predictors: (Constant), CNFP, OE, QMP4

d. Dependent Variable: CFP

Table 3 summarizes that *the first step* elucidates 45.4 percent of the variance in the dependent variable (CFP), F (1, 1330)= 1,104.569, p= 0.000, Durbin Watson= 1.718. The majority of the variance explained in the dependent variable (CFP) could be attributed to QMP_4. *The second equation* indicates that the entrance of the mediating variables affects the amount of variance explained in the dependent variable (CFP), which increases by 2.4 percent, $F(1, 1329)= 61.080, p= 0.000$. Mediators positively predict the company financial performance, and both the independent variable and the mediating variables entered in *the third step* increase the amount of variance explained in CFP by 0.2 percent, F (1, 1328)= 5.926, *p*= 0.015. Therefore, mediation is obviously existent in the third equation. In conclusion, we find that OE and CNFP mediate the relation between top management commitment and financial performance.

H_{2a-f}: *Operational excellence practices (OE) and company nonfinancial performance (CNFP) partially mediate the impacts of six critical factors of quality management practices (QMP) on company financial performance (CFP).*

The results of the hierarchical multiple regressions are then double-checked by forcing six critical factors of quality management practices (QMP_{1-6}) into one factor QMP, and it produces a marginally significant result; the p-value is 0.070 (p d" 0.10). Two out of the six critical factors of quality management practices (QMP_1 and QMP_4) positively affect the company financial performance through the partial mediation of operational excellence practices, and the change in R^2 is 0.001 (see Table 4). Hence, the sub-hypothesis H_3 ($H_{3.7b}$) is supported. The results are summarized in Figure 7 and Table 4, which show significant

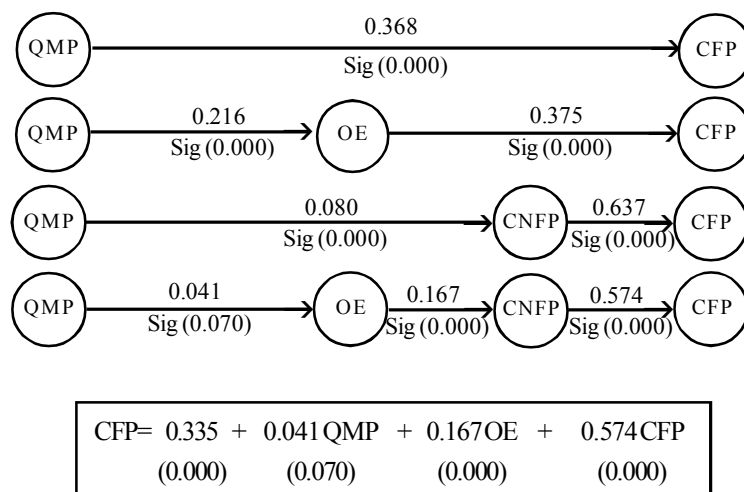Figure 6. **The Hierarchical Multiple Regression 2a-f**

$$CFP= 0.335 + 0.041\,QMP + 0.167\,OE + 0.574\,CFP$$
$$(0.000) \quad (0.070) \quad (0.000) \quad (0.000)$$

Table 4. **The Result of R² Change 2a-f**

Model	R	R-Square	Adj. R-Square	Srd. Error of the Estimate	Change Statistic					
					R-Square Change	F-Change	df1	df2	Sig. F-Change	Durbin Watson
1	0.463a	0.214	0.214	0.48920	0.214	362.729	1	1330	0.000	
2	0.691b	0.478	0.477	0.399	0.263	670.284	1	1329	0.000	
3	0.692c	0.479	0.478	0.3986	0.001	3.297	1	1328	0.070	1.740

a. Predictors: (Constant), CNFP

b. Predictors: (Constant), OE, CNFP

c. Predictors: (Constant), OE, CNFP, QMP

d. Dependent Variable: CFP

paths from QMP to OE, from OE to CNFP, and from CNFP to CFP. In addition, the path coefficient between QMP and OE is significant, and the equation shows partial mediation.

The results in Table 4 indicate that *the first step* explains 21.4 percent of the variance in the dependent variable (company financial performance), F (1, 1330)= 362.729, p= 0.000, Durbin Watson= 1.740. As expected, the majority of the variance explained in CFP could be attributed to the critical factors of quality management practices (QMP). Subsequently, outputs from *the second step* indicate that including the mediators increases the amount of variance explained in CFP by approximately 26.3 percent, F (1, 1,329)= 670.284, p= 0.000. The combined variables (the independent variable QMP and the mediating variables WCC and OE) entered in *the third step* improve the amount of variance explained in CFP by 0.1 percent, F (1, 1,328)= 3.297, p= 0.070. Therefore, mediation is existent, and the effects of mediators are significant in the third

equation. Hence, we find that the critical factors of quality management practices affect the company financial performance through operational excellence practices and company non-financial performance. The mediating variables (OE and CNFP) partially mediate the impacts of the critical factors of quality management practices (QMP) on the company financial performance (CFP). Thus, H_{2a-f} is substantiated.

Conclusion

The results of mediation analysis indicate the explanatory power of partial mediating variables (OE and CNFP) in the relationship between quality improvements or top management commitment and CFP. The findings extend the research on TQM implementation by addressing the calls for research that focuses on mediating variables in the relation between QMP and CFP (Maiga and Jacobs 2005; Demirbag et al. 2006). Specifically, the data from this study suggest that OE and CNFP

partially mediate the relation between quality improvements or top management commitment and CFP. When all of the six QMP components are combined and examined as one QMP construct, OE and CNFP are found to mediate the relation between QMP and CFP.

The results of this study parallel the findings reported by Shah and Ward (2003) that contextual factors of an organization mediate the relationship between QMP and company performance. The oil and gas managers' confirmation also supports these findings that OE and CNFP mediate the relation between quality improvements or top management commitment and CFP. Both quality improvements and top management commitment are the primary critical factors of QMP to improve CFP through OE and CNFP. A set of OEs (safety, environment, health, reliability, and efficiency) are very crucial in the oil and gas industry, especially for increasing the oil and gas production (the level of productivity) in the upstream sector, and improving operational reliability in the downstream sector.

The hypotheses not confirmed by the data in this study are the ones which conjecture that OE and CNFP would mediate the relation between supervisory leadership *or* supplier involvement *or* trainings to improve products/services *or* cross-functional relationship team among SBUs and CFP. WCC and CNFP also mediate the relation between quality improvement programs

or supervisory leadership *or* supplier involvement *or* top management commitment *or* trainings to improve products/services *or* cross-functional relationship team among SBUs and CFP.

According to the oil and gas managers' confirmation about our findings, the Indonesian oil and gas companies have already implemented WCC since 2004 to achieve their visions of being recognized as world-class companies. Although WCC has been and will continue to be a vital part of business operations, companies must fundamentally reconsider their ways of conducting business. Based on their experiences in implementing WCC, those managers recall that the central barrier to the effectiveness of WCC lies in the low commitment of top management. The majority of top management are still not fully supportive and committed to WCC. Besides, they view it as a measure intended to increase short-term profits rather than what Wilkinson et al. (1998: 20) call "a national survival strategy" (Soltani et al. 2008).

Despite some attempts on the applicability of TQM practices and the contextual factors of an organization which may relate to the sustainability of TQM implementation programs as well as their impacts on firm performance, there is a lack of comprehensive empirical evidence with respect to the extent of TQM implementation sustainability and its effect on the performance of oil and gas companies. This study presents new data and empirical insights into the structural rela-

tions among the critical factors of quality management practices, world-class company practices, operational excellence practices, and company performance (non-financial and financial) in the oil and gas companies operating in Indonesia. In this study, we are interested in two contextual factors in the oil and gas industry, i.e., world-class company practices and operational excellence practices. The specification of the research framework consists of a set of hypotheses (H1a-f, H2a-f)) resulting in a strong fit of structural relations among the variables in the framework. Although six critical factors of quality management practices affect the world-class company practices, and four critical factors of quality management practices affect the operational excellence practices, only the operational excellence practices play a partial mediating role in the relations among two critical factors of quality management practices (QMP1: Quality Improvement Programs and QMP4: Top Management Commitment), company non-financial performance, and company financial performance.

Any oil and gas company operating in Indonesia that is willing to employ TQM sustainability should develop quality improvement programs, top management commitment, and OE in order to enjoy more robust implementation. This would help the oil and gas managers with the allocation of resources to the areas that have the most significant effects on CNFP.

The findings of this study also demonstrate the importance of understanding the consequences of company non-financial performance (CNFP) in the oil and gas industry. Managers must be aware of the impact of company non-financial performance, which include customer satisfaction, employee satisfaction, and community involvement, on the company financial performance. Not only does the non-financial performance directly enhance the company financial performance, but it also indirectly strengthens the long-term organizational effectiveness and survival. The company non-financial performance can be improved in several ways, such as by conducting sustainable development programs (community development, corporate social responsibility, global warming anticipation programs, etc.), which will involve internal as well as external customers in determining processes related to the decisions on benefits, the provision of adequate information on how rewards and punishments are determined, and the excellent and timely management of complaints by society. Furthermore, managing the company non-financial performance may serve to minimize the customers' reactions to perceived unequal outcomes (e.g., a pay raise policy based on the merit pay system) (Rifai 2005).

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