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Employing Quality Management Principles To Improve The Performance Of Educational Systems: An Empirical Study Of The Effect Of Iso 9001 Standard On Teachers And Administrators Performance In The Indonesian Vocational Education System

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EMPLOYING QUALITY MANGEMENT PRINCIPLES TO IMPROVE THE PERFORMANCE OF EDUCATIONAL SYSTEMS: AN EMPIRICAL STUDY OF THE EFFECT OF ISO 9001 STANDARD ON TEACHERS AND ADMINISTRTORS PERFORMANCE IN THE INDONESIAN VOCATIONAL EDUCATION SYSTEM

by

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ABSTRACT

ISO 9001 has been world widely implemented in both manufacturing and service organizations. A lot of studies have been conducted to investigate the effects of ISO 9001 implementation on the performance of these organizations. Most of these studies show that ISO 9001 implementation realized positive operational improvements and financial success.

Building on the merits of successful implementation of ISO 9001 quality management system in manufacturing and service, educational institutions have been attempted to adopt it in their operations. Even though there are studies relating ISO implementation to education, no research has been done to investigate the effects of ISO 9001 at the individual level.

The objective of this research is to investigate the effects of ISO 9001 quality management implementation on the performance of administrators and teachers. The Indonesian vocational education system is selected as a case example as there is a significant number of such institutions in Indonesia that attempt to achieve ISO certification and there is a national need to improve the performance of vocational education. It is a challenge to assess objectively the degree of ISO 9001 implementation in this specific educational context because of the size and diversity. This study relies on survey that measures the respondents' perception. Hence, this study applies a self-reported survey based performance measurement. The questionnaires are developed based on extensive literature review. Partial Least Squares Structural Equation Modeling (PLSSEM) has been used to examine the relationships between the different elements of quality management systems, quality culture; administrator and teacher performances.

The study is able to examine multiple interrelated dependence and subsequent relationships simultaneously among examined factors such as teacher and administrator performance, existing

quality culture and ISO principles; and to incorporate variables that cannot be directly measured, such as leadership, for example. The findings of this study show that ISO 9001 implementation has positive significant effect on the performance of the vocational school administrator and teacher. The study also identifies key influencing elements of the ISO quality management system and examines their direct and indirect relationships with teacher and administrator performances. This study is expected to improve the current practices in implementing ISO and quality culture in any educational settings, specifically in the case of vocational educational system.

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CHAPTER 1: INTRODUCTION

1.1. Research Background

ISO 9000 is a quality management standard that can be implemented in any organization and is an excellent starting point for the initiation of performance excellence in organizations. ISO certification has gained its popularity very rapidly. It was reported that the total number of ISO 9001 certificates that have been issued in the end of 2009 has passed 1,000,000 (International Organization of Standardization, 2011b). The number of ISO 9001 (2000 and 2008 versions) certified companies has been approximately increased 8% from previous year (2008). The increasing number of users and changes to the standards implies that it is essential to clarify the effectiveness of ISO on the certified organizations. Past studies show that ISO 9000 is perceived to have positive impacts on financial (Benner & Veloso, 2008; Corbett, Montes-Sancho, & Kirsch, 2005; Sharma, 2005), business (Naveh & Marcus, 2004; Singh, 2008), operational performances (Baird, Hu, & Reeve, 2011; Kaynak, 2003) in manufacturing and non-manufacturing organizations. Due to the ISO's merits in non-manufacturing organizations, education institutions have also been interested in implementing ISO 9000.

Indonesia is a very complex country in view of its ethnic diversity, geographic and population. In terms of ethnic and language diversities, Indonesia has the greatest ethnic diversity in the world. Based on Central Intellegence Agency (2008), there are many distinct ethnic groups, comprising 40.6% Javanese, 15% Sundanese, 3.3% Madurese, 2.7% Minangkabau, 38.4% of many others (2000 census). Obviously, those diverse ethnic groups must be served on the basis of their different needs.

In term of geography, Indonesia consists of roughly 17,000 islands scattered throughout the country. However, the five largest islands are only Kalimantan, Papua Sumatera, Sulawesi, and Java, and the rest of them are small islands and even very small ones. This geographic complexity poses challenges that require different alternatives in serving education in terms of policy, planning, budgeting, communication, management, infrastructure, transportation, to mention just a few. Thus, one size of education service for all is not appropriate.

In term of population, Indonesia is the world's fourth most populous nation having 231 million people (Indonesia, 2010). With this huge population, there is a clear recognition in Indonesia that nation development rests upon the development of its people. People are the only active human resources and other resources such as financial, material and natural resources are all passive ones. Therefore, raising the quality of its people is the key towards long-term national development. For this reason, Indonesia has always placed prime emphasis on education as the basis for developing the nation. For example, it is clearly mandated by Indonesian Constitution 1945 (the fourth amendment, 2002) that minimum twenty percent (20%) of national and local government budgets must be allocated to education budget. Not only this, currently, after the success of nine year compulsory basic education (grade 9), grand design for twelve year universal schooling (grade 12) is being endeavored.

According to Center of Education Statistics (2010) there are about 270 thousand schools to accommodate roughly 50 million students, starting from kindergarten up to twelfth grade. Respectively, the total number of schools and students for each level is as follow: kindergarten/TK (67,550 schools and 2,947,193 students); primary schools/SD (143,252 schools and 27,328,601 students); junior secondary schools/SMP (29,866 schools and 9,255,006 students); senior secondary schools/SMA (11,036 schools and 3,942,776 students); vocational schools/SMK (8,399 schools and

3,319,068 students); and special schools (1,803 schools and 74,293 students). Having this big number, consequently, Indonesia's education system is very large, complex and diverse when it comes to providing quality education. Thus, education implementation is a very crucial when it comes to geographic considerations, policy communication, human resource capacity, financial resource, material resource, and bureaucratic structures.

Raising quality education at all levels have been seriously undertaken by the Indonesian Government. National education quality standards, regulations, criteria, procedures, policy development, strategic planning and increased education budget are only some examples among many other serious issues that the Indonesian government is investing a lot of effort in order to improve education quality in Indonesia.

1.1.1. World-Class Schools

In 2006, Ministry of National Education (MONE) introduced world class schools (WCS for short) and some schools have been tightly selected as a pilot for world class schools (WCS for short). According to Office of Research and Development (2010b), 195 primary schools, 299 junior secondary schools, 321 senior secondary schools, and 295 vocational schools throughout Indonesia have been selected as a pilot for developing WCS to cope with the current and future enormous real globalization challenges. Those all piloted WCSs are insisted to implement International Organization for Standardization of 9001:2008 (ISO for further use) particularly in quality management principles, but currently, only vocational schools which are all complying to adopt ISO. In fact, those vocational schools which propose to be WCS must have ISO Certification before registered as WCS. Thus, ISO Certificate is a requirement for vocational schools to be registered as

WCS. Other schools such as primary, junior and general secondary schools are not all implementing ISO due to a non-mandate.

Vocational schools have been selected as the focus (target) of this study due to two reasons. First, there is a need to clarify the effectiveness of ISO 9001 on vocational schools due to existence debates and limited number of studies conducted by other researchers. Second, all vocational schools classified as world class schools (WCS) implement ISO and quality culture, thus it is easier to select them randomly as research sample. It was stated that this study is urgently needed by government in order to improve practices in ISO and quality culture implementation. This study is important to carry out in order to provide policy input to MONE on improving the effectiveness of ISO implementation in vocational schools.

1.2. Statement of Problem

Improving the quality of education has always been the issue for many researchers. When it comes to developing countries, like Indonesia, the need is even most urgent to work on initiatives to improve this important area societal need. The Indonesian government is facing a dilemma in improving education, particularly vocational education. The improvement of quality, education relevancy, and training in order to fulfill workforce market demand is still questionable (Newhouse & Suryadarma, 2011). There is still a gap between vocational school's curriculum relevance and the quality of teaching-learning process and the needs of industries (Di Gropello, Kruse, & Tandon, 2011). Vocational schools are supposed to prepare students for gainful employment, and yet, for example the graduate unemployment rate in Indonesia is still high i.e. 13.81% and even higher than their counterparts (general high school) which is 11.90% (Indonesian Central Bureau of Statistics, 2010). The performance of vocational school administrator (73.5 on 100 scale basis) is still under the

passing score criteria (76 on 100 scale basis) determined by Institute of Development and Empowerment for School Administrators (2010). As for the teacher, Baedhowi (2009) found that only 347,300 (13.32%) from the total teacher number of 2,607,311 in Indonesia who were considered to be competent teacher.

1.3. Research Questions

Within the frameworks of quality management principles, this study attempts to answer the following question: "Does ISO 9001:2008 implementation have effects on the performances of vocational school administrators and teachers?"

More specifically, this research addresses the fundamental issue:

"What is the causal relationship between ISO implementation, quality culture, and the performances of vocational school administrator and teacher?"

1.4. Research Objectives

The main objective of this study is to investigate the effects of ISO implementation on the performance of vocational education administrator and teacher in Indonesia, by developing a theoretical model and examining it empirically. This study examines the level of ISO 9001:2008 knowledge and the extent of its implementation in vocational education. It also investigates the level of performance of vocational education administrators and teachers. The study also attempts to investigate the relationships between ISO knowledge and human resource performances, specifically in vocational education setting.

1.5. Research Relevance

The research carried out in this dissertation is relevant to educational school districts, and vocational schools in particular, where teachers' and administrators' performances are keys to improve the overall educational goals. The study attempts to provide a model that links the ISO 9001:2008 implementation with quality culture, performances of administrator and teacher.

1.6. Research Contributions

This study is expected to contribute to both theoretical and practical importance. Theoretically, this study is expected to contribute to the advancement of scholarly knowledge about implementation of ISO in vocational schools. Practically, this study is going to find evidence that can be used to provide a solid basis for seeking improvement of the quality of vocational school administrator and teacher performance in Indonesia which is hopefully leading to the improvement of vocational school quality and desired student performance, respectively. This study is also expected to provide ways of improving current practices in implementation of ISO in vocational schools in Indonesia.

The Indonesian government can also use the insights of this study to support the vocational schools improvement. This study is urgently needed to provide inputs to Indonesian Ministry of Education and Culture regarding national policy of ISO implementation in vocational education.

In addition, this study is expected to contribute to development of academic knowledge in the area of quality management in vocational education. So far, extensive research focusing on Indonesia's vocational educational area has not been done by researchers.

1.7. Potential of Proposed Research

The conceptual model of the impacts of ISO 9001 on vocational education can be expanded in other levels of education, institution performance, and other applicable performance dimensions. ISO 9001:2008 is also not the only quality management practice that can be implemented in any organizations. The structural relationship model can provide any organizations to understand the causal relationship of management practices and the organization key variables so that the management practices can be adopted effectively.

1.8. Structure of the Research

This chapter provides an overall introduction to the research. Chapter two presents review of literature on quality, ISO, vocational education in Indonesia, and structural equation modeling. Chapter three describes different variables and research hypothesis, followed by chapter four that provides the research methodology employed in this research. Chapter five presents the results and discussions of the data analysis. Chapter six provides the conclusion of this study.

CHAPTER 2: LITERATURE REVIEW

The objective of this chapter is to provide an overview of ISO 9001:2008 and quality culture and their effects on vocational school administrator and teacher performances. To achieve this objective, this chapter will review related literatures on quality, ISO 9000 in education, Indonesian education system, vocational school administrator and teacher performances, and structural equation modeling.

2.1. Quality Management and Values

2.1.1. Quality Concepts

Quality has evolved from concept into practices, techniques and articulated procedure (Harvey, 1998). Many researchers and practitioners agree that quality is important in long-term organization performances (Talib, Rahman, & Qureshi, 2010) even though quality can be defined in many various definitions (Evans & Lindsay, 2008; Hoyle, 2009; Hutchins, 1997; Reeves & Bednar, 1994). Reeves and Bednar (1994) summarize quality definitions from previous philosophers and researchers into four definitions: (1) excellence, (2) value, (3) conformance to specifications, (4) meeting and/or exceeding expectation .

Different individuals define quality differently (Heizer, 2008). The most recognized gurus in quality who have significantly contributed to the field of quality management are Walter E. Deming, Joseph J. Juran, Armand Feigenbaum, and Philip Crosby. The existence of various definitions of quality implies that quality needs to be defined accordingly based on different circumstances because "each definition has strengths and weaknesses in relation to measurement, and generalizability, managerial usefulness, an consumer relevance" (Reeves & Bednar, 1994, p. 435). Reeves and Bednar

(1994) also argue regarding the inconsistency results of relationship between quality and organization key variables (price, market share, cost, nature of organizational output, time, and multiple constituencies). Due to these inconsistencies results, organizations' managers need to understand each definitions of quality along with its strengths and weaknesses in order to understand the roles of quality in organization (Hoyle, 2009; Reeves & Bednar, 1994).

Deming does not literally define quality. However, his contributions provide guidance for organization to understand the importance of quality and effectively manage the organizations itself. Deming argues that variation in design, process, manufacturing results in poor organization performance (Evans & Lindsay, 2008). Therefore continues improvement needs to be initiated in order to reduce variation. Deming developed Deming's 14 Points to manage effective organization. These points which are adapted from Evans and Lindsay (2008) include: (1) Create a vision and demonstrate commitment, (2) Learn the new philosophies, (3) Understand inspection, (4) Stop making decisions purely on the basis of cost, (5) Improve constantly and forever, (6) Institute training, (7) Institute Leadership, (8) Drive out fear, (9) Optimize the efforts of teams, (10) Eliminate exhortations, (11) Eliminate numerical quotas and management by objective, (12) Remove barriers to pride in Workmanship, (13) Encourage education and self-improvement, and (14) Take action.

The Deming's 14 Points implies that there is a need of cultural change in the organization to facilitate quality improvement practice. Furthermore, it requires strong leadership in order to guide the followers to implement the Deming's 14 Points so that the organization can be managed effectively. However, Deming does not specify specific leadership style that can be applied to implement the Deming's 14 Points.

Juran (1986) defines quality as "fitness for use". Juran proposes Quality Trilogy: (1) quality planning, (2) quality control and (3) quality improvement. Quality planning is "the process of meeting the organization goal". It starts by defining both the internal and external customers. The customers' needs also need to be identified. These needs are translated into product or service specification requirements. Quality control is "the process of meeting quality goals during operations" (Juran, 1986). Statistics process control can be used as means to reduce variability and monitor the process performance (Montgomery, 2007). This process ensures that the product or service meets the requirements. Quality improvement is "the process of exceeding the current performance".

Feigenbaum proposes three step approach to quality: quality leadership, quality technology, and organizational commitment. Feigenbaum is also known for using phrase "Total Quality Control". Quality is applied to all stages in organization. Thus, it encourages involvement and commitment (Evans & Lindsay, 2008). Feigenbaum also states that leadership plays an important role in leading the quality effort.

Crosby defines quality as "conformance to requirements" (Evans & Lindsay, 2008). He is also known for his quality philosophy "Absolutes of Quality Management" that includes the following points adapted from (Evans & Lindsay, 2008): (1) quality means conformance to requirements, not elegance, (2) there is no such thing as quality problem, (3) there is no such thing as the economics of quality; doing the job right the first time is always cheaper, (4) the only performance measurement is the cost of quality, which is the expense of nonconformance, and (5) the only performance standard is zero defects.

Total quality can be characterized by its principles, practices, and techniques (Dean Jr & Bowen, 1994). Principle is defined as "law, truth, or assumption that is verifiable" (Hoyle, 2009, p.

9). Dean Jr and Bowen (1994) explain that quality principle is the root of quality practices and quality techniques or tools. Quality practices are the implementation of quality principles. Thus, understanding the nature quality practice requires understanding the principles of quality. Quality techniques or tools are useful if they can support the quality principles.

Total quality principles which are on the highest level of the pyramid consists of customer focus, continuous improvement, and teamwork (Dean Jr & Bowen, 1994). ISO 9000, as a quality practice, embraces eight quality management principles consisting of leadership, customer focus, continual improvement, process approach, system approach, factual approach, involvement of people, and mutually beneficial supplier relationship (Hoyle, 2009). Thus, ISO already includes the three total quality principles.

2.1.2. Quality Practices

Quality practices that have been developed based on the core of quality concepts include Total Quality Management, quality assurance, Malcolm Baldrige, and ISO 9000 which are described as the following.

2.1.2.1. Total Quality Management

Total Quality Management (TQM) has been defined somewhat differently, but the core value is the same i.e. improving quality in order to conform to requirements although the term requirements are subject to debate. For example, Hradesky (1995) defines TQM as "a philosophy, a set of tools, and process whose output yields customer satisfaction and continuous improvement". Although his definition seems very broad and it looks like plenty of rooms for debate, but he clearly offers ten (10) tracks in the program of TQM development, namely foundation track,

implementation track, cultural track, recognition and rewards, leadership/team building, management skills track, core techniques, advanced techniques, customer focus, and train the trainer.

TQM was also defined slightly different by Sashkin and Kiser (1993): "TQM means that organization's culture is defined by and supports the constant attainment of customer satisfaction through an integrated system of tools, techniques, and training. This involves the continuous improvement of organizational processes, resulting in high quality products and processes". Although their definition tends to focus on organization's culture, but the tools, techniques and training used are all support the attainment of customer satisfaction.

The application of TQM has been extended to education settings. Arcaro (1995) developed total quality schools (TQS) model based on the house of quality consisting of a roof or total quality schools, five pillars supporting the roof (customer focus, total involvement, measurements, commitment, and continuous improvement), and foundations consisting of beliefs and values expressed in quality vision and mission. Arcaro (1995) emphasizes the importance of beliefs and values because these foundations "determine the strength and success of quality transformation". Briefly, the five pillars can be described as follow. According to Arcaro (1995), the school cannot improve the school quality without recognizing the school's customers. Second, quality improvement is everybody business and thus, total involvement is a must. Third, quality measurement must be well understood by school members, i.e. what, why, and how to measure.

Fourth, system view of education (holistic view of school as a system) must be used as an approach to improve or transform quality. School members must recognize that, the school is considered as a holistic system and therefore, partial consideration will create ineffectiveness and inefficiency of school quality improvement.

Arcaro (1995) proposes that TQS must begin with quality vision and mission based on personal beliefs and values of school stakeholders consisting of school board members, school administrator, teachers, administrative staff, students, and parents.

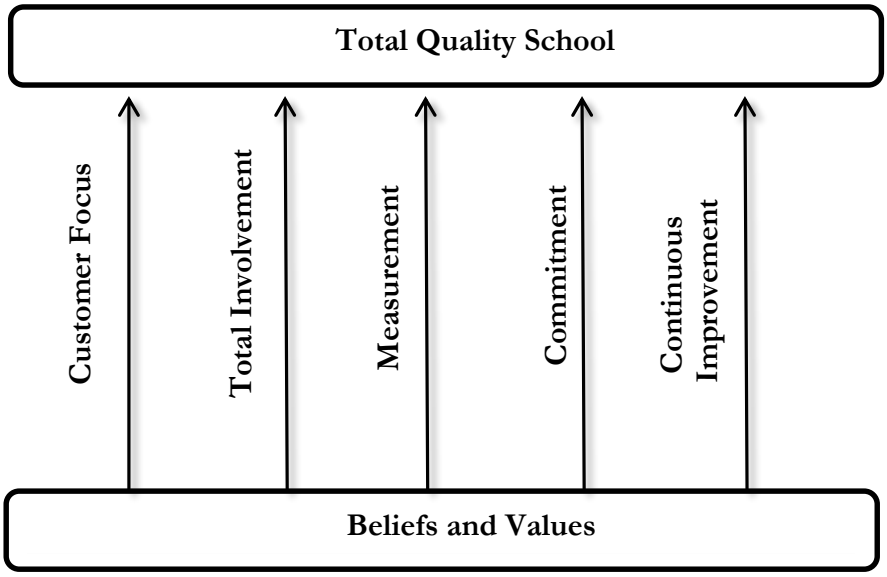


Figure 2-1: Total Quality School Model (adapted from Arcaro (1995))

2.1.2.2. Quality Assurance

According to (Arnold & Holler, 1995), quality assurance is "all those planned and systematic actions necessary to provide adequate confidence that a system or product will perform satisfactorily in service". They further claim that quality assurance responsibilities include: "setting broad goals, providing guidance, setting direction, reviewing qualifications and training personnel, reviewing quality-related records, developing and documenting as well as following up quality procedures, scheduling and conducting as well as following up quality audits, being involved in procurement cycle, being involved in the design review cycle, and scheduling and conducting surveillance".

Quality assurance has somewhat relationship with quality control. Quality control emphasizes on fulfilling the quality requirements, whereas quality assurance has a role to make sure that quality control perform as is intended to do (Johnson & Johnson, 2000). Quality assurance is somewhat similar to ISO, TQM, and Malcolm Baldrige in that they all address quality transformation or improvement. The different between them lies in the stress of input (quality design), process or implementation (quality of conformance to design) and quality output (quality of performance).

2.1.2.3. Malcolm Baldrige

Malcolm Baldrige model of quality management practice is the expansion of application of Malcolm Baldrige National Quality Award originally for US companies excelling in quality management and quality of achievement to education settings (Arcaro, 1995).

The award criteria are based on core values and concepts of customer focus-driven quality, leadership, continuous improvement, total participation, fast response, design quality and prevention, long-range outlook, management by fact, partnership development, and community responsibility. Although Malcolm Baldrige model is slightly different from ISO and TQM, they all address the ways to transform the existing quality to expected quality.

2.1.2.4. ISO 9000

ISO 9000 family of standards is a set of standards and guidelines relating to quality management system (International Organization of Standardization, 2011a). (International Organization of Standardization, 2011a) defines ISO 9001:2008 as " the standard that provides a set of standardized requirements for quality management system". ISO 9001 has been revised in 1994,

2000, and 2008. ISO 9001 does not guarantee the quality of the product (International Organization of Standardization, 2011d) and high organizational performance (Kim, Kumar, & Kumar, 2011). However, ISO 9000 implementation ensures that it delivers consistency to customer (Cianfrani, Tsiakals, & West, 2009; Corbett et al., 2005; Moreland & Clark, 1998), regulators, and the organization' own internal (Cianfrani et al., 2009) requirements, as well as the outputs produced, in terms of conformance to specification (Naveh and Marcus, 2005). Consistency indicates that the process variation is under control within the specified requirements. It can be used as quality and customer satisfaction measurement (Hutchins, 1997). However, ISO 9000 can be interpreted and understood differently from one organization to others. Different auditors also have different capabilities and methodologies in conducting the audit. Thus, there is variation in implementing ISO 9000 (Hutchins, 1997).

Although ISO was founded in 1947 in Geneva Switzerland, Indonesia has only recently adopted it. Many institutions in Indonesia both public and private sectors including education institutions are now implementing ISO. In education institutions, it is strongly insisted to adopt ISO for those education institutions that are already designated as a world class school (WCS) or a world class university (WCU).

ISO/TC 176, the ISO technical committee that is responsible of the integrity of the quality management standardization (International Organization of Standardization, 2011e), defines quality management principle as "a comprehensive and fundamental rule or belief, for leading and operating an organization, aimed at continually improving performance over the long term by focusing on customers while addressing the needs of all other interested parties" (Hoyle, 2009).

Quality management principles consist of eight keys that contribute to the success of quality systems. These are: customer focus, leadership, involvement of people, process approach, system

approach to management, continual improvement, factual approach to decision making and mutually beneficial supplier relationships (International Organization of Standardization, 2011e). These principles are translated into requirements in ISO 9000. Since the requirements of ISO 9001:2008 are based on these principles, the requirements are related to one or more of these principles (Hoyle, 2009). The following description of each of eight quality management principles is quoted from ISO 9000:2005: Quality Management Systems – Fundamentals and Vocabulary. Each of these principles is presented below for further information and its relevance to the presented study.

Principle 1 - Customer Focus: **"**Organizations depend on their customers and therefore should understand current and future customer needs, should meet customer requirements and strive to exceed customer expectations" (International Organization of Standardization, 2011f). Customer can be determined differently depending on the environment. In educational setting, Hutchins (1997, p. 71) states that "customer can be determined as students, teachers, administration, school board, parents, and/or other tax payers". Arcaro (1995) also states that "everyone is both a customer and supplier". Furthermore, the customers can be within and external to the education system. Thus, identifying the customer can be viewed from different perspectives (R. G. Lewis & Smith, 1994). It is important to clearly identify the customers because different customers have different needs. Hence, when the customers are correctly identified, the organization can focus on fulfilling the customer needs that can result in satisfaction. R. G. Lewis and Smith (1994) also state that the successfulness of organization can be measured by customer satisfaction. Moreover, customer satisfaction is related to organization competitiveness (Pyzdek & Keller, 2003). It is the top management responsibility to be able to convert customer needs into ISO requirements once the customer needs are identified (Tsim, Yeung, & Leung, 2002).

Principle 2 – Leadership: **"**Leaders establish unity of purpose and direction of the organization. They should create and maintain the internal environment in which people can become fully involved in achieving the organization's objectives" (International Organization of Standardization, 2011f). It is important for a leader to clarify and articulate the vision, as well as to explain the methods to achieve the vision so that the followers are able to see the organization direction and motivated to achieve it (Evans & Lindsay, 2008). A leader also has important role to communicate ISO values and systems to the followers so that they can embrace ISO as part of organization culture (Hutchins, 1997). Thus, a leader should be able to identify the shared values and vision because there is a sense of ownership that makes the followers want to commit themselves to make their visions into reality (Kouzes & Posner, 2003). Arcaro (1995) refers these vision ownership acceptance and implementation as "the concept of shared responsibility and empowerment". He also states that people are encouraged to be creative and innovative in achieving the organization vision as well as their visions. Kouzes and Posner (2003) also state that shared values and visions allow the followers to not only achieve their values and visions but also the organization values and visions. In addition, strong leadership can drive the organization to create and sustain the culture that is identified as an important factor long-term successfulness in any organizations. Many recent studies also show that leader plays important roles in enhancing organizational performance (Valmohammadi, 2011).

Principle 3 - Involvement of People: **"**People at all levels are the essence of an organization and their full involvement enables their ability to be used for the organization's benefit" (International Organization of Standardization, 2011f). People, as human resource, are important in organizational changes. Involving the people in organization efforts create shared values (Hoyle, 2009), make substantial contribution to quality (Evans & Lindsay, 2008), and motivate them to

contribute to changing organizational culture (Kim et al., 2011). Since quality culture is part of organizational culture (Ehlers, 2009), it is expected that people involvement can be related to quality culture. In addition, employee commitment is also related performance at both individual and organizational level (Fang, Chen, & Hung, 2008; Mowday, 1999).

Principle 4 - Process Approach: " A desired result is achieved more efficiently when activities and related resources are managed as a process" (International Organization of Standardization, 2011f). Hoyle (2009) states that process approach is about linking objectives, activities, resources, and constraints. In addition, process approach is expected to improve performance which is measured by cost, results, and opportunities (International Organization of Standardization, 2011c). Moreover, process management is positively related to inventory performance (Kaynak, 2003). However, this study also shows that process management does not directly affect quality performance. Thus, there is mixed result of process approach implementation.

Principle 5 - System Approach to Management: **"**Identifying, understanding and managing interrelated processes as a system contributes to the organization's effectiveness and efficiency in achieving its objectives" (International Organization of Standardization, 2011f). A system can have more than one functions or processes in an organization. It is important to recognize the interaction of among the functions or processes because changing one of them can influence or affect the others (Hoyle, 2009). Thus, system approach emphasizes on the interactions of processes.

Principle 6 - Continual Improvement: "Continual improvement of the organization's overall performance should be a permanent objective of the organization"(International Organization of Standardization, 2011f). Deming promotes continual improvement in order to reduce variability in process, service, and design (Evans & Lindsay, 2008) because when the variability increases the quality decreases (Montgomery, 2007, p. 6) . PDCA cycle, developed by Walter Shewhart, provides

continuous improvement concept. This cycle consists of four stages: plan, do, check, and Act (Heizer, 2008). Cianfrani et al. (2009) illustrate ISO 9000 requirements as continuous improvement loop in Figure 2-2.

Plan is the process of identifying the improvement. Do is the process of testing the plan. Check is the process of assuring the plan works as intended. Act is the implementation of the plan. Thus, ISO 9000 requirements embodies PDCA (Plan, DO, Check, Act) cycle (Rusjan & Alic, 2010) which represent continuous improvement.

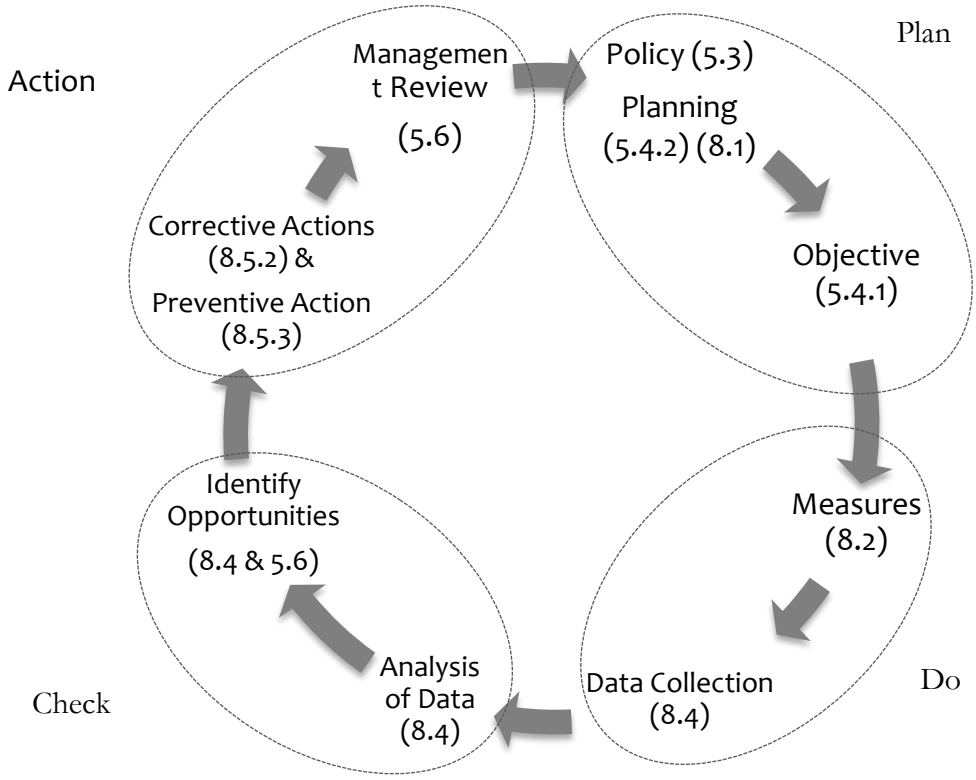


Figure 2-2: Continuous improvement loop and associated ISO 9001:2008 clauses (adapted from Cianfrani et al. (2009))

Principle 7 - Factual Approach to Decision Making: **"**Effective decisions are based on the analysis of data and information" (International Organization of Standardization, 2011f). According to Deming (1986), quality can be improved if it measurable. Thus, it is important to collect data and information accurately so that the process of analyzing the data and information results in meaningful in terms of linkage between key measures and business performance (Evans & Lindsay, 2008). Statistical process control, design of experiment and quality function deployment are some of the quality tools to analyze and improve quality.

Principle 8 - Mutually Beneficial Supplier Relationships: "An organization and its suppliers are interdependent and a mutually beneficial relationship enhances the ability of both to create value" (International Organization of Standardization, 2011f). Establishing long-term relationship and minimizing the number of suppliers can improve the relationship with the supplier (Kaynak, 2003). By having close relationship, these parties can have more focus on solving quality problem. Moreover, Baird et al. (2011) argue that supply chain management is positively related to inventory performance. However, their study shows that it does not significantly related to quality performance.

Quality management principles are translated into requirements. The successfulness of standards implementation is related to ISO 9000 policy and procedural knowledge (Russo, 1995). Policy and procedural knowledge has been reported to have positive relationship with human resource performances that are measured by decision making and problem solving (Nair, 2002). Krueger (1999) confirms that employees' policy and procedural knowledge are related to private sector organizational performance. ISO (2011b) provides the expectations of implementing each of quality management principles.

The performance realization framework designed by Kim et al. (2011) suggests that the ISO 9000 requirements customization has to be aligned with the organizational goal and strategy. The purpose of customization is to hindrance employee resistance and incompatibility with their own systems. Thus, the ability to customize the ISO 9000 requirements requires understanding and knowledge of the quality management principles. The level of ISO 9000 policy and procedural knowledge and the ability to customize the ISO 9000 requirements to be aligned with the organizational strategies and goals can be used as measure indicators of quality management principles.

The eight quality management principles are very important for education institutions to adopt if they want to improve their quality. They are very important for education institutions because of their appropriateness for quality education improvement. In fact, many Indonesian schools and universities including vocational schools have already implemented them. However, ISO implementation is still in a big challenge. To some extent, the expression of what quality management principles and quality culture to be implemented is the easy part. The hard part is how to implement them totally, consistently, and passionately. It is fully cognizant of complexity and diversity when it comes to ISO implementation and in fact, detailed implementation is a big challenge. Thus, research on ISO is needed in order to improve future practices of ISO implementation in vocational schools.

2.1.3. Quality Culture

Education or school improvement can utilize reform approaches simultaneously or separately i.e. human resource, structural, political, free market economic, and school culture or

ethos approaches (Deal, Peterson, & Center, 1990). This section deals with last one i.e. cultural approach.

In education, quality is conformance to mission specification and goal achievement – within publicly accepted standards of accountability and integrity (Bogue & Saunders, 1992). While school culture is defined as behavioral patterns and values, beliefs, and norms that define and sustain those patterns (Deal et al., 1990). So, what is quality culture, why quality culture, what are the elements of quality culture, and how to change existing to desired quality cultures, are questions that require clarification although school itself lacks of clear quality threshold as claimed by Lomax (1996).

In term of definition, quality culture has been formulated differently although they are mostly convergent in their main meaning. For example, although the definition does not address quality directly, but Deal and Peterson's definition of culture (1990) is relevant to present here. They define culture as character as it reflects deep patterns of values and beliefs, and traditions that have been formed over the course of its history. Culture is also defined by (Davis, 1984) as "the pattern of shared beliefs and values that give the members of an institution meaning and provide them with the rules for behavior in their organization". Although both definitions do not specifically put the word "quality", but they are related to quality because quality culture also relates to values and beliefs. Sashkin and Kiser (1993) define quality culture as a certain set of values and beliefs which tell us what is right and what is wrong in quality. They, further, divide quality culture into eight elements, namely: (1) quality information must be used for improvement, not to judge or control people, (2) authority must be equal to responsibility, (3) there must be rewards for results, (4) cooperation, not competition, must be the basis for working together, (5) employees must have secure jobs, (6) there must be a climate of fairness, (7) compensation should be equitable, and (8) employees should have

an ownership stake. It is believed that if organizations implement those culture elements, their performance will improve.

R. G. Lewis and Smith (1994) develop instrument of total quality culture assessment measured by environment, products and services, methods, people, organizational structure, and total quality mindset. This instrument is very relevant to my dissertation because it deals with education. The quality culture instrument is also very comprehensive in nature and therefore, it will be partly used as instrument for this dissertation.

Evans and Lindsay (2008, p. 442) define culture as "an organization's value system and its collection of guiding principles". Based on the literature reviews regarding quality management principles (Evans & Lindsay, 2008; Hoyle, 2009; Kim et al., 2011), shared values and commitment are created. By creating these cultural characteristics, people can be motivated to perform their tasks (Hoyle, 2009). However, solely relying on motivation cannot achieve maximum task performance. The leader has important role to establish environment to allow the people improve their performances. In addition, customer focus also plays important role to drive the leader action and decision.

In essence, from the above readings on quality culture, it can be synthesized that quality culture is quality character as it reflects deep patterns of values and beliefs to commit to quality for customer. In this research, it is believed that quality culture will have significant influence on vocational school administrator and teacher performances.

2.2. ISO 9000 in Education

ISO 9000 has been implemented over the world, for example in private schools in Thailand (Ayudhya, 2001), education system in Hongkong (Chan & Lai, 2002), education system in England

(T. Thonhauser & Passmore, 2006), public primary and secondary schools in United Stated (Bae, 2007), and private university college in Malaysia (Choon Boey Lim, 2008). Although ISO 9000 has been implemented world widely in manufacturing and non-manufacturing or service organizations, the implementation of ISO in vocational education is considered as new. Currently, there are only few researches that study the ISO implementation in vocational education.

According to a study conducted by Van den Berghe (1997), factors that influence the successful ISO 9000 implementation include organization status of the school, an existing quality policy, the stability of the school, an understanding of internal process, the financial status of the school, a motivated individual supporting ISO 9000 implementation senior management commitment, a limited number of customers and products, and the size of the school.

A study conducted by T. L. Thonhauser (2005) shows that the factors that are resulted in successful ISO 9000 implementation in education are the management representative, the organization status of institution before ISO 9000, and major project changes during ISO 9000 implementation. The study shows that management representative should be highly regarded by other school members. The school should also be organized or in stable status before ISO 9000 implementation. The school should also have previous quality management practices. The school should also not have other project changes during ISO 9000 implementation.

Meanwhile, the ISO 9000 implementation is difficult to apply, time consuming and paper intensive, short term implementation, lack of information about ISO 9000, no personal involvement process, difficulty understanding the language and terms of the standard, and expensive process of implementation (Bevans-Gonzales & Nair, 2004; Nair, 2002).

Due to the existence debates on the effectiveness of ISO 9000 in education setting, it implies that there is essential need to study implementation of ISO 9000 in vocational education.

2.3. Indonesian Education System

Indonesian education is based on Indonesia's 1945 Constitution i.e., unity of the nation and social equity which are expressed in Indonesian nation state philosophy, namely Pancasila (Panca = five; sila = principle). In very brief, Pancasila means that citizens of Indonesia believe in the one and only God, strive toward just and civilized humanity, are committed to national unity, democracy guided by the wisdom of unanimity arising from deliberations, and social justice for all Indonesian citizens. Consequently, the aim of Indonesian education system is to develop student potential fully in order to believe in the one and only God, to be citizens who are humanistic, healthy, strongly managed hard and soft sciences, smart, creative, self-supporting, and to be democratic and responsible citizens as stipulated in Law of Number 20 Year 2003 on National Education System.

To achieve the above aim of education, Indonesian education is structured as follows: six years primary school, three years junior secondary school, three years senior secondary school divided into two tracks namely general secondary and vocational secondary, and higher education divided into two tracks namely academic and professional. Figure 2- 3 depicts the structure of education in Indonesia, from primary up to higher education. As a sub-system, vocational school is above junior secondary school and under higher education institution.

Brief comments on Indonesian education structure as seen in Figure 2-3 are explained as follows. Six years of primary school and three years of junior secondary school (it is now called nine years basic education) is compulsory for any citizen under fifteen years of age. They must go to six years of primary school and three years of junior secondary school and the government will cover school finances. After graduating from junior secondary school, students have a choice to either to enter general secondary school or vocational school.

Academic Track	Professional Track
Ph.D.	Super Specialist
Master	Specialist
Undergraduate (Bachelor)	Diploma 4
	Diploma 3
	Diploma 2
	Diploma 1
General Secondary School	Vocational School
Junior Secondary School	
Primary School	

Figure 2-3: Structure of Education in Indonesia

Likewise, after graduating from either general secondary school or vocational school, students also have a choice; either pursues to higher education in academic track (university to get bachelor, master, and Ph. D degree) or goes to professional track (diploma 1, 2, 3, 4, specialist, and super specialist) or they directly go to work for some reasons not pursuing to higher education. In Indonesia, Islamic education, from primary school up to higher education, is very strong and managed by Ministry of Religious Affair. Although structurally they are under Ministry of Religious Affair, technically/academically, they must follow norms, standards, procedures, and criteria developed by Ministry of Education and Culture.

Since 1999, administratively, except Islamic education institutions, Indonesian education has been decentralized to local governments, namely to provinces and districts. Indonesia consists of 33 provinces and 530 districts. Decentralization of education is done through two types of

decentralization, namely de-concentration and devolution. In de-concentration, the central government (Ministry of National Education/MONE) disperses responsibility for certain education services or it is simply shifting of workload from central government to 33 provinces, but they are still guided and supervised by central government and therefore it does not involve transfer of authority.

In devolution, however, central government (MONE) transfers authority and responsibility to 530 districts on the management of education, particularly primary and secondary education because higher education is directly decentralized from MONE to higher education institutions and they are not under province and district government (Indonesia, 2004). Thus, at the present time, vocational school is administratively under the authority and responsibility of district government, and MONE has only indirect control over such 530 districts.

2.3.1. Vocational School as a Sub-System

As a subsystem of Indonesian national education system, vocational education (hereafter vocational school is used interchangeably with vocational education) offers diverse programs such as agriculture, husbandry, health, hotels and tourism, arts and handicrafts, business and commerce, and industry. Vocational education plays very important roles in economic development. Study conducted by UNESCO-UNEVOC (2006) found that "the higher the GDP per capita, the higher the percentage of technical/vocational enrollment PTVE) where PTVE is participation of technical and vocational education or the number of students enrolled in technical/vocational programs at a given level of education as a percentage of the total number of students enrolled in all programs (technical/vocational and general) at that level". In Indonesia, study conducted by Directorate of Vocational Education (2008) concluded that there was positive correlation between the number of

vocational school students and product domestic regional bruto (PDRB) and economic growth. The more vocational school students were, the higher PDRB and economic growth were. These two studies were consistently supported by research finding that "all countries invest in technical-vocational education and training, in fact, correlations indicate that the higher the level of country income, generally the higher the proportion of students enrolled in technical/vocational education and training institutions" (Asian Developmen Bank, 2008). On the basis of these studies, Directorate of Vocational Education is planning to increase the proportion between the number of vocational secondary school students and general secondary school students from 30%:70% in 2005 to 70%:30% in 2014 (Directorate of Vocational Education, 2010).

However, raising quality of vocational education is a big challenge because of its complexity, diversity, sheer number of people involved (more than three millions of students, more than five hundred thousand of teachers) and a far flung organization throughout Indonesia. The existing vocational education sub-system exhibit a great amount of inertia, albeit that the private sector response is generally faster than the public sector response (Djojonegoro, 1996). In addition, vocational school subsystems tend to focus on formal training geared toward wage employment which may absorb only a minority of those entering labor market (Asian Development Bank, 2009). This is due to lack of link and match between vocational schools and the world of work. Thus, it must be fully cognizant of complexity and diversity when seeking improvement in vocational education (Djojonegoro, 1994).

In 2007, Directorate of Vocational Education (Directorate of Vocational Education, 2007), Ministry of National Education, the Republic of Indonesia selected 300 from 8,399 vocational schools designated as pilot for developing world class vocational school (WCS). The establishment of WCS was actually to respond two things, the law mandate and globalization challenges. The Law

Number 20 Year 2003 (Indonesia, 2003) on National Education System, Article 50, verse (3) mandate that central government and/or local government establish at least one WCS in all levels of education. Globalization challenges are characterized by tight competition among countries requiring professional and skilled human resources as one of the most important assets, shrinking distances among countries causing no gap in information due to information technology, and pace of change becomes faster and faster. Globalization challenges require high quality of human resources and WCS are assigned to prepare them.

All designated 300 world class vocational schools have been implementing ISO, which means, have been implementing quality management principles and quality culture. But the question is "how strong do ISO and quality culture influence vocational school administrator and teacher performance?" The hypothetical answer will be explored after reviews of literatures, while the real answer will be found from data collection and data analysis.

2.3.2. World Class School Development to Date

The objective of this writing is to describe at glance the development of world-class schools (WCS) in Indonesia. In order to achieve this, the following will discuss briefly about background, meaning, expected long-term objective, WCS and its indicators, efforts undertaken, and challenges that lie ahead in developing WCS.

2.3.2.1. Background

Why WCS? The Education Law Number 20 Year 2003 on National Education System, Article 50 verse (3) mandates that "Government and/or local government must develop at least one school to be world class school at all school levels". In addition, globalization has created tight

competition among countries requiring high quality of competitive factors such as human resources, management, and technology. WCS was initiated to create high quality of human resources capable of competing with other countries in global era.

The initiation of WCS was started in 2002 with two primary schools and two junior secondary schools named as coalition schools with the intention to have information and ideas exchanges among schools in ASEAN countries (SEAMEO). In 2003, every province was pointed to have one coalition school totaling 31 for primary and junior high schools. In 2005, teaching Math and Science in English was introduced in those schools, and in 2006, those schools were appointed as WCS and some senior general and vocational high schools started joining to become WCS.

2.3.2.2. Definition of World Class School

What is the meaning of World Class School (WCS)? WCS is a school which has already fulfilled Indonesian National Standard of Education (NSE) plus X, where X is a widening and/or deepening to NSE. In a complete formula, WCS can be formulated as follow:

Table 2-1: Concept of WCS

WCS= NSE + X			
Schools	NSE		X
WCS – PS	NSE		1, 2, 3
WCS – JSS	NSE	+	1, 2, 3
WCS – SSS	NSE		1, 2, 3, 4
WCS – VS	NSE		1, 2, 3, 4

Notes:1 = Widening/deepening of 8 components of NSE
2 = ICT (Information Communication Technology
3 = Foreign language (mainly English)
4 = Cross culture understanding
PS = Primary School
SSS = Senior Secondary School

VS = Vocational School
JSS = junior Secondary School

NSE has eight main components standards, namely: graduate competency, curriculum, teaching-learning process, teacher and other school personnel, school facilities, school funding, school management, and student assessment.

X is sought through benchmarking with school standards in other countries, particularly developed countries. If NSE is lower than school standards from developed countries, then X (widening and/or deepening to NSE) should be added. If NSE is the same as or even higher than other school standards from developed countries, none is added to NSE.

In addition, WCS may use English language as a means in teaching-learning process, starting from grade 5. ICT use is also applied in WCS, for example in teaching-learning process, library, and administration. For detail of WCS formula in each of eight component standard, see Guidelines on Quality Assurance for WCS produced by Ministry of National Education (2007a) and the Regulation of Ministry of National Education Number 78 year 2009(Ministry of National Education, 2009) on World Class School (Sekolah Bertaraf Internasional or SBI for Indonesian short term).

2.3.2.3. Criteria of World Class and its Indicators

WCS = NSE + X. Some components of NSE are derived into sub-standards. For example, teacher may be sub-standardized into primary school teacher, junior high school teacher, general senior high school teacher, and vocational senior high school teacher. School facility, for example, is also sub-standardized into general school and vocational school facility standards.

The complete indicators for each WCS criteria can be seen from Guidelines on Quality Assurance for WCS produced by Ministry of National Education (2007a) and the Regulation of

Ministry of National Education Number (Ministry of National Education, 2009)78 year 2009 on World Class School. The followings are selected criteria of WCS adapted from those two important documents, see Table 2-2.

Table 2-2: Selected Criteria for WCS

Criteria	Indicators
NSE	All 8 NSE components fulfilled
Graduates	NSE fulfilled, international tests, international Olympiads, work opportunity for vocational school graduates
Accreditation	A (>95)
Curriculum	NSE widened/deepened from school standards in developed countries
Teaching-learning process	NSE widened/deepened from school standards in developed countries, use English, use ICT
Teachers	NSE widened/deepened from school standards in developed countries: Primary School >10%, Junior Secondary >20%, Senior Secondary > 30% of Masters /Doctor Degree, able to teach in English, use ICT
School administrator (head master)	NSE widened/deepened from school standards in developed countries, good English communication, and use ICT
School facility	NSE widened/deepened from school standards in developed countries, ICT base, ISO 17025
Financing	NSE widened/deepened from school standards in developed countries, allowed to get school fee from students based on SDP, cross- subsidy to poor students
School Management	NSE widened/deepened from school standards in developed countries, ISO 9001, ISO 14000
Student Assessment	NSE widened/deepened from school evaluation standards in developed countries
School Culture	Established learning community in school
Cooperation	NSE widened/deepened from school standards in developed countries (academics)

2.3.2.4. Expected Long-Term Objective

The expected long-term objective of WCS is to have Indonesian schools having high international competitiveness as measured by quality in terms of the aforementioned eight standards

(NSE) plus X. In practice, for example, the Indonesian WCS quality may be measured by international tests on hard sciences such as mathematics, physics, chemist, biology, technology, and by international Olympiads in those subject matters.

2.3.2.5. Efforts Undertaken and Results

There have been a lot of efforts undertaken by Ministry of National Education (MONE) in developing WCS, both inputs and activities. In terms of inputs, MONE has provided Guidelines on Quality Assurance for WCS produced by Ministry of National Education (2007a), Regulation of Ministry of National Education Number 78 (Ministry of National Education, 2009)year 2009 on World Class School, WCS criteria, WCS operational guidelines, monitoring and evaluation instruments, learning materials, learning media, school facilities, and school block grant to finance WCS.

In terms of activities, MONE has trained teachers, school administrators, and school committees, domestically and internationally. WCS have been trained to produce school development plan (SDP), both strategic and operational. They have already implemented SDP, results evaluated annually, and based on evaluation reflection, WCS improves SDP for future activities. From 2006 up to 2009, there had been 1,110 WCS developed. Due to society criticisms (too expensive, creation of elitist schools, etc.), MONE does not intend to add more WCS, at least for the time being.

2.4. Vocational School Administrator and Teacher Performances

Quality can be improved if it is measureable (Deming, 1986). In service industry such as in hotel (Hartline & Jones, 1996) and health care (Andaleeb, 2001), employee performances influence

customer perception of quality and value. Furthermore, the perceived service quality leads to customer satisfaction in health care context (Bowers, Swan, & Koehler, 1994; Choi, Cho, Lee, Lee, & Kim, 2004; Lee & Yom, 2007).

It is a challenge to assess objectively the degree of ISO 9000 implementation in education context. In addition, values and beliefs drive norms and behaviors. Thus, this study relies on survey that measures the respondents' perception. Hence, this study applies a self-reported survey based performance measurement.

There are studies that show no relationship between ISO 9000 implementation and organizational performance because there is a factor, such as motivation, that influences the level of performance (Singels, Ruel, & Van de Water, 2001). Their study measures organizational performance using indicators consisting of production process, company result, customer satisfaction, personnel motivation, and investment on means. Different researchers use different indicators to measure organization performances (Talib et al., 2010). Huarng, Horng, and Chen (1999) use quality, cost, sales, and internationalization as performance indicators.

Indicators that measure quality dimensions vary in service organizations because of human behavior and perception complexity involved in different service organization settings (Mahapatra & Khan, 2007). Therefore, the performance measurement indicators need to be relevant to organization settings and reflect organization goals. The most complete indicators that measure the performance of vocational administrator and teacher have been developed by Gephart and et al. (1975)

2.4.1. Vocational School Administrator Performance

Top management has important roles in planning quality management system because it is the top management who understands the overall organization's objectives, quality objectives, organizational strategies, current results, business risks and opportunities (Cianfrani et al., 2009). Thus, the school principal plays a role as the top manager in vocational school setting. Vocational school administrator performance is defined as quality process used and product developed by vocational school administrator when performing his/her duties and tasks. Readings on vocational school administrator performance may be stated in different ways but they are more likely showing similarity than dissimilarity. For example, National Center for Research in Vocational Education or NCRVE for short (Ohio State Univ, 1983) formulated vocational School administrator performance consists of the following four dimensions: (1) a task dimension, (2) a process dimension, (3) an environmental dimension, and (4) a personal skills dimension.

The task dimension describes what a school administrator has to deal with. Gephart and et al. (1975, p. 55) identified the following broad areas of responsibility that typify the roles of school administrators: school development planning, instructional management, personnel management, student management, school facility management, financial management, school-community relations, instructional leadership and school culture development, professional development, and supervision/monitoring and evaluation.

The process dimension describes how vocational school administrator performs the above various tasks through various activities such as decision making, programming, motivating, evaluating, and coordinating. Those processes describe major actions taken by vocational school administrator to perform tasks that are already identified earlier.

The environmental dimension deals with environment where, when, with whom, and style of life vocational school administrator works. Although the tasks and processes of vocational school administrator may be similar across the country, but different environment requires different style of leadership. Different time, people, culture, and bureaucratic structures are such examples that may influence the work of vocational school administrator.

The personal skills dimension also influence the performance of vocational school administrator. Different people have different styles and skills with them as they fulfill their roles. Personal skills such as self-discipline, personal relationship, responsibility, sociability, speaking, listening, tolerance, empathy, honesty, and integrity strongly influence the performance of vocational school administrator.

Another different description of vocational school administrator performance but they are likely similar is the enactment of Ministry of National Education Regulation, Republic of Indonesia, Number 13 Year 2007 (Ministry of National Education, 2007c) on Standard of School Administrator . The regulation identifies four major competencies that must be performed by school administrator: good personal skills, managerial skills, entrepreneurial skills, supervisory skills, and social skills. Vocational school administrators are evaluated on the basis of those four dimensions of skills.

Focusing on school management, Ministry of National Education Regulation, Republic of Indonesia Number 19 Year 2007(Ministry of National Education, 2007b) on Standard of School Management states that any school administrator must perform the following school management skills: school development plan (vision, mission, objectives, school work plan), execution of school development plan (school guidelines, school organization structure, school activities implementation, student management, curriculum and instruction management, personnel

management, facility management, business and financial management, school culture and environment, school – community relationship), supervision and evaluation (supervision program, school self-evaluation, evaluation and development of decentralized school curriculum, evaluation of personnel, and school accreditation), leadership, management information system, and special assessment for schools beyond standard.

Ministry of National Education Regulation, Republic of Indonesia, Number 28 Year 2010 on Assigning Teacher (Ministry of National Education, 2010a) as a School Administrator stipulates that school administrator performance is evaluated in three dimensions: (1) efforts to develop school, (2) improved quality based on eight national education standards (graduate competency, curriculum, teaching-learning process, school personnel, school facilities, finance, school management, and evaluation), and (3) self-professional development.

2.4.2. Vocational School Teacher Performance

Vocational school teacher performance is defined as quality process used and product developed by vocational school teacher when performing his/her duties and tasks. Readings from vocational school teacher performance vary slightly in their descriptions, but they show more similarity than dissimilarity. However, the formulation of vocational school teacher performance formulated by National Center for Research in Vocational Education (NCRVE for short) is the most complete one.

For example, the Ministry of National Education Regulation, Republic of Indonesia Number 16 Year 2007 on (Ministry of National Education, 2007d)stipulates that any teacher must be able to perform the following competencies: pedagogical competency, personal competency, social competency, and professional competency. Detail description for each teacher competency is

available in that regulation, but specific characteristics for vocational teacher competencies are not clear.

The above aspects of vocational teacher performance are comprehensive and those aspects are for both general senior secondary and vocational teachers, but not specifically designed for vocational teachers. Lack of specificity for vocational teachers is its weakness.

The National Center for Research in Vocational Education (1983) located in Ohio State University formulated vocational school teacher performance consists of the following dimensions: instructional planning, instructional execution, instructional evaluation, instructional management, vocational guidance, vocational student organization, school-community relations (coordination with business, industry, labor, government, etc.), and professional development. In their descriptions, all those teacher performances are contextually related to vocational schools. Thus, the performance dimensions which are formulated by NCRVE are more appropriate for measuring vocational school teacher performance.

2.5. Literature Gap

ISO 9000 has been implemented world widely in manufacturing and service organizations. The literatures reviews show that there are mixed results in implementing ISO. Furthermore, there are limited studies that investigate the effects of ISO on vocational administrator and teachers' performances.

Most of the ISO implementation studies investigate its effects on organizational performance level. Only few studies have attempts to investigate its effects on individual performance level, especially in vocational education. In addition, most studies also use different

dimensions or indicators to measure a variable or factor. Thus, it is important to use indicators that are relevant to the type of management practices and organizations being studied.

It is a challenge to assess objectively the degree of ISO 9000 implementation in education context. Thus, there is a need to clarify the effectiveness of ISO implementation on education setting particularly on vocational education in Indonesia. Table 2-3 summarizes study results of relationships between ISO implementation and various performance measures and Table 2-4 identifies the need for this research and how the developed model has responded to fill-in the gap on needed knowledge in this specific area of concern.

Table 2-3: Literature Summary

Author	ISO Dimension			Performance level Measure		Organization Type		Directionality Relationship		Significant Result	
	Single	Multi		Organization	Individual	M	S/E	Direct	Indirect	Yes	No
		QM	Non-QM								
Benner and Veloso (2008) Corbett et al. (2005)	Single			Financial		M		Direct		Yes	
Sharma (2005)	Single			Financial		M	S	Direct		Yes	
Naveh and Marcus (2004)	Single			Business & Operation		M	S	Direct		Yes	
Nair (2002)			Non-QM		Individual		E	Direct		Yes	
Singels & Water (2001)	Single			Organization		M	S	Direct			No
Van den Berghe (1997)			Non-QM	Organization			E	Direct		Yes	
Kuncoro (2013)		QM			Individual		E	Direct	Indirect	Yes	

Notes: QM: Quality Management S: Service E: Education

Table 2-4: Literature Gap Summary

Author	ISO Dimension		Performance level Measure	Organization Type	Directionality Relationship	Significant Result?
	MULTI?	QM?	Individual?	EDUCATION?	Y/N	Y/N
Benner and Veloso (2008) Corbett et al. (2005)	N	N	N	N	N	Y
Sharma (2005)	N	N	N	N	N	Y
Naveh and Marcus (2004)	N	N	N	N	N	Y
Nair (2002)	Y	N	Y	Y	N	Y
Singels & Water (2001)	N	N	N	Y	N	N
Van den Berghe (1997)	Y	N	N	Y	N	Y
Kuncoro (2013)	Y	Y	Y	Y	Y	Y

Notes: QM: Quality Management Y: Yes N: No

CHAPTER 3: VARIABLES AND RESEARCH HYPOTHESES

Building on the findings from the review of literature that is presented in Chapter two, the instruments that are designed to measure the relationships between ISO quality management principles, quality culture, and vocational school administrator and teacher performance are designed.

The factors that define the implementation of ISO quality management principles, quality culture, vocational school administrator and teacher performance need to be measured. However, these factors, referred as constructs or latent variables, cannot be directly measured. Therefore, latent variables need to be measured by more than one indicator or observed variable (Tabachnick & Fidell, 2007).

3.1. Variables

3.1.1. ISO Quality Management Principles

ISO 9001 requirements are developed based on eight quality management principles (International Organization of Standardization, 2011f). These eight quality management principles are customer focus, leadership, involvement of people, process approach, system approach to management, continual improvement, factual approach to decision making, and mutually beneficial supplier relationship. Thus, these eight quality management principles represent the observed variables that measure the extent of the implementation of ISO quality management principles. The ISO Quality Management Principles construct is presented graphically in Figure 3-1.

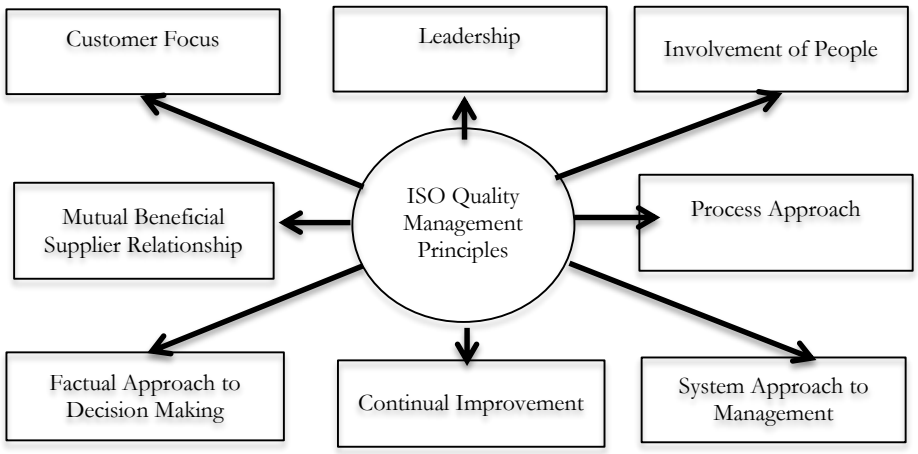


Figure 3-1: Quality Management Principles

Appendix A provides details measurement variables that measure each of ISO quality management principles.

3.1.2. Quality Culture

An organization requires social change in order to achieve total quality, especially in education (R. G. Lewis & Smith, 1994). Quality culture, as an aspect of social system, cannot be measured directly. There are six components that need to be addressed in order to change culture that leads to quality-driven organization (R. G. Lewis & Smith, 1994). These quality culture components include environment, product or service, methods, people, organizational structure, and mindset of total quality improvement.

Sashkin and Kiser (1993) divide quality culture into eight elements that are presented in Chapter Two. All of these elements are included as quality culture components presented by R. G. Lewis and Smith (1994), which represent comprehensive observed variables to measure quality

culture. The complete breakdown of these observed variables are presented in Appendix A. The quality culture construct is presented graphically in Figure 3-2.

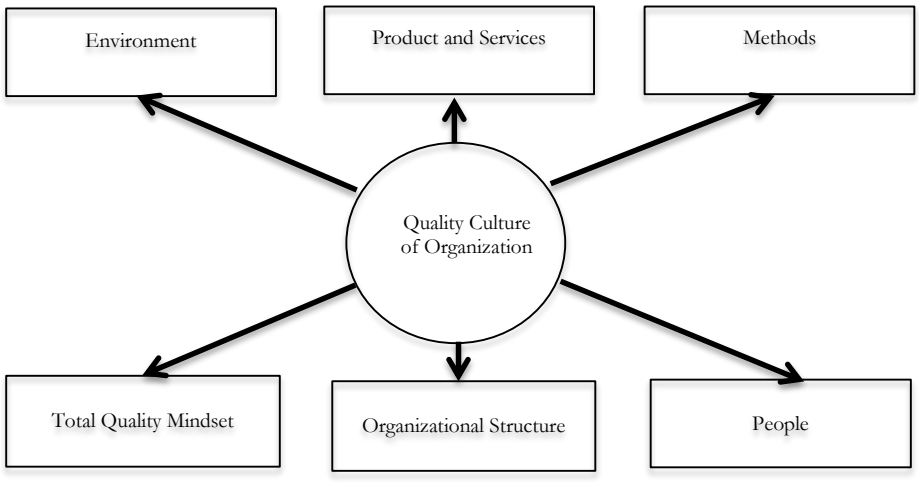


Figure 3-2: Quality Culture of Organization

3.1.3. Vocational School Administrator and Teacher Performance

Chapter two discusses vocational school administrator and teacher performance dimensions provided by National Center for Research in Vocational Education (1983), Gephart and et al. (1975, p. 55), and Ministry of National Education Regulation (2007). Among these readings, NCRVE (1983) provides comprehensive administrator and teacher performance dimensions, which will be used as observed variables.

The vocation school administrator and teacher performance constructs are assessed by measuring factors such as school development planning, instructional management, personnel management, student management, school facility management, school-community relations, instructional leadership and school culture development, professional development, and supervision and evaluation.

The vocational school teacher performance can be assessed through measures of instruction planning, instructional execution, instructional evaluation, instructional management, vocational guidance, vocational student organization, school-community relations, and professional development.

3.2. Relationships between variables

3.2.1. Effects of ISO Quality Management Principles on School Administrator and Teacher

Research findings on the effects of ISO 9001:2008 on vocational school administrator and teacher performances in Indonesia are very limited, and in fact, national studies on them are even none. My national study will be pioneering one and it is hoped to provide inputs to stakeholders in vocational education at the national, provincial, district, and school levels.

There are, however, researches which are conducted by scholars in other countries on ISO and TQM but do not directly address their effects on vocational school administrator and teacher performances. The research findings on the effects of ISO on organization performance are, however, still contradictive. For example, (Dale, van der Wiele, & van Iwaarden, 2007) claim that "TQM is one of the most powerful creators of sales and revenue growth, genuinely good new jobs, and soundly based and sustainable business expansion" (Dale et al., 2007, p. 3). Other researchers (Huarng & Chen, 2002) found that TQM has positive influence on work motivation of employees, improves employees' job satisfaction, reduce interest to job transfer, reduce cost and improve business performance, improve management performance, and improve human resource quality.

In Indonesia, there are limited researches on ISO and TQM, but they address only in small scale and are limited to the internalization of TQM application, implementation of TQM in higher

education institution, and none of them addresses the effects of ISO on vocational school administrator and teacher performance national. For example, Suryadi (2003) found that if TQM values were to be implemented in Atma Jaya University of Yogyakarta City in Indonesia, the majority of university administrators and faculties accepted them very well, but they lack of capacity if the university is going to implement TQM.

In short, there have been researches on ISO implementation in several organizations, but they found that the effects of ISO on organization performance are still mix. In addition, none of them addresses the effects of ISO on education organization performance, particularly on vocational education performance of school administrators and teachers.

Thus, the effect of ISO quality management principles on vocational school administrator and teacher performance is assessed by testing the following hypotheses, which is also presented graphically in Figure 3-3

H01: ISO 9001:2008 has no effect on vocational school administrator performance.

H02: ISO 9001:2008 has no effect on vocational school teacher performance.

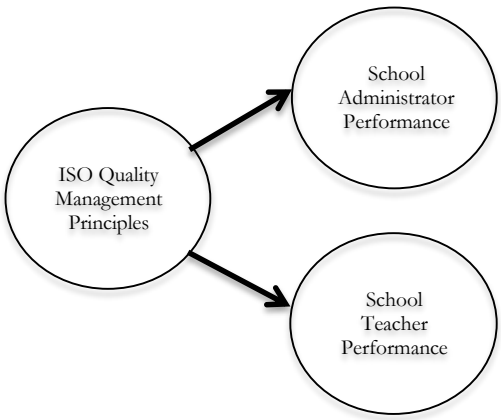


Figure 3-3: Effect of ISO 9001 on Performances of School Human Resources

3.2.2. Effects of Administrator Performance on Teacher Performance

Based on the administrator performance dimensions defined in the literature review, an administrator engage and communicates with the teachers by implementing policies, managerial actions, leadership styles, etc. Most of these interactions involve teachers to perform their job. Thus, the effect of vocational school administrator on teacher performance is assessed by testing the following hypotheses, which is also presented graphically in Figure 3-4.

H03: Vocational school administrator performance has no effect on vocational school teacher performance.

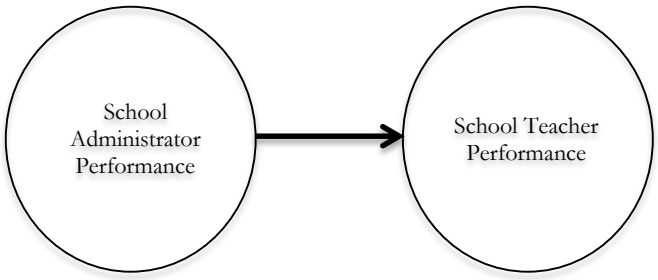


Figure 3-4: Effect of Administrator Performance on Teacher Performance

3.2.3. Effects of Quality Management Principles on Quality Culture

In order to implement new management practice (e.g. ISO 9000, total quality management, Malcolm Baldrige), changes in organization's culture is necessary (Deming, 1986; Lakhe & Mohanty, 1994) because it will affect the employees' value and beliefs (Nahm, Vonderembse, & Koufteros, 2004; Ngowi, 2000) which then affects activities, attitudes, behaviors (Elçi, Ki, & Ertürk, 2007). However, the organizational people may respond the changes by showing supportive or resistant behaviors and attitudes (Lamm & Gordon, 2010). Grumdahl (2010) states that changes in organizational culture can affect policy, decisions, and behaviors. According to (Carlsson &

Carlsson, 1996), implementing ISO involves communication and exchanges of information which result in changes of organization culture.

The individuals' responses toward organization changes are due to the important role of value in driving and motivating individual's commitment, decision and action (Kouzes & Posner, 2003; Sullivan, Sullivan, & Buffton, 2001). However, individuals and organization may have different values. It is also possible that organization or individuals have not well clarified their values. The leader plays important role to clarify, align and share value between individuals and organization because aligning and sharing values between individuals and organization result in significant positive attitude and work performance (Evans & Lindsay, 2008; Hutchins, 1997; Kouzes & Posner, 2003). Thus, the effect of ISO quality management principles on quality culture is assessed by testing the following hypothesis, which is presented graphically in Figure 3-5.

H04: ISO 9001:2008 has no effects on quality culture.

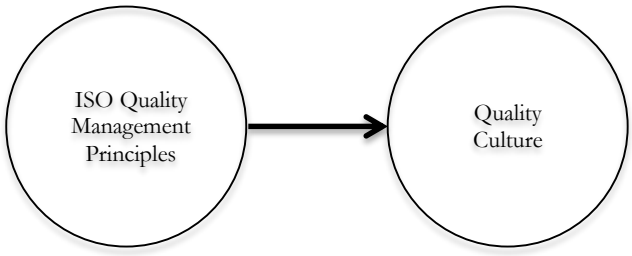


Figure 3-5: Effect of ISO 9001 on Quality Culture

3.2.4. Effects of Quality Culture on School Administrator and Teacher Performances

Quality management principles implementation does not directly affect individual job performance. Stashevsky and Elizur (2000) show that applying quality management principles and

participate in decision making lead to improvement effort which then affects individual job performance.

Kaynak (2003) includes leadership, training, employee management, information and analysis, supplier management, process management, customer focus, and continuous improvement as total quality practices. Total quality practices that include almost all of the ISO quality management principles are positively related to employee performance (Kaynak, 2003). However, total quality practices do not directly affect the employee performance. According to Kaynak (2003), total quality practices create quality culture that motivates the employee to improve their performance.

Although it may not be as clear as how culture can affect quality, culture plays an important role in shaping quality today (Arnold & Holler, 1995). Culture is recognized as one of the important factors to improve organization performance. As Sashkin and Kiser (1993) claim that, if organizations implement the aforementioned eight culture elements, their organization performance will improve. In fact, when United States of America was under the administration of President George Bush, he implemented TQM at Federal Government, but he reminded us that, to achieve TQM successfully requires "the establishment of cultural shift within an organization aimed at making the new culture more participative" (F. L. Lewis & (U.S.), 1991). Although he did not explicitly mention quality culture and only mentioned new culture, he implicitly advocated quality culture as an important factor in TQM.

The influence of culture on organization performance is recognized by International Labor Office and Asian Productivity Organization (Prokopenko & North, 1997) as follows:

> Productivity culture, as a core philosophy of an organization, shapes behaviors, values and patterns of work. It sets the goals of a company as generating more value from available resources, serving customers' needs, developing harmonious working relationships between

> management and labor, and sharing the fruits of productivity improvement fairly with customers, workers, managers and investors. Its ultimate objective is to improve the quality of working life and the quality of life itself.

The above quotation clearly informs any organization including vocational school, that culture is not only important for an organization, but it is part of organization life and in fact, it is the soul of organization. Wilkins and Ouchi (1983) state that organizational culture has significant effect on overall organizational performances. Thus, culture is able to direct and influence organization performance, including vocational school, where school administrator and teacher performance is part of it. Elçi et al. (2007) confirm that quality culture is positively associated with job performance.

R. G. Lewis and Smith (1994) even offer steps to transform the existing culture into quality culture as follows: changes in system and structures, actions, roles, behaviors, attitudes, norms, values, and finally to quality culture. Elçi et al. (2007) confirm that quality culture is positively associated with job performance.

Although the above readings do not specifically address the effects of ISO on vocational school administrator and teacher performances, they provide lessons learned and directions that, quality culture may affect organization performance, including vocational school performance, where administrator and teacher performance is part of it. Thus, the effect of quality culture on vocational school administrator and teacher performance is assessed by testing the following hypotheses which are presented graphically in Figure 3-6.

H05: Quality culture has no effects on vocational school administrator performance.

H06: Quality culture has no effects on vocational school teacher performance.

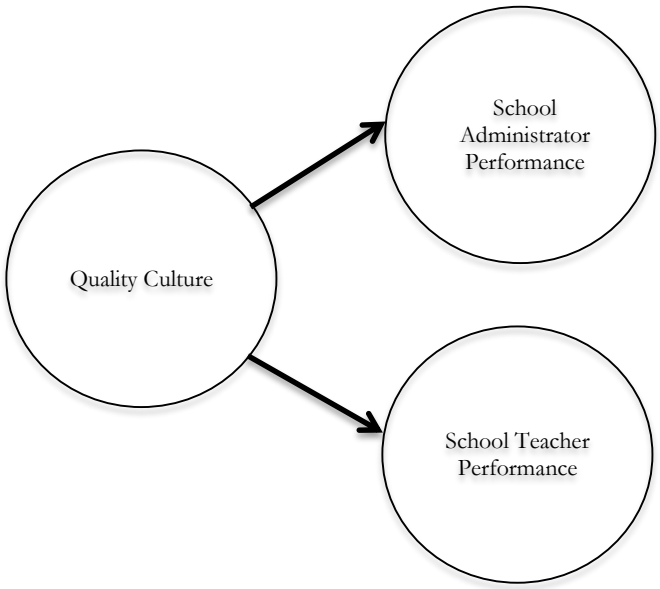


Figure 3-6: Effect of Quality Culture on Vocational School Human Resources

3.3. Research Hypotheses

Based on review of related literatures, the main research question: "Does ISO 9001:2008 implementation have effects on the performances of vocational school administrators and teacher?" can be answered by testing the following six hypotheses as follows:

1. ISO 9001:2008 has no effect on vocational school administrator performance.
2. ISO 9001:2008 has no effect on vocational school teacher performance.
3. Vocational school administrator performance has no effect on vocational school teacher performance
4. ISO 9001:2008 has no effect on quality culture
5. Quality culture has no effect on vocational school administrator performance.
6. Quality culture has no effect on vocational school teacher performance.

All of these hypotheses can be presented in Figure 3-7.

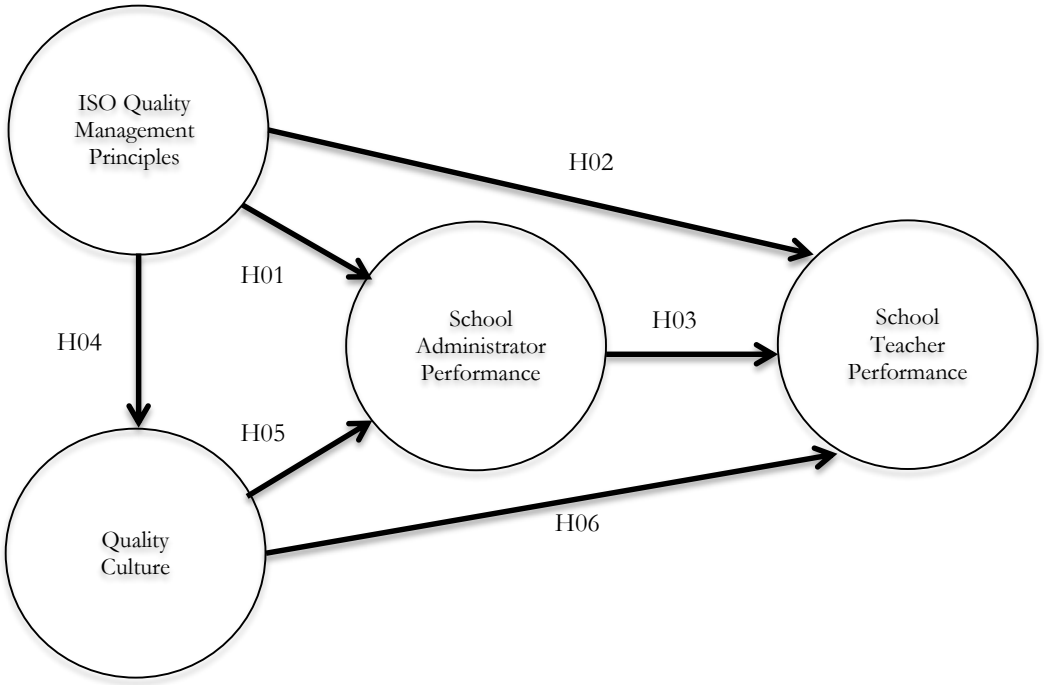


Figure 3-7: Conceptual Model

CHAPTER 4: RESEARCH METHODOLOGY

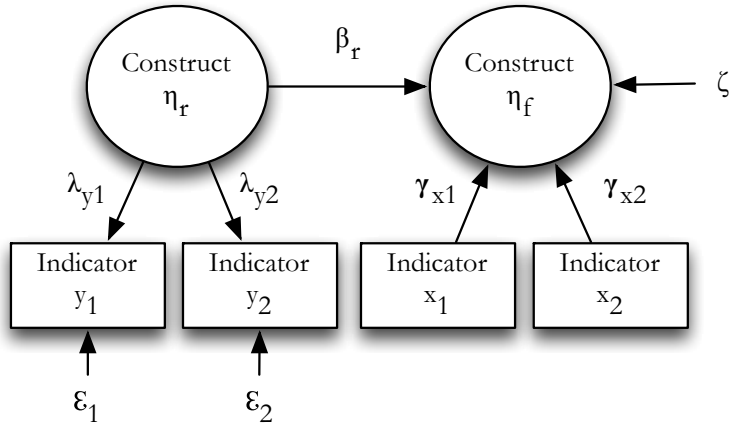
The conceptual model developed in chapter three needs to be assessed in order to evaluate the hypothesized relationships between the different constructs; ISO, Quality Culture, Performances of Vocational Administrator and Teacher. Structural equation modeling was selected to assess these relationships. This chapter presents the use of structural equation modeling in this study in assessing the hypothesized relationships between the different constructs; ISO, Quality Culture, Performances of Vocational Administrator and Teacher.

4.1. Model Specification

The conceptual model, consisting of interrelated latent variables or constructs that need to be examined, can be illustrated graphically by a path diagram. Since the constructs cannot be measured directly, a measurement model for each of the constructs need to be developed in order to measure the constructs. Thus, path diagram consists of two models, the structural model, which describes the relationships between the constructs, and the measurement models, which describes the relationships between the constructs and their indicators.

There are two different types of measurement models in terms of the relationship between the constructs and their indicators. These two measurement types consist of reflective and formative measurement models. In a reflective model, the construct causes the indicators (Diamantopoulos & Winklhofer, 2001) and explains the indicators (Fornell & Bookstein, 1982). In addition, the indicators are highly correlated (Chin, 1998), and mutually interchangeable (Jarvis, MacKenzie, & Podsakoff, 2003). Whereas in a formative model, the indicators influence the construct (Diamantopoulos & Winklhofer, 2001) meaning that each of the indicators has different dimensions

to form a construct (Fornell & Bookstein, 1982). Thus, these indicators are not mutually interchangeable (Jarvis et al., 2003). It is important to specify the type of the measurement model because it will affect the model estimations. Figure 4-1 illustrates these two different types of measurements in a structural model. In structural model, the circle, square, and arrows represent the construct, indicator, and sequential relationship, respectively.



(a) Reflective model (b) Formative model

Figure 4-1: Reflective and Formative in a Structural Model

In Figure 4-1 (a), the relationship between the construct and the indicator is reflective. The construct explains the indicators. Whereas in Figure 4-1(b), the relationship between the construct is formative. The indicators influence the construct. These model can also be written differently in mathematical terms as the following equations.

$$y_1 = \lambda_{y1}\, \eta_r + \varepsilon_1 \quad (1)$$

$$y_2 = \lambda_{y2}\, \eta_r + \varepsilon_2 \quad (2)$$

$$\eta_f = \eta_r\, \beta_r + \gamma_{x1}\, x_1 + \gamma_{x2}\, x_2 + \zeta \quad (3)$$

where:

y_i is indicator of endogenous variable i in reflective model

λ_{yi} is the loadings of indicator y_i in reflective model

η_r is the latent construct variable r scores or values in reflective model

ε_I is the measurement error of indicator i in reflective model

x_i is indicator of endogenous variable I in formative model

γ_{xi} is the weights of indicator x_i in formative model

η_f is the latent construct variable f scores or values in formative model

ζ is the measurement error of construct η_f in formative model

β is the path coefficient

In general these equations can also be written as the following equations.

$$y_{i,r} = \lambda_{y,r}\, \eta_r + \epsilon_{i,r} \quad (4)$$

$$\eta_f = \Sigma\, \eta_r\, \beta_r + \Sigma\, \Upsilon_{xif}\, x_{if} + \zeta_f \quad (5)$$

A structural model can contain two layers of constructs instead of one layer. A complex model that involves higher-order model can be established in PLS-SEM. The overall structural

model can have different combinations of reflective and formative relationships which can be shown in the following figure. Involving higher-order model enables the researcher to reduce the collinearity issues and the number of relationship in a structural model and, and solve discriminant validity (Ringle, Jr., Hult, & Sarstedt, 2013).

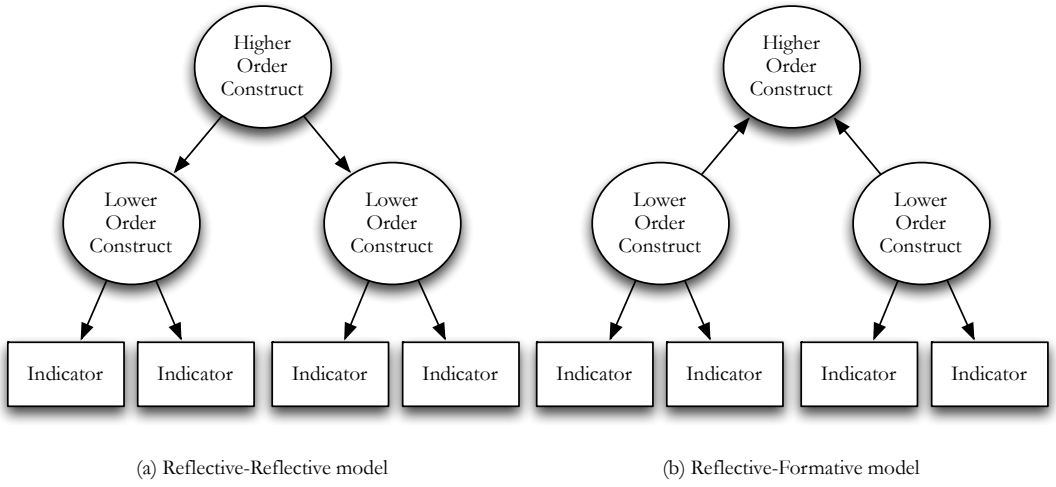


Figure 4-2: Hierarchical Construct Model

In model (a) of Figure 4-2, the relationship between the higher order construct and the lower order construct, and the relationship between the lower order constructs and their indicators are both reflective. It means that the higher order construct explains two lower order constructs; and the lower order constructs explains their indicators. Whereas in model (b), the relationship between the higher order construct and the lower order construct, and the relationship between the lower order constructs and their indicators are formative and reflective, respectively. It means that the lower order constructs explain the higher order construct and the indicators.

In this study, the constructs are measured by variables that cannot be measured directly. Thus, there is need to consider to use hierarchical construct model to examine the conceptual model. Based on the variables and hypothesis defined in chapter three, the hierarchical construct model can be specified in Figure 4-3.

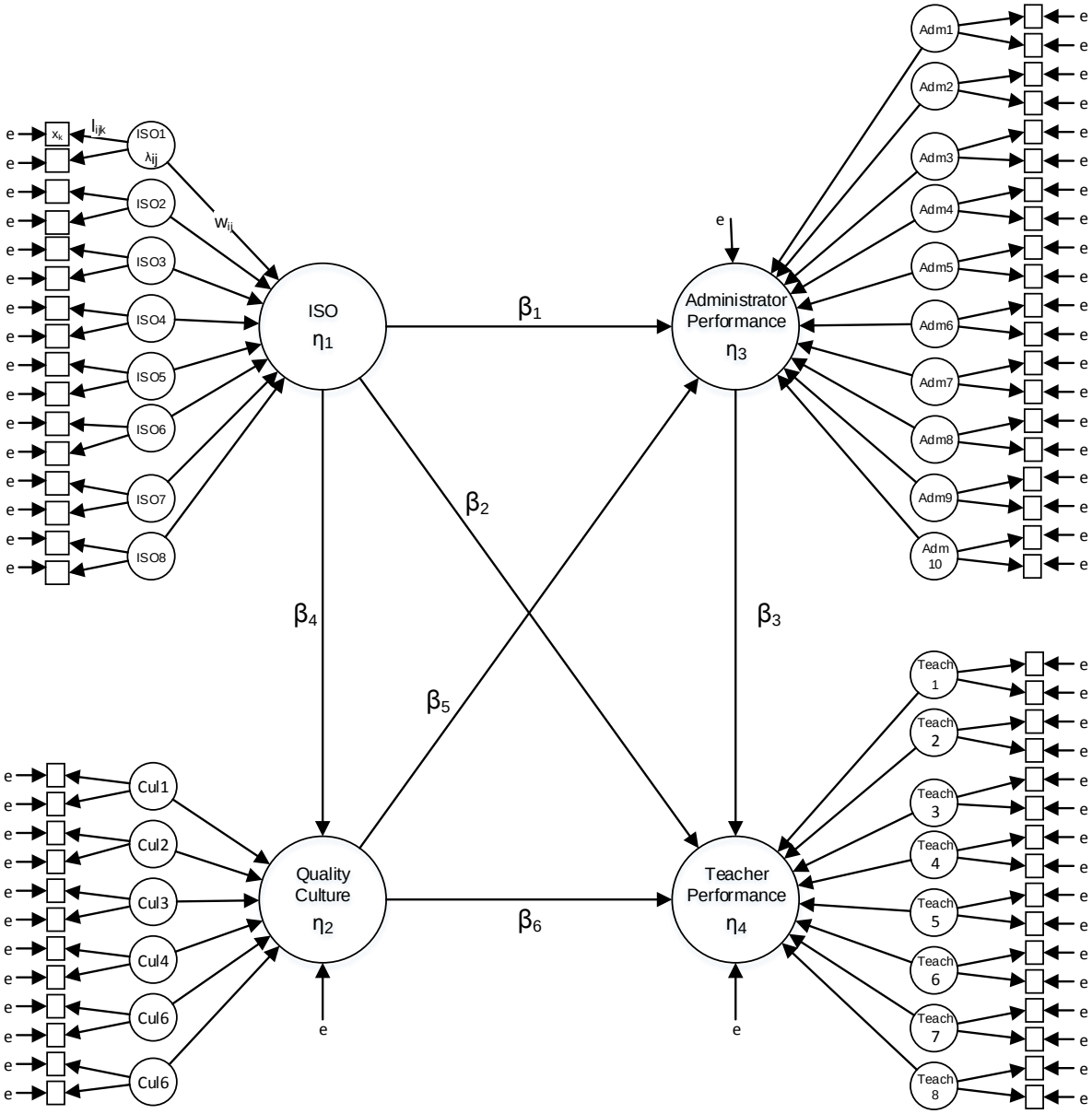


Figure 4-3: Hierarchical Order Model

In this hierarchical model, ISO, quality culture, administrator and teacher performance, represented by the big circle, serve as the higher order constructs (HOCs). Each of these constructs is explained by the lower order constructs (LOCs) which represented by the small circles. Each of the lower order construct (LOC) is manifested by the indicators, represented by the rectangular. These indicators have values obtained from the questionnaires.

The strength of relationship between high order constructs is indicated by path coefficient (β). The relationship between the higher order construct and the lower construct is measured by the outer weights (w). The relationship between the lower constructs and their indicators is measured by the outer loadings (l). ISO, quality culture, administrator and teacher performances are explained by eight, six, ten, and eight lower constructs, respectively, in formative relationship. These relationships can also be written in mathematical mode as follows.

$$x_{ijk} = \lambda_{ij}\, l_{jk} + e_{ijk} \quad (6)$$

$$\eta_i = \lambda_{ij}\, w_{ij} + e_i \quad (7)$$

$$\eta_2 = \eta_1\, \beta_4 + e_2 \quad (8)$$

$$\eta_3 = \eta_1\, \beta_1 + \eta_2\, \beta_5 + e_3 \quad (9)$$

$$\eta_3 = \eta_1\, \beta_2 + \eta_2\, \beta_6 + \eta_3\, \beta_3 + e_4 \quad (10)$$

where:

x_{ijk} is the variable value of an indicator k of construct i and lower construct j

λ_{ij} is the variable value of lower construct j of construct i

η_i is the variable value of construct i

l_{jk} is the outer loading for indicator k of construct i and lower lower construct j

w_{ij} is the outer weight of lower construct j of construct i

β is the relationship strength between constructs

e is the measurement error

Both of the higher and lower constructs can be seen in the Table 4-1. Furthermore, each of these lower constructs are measured by indicators or measurement items represented by the data collected from the questionnaires. The questionnaire can be seen in Appendix C.

4.2. Measurement Items

This study uses four types of research instruments (Table 4-1). The first research instrument (ISO) is adapted from International Organization of Standardization (2011f). The second research instrument (quality culture) is adapted from R. G. Lewis and Smith (1994). The third research instrument (administrator performance) is adapted mainly from the National Center for Research in Vocational Education, USA (Ohio State Univ, 1983) with slightly modified and combined with instrument developed by the Indonesian Ministry of Education and Culture. The fourth research instrument (teacher performance) is adapted from the National Center for Research in Vocational Education (Ohio State Univ, 1983) with slightly modified and combined with instrument developed by the Indonesian Ministry of Education and Culture.

A five-point Likert scale is used for the scoring system for all of the constructs. The higher rating indicates the higher degree of knowledge and the extent of implementation perceived by the respondents. The number of items for each sub-variable can be seen in Table 4-1. A total of 133 measurement items are used to measure the construct. The details of measurement items for each sub-variable can be seen in Appendix A.

4.3. Data Collection

Data was collected by using questionnaires that consist of four parts of data. These four parts of data include ISO, quality culture, administrator performance, and teacher performance. First, questionnaires of ISO data will be collected from teachers or vice school administrators who are responsible for managing the ISO document. Second, questionnaires of quality culture data will be collected from teachers. Third, questionnaires of administrator performance data will be collected administrators. Fourth, questionnaires of teacher performance data will be collected from the same teachers who answer part three of the questionnaires. All of the questionnaires measure the respondents' perception of the extent of knowledge and implementation of the constructs (ISO, quality culture; performances of administrator and teacher).

Table 4-1: Research Instrument Summary

No	Higher and Lower Constructs	Code	Number of Items	References
1	ISO 9001: 2008: a. Customer Focus b. Leadership c. Involvement of People d. Process Approach e. System Approach to Management f. Continual Improvement g. Factual Approach to Decision Making h. Mutually Beneficial Supplier Relationships Total	 ISO1 ISO2 ISO3 ISO4 ISO5 ISO6 ISO7 ISO8	 4 4 3 4 4 3 3 3 28	International Organization of Standardization (2011f)
2	Quality Culture: a. Environment b. Products and services c. Methods d. People e. Organizational structure f. Total quality mindset Total	 Cul1 Cul2 Cul3 Cul4 Cul5 Cul6	 6 3 6 6 4 12 37	R. G. Lewis and Smith (1994)
3.	Administrator Performance:			

No	Higher and Lower Constructs	Code	Number of Items	References
	a. School Development Planning	Adm1	4	Ohio State
	b. Instructional Management	Adm2	4	Univ (1983)
	c. Personnel Management	Adm3	5	
	d. Student Management	Adm4	4	
	e. School Facility Management	Adm5	3	
	f. Financial Management	Adm6	3	
	g. School-Community Relations	Adm7	3	
	h. Instructional Lead. & School Cult. Dev.	Adm8	3	
	i. Professional Development	Adm9	2	
	j. Supervision/Monitoring and Evaluation	Adm10	2	
	Total		33	
4.	Teacher Performance:			
	a. Instructional Planning	Teach1	4	
	b. Instructional Execution	Teach2	8	
	c. Instructional Evaluation	Teach3	3	
	d. Instructional Management	Teach4	4	Ohio State
	e. Vocational Guidance	Teach5	4	Univ, 1983)
	f. Vocational Student Organization	Teach6	5	
	g. School-Community Relations	Teach7	5	
	h. Professional Development	Teach8	2	
	Total		35	

4.3.1. Population and Sample

The target population of this research is vocational schools in Indonesia that have been implementing ISO 9001. The total number of vocational schools in Indonesia is 10640 (Kejuruan, 2013). However, not all of them have been implementing ISO. Nevertheless, there are 295 WCS that can be certainly identified to have ISO certification. In order to increase the response rate, more ISO-certified vocational schools were invited participate the survey. Simple random sampling method was employed to select the sample. A total of 503 vocational schools were invited to participate the survey.

4.3.2. Source of Data

The researcher obtained data from both primary and secondary sources. The respondents who participated in this survey were the administrators and the teachers who work at vocational schools that had obtained ISO 9001 certification. Thus, these respondents are the primary sources of the data. The secondary source of data that were used to search and verify the ISO-certified vocational schools was retrieved from the website (Kejuruan, 2013) managed by the Indonesian government. Whereas the identity of the respondents can be verified from other Indonesian government website that can be seen publicly (Menengah, 2013).

4.4. Data Analysis

Based on the research questions to be answered and research design already made, structural equation modeling will be used as the main data analysis developed by Pedhazur (1997), Tabachnick and Fidell (2007) and Hair, Black, Babin, Anderson, and Tatham (2010). Structural equation modeling (SEM) can be used to study direct and indirect effects of a variable by incorporating correlation method.

There are two types of SEM that can be used to estimate the relationship between constructs. The first type of SEM is based on covariance approach than can estimate the model parameters by minimizing the difference between the estimated and sample covariance matrices (Ringle et al., 2013). The second type of SEM is based on variance approach that can estimate the path relationships by minimizing the error terms or maximizing the variance explained values of the endogenous constructs (Ringle et al., 2013). The type of SEM that was used to examine the theoretical model of this study is Partial Least Squares (PLS) Structural Equation Modeling (SEM).

4.4.1. Structural Equation Modeling

Structural equation modeling is suitable to test this study's research hypotheses because it is able to examine multiple interrelated dependence or subsequent relationships simultaneously and to incorporate variables that cannot be directly measured (Hair et al., 2010). It also allows dependent variable in a relationship becomes an independent variable in other relationship.

In this study, there are more than one hypotheses that can be interrelated. Each of these hypotheses involves theoretical concept or hypothetical factor that can be represented in many dimensions. It requires multiple indicators to represent this concept or factor. Thus, there is a latent variable or construct, a variable that cannot be measured directly, and an observed variable, a variable that can be measured directly.

According to Hair et al. (2010) the measurement error can be reduced if a latent variable is measured by multiple questions or observed variables. In addition, the relationship estimation can be measured more precisely and accurately because the measurement error is incorporated in the analysis.

4.4.2. Partial Least Squares Structural Equation Modeling

4.4.2.1. Model Characteristic

The conceptual model presented in **Error! Reference source not found.** is recursive which means that there is no circular relationship between the constructs or latent variables. This model characteristic satisfies the requirement of PLS-SEM algorithm (Ringle et al., 2013). This model involves 4 main constructs with maximum of 10 sub-constructs per construct, and a maximum of 13 measurement indicators per sub-construct. Thus, it can be considered as a complex model. In addition, this model also involves both reflective and formative relationships. The relationship

between the construct and the sub-constructs is formative. Whereas the relationship between the sub-construct and the measurement indicators is reflective. Thus, this type of model is incorporated with higher order model which can be illustrated in Figure 4-4 below.

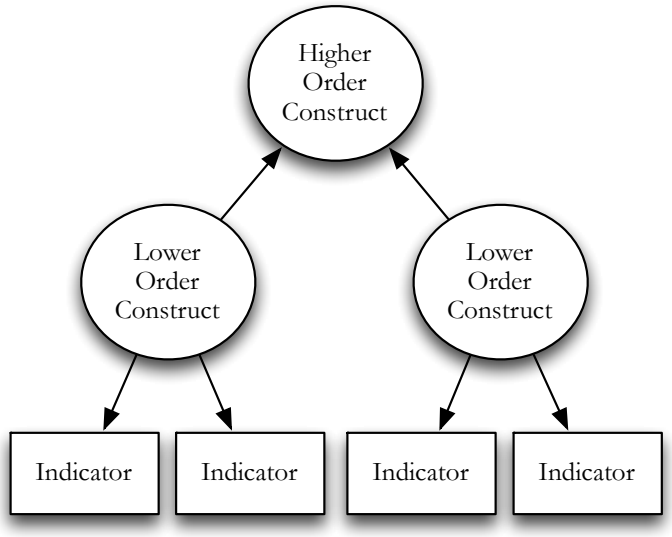


Figure 4-4: Reflective-formative model

Hierarchical component model is a structural model that involves more than one layer of constructs (Ringle et al., 2013). Thus, it consists of higher order component and lower order component. The relationship between the higher order constructs and the lower order constructs has the same analogue as the relationship between latent variables and measurement variables. Thus, it can have reflective or formative model. The overall structural model can have different combinations of reflective and formative relationships. As the structural model of this study is characterized with reflective-formative type, a two-stage approach is suggested to be applied to evaluate the structural model (Becker, Klein, & Wetzels, 2012; Ciavolino & Nitti, 2013; Ringle et al., 2013). At the first stage, the latent variables values (latent construct scores) of the lower order

components are estimated using repeated indicator approach. Secondly, these values can be used as the measurement values for the higher order components. This approach is illustrated in Figure 4-5.

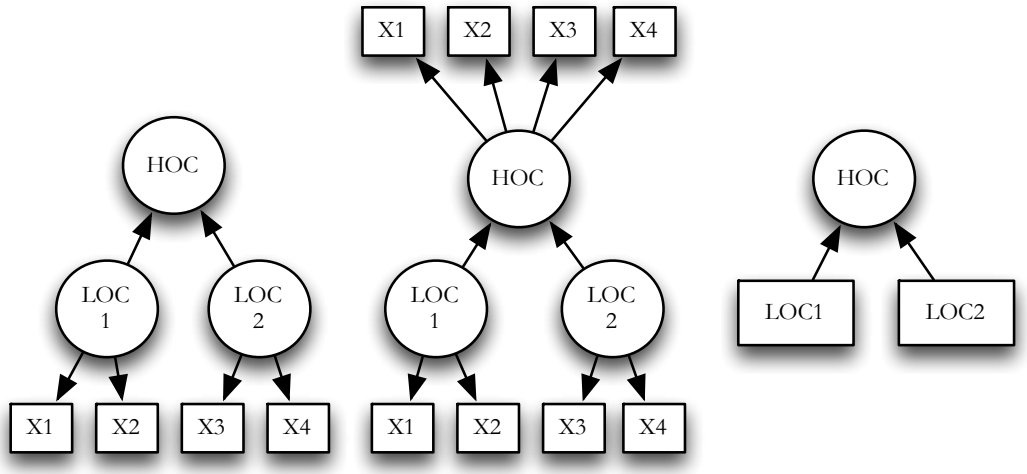


Figure 4-5: Two-stage Approach Model (adapted from Ciavolino and Nitti (2013); Ringle et al. (2013))

4.4.2.2. Data Characteristics

The Partial Least Squares Structural Equation Modeling was particularly used to examine the theoretical model of this study because of its robustness to small sample size and/or non-normally distributed data and its ability to examine complex structural model (Ringle et al., 2013). PLS-SEM allows smaller number of sample size than covariance based-SEM. The recommended minimum sample size is 10 times the highest number of indicators in a single formative construct or 10 time the highest number pointing to a construct in a structural model (Barclay, Higgins, & Thompson, 1995).

Statistical power analysis can be used to determine whether the sample size provides adequate statistical power given the desired effect size and significance level (Faul, Erdfelder, Buchner, & Lang, 2009). Ideally, the samples size should provide statistical power of 80%. Since PLS-SEM analysis is based on ordinary least squares regression, the sample size can be determined using the power analysis provided by Cohen (1992).

4.4.2.3. Model Estimation

PLS-SEM algorithm starts by estimating the latent construct scores obtained from a set of direct linear combination relationships consisting of weights and loadings for formative model and reflective model, respectively (Fornell & Bookstein, 1982; Ringle et al., 2013). Then, the latent constructs scores are used in Ordinary Least Squares (OLS) regression to estimate the path relationship coefficients (β), which are the relationship between the constructs, and coefficient of determination (R^2), which are the percentage variance explained, by using bootstrapping method, a repeated randomly subsampling with replacement (Ringle et al., 2013), is used to estimate the outer weights and t-values statistics. The higher the path coefficient, the higher the effect of predictor variables (latent construct) on the explained variables (latent construct). The significance of path coefficients is examined by the associated t-value statistics. The path coefficient is considered to be significant if the associated t-value is higher than 1.96 at significance level of 5%. The SmartPLS software (Ringle, Wende, & Will, 2005) is used to perform PLS-SEM analyses and estimate the parameters in the PLS model.

4.4.2.4. Reliability and Validity

The main PLS-SEM evaluation consists of measurement and structural model assessments. The purpose of measurement model assessment is to ensure that the indicators accurately and significantly measure the construct by examining its reliability and validity (Aibinu & Al-Lawati, 2010; Hair et al., 2010). According to Ringle et al. (2013), reliability is a measure of which the data are consistent or close to each other. Whereas, validity is a measure of which the reliable data accurately predict the true target. Thus, data need to be reliable before assessing validity. The measurement model which depicts the relationship between the indicators and the lower order construct is evaluated differently between the reflective and the formative measurement models. Thus, the reliability and validity assessment between reflective and formative model are evaluated differently.

A reflective model evaluation is evaluated by assessing the internal consistency reliability, indicator reliability, convergent validity, and discriminant validity. Internal consistency (ϱ_c) is a reliability measure of which the indicators provide consistency of results on the same test (Ringle et al., 2013). According to Ringle et al. (2013), internal consistency can be calculated using the following formula:

$$\rho_c = \frac{(\sum_i l_i)^2}{(\sum_i l_i)^2 + \sum_i var(e)} \quad (11)$$

$$var(e) = 1 - (l_i)^2 \quad (12)$$

where:

ρ_c is the internal consistency reliability

l_i is the standardized outer loading of indicator *i* internal consistency reliability

$var(e)$ is the variance of the measurement error internal consistency reliability

Internal consistency values between 0.7 and 0.9 are considered to provide satisfactory reliability (Nunnally, 2010). The outer loading is estimated trough regression of indicator on its corresponding construct.

Convergent validity measures "the extent to which a measure correlates positively with alternative measures of the same construct" (Ringle et al., 2013). It can be evaluated by assessing the outer loading, average variance extracted (AVE) and correlation between variables. The average variance extracted is the average of the sum of the squared loadings which can be written in the following equation.

$$\text{AVE}_j = \frac{\sum_i^n l_{ij}^2}{n} \tag{13}$$

where:

AVE_j is the average construct extracted of construct j

l_{ij} is the loading of indicator i in construct j

n is the number of loadings

A latent construct is considered to explain significant variance of its associated indicators if the latent construct and its associated indicators share at least 50% of the variance or outer loading of 0.708 (the square root of 50%). An indicator that has outer loading between 0.4 and and 0.7 can

still be included in the model if the deletion of the indicator does not increase the AVE and composite reliability. An AVE of at least 0.5 is considered to have at least half variance explained by the construct. Discriminant validity measures the extent to which a construct does not belong to other constructs by using the Fornel-Larcker criterion. The square root of the construct's AVE needs to be higher than the highest correlation with other constructs.

A formative measurement model is evaluated by assessing collinearity among the indicators and the significance and relevance of outer weight. The collinearity indicates high correlation between two indicators. It means that there are redundant indicators that measure the construct. If there are redundant indicators, these indicators need to be removed from the model until there is no redundant indicator. The outer weight, like the outer loading, is estimated trough regression of indicator on its corresponding construct. According to Ringle et al. (2013), the outer weight is considered to be significant to measure the construct if the corresponding t-statistics is higher than 1.96 at significance level 0.5. If the outer weight is not significant but the outer loading is higher than 0.5, the indicator can still be included in the model. Moreover, if the outer loading is below 0.5 and significant, the indicator can still be included in the model.

The structural model which depicts the relationship between the higher order constructs is evaluated by assessing the size and significance of path coefficient (β), coefficient of determination (R^2), and the relevance significance relationships. The path coefficient is considered to be significant if the corresponded t-statistics is higher than 1.96 at significance level 0.5. The coefficient of determination (R^2) represents the percentage of variance explained, which has range from 0 and 1. The overview of PLS-SEM steps can be depicted in Figure 4-6.

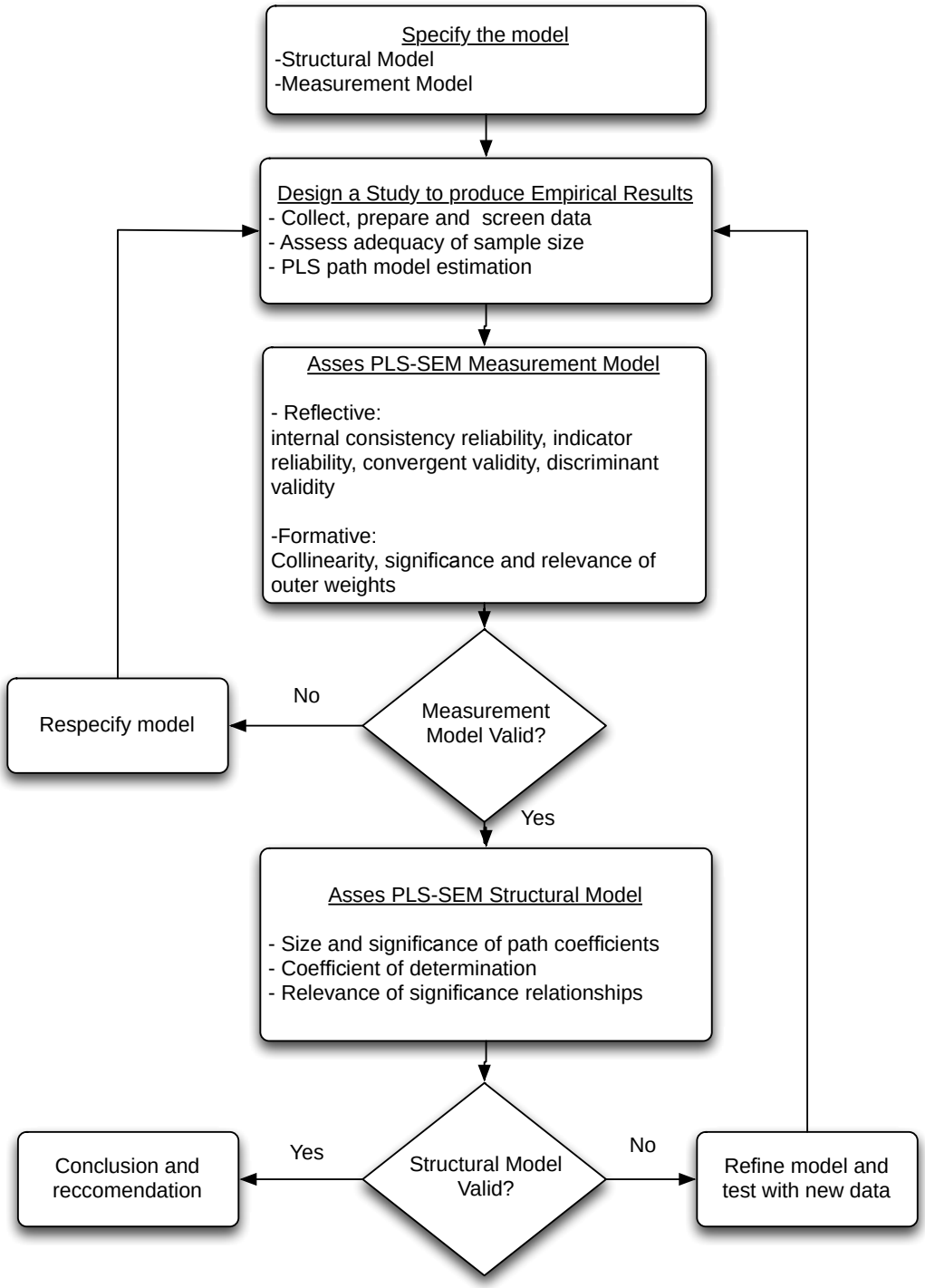


Figure 4-6: Partial Least Squares Structural Equation Modeling Steps (adapted from Hair et al. (2010), Kline (2010), and(Ringle et al., 2013))

4.5. Rationale of Methodology

A conceptual model was developed based on the literature review, research questions, and hypotheses. This conceptual model needs to be converted and derived into unobservable latent variables or constructs and indicators, which are linked by a set of hypotheses which can be represented graphically by a path diagram (Diamantopoulos, 1994; Haenlein & Kaplan, 2004; Pedhazur, 1997).

In order to investigate the effect of ISO quality management principles implementation on the performance of the administrator and the teacher, each of these variables need to be measured by conducting quantitative data collection method and survey were conducted. Questionnaires have been developed to measure the extent of the implementation of the constructs (ISO quality management principles, quality culture, performances of the administrator and teachers).The questionnaires rely on self-reported survey based performance measurement. A five-point Likert scale, ranging from (1) weakest level of implementation to (5) strongest level of implementation, is used for the scoring system for all of the measurement items or indicators.

Data analysis is conducted by applying Partial Least Squares (PLS) method of Structural Equation Modeling (SEM) in order to investigate the relationships between these constructs. PLS-SEM is employed to examine the effects of ISO on administrator performance, the effects of ISO on teacher performance, the effects of quality culture on administrator performance, and the effects of quality culture on teacher performance.

CHAPTER 5: RESULTS AND DISCUSSIONS

The primary focus of this chapter is to address the research hypotheses developed in Chapter 3. This Chapter provides the results and discussions of the data analysis by incorporating the survey data to examine the hypotheses relationships as presented at the end of Chapter 3 and using the Partial Least Squares methodology presented in Chapter 4. The first stage of this method, the model specification, is already presented in Chapter 4. Second, the data collected from the survey are used as indicators to measure the constructs (ISO, quality culture; performances of administrator and teacher).

Partial least square consists of two main assessments which include measurement and structural measurements. First, the data need to reliable and valid to measure the latent variables or constructs (ISO, quality culture; performances of the administrator and teacher). Once the measurement model is valid, the structural model, which illustrates the hypotheses relationships, can be examined. This last assessment provides answer whether the relationships between constructs are significant or not.

5.1. Data Characteristics

5.1.1. Descriptive Statistics of the Survey Data

Partial least squares does not require the data be normally distributed. However, it is important to verify that the data is not extremely far from normally distributed because it influences the parameter estimations in structural equation model. The data characteristics can be measured by the mean, standard deviation, skewness and kurtosis in order to identify the distributional form. Appendix C provides the description statistics of indicators for each of the indicators.

All of the ISO indicators show that the skewness are between -1 and 1. It means that the data is approximately symmetric, which satisfies one of normal distribution requirements. Most of the indicators show that the kurtosis are between -1 and 1, suggesting that the distribution are not too flat and peaked, respectively. However, there are 11 indicators indicated by the bold font on Appendix C which have kurtosis above 1. The maximum kurtosis is 2.882 which means that the distribution is too peak. However, the kurtosis values are not far away from 1. Thus the data can still be used for the next analysis.

As for the quality culture, almost all of the indicators have skewness between -1 and 1, which indicate that they have symmetric distribution. However there are 10 indicators that show kurtosis above 1. The maximum kurtosis value is 2.383 which is not far from 1. This data can still be used for the next analysis.

The descriptive statistics for indicators of the administrator and teacher performances conclude the same result analysis that the data are not extremely far from normal distribution. Thus, the data can still be used for the next analysis.

5.1.2. Sample Size

The minimum number of sample size can be determine using the ten times rule (Barclay et al., 1995) and power analysis Cohen (1992) . The maximum number of formative indicators to measure a construct in the structural model is 10, which is indicated by the number of sub-variables in Quality Culture (Table 4-1). Whereas the maximum number of structural paths directed to particular construct is 12 (10 sub-variables and 2 structural paths from ISO and quality culture), which is indicated by the administrator performance construct (Figure 4-3 and Table 4-1). Thus, the minimum sample size is 120 (10 multiplied by 12). The total number of vocational schools in

Indonesia is 10640 (Kejuruan, 2013). Meanwhile, this study obtained 187 samples out of 503 (response rate of 37.1%) invited samples, but only 178 samples are usable and valid. The level of missing data of the 178 valid samples is less than 5% per indicator. Since the percentage of missing values is relatively small, it is suggested that the missing values are replaced by the mean (Ringle et al., 2013). According to the ten times rule (Barclay et al., 1995), the number of valid samples (178 samples) is roughly adequate to be the sample size because it exceeds the minimum sample size (120 samples).

Statistical power analysis can be used to determine whether the sample size provides adequate statistical power given the desired effect size and significance level (Faul et al., 2009). Ideally, the samples size should provide statistical power of 80%. Since PLS-SEM analysis is based on ordinary least squares regression, the sample size can be determined using the power analysis provided by Cohen (1992). Proportion of variance explained R^2 value higher than 0.2 is considered to have adequate explanation (Ringle et al., 2013). In this study, in order to detect minimum the proportion of variance explained R^2 value of 0.1 for significance level of 5% given the maximum number of paths directed to particular construct of 12, the minimum sample size requirement is 103 which already satisfied by the number of samples (178 sample) collected in this study.

5.2. Model Assessment

A final purpose of model assessment is to find out the significant relationships between constructs (ISO, quality culture, the performances of administrator and teacher). The first step of the model assessment is to examine the measurement model. This assessment determines whether the indicators (data from questionnaires) can be included in the model to measure the lower order

constructs (eight ISO principles, six dimensions of quality culture, ten measures of administrator performances, and .eight measures of teacher performances).

The next assessment is to determine the dimensions (lower order constructs) of the higher order constructs (ISO, quality culture, and the performances of administrator and teacher) that can be included in the model. In other words, this assessment finds out which part of ISO, quality culture, and performances of administrator that are significant and important to measure those constructs. The last model assessment is to measure the significant relationships between constructs to test the hypotheses developed in Chapter 3.

5.2.1. Measurement Model Assessment

Measurement model is examined by assessing the reliability and validity in order to ensure that the indicators accurately and significantly measures the construct (Aibinu & Al-Lawati, 2010; Hair et al., 2010). The purpose of this assessment is to determine whether the indicators can still be included in the model. Since the model comprises of two layers of construct, the reliability and validity of the lower order construct need to be assessed. Then, the latent construct scores obtained from lower order construct by running the software can be used to assess the higher order construct.

5.2.1.1. Reflective Model Reliability and Validity

The lower order construct (LOC) has been characterized to have reflective model. Thus, the assessment of this model consists of internal consistency reliability, indicator reliability, convergent validity, and discriminant validity.

An initial PLS-SEM software execution of the model produces outer loadings, indicator reliability, composite reliability, average variance extracted, and correlations between lower order constructs (LOCs). All of the indicators have outer loading values of at least 0.707. It indicates that the indicators provide consistency of results on the same test. However, there are two indicators, student placement service (one of the measurement indicators of Student Management in Administrator Performance) and feeling of belong (one of the measurement indicators of People in Quality Culture) that have outer loading values lower than 0.707. Table 5-1 shows the decision is made to remove indicators from the model.

Table 5-1: Indicator Deletion Decision

Indicator	Construct	Composite Reliability		Average Variance Extracted		Decision
		Before deletion	After deletion	Before deletion	After deletion	
Student Placement Service	Student Management – Administrator's Performance	0.8401	0.8425	0.5691	0.6414	Delete indicator
Feeling of belong	People – Quality Culture	0.8828	0.8858	0.5587	0.6414	Delete indicator

These two indicators have outer loadings 0.6813 and 0.6306, respectively, which are both lower than 0.707. The deletion of one of indicators of student placement service (Adm4) increases both the composite reliability from 0.8401 to 0.8425 and the average variance extracted from 0.5691 to 0.6414. The deletion of one of indicators of belong feeling (Cul1) increases both the composite reliability from 0.8828 to 0.8858 and the average variance extracted from 0.5587 to 0.6414. Thus, these indicators are deleted to meet a minimum indicator reliability of 0.5. All of the AVE and the composite reliability are above 0.5 and 0.7, respectively. Thus, the criteria of internal consistency and

convergent validity are satisfied. In other words, the indicators provide consistency of results on the same test.

The next assessment is to measure the Discriminant Validity. Discriminant validity measures the extent to which a construct does not belong to other constructs by using the Fornel-Larcker criterion. The square root of the construct's AVE needs to be higher than the highest correlation with other constructs. Table 5-2, Table 5-3, Table 5-4, and Table 5-5 show the discriminant validity using Fornell-Larcker criterion for lower order construct (LOC) administrator performance, quality culture, ISO, and teacher performance, respectively. The numbers in bold font represent the square root of average variance extracted (AVE), whereas other numbers represent the correlation between LOCs.

In summary, the Fornell-Lacker criterion analysis shows that the square root of the LOC's AVE are higher than the highest correlation with other LOCs. Thus, the discriminant validity requirement is satisfied. In other words, the proposed dimensions (lower order constructs) of the constructs do not belong to other constructs. Thus, there are no redundant variables that measure other constructs. Hence, these dimensions of the constructs are retained in the model for further analysis.

Table 5-2: Fornell-Larcker Criterion for LOC of Administrator Performance

Construct	Adm1	Adm2	Adm3	Adm4	Adm5	Adm6	Adm7	Adm8	Adm9	Adm10
Adm1	**0.7806**									
Adm2	0.7244	**0.7732**								
Adm3	0.6907	0.7325	**0.7619**							
Adm4	0.6220	0.6115	0.6160	**0.8010**						
Adm5	0.5602	0.5537	0.6111	0.4744	**0.8408**					
Adm6	0.6748	0.6009	0.6715	0.5595	0.5979	**0.8501**				
Adm7	0.6209	0.5876	0.5804	0.4310	0.5023	0.5444	**0.7673**			
Adm8	0.6237	0.6070	0.6793	0.6505	0.5122	0.5997	0.5577	**0.8278**		
Adm9	0.6019	0.5732	0.6504	0.5703	0.4768	0.5524	0.5536	0.6626	**0.9142**	
Adm10	0.5931	0.5308	0.6039	0.5081	0.5029	0.5519	0.4670	0.5402	0.6239	**0.9523**

Construct	Adm1	Adm2	Adm3	Adm4	Adm5	Adm6	Adm7	Adm8	Adm9	Adm10
Cul1	0.3729	0.2611	0.3327	0.2516	0.2955	0.2935	0.3383	0.1948	0.2178	0.1991
Cul2	0.2956	0.2401	0.2718	0.2220	0.3376	0.2601	0.3184	0.2171	0.2449	0.3209
Cul3	0.2976	0.2766	0.3272	0.2433	0.3082	0.2424	0.2851	0.3034	0.2547	0.2710
Cul4	0.4431	0.3092	0.3435	0.2345	0.3915	0.3544	0.3744	0.2514	0.2486	0.2884
Cul5	0.3035	0.2330	0.2725	0.1619	0.3265	0.2302	0.2835	0.1470	0.2077	0.1454
Cul6	0.3918	0.2846	0.3295	0.2628	0.3745	0.2944	0.3580	0.2814	0.2746	0.3005
ISO	0.4140	0.3560	0.3326	0.2372	0.3447	0.3349	0.3746	0.2723	0.2885	0.2221
ISO1	0.4191	0.3169	0.3389	0.2621	0.3464	0.3128	0.3802	0.3214	0.3120	0.2902
ISO2	0.4094	0.3238	0.3019	0.2124	0.3257	0.3355	0.3836	0.2423	0.3262	0.2419
ISO3	0.2886	0.2955	0.2601	0.1721	0.2552	0.2869	0.2844	0.2269	0.1955	0.1554
ISO4	0.3474	0.3338	0.2745	0.2177	0.2722	0.2648	0.2791	0.2227	0.2120	0.1520
ISO5	0.3540	0.3086	0.2784	0.2136	0.3029	0.2810	0.3321	0.2161	0.2325	0.1650
ISO6	0.3679	0.2800	0.2729	0.1981	0.2700	0.3434	0.2958	0.1934	0.2435	0.1496
ISO7	0.3165	0.2583	0.2897	0.1818	0.3127	0.2670	0.2852	0.2284	0.2302	0.2041
ISO8	0.2793	0.2852	0.2304	0.1287	0.2439	0.1804	0.2821	0.1835	0.1837	0.1330
Teach1	0.3721	0.3172	0.3474	0.2956	0.2722	0.3605	0.3280	0.3185	0.2891	0.3085
Teach2	0.4258	0.3059	0.3354	0.2988	0.3082	0.3648	0.3792	0.3283	0.3278	0.3251
Teach3	0.2631	0.2995	0.3652	0.2892	0.2967	0.2930	0.3188	0.2624	0.2912	0.2730
Teach4	0.4137	0.3249	0.3677	0.2302	0.3801	0.4108	0.3957	0.2894	0.3467	0.3323
Teach5	0.3446	0.2982	0.3296	0.2681	0.3009	0.2714	0.3923	0.2733	0.3162	0.2956
Teach6	0.3513	0.2775	0.2839	0.2389	0.3026	0.3986	0.3752	0.2230	0.2933	0.2537
Teach7	0.2394	0.2089	0.2153	0.1647	0.2237	0.2040	0.3309	0.2204	0.2261	0.1700
Teach8	0.3321	0.2465	0.2367	0.2483	0.2704	0.2911	0.2364	0.1940	0.2095	0.2322

The Fornell-Lacker criterion analysis in Table 5-2 shows that the square root of the average variance extracted (indicated by the bold font) of the lower order construct of administrator are higher than the highest correlation with ISO, quality culture, and teacher performance. These lower order constructs are not suitable to measure other constructs. Thus, the dimensions of administrators' performance consisting of school development planning, instructional management, personnel management, school facility management, school-community relations, instructional leadership, professional development, Supervision and Evaluation are distinct from other dimensions in that they do not belong to other dimensions (lower order constructs). Thus, the results support conclusion that there is adequate discriminant validity between constructs.

Table 5-3: Fornell-Larcker Criterion for LOC of Quality Culture

Construct	Cul1	Cul2	Cul3	Cul4	Cul5	Cul6
Cul1	**0.7799**					
Cul2	0.6047	**0.8452**				
Cul3	0.6822	0.6797	**0.7755**			
Cul4	0.7276	0.6439	0.6914	**0.7752**		
Cul5	0.6566	0.5349	0.6488	0.7286	**0.8112**	
Cul6	0.7077	0.6434	0.7583	0.7568	0.7276	**0.7206**
ISO	0.6062	0.4489	0.6077	0.6071	0.5539	0.6078
ISO1	0.5199	0.4408	0.5227	0.5610	0.4522	0.5485
ISO2	0.5347	0.3806	0.5015	0.5459	0.4816	0.5139
ISO3	0.4933	0.2921	0.4353	0.4086	0.4397	0.4551
ISO4	0.5351	0.3687	0.5462	0.5343	0.4854	0.5343
ISO5	0.5405	0.3906	0.5491	0.5437	0.5195	0.5272
ISO6	0.4093	0.2755	0.3960	0.4462	0.4689	0.4570
ISO7	0.5427	0.4856	0.5833	0.5301	0.4657	0.5503
ISO8	0.5296	0.4017	0.5782	0.5190	0.4355	0.5292
Teach1	0.4337	0.3551	0.4132	0.4696	0.5190	0.4859
Teach2	0.5248	0.4457	0.5116	0.5452	0.4797	0.5495
Teach3	0.4816	0.4103	0.4686	0.5126	0.4016	0.4663
Teach4	0.5004	0.3950	0.4252	0.5081	0.4835	0.5047
Teach5	0.5340	0.4333	0.5064	0.5389	0.5269	0.5414
Teach6	0.4380	0.3956	0.3610	0.4209	0.3017	0.4041
Teach7	0.4164	0.3842	0.4107	0.4412	0.3550	0.4022
Teach8	0.4323	0.4711	0.5006	0.5025	0.4231	0.4687

The Fornell-Lacker criterion analysis in Table 5-3 shows that the square root of the average variance extracted (indicated by the bold font) of the lower order construct of Quality Culture are higher than the highest correlation with ISO, and teacher performance. These lower order constructs are not suitable to measure other constructs. Thus, the dimensions of quality culture consisting of environment, products services, methods, people, organization structure and total quality are distinct from other dimensions in that they do not belong to other dimensions (lower

order constructs). The results support conclusion that there is adequate discriminant validity between constructs. Hence, the discriminant validity requirement is satisfied.

Table 5-4: Fornell-Lacker Criterion for LOC of ISO

Construct	ISO1	ISO2	ISO3	ISO4	ISO5	ISO6	ISO7	ISO8
ISO1	**0.8223**							
ISO2	0.7125	**0.8060**						
ISO3	0.6018	0.5995	**0.8555**					
ISO4	0.7026	0.7305	0.6513	**0.8250**				
ISO5	0.6573	0.7204	0.6378	0.8041	**0.8454**			
ISO6	0.6310	0.6961	0.6053	0.7102	0.6867	**0.8833**		
ISO7	0.6632	0.6378	0.5961	0.7503	0.7004	0.6600	**0.8308**	
ISO8	0.6571	0.6930	0.6299	0.7575	0.7061	0.6675	0.7285	**0.8803**
Teach1	0.4317	0.3795	0.3256	0.3820	0.3750	0.4076	0.3514	0.3229
Teach2	0.4940	0.4753	0.4004	0.4494	0.4565	0.4618	0.4793	0.4478
Teach3	0.4605	0.4291	0.3670	0.4419	0.4159	0.3908	0.4536	0.4707
Teach4	0.5274	0.5100	0.4706	0.4444	0.4873	0.4425	0.4311	0.4558
Teach5	0.4444	0.4140	0.4484	0.4639	0.4663	0.4229	0.4566	0.4450
Teach6	0.4022	0.4610	0.3935	0.3987	0.4226	0.4717	0.4004	0.4371
Teach7	0.3725	0.4058	0.3800	0.4010	0.4098	0.4046	0.4389	0.4459
Teach8	0.3213	0.3967	0.3508	0.3963	0.3531	0.3543	0.4488	0.4118

The Fornell-Lacker criterion analysis in Table 5-4 shows that the square root of the average variance extracted (indicated by the bold font) of the lower order construct of ISO are higher than the highest correlation with teacher performance. These lower order constructs are not suitable to measure other constructs. Hence, the dimensions of ISO consisting of customer focus, leadership,

people involvement, process approach, system approach, continual improvement, factual approach, and mutually beneficial supplier are distinct from other dimensions in that they do not belong to other dimensions (lower order constructs). Thus, the discriminant validity requirement is satisfied.

Table 5-5: Fornell Larcker Criterion for LOC of Teacher Performance

Construct	Teach1	Teach 2	Teach 3	Teach 4	Teach 5	Teach 6	Teach 7	Teach 8
Teach1	**0.8260**							
Teach2	0.6535	**0.7353**						
Teach3	0.6099	0.7125	**0.8106**					
Teach4	0.5888	0.7179	0.6786	**0.8287**				
Teach5	0.5996	0.6626	0.6393	0.6599	**0.7758**			
Teach6	0.4718	0.5131	0.5322	0.5880	0.6020	**0.8233**		
Teach7	0.3638	0.5204	0.4936	0.5375	0.5517	0.5368	**0.8244**	
Teach8	0.4662	0.5132	0.5319	0.5035	0.5296	0.5152	0.5887	**0.8547**

The Fornell-Lacker criterion analysis in Table 5-5 shows that the square root of the average variance extracted (indicated by the bold font) of the lower order construct of Teacher performance are higher than the highest correlation with its own other lower order constructs. These lower order constructs are not suitable to measure other constructs. Hence, the dimensions of teacher's performances instructional planning, instructional execution, instructional evaluation, instructional management, vocational guidance, vocational student organization, school-community relations, and professional development are distinct from other dimensions in that they do not belong to other dimensions (lower order constructs). Thus, the discriminant validity requirement is satisfied.

In summary, the reliability and validity of the lower order constructs (LOC) measurement model (reflective model) are satisfied which can be shown in the Table 5-6.

Table 5-6: Results Summary for Reflective Measurement Model

Lower Order Construct	Lowest Indicator Loadings	Lowest Indicator Reliability	AVE	Composite Reliability	Discriminant Validity
ISO1	0.8056	0.6490	0.6761	0.8930	Yes
ISO2	0.7698	0.5926	0.6497	0.8810	Yes
ISO3	0.8308	0.6902	0.7318	0.8911	Yes
ISO4	0.8082	0.6532	0.6807	0.8950	Yes
ISO5	0.8317	0.6917	0.7147	0.9092	Yes
ISO6	0.8582	0.7365	0.7803	0.9142	Yes
ISO7	0.7828	0.6128	0.6903	0.8697	Yes
ISO8	0.8788	0.7723	0.7749	0.9117	Yes
Cul1	0.7369	0.5430	0.6083	0.8856	Yes
Cul2	0.8116	0.6587	0.7143	0.8823	Yes
Cul3	0.7084	0.5018	0.6014	0.9003	Yes
Cul4	0.6721	0.4517	0.6010	0.9000	Yes
Cul5	0.7971	0.6354	0.6581	0.8850	Yes
Cul6	0.6477	0.4195	0.5193	0.9282	Yes
Adm1	0.7314	0.5349	0.6093	0.8615	Yes
Adm2	0.7302	0.5332	0.5978	0.8558	Yes
Adm3	0.7420	0.5506	0.5805	0.8737	Yes
Adm4	0.7329	0.5371	0.6416	0.8425	Yes
Adm5	0.8112	0.6580	0.7069	0.8785	Yes
Adm6	0.7767	0.6033	0.7227	0.8863	Yes
Adm7	0.7643	0.5842	0.5887	0.8111	Yes
Adm8	0.7821	0.6117	0.68520	0.8670	Yes
Adm9	0.9086	0.8256	0.8357	0.9105	Yes
Adm10	0.9513	0.9050	0.9068	0.9511	Yes
Teach1	0.7573	0.5735	0.6823	0.8954	Yes
Teach2	0.6648	0.4420	0.5407	0.9036	Yes
Teach3	0.7844	0.6153	0.6571	0.8517	Yes
Teach4	0.7665	0.5875	0.6867	0.8974	Yes
Teach5	0.7107	0.5051	0.6018	0.8575	Yes
Teach6	0.7147	0.5108	0.6779	0.9127	Yes
Teach7	0.7835	0.6139	0.6796	0.9137	Yes
Teach8	0.8268	0.6836	0.7305	0.8442	Yes

Thus, there no redundant dimensions (lower order constructs) that need to be removed from the model.

5.2.1.2. Formative Model Reliability and Validity

The next step after assessing the lower order construct (LOC) measurement model is to examine the higher order construct (HOC) measurement model. The higher order construct has been characterized to have formative model. Thus, the assessment of this model consists of collinearity assessment, significance and relevance outer weights. Collinearity indicates high correlation between two or more formative indicators (Ringle et al., 2013). It signifies that there are redundant indicators that measure the construct. Thus, it will influence the weights estimation and statistical significance in the structural model. Collinearity is measured by variance inflation factor (VIF), which indicates "the degree to which the standard error has been increased due to the presence of collinearity" (Ringle et al., 2013). The collinearity measure is calculated using Equation (14) as follows.

$$VIF = \frac{1}{(1-R^2)} \quad (14)$$

where:

VIF is the variance inflation factor

R^2 is the percentage of variance explained

The variance inflation factor (VIF) needs to be below 5 in order to avoid the collinearity issue. This value indicates that 80% of the variance is explained by other indicators that measure the

same construct. Table 5-7 shows the results of variance inflation factor (VIF) for the lower order constructs. All of the variance inflation factor (VIF) are below 5, which indicate that there is no collinearity issue. In other word, these constructs do not have same information from one to another. Thus, these constructs can be included in the structural model.

Table 5-7: Collinearity Assessment in Measurement Model

ISO			Quality Culture			Administrator Performance			Teacher Performance		
Indicators	R^2	VIF	Indicators	R^2	VIF	Indicators	R^2	VIF	Indicators	R^2	VIF
ISO1	0.614	2.591	Cul1	0.62	2.632	Adm1	0.674	3.067	Teach1	0.517	2.07
ISO2	0.671	3.04	Cul2	0.534	2.146	Adm2	0.65	2.857	Teach2	0.663	2.967
ISO3	0.517	2.07	Cul3	0.665	2.985	Adm3	0.697	3.3	Teach3	0.611	2.571
ISO4	0.766	4.274	Cul4	0.699	3.322	Adm4	0.542	2.183	Teach4	0.632	2.717
ISO5	0.71	3.448	Cul5	0.617	2.611	Adm5	0.467	1.876	Teach5	0.601	2.506
ISO6	0.613	2.584	Cul6	0.719	3.559	Adm6	0.583	2.398	Teach6	0.478	1.916
ISO7	0.674	3.067				Adm7	0.491	1.965	Teach7	0.481	1.927
ISO8	0.517	2.07				Adm8	0.614	2.591	Teach8	0.461	1.855
						Adm9	0.585	2.41			
						Adm10	0.499	1.996			

In formative model, the construct is built from the combination of indicator scores and the corresponded weights in linear relationships (Ringle et al., 2013). Thus, the outer weights need to be significant in order to explain the relationship between the construct and the corresponded indicators. Bootstrapping method, a repeated randomly subsampling with replacement (Ringle et al., 2013), is used to estimate the outer weights and t-values statistics. It is suggested that the process of subsampling be at least 5,000 times. An indicator is deleted from the model if its outer weight and the outer loading are not significant, indicated by the t-value lower than 1.96 at significant level 0.05. Table 5-8 and Table 5-9 provide the outer weight and outer loading significance tests, respectively.

Table 5-8: Outer Weight Significance Test

Relationship between the indicator and the construct	Outer Weight (w)	Standard Error (STERR)	t-values (|w/STERR|)	Significance test t- values > 1.96
ISO1 -> ISO	0.3404	0.1405	2.4233	Keep indicator
ISO2 -> ISO	0.2933	0.1231	2.3817	Keep indicator
ISO3 -> ISO	0.0897	0.1161	0.7728	Further analysis
ISO4 -> ISO	-0.1073	0.1543	0.6953	Further analysis
ISO5 -> ISO	0.2113	0.1469	1.4384	Further analysis
ISO6 -> ISO	0.0308	0.1373	0.2241	Further analysis
ISO7 -> ISO	0.2647	0.1467	1.8041	Further analysis
ISO8 -> ISO	0.0408	0.1573	0.2592	Further analysis
Cul1 -> Culture	0.269	0.1317	2.0421	Further analysis
Cul2 -> Culture	0.0641	0.105	0.6105	Further analysis
Cul3 -> Culture	0.1057	0.1577	0.6701	Further analysis
Cul4 -> Culture	0.3825	0.1512	2.5303	Keep indicator
Cul5 -> Culture	0.0505	0.145	0.3487	Further analysis
Cul6 -> Culture	0.2609	0.1656	1.5758	Further analysis
Adm1 -> Administrator Perf.	0.5175	0.21	2.4643	Keep indicator
Adm2 -> Administrator Perf.	-0.1418	0.1919	0.739	Further analysis
Adm3 -> Administrator Perf.	0.0678	0.2283	0.2971	Further analysis
Adm4 -> Administrator Perf.	-0.0329	0.1968	0.167	Further analysis
Adm5 -> Administrator Perf.	0.2834	0.1373	2.0646	Keep indicator
Adm6 -> Administrator Perf.	0.1258	0.2064	0.6096	Further analysis
Adm7 -> Administrator Perf.	0.3871	0.1592	2.4307	Keep indicator
Adm8 -> Administrator Perf.	-0.1329	0.2097	0.6337	Further analysis
Adm9 -> Administrator Perf.	0.0633	0.1754	0.3609	Further analysis
Adm10 -> Administrator Perf.	0.0181	0.1817	0.0998	Further analysis
Teach1 -> Teacher Perf.	0.1052	0.1035	1.0161	Further analysis
Teach2 -> Teacher Perf.	0.2959	0.13	2.2765	Keep indicator
Teach3 -> Teacher Perf.	-0.0102	0.151	0.0678	Further analysis
Teach4 -> Teacher Perf.	0.2488	0.136	1.829	Further analysis
Teach5 -> Teacher Perf.	0.2024	0.1263	1.6023	Further analysis
Teach6 -> Teacher Perf.	0.1328	0.1512	0.8786	Further analysis
Teach7 -> Teacher Perf.	0.0701	0.1402	0.5	Further analysis
Teach8 -> Teacher Perf.	0.1932	0.129	1.4975	Further analysis

Based on the results of the outer weight significance test in Table 5-8, there are only six indicators or lower order constructs (ISO1: Customer Focus, ISO2: Leadership, Cul4: People, Adm1: School Development Planning, Adm5: Personnel Management, and Teach2:Instructional Execution) that provide significance relationship with their corresponded constructs. Thus, these indicators are included in the model. An illustration of the results of outer weight significance test can also be seen in Figure 5-1 (the fade color indicates non significance).

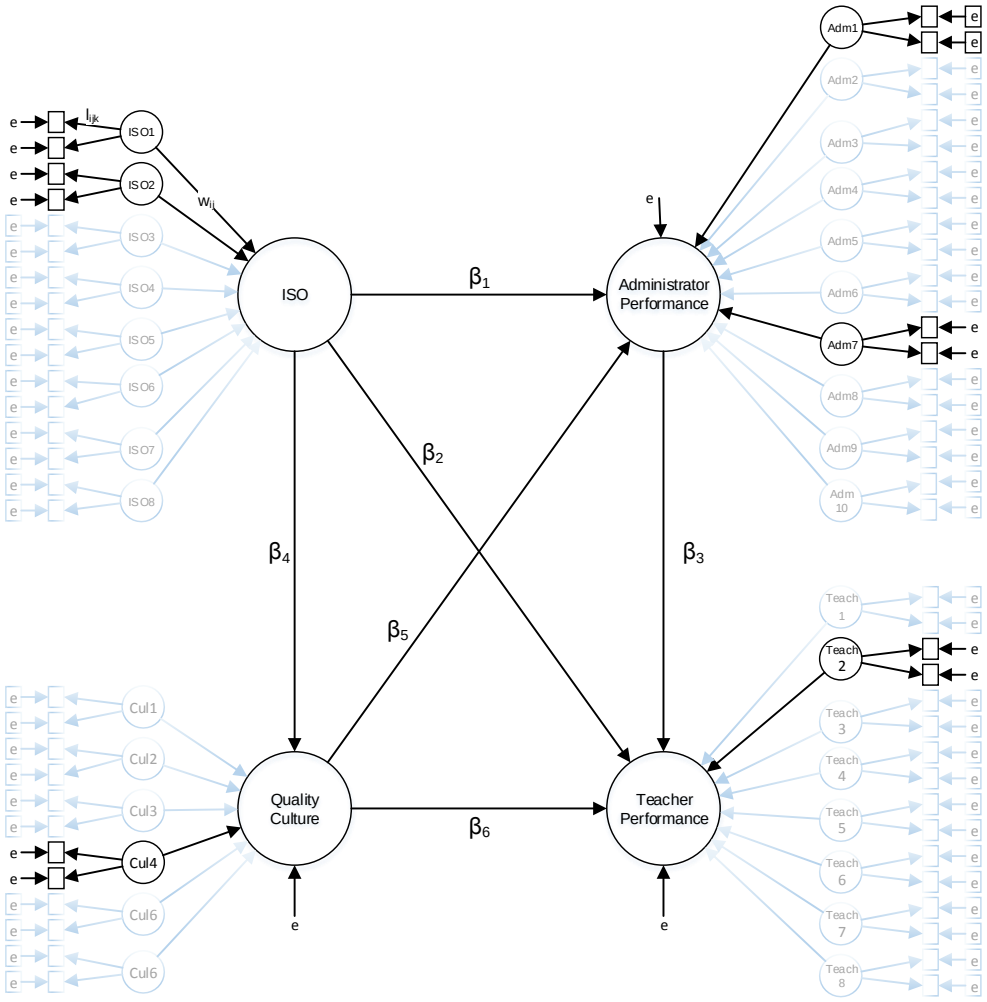


Figure 5-1: Significance of the Measurement Model

Based on the illustration in the Figure 5-1, the level of ISO implementation is only positive significantly affected by the knowledge and implementation of Customer Focus and Leadership. The quality culture is positive significantly affected by People. The vocational school administrator has significant performances in School Development Planning and Personnel Management. The teacher has significant performances in Instructional Execution.

The other dimensions (lower order constructs) that do not have significant outer weight indicated by t-values lower than 1.96 (t-statistics value at significance level 0.05) still need further analysis (outer loading significance test) whether these indicators can still be included in the model or not. The results of the next analysis, the outer loading significance test, can be seen in Table 5-9.

Table 5-9: Outer Loading Significance Test

Relationship between the indicator and the construct	Outer Loading (*l*)	Standard Error (STERR)	t-values (|*l*/STERR|)	Significance test t- values > 1.96
ISO1 -> ISO	0.8886	0.0497	17.873	Keep indicator
ISO2 -> ISO	0.8819	0.0498	17.6938	Keep indicator
ISO3 -> ISO	0.7373	0.0779	9.4687	Keep indicator
ISO4 -> ISO	0.8257	0.0562	14.6921	Keep indicator
ISO5 -> ISO	0.8525	0.0558	15.2663	Keep indicator
ISO6 -> ISO	0.7748	0.078	9.9385	Keep indicator
ISO7 -> ISO	0.8484	0.0538	15.7789	Keep indicator
ISO8 -> ISO	0.8054	0.0663	12.1423	Keep indicator
Cul1 -> Culture	0.876	0.0465	18.8316	Keep indicator
Cul2 -> Culture	0.7398	0.0661	11.1993	Keep indicator
Cul3 -> Culture	0.8279	0.0631	13.1191	Keep indicator
Cul4 -> Culture	0.9269	0.0389	23.8366	Keep indicator
Cul5 -> Culture	0.7986	0.067	11.9208	Keep indicator
Cul6 -> Culture	0.8989	0.0431	20.8389	Keep indicator
Adm1 -> Administrator Perf.	0.8912	0.0665	13.4056	Keep indicator
Adm2 -> Administrator Perf.	0.6879	0.0934	7.3639	Keep indicator
Adm3 -> Administrator Perf.	0.7453	0.0997	7.4747	Keep indicator
Adm4 -> Administrator Perf.	0.5747	0.1164	4.9363	Keep indicator
Adm5 -> Administrator Perf.	0.7616	0.0754	10.1045	Keep indicator
Adm6 -> Administrator Perf.	0.7625	0.0976	7.8154	Keep indicator
Adm7 -> Administrator Perf.	0.8306	0.0794	10.4549	Keep indicator
Adm8 -> Administrator Perf.	0.6167	0.1168	5.2794	Keep indicator
Adm9 -> Administrator Perf.	0.6611	0.0978	6.7604	Keep indicator
Adm10 -> Administrator Perf.	0.6345	0.1045	6.0723	Keep indicator
Teach1 -> Teacher Perf.	0.7384	0.0717	10.3037	Keep indicator
Teach2 -> Teacher Perf.	0.8739	0.0432	20.2367	Keep indicator
Teach3 -> Teacher Perf.	0.771	0.0677	11.3841	Keep indicator
Teach4 -> Teacher Perf.	0.8628	0.0562	15.3427	Keep indicator
Teach5 -> Teacher Perf.	0.8401	0.0571	14.7022	Keep indicator
Teach6 -> Teacher Perf.	0.7341	0.0747	9.8277	Keep indicator
Teach7 -> Teacher Perf.	0.6877	0.0875	7.859	Keep indicator
Teach8 -> Teacher Perf.	0.7308	0.0701	10.4195	Keep indicator

Based on the results of Table 5-9, all of the indicators in high order construct have outer loadings higher than 0.5 which indicates that all of the indicators can be included in the model. However, it means that the indicators that do not pass the outer weight significance test (Table 5-8) are not significant but they are still absolute important.

5.2.2. Structural Model Assessment

The next step after assessing the measurement model is to evaluate the final structural model. The purpose of this step is to evaluate the ability of the model to predict and the relationship between the constructs (Ringle et al., 2013). These evaluations include assessment collinearity of the structural model, the significance of the path coefficient (β), and the coefficient of determination (R^2), and the relevance of significance relationship.

5.2.2.1. Collinearity Assessment

The collinearity assessment starts by using the latent variables scores obtained from running SmartPLS software (Ringle et al., 2005). These latent variable scores are used to run multiple regressions with a set of predictor constructs as independent variables and any other latent variable, which does not serve as the dependent variable by using PLS-SEM software.

Table 5-10 shows the results of variance inflation factor (VIF) for the higher order constructs. Variance inflation factor is calculated using equation (14). It is obtained by regressing an exogenous variable with other exogenous variables that explain the same endogenous variable.

Table 5-10: Variance Inflation Factor Results of Structural Model

First Set			Second Set		
Construct	R^2	VIF	Construct	R^2	VIF
ISO	0.455	1.835	ISO	0.472	1.894
Culture	0.455	1.835	Culture	0.482	1.931
			Administrator Perf.	0.208	1.263

Table 5-10 consists of two set of variance inflation factor results because there are two endogenous variables (administrator and teacher performances) that are linked into more than one exogenous variables (ISO and Quality Culture). The path model shows that the performance of administrator is explained by ISO implementation and quality culture. Thus, two regression analyses are performed by first including ISO as dependent variable and Quality Culture as independent variable. Second, the regression analysis is performed by switching the ISO as independent variable and Quality Culture as dependent variable.

The path model show that administrator performance is explained by the ISO, Quality Culture and the performance of the administrator. Thus, three regression analyses are performed by including ISO as dependent variable; and Quality Culture and Administrator Performance as independent variables. Second, Quality Culture serves as dependent variable, and the rest serve as independent variables. Third, the Administrator performance serve dependent variable, and the rest serve as independent variables.

All of the variance inflation factor (VIF) are below 5, which indicate that there is no collinearity issue. In other words, these constructs do not have same information to measure the same variables. Therefore, there are no redundant constructs in the model. Thus, these constructs can be included in the structural model.

5.2.2.2. Structural Model Path Coefficient

The strengths of relationships between constructs are indicated by the path coefficients (β) which are obtained from examining multiple regressions using equation (6) through (10) The structural model that includes the path coefficients with their respective t-test statistics indicate that all of the paths show significant relationships as shown in the following figure. All of the t-test statistics are above 1.96 which is the statistics significance assessed at p-value < 0.05. In total, the six null hypothesized relationships were not supported by the data. In other words, all of the relationships have positive significant effects.

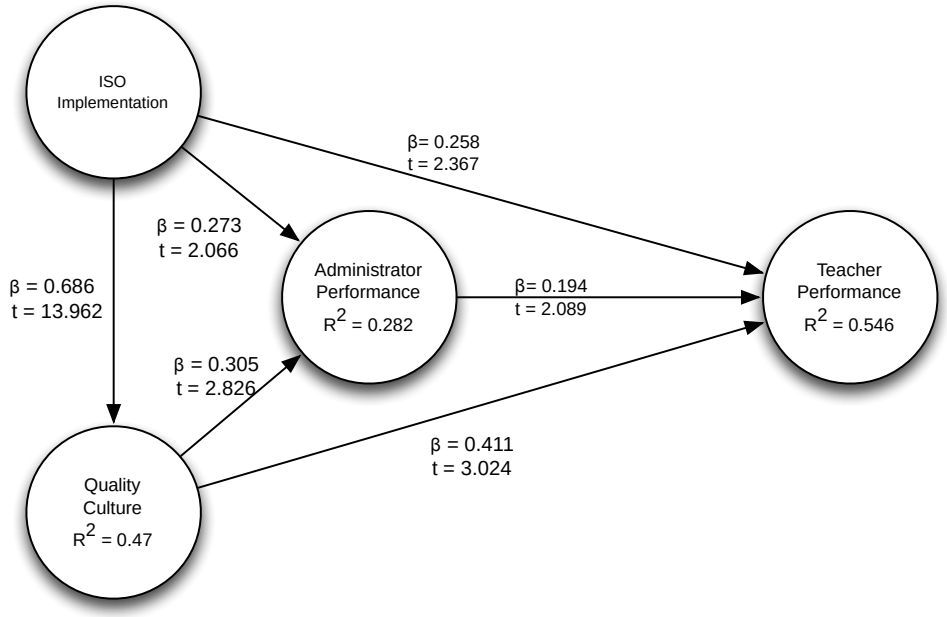


Figure 5-2: Path Diagram

Coefficient of determination (R^2) is another measure to evaluate structural model and predict the model accuracy. Thus, only endogenous constructs, constructs that are being explained, that

have coefficient determination (R^2). In this case, the constructs other than ISO (quality culture; performances of administrator and teacher) have coefficient of determinations (R^2). Coefficient of determination (R^2) of an endogenous construct signifies the proportion of variance explained by any exogenous construct linked to it. According to Ringle et al. (2013), the level coefficient of determination of 0.25, 0.5, and 0.75 can be categorized as weak, moderate, and substantial predictive accuracy, respectively. Forty percent of the variance of Quality Culture is explained by ISO implementation. Thus, ISO implementation can moderately predict the level of quality culture implementation. Whereas, about twenty eight percent of the variance of the administrator performance is explained by ISO implementation and quality culture. It means that the accuracy of implementation of ISO and quality culture to predict the performance of administrator is weak. Meanwhile, about almost fifty five percent of the variance of the teacher performance is explained by ISO implementation, quality culture, and administrators' performance. It signifies that ISO implementation, quality culture and administrators' performance are substantially accurate to predict the performance of the teacher.

Thus, ISO implementation has positive significant effects on the quality culture, the performances of administrator and teacher. The culture has positive significant effects on performances of the administrator and the teacher. The performance of administrator also has positive significant effects on the performance of the teacher.

5.2.2.3. Relevance of Significance Relationship

Relevance of significance relationship provides further analysis in understanding the importance of the constructs. It measures the extent to which the effects of construct relevant to other constructs. Thus, this analysis provides both direct and indirect effects evaluation. The sum of

these direct and indirect effect results in total effect. The direct effect is measured by the path coefficient. The indirect effect on an endogenous construct is calculated by summing the multiplication of the path coefficients that linked indirectly (Ringle et al., 2013).

$$E_{Ty} = E_{Dy} + E_{Iy} \quad (15)$$

where:

E_{Ty} is the total effect on endogenous construct y

E_{Dy} is the direct effect on endogenous construct y

E_{Iy} is the indirect effect on endogenous construct y

According to the path diagram in Figure 5-4, the indirect effect of ISO on the teacher performance can be examined from the indirect relationships ranging from ISO to Teacher's Performance:

1. ISO → Quality Culture →Administrators' Performance →Teacher's Performance
2. ISO→ Administrators' Performance →Teacher's Performance
3. ISO→Quality Culture→Teacher's Performance

Thus, the indirect effect of ISO on Teacher Performance is calculated the following

$$E_{ISO\text{-}Teacher} = \beta_{ISO\text{-}Culture}\,\beta_{Culture\text{-}Administrator}\,\beta_{administrator\text{-}Teacher} + \beta_{ISO\text{-}Administrator}\,\beta_{administrator\text{-}teacher} + \beta_{ISO\text{-}Culture}\,\beta_{Culture\text{-}Teacher}$$

$$= (0.686)(0.305)(0.194) +$$

(0.273)(0.194)+

(0.686)(0.411)

= 0.3756

Using the same procedures to calculate the indirect effect of ISO on teacher performance, the total effect of exogenous constructs on the endogenous constructs can be summarize in Table 5-11.

Table 5-11: Total Effects on Teacher Performance

CONSTRUCT	Direct Effect on Teacher Performance	Indirect Effect on Teacher Performance	Total Effect on Teacher Performance
ISO	0.258	0.3756	0.6336
Culture	0.411	0.0592	0.4702
Administrator Performance	0.1937	0	0.1937

Table 5-11 shows that the indirect effect of ISO on Teacher Performance (0.3756) is higher than the its direct effect (0.258). Thus, the mediators, quality culture and administrator performance, play important role in influencing the teacher performance. Quality culture has higher direct effect (0.411) on the teacher performance than its indirect effect (0.0592) because the administrator performance has weak influence (0.0592) on the performance level of the teacher. However, influencing the performance of administrator improve the performance of the teacher.

Table 5-12: Total Effects on Administrator Performance

CONSTRUCT	Direct Effect on Administrator Performance	Indirect Effect on Administrator Performance	Total Effect on Administrator Performance
ISO	0.2730	0.2089	0.4819
Culture	0.3051	0	0.3051

Table 5-12 shows that ISO has almost equal direct and indirect effects on the administrator performance. The impact of ISO on quality culture plays important role in influencing the administrator performance.

5.3. Summary of Results and Discussion

A conceptual model was developed to answer the main research question whether ISO 9001:2008 implementation has effect on the performances of vocational school administrator and teacher. The conceptual model, which illustrates the research hypotheses in this study, is examined by using Partial Least Squares Structural Equation Modeling because its ability to examine multiple interrelated dependence or subsequent relationships simultaneously. A survey has been conducted by using questionnaires to measure the level of ISO implementation, quality culture, the performances of administrator and teacher.

The results of data analysis show that ISO 9001 implementation has positive significant effect on quality culture and the performances of administrator and the teacher. Quality culture also has positive significant effect on the performance of the administrator and the teacher. The performance of the administrator also has significant effect on the performance of the teacher. Based on these results, these imply that ISO 9001 implementation has both direct and indirect effects on the performances of the vocational school administrator and teacher. In other words, the effect of ISO 9001 on the performances of administrator and teacher is partially mediated by quality culture. The effect of ISO 9001 on the performance of teacher is partially mediated by the quality culture and the performance of the administrator. As the understanding and the implementation of ISO 9001 increase, the quality culture implementation increases. In turn, quality culture improvement increases the performances of the administrator and the teacher.

Further analysis shows that only the customer focus and leadership of ISO 9001 principles are important and significant to measure ISO 9001 understanding and implementation The rest of the ISO 9001 principles (Involvement of People, Process Approach, System Approach to Management, Continual Improvement, Factual Approach to Decision Making, and Mutually Beneficial Supplier) are not significant but these principles are still important to understand and implement in order to affect more on the vocational school administrator and performance.

In Quality Culture, the dimension of People is the only one of the measures that is significant and important. Other dimensions (Environment, Products and Services, Methods, Organization Structure, and Total Quality Mindset) of the Quality Culture are not significant but these dimensions are still important to be included in the model to measure Quality Culture.

In the construct of Administrator Performance, the component of School Development Planning and the Personnel Management show significant effect to measure the performance of administrator. Other components (instructional management, school facility management, school-community relations, instructional leadership, professional development, Supervision and Evaluation) of the performance of administrator are not significant but these are also important to be included in the model to measure the performance of administrator.

In the construct of Teacher Performance, Instructional Execution is the only one significant component that measures the Teacher Performance. The rest of the Teacher performance measurements performances instructional planning, instructional evaluation, instructional management, vocational guidance, vocational student organization, school-community relations, and professional development are not significant but these are still important components to measure Teacher Performance.

In addition, the analysis of indirect effect shows that the inclusion of mediator (Quality Culture) can increase the effect of ISO 9001 on the performances on the administrator and teacher. Furthermore, the influence of ISO on the administrator also increases the performance of the teacher.

CHAPTER 6: CONCLUSIONS

This chapter presents the conclusion of this study that begins with the summary of this study, summarizes the results of this study and concludes the implication of ISO implementation on the performance of the vocational school administrator the teacher, contributions, recommendations, limitations and potential for future research.

6.1. Summary

The main objective of this study is to investigate the effects ISO 9001 quality management principles implementation on administrator and teacher performances in Indonesian vocational education. A conceptual model has been developed to evaluate the relationships. Questionnaire has been developed in order to measure the degree of relationship between constructs. Partial Least Square Structural Equation Modeling has been used to examine the conceptual model because its ability to multiple interrelated dependence or subsequent relationships simultaneously.

The measurement model assessment shows that only the customer focus and leadership of ISO 9001 principles are important and significant. The rest of the ISO 9001 principles (Involvement of People, Process Approach, System Approach to Management, Continual Improvement, Factual Approach to Decision Making, and Mutually Beneficial Supplier) are not significant but these are still absolutely important to be implemented. This assessment also shows that the only Quality Culture dimension that is significant and important measure is People. Other dimensions of Quality Culture are not significant but they are still important to be implemented. The component of School Development Planning and the Personnel Management show significant effect to measure the performance of administrator. Instructional Execution is the only one significant component that

measures the Teacher Performance. In summary, this assessment implies that the non-significant dimensions need to be improved in terms of the knowledge and the implementation.

The results of the study provide model supports for the conceptual model that links the ISO 9001:2008 implementation with quality culture, performances of administrator and teacher. Partial Least Squares Structural Equation Modeling shows that ISO implementation has positive significant effects on the quality culture; and the performances of the administrator and teacher. Vocational administrator performance also has positive significant effect on the vocational school teacher performance. Quality culture has positive significant effect on the performances of vocational school administrator and teacher. Thus, these findings answer the research questions.

6.2. Research Contributions

The conceptual model of this study represents the first attempt to examine multiple dependence or subsequent relationships simultaneously by using Partial Least Squares Structural Equation Modeling methodology in the area of Quality and Vocational Education settings.

This study is not only able to confirm the significant effect of ISO quality management implementation on the performance of vocational school administer and teacher but this study also able to identify the key elements of ISO that contributes to significant effect. Moreover, it is able to show the dimensions of ISO, quality culture, performances of administrator and teacher that need to be improved. This study provides the understanding on how ISO 9001:2008 quality management practice affects the performances of human resources.

6.3. Recommendations

It is recommended that the implementation of ISO in vocational education be continued as it shows significant effect on the vocational school human resource performances. According to the findings of this study, there are some measurement indicators that are not significant but are absolute important to be implemented even though the current practice has already proven to have significant effect on the performances of vocational school administrator and teacher.

In this study, the areas that need to be improved in understanding and implementing ISO 9001:2008 are Involvement of People, Process Approach, System Approach to Management, Continual Improvement, Factual Approach to Decision Making, and Mutually Beneficial Supplier.

Further analysis shows that ISO implementation and quality culture have both direct and indirect effects on the vocational school human resources performances. The relevance of significance analysis show that mediators, quality culture and administrator's performance, play important roles in improving the effect of ISO on Teacher performance. Quality Culture also plays important roles as a mediator between ISO and administrator performance. Even though ISO has positive direct effect on performances of the administrator and the teacher, the influence of ISO on the quality culture can furthermore improve the performances of administrator and the teacher. In addition, when ISO positively influences the performance of administrator, the performance of administrator positively influence the performance of the teacher. Hence, including mediator in the model can provide more understanding the relationships between constructs.

Based on the research findings, it is recommended that the policy of Indonesian Ministry of Education and Culture on the application of ISO on vocational schools in Indonesia be continued in the future. Thus, it is important to provide efforts (e.g. training, workshops, inviting successful ISO

certified company, etc.) to have the administrators and teachers understand the principles of ISO and implement them in education settings.

6.4. Limitations and Future Research

This study is limited to the vocational education settings. Nowadays, ISO has been implemented in many areas. Thus it cannot be used to generalize beyond this scope. However, the rationale methodology in this study can be used to conduct in many areas. Thus, it helps to understand the impact of an implemented practice on certain performances more accurately.

This study only examines the influence of one implemented practice (ISO 9001) on performances. Future study can involve more than one practices to see the interaction effects that influence other variables. Further study can also explore more variables or constructs that can be involved in the model as moderators. This will provide better understanding about cause and effect relationship in a complex model.

Figure 6-1 shows an illustration on how a moderator can be included in the conceptual model. The model shows that the relationship between the management and organization performance is moderated by a moderator. This model shows that the moderator is an independent variable which is not affected by other independent variable.

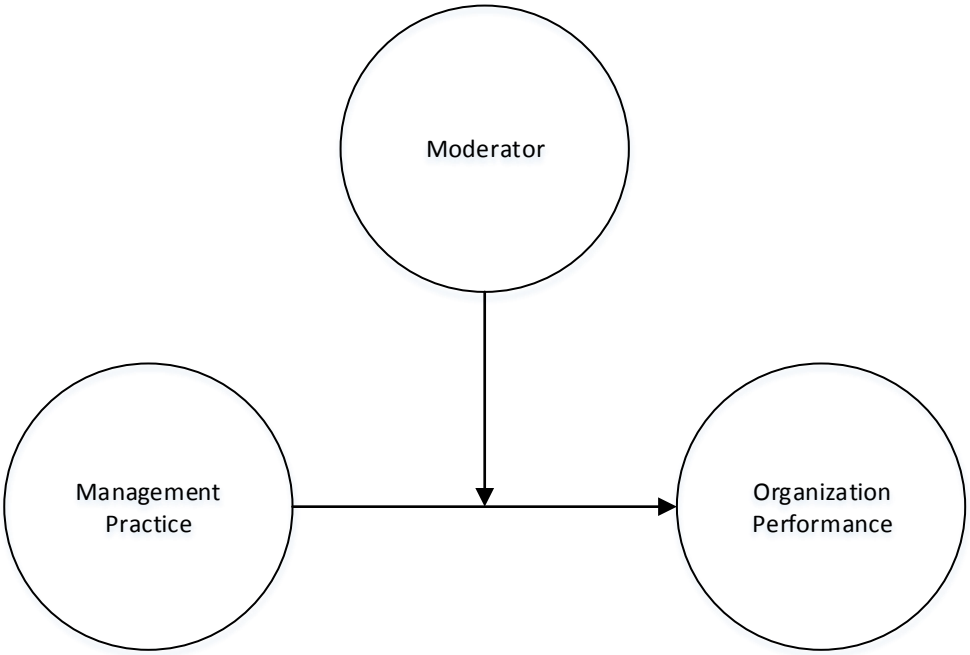


Figure 6-1 Moderator in the Conceptual Model

APPENDIX A: RESEARCH INSTRUMENT

VARIABLE 1:
QUALITY MANAGEMENT PRINCIPLES

Please rate the level of your knowledge and the extent of implementation on each of the following component using following criteria: 1 = poor, 2 = fair, 3 = average, 4=good, 5 = excellent.

Table A-1: Quality Management Principles Measurement Items (adapted from ISO (2011f))

ISO Quality Management Principles	No	Knowledge and Implementation Components	Level of Knowledge and Implementation				
			1	2	3	4	5
Customer Focus	1	Researching and understanding customer needs and expectations					
	2	Ensuring that the objectives of the organization are linked to customer needs and expectations					
	3	Measuring customer satisfaction and acting on the results					
	4	Converting customer needs into ISO requirements					
Leadership	5	Considering the needs of all interested parties including customers, owners, employees, suppliers, financiers, local communities and society as a whole					
	6	Clarify and articulate vision					
	7	Creating and sustaining shared values, fairness and ethical role models at all levels of the organization					
	8	Providing people with the required resources, training and freedom to act with responsibility and accountability					
Involvement of People	9	Getting people understanding the importance of their contribution and role in the organization					
	10	Getting people freely sharing knowledge and experience					
	11	Getting people openly discussing problems and issues					

ISO Quality Management Principles	No	Knowledge and Implementation Components	Level of Knowledge and Implementation				
			1	2	3	4	5
Process Approach	12	Systematically defining the activities necessary to obtain a desired result.					
	13	Establishing clear responsibility and accountability for managing key activities					
	14	Analyzing and measuring of the capability of key activities					
	15	Evaluating risks, consequences and impacts of activities on customers, suppliers and other interested parties					
System Approach to Management	16	Structuring a system to achieve the organization's objectives in the most effective and efficient way.					
	17	Understanding the interdependencies between the processes of the system.					
	18	Providing a better understanding of the roles and responsibilities necessary for achieving common objectives and thereby reducing cross-functional barriers.					
	19	Understanding organizational capabilities and establishing resource constraints prior to action.					
Continual Improvement	20	Employing a consistent organization-wide approach to continual improvement of the organization's performance.					
	21	Making continual improvement of processes and systems an objective for every individual in the organization.					
	22	Establishing goals to guide, and measures to track, continual improvement.					

ISO Quality Management Principles	No	Knowledge and Implementation Components	Level of Knowledge and Implementation				
			1	2	3	4	5
Factual Approach to Decision Making	23	Ensuring that data and information are sufficiently accurate and reliable.					
	24	Analyzing data and information that results in meaningful in terms of linkage between key measures and organization performances using valid methods					
	25	Making decisions and taking action based on factual analysis, balanced with experience and intuition.					
Mutual Beneficial Supplier Relationship	26	Establishing relationships that balance short-term gains with long-term considerations.					
	27	Identifying and selecting key suppliers.					
	28	Establishing joint development and improvement activities.					

VARIABLE 2:
INSTRUMENT OF QUALITY CULTURE

Please rate your vocational school on the following criteria: 1 = does not apply, 2 = fair, 3 = neutral, 4 = somewhat applies, 5 = definitely applies.

Table A-2: Quality Culture Measurement Items (excerpted from Lewis and Smith (1994))

Quality Culture	No	Knowledge and Implementation Components	Level of Knowledge and Implementation				
			1	2	3	4	5
Environment	1	Accepts responsibility to all stakeholders					
	2	School demonstrates long-term focus					
	3	Human rights and diversity accepted					
	4	Workers empowered					
	5	Workers supported by management					
	6	A shared common vision exists					
Product and Services	7	Satisfy customer needs and expectations					
	8	Customer input to service development					
	9	Measure customer satisfaction proactively					
Methods	10	Study/learn from successes and failures					
	11	Establish operational definitions of quality for key processes					
	12	Obtain constant feedback					
	13	Study/learn from others					
	14	Manage processes and stabilize through Statistical Process Control					
	15	Communicate using data					
People	16	Feel "I belong"					
	17	Recognize contribution					
	18	Learn continuously					
	19	Committed to team					
	20	Share customer vision					
	21	"Connected" to customer					

Quality Culture	No	Knowledge and Implementation Components	Level of Knowledge and Implementation				
			1	2	3	4	5
Organizational Structure	22	Cooperate at all levels					
	23	Operate all systems/ processes using total quality					
	24	Understand roles/responsibilities					
	25	Encourage creativity and innovation					
Total Quality Mindset	26	Improved quality increases					
	27	Recognize that variation is normal					
	28	All members learn continuously					
	29	All employees use data					
	30	Employ the PDCA cycle					
	31	Measure and track results					
	32	Recognize that all outcomes result from a process					
	33	Recognize that all quality means continuous improvement					
	34	Recognize that managers control (are responsible for) the work process					
	35	Practice systems thinking					
	36	Move from enumerative to analytical approach					
	37	Customer needs define quality					

VARIABLE 3:
INSTRUMENT OF VOCATIONAL SCHOOL ADMINISTRATOR PERFORMANCE

Rate the vocational school administrator's performance level on each of the following performance component. Indicate the level of the vocational school administrator's performance by placing an X in the appropriate column under the level of performance heading. Note: 1 (poor), 2 (fair), 3 (average), 4 (good), and 5 (excellent).

Table A-3: Administrator Performance Measurement Items (adapted from Ohio State University (1983))

Administrator Performance	No	Performance Components	Level of Performance				
			1	2	3	4	5
School Development Planning	1	Develop school desired outcomes					
	2	Develop programs to achieve school desired outcomes					
	3	Develop spending plan to support school programs					
	4	Develop school revenue plan					
Instructional Management	5	Direct curriculum development					
	6	Guide the development and improvement of instruction					
	7	Manage the development of master schedule					
	8	Support school staff in developing competency based teaching materials					
Personnel Management	9	Appraise school staff development needs					
	10	Facilitate school staff development program					
	11	Assign school staff in relevant subjects					
	12	Support school staff creativities and innovations					
	13	Manage school staff affairs					

Administrator Performance	No	Performance Components	Level of Performance				
			1	2	3	4	5
Student Management	14	Manage student recruitment and admissions					
	15	Provide systematic guidance services					
	16	Maintain school discipline					
	17	Provide student placement services					
School Facility Management	18	Provide facilities required to run schools					
	19	Manage (maintain and repair) school facilities					
	20	Manage the purchase of school facilities					
Financial Management	21	Prepare school budgets					
	22	Identify financial resources for school					
	23	Manage the use of money					
School-Community Relations	24	Involve the world of work in school development					
	25	Organize and work with the world of work for student work experience					
	26	Promote school to community					
Instructional Leadership & School Culture Dev.	27	Provide instructional leadership to school staff					
	28	Develop learning community at the school					
	29	Facilitate school culture development					
Professional Development	30	Encourage continuing professional development for school staff					
	31	Plan for school principal professional development					
Supervision/ Monitoring and Evaluation	32	Supervise school staff					
	33	Evaluate school staff performance					

VARIABLE 4:
INSTRUMENT OF VOCATIONAL SCHOOL TEACHER'S PERFORMANCE

Rate the vocational school teacher's performance level on each of the following performance component. Indicate the level of the vocational school teacher's performance by placing an X in the appropriate column under the level of performance heading. Note: 1 (poor), 2 (fair), 3 (average), 4(good), and 5 (excellent).

Table A-4: Teacher Performance Measurement Items (adapted from Ohio State University (1983))

Teacher Performance	No	Performance Components	Level of Performance				
			1	2	3	4	5
Instructional Planning	1	Develop student performance objectives					
	2	Develop a unit of instruction					
	3	Develop a lesson plan					
	4	Prepare instructional materials					
Instructional Execution	5	Introduce, present, and summarize a lesson in a good manner (effective and efficient)					
	6	Use/employ varieties of teaching methods appropriate for different lessons					
	7	Use/employ varieties of teaching medias appropriate for different lessons					
	8	Direct student laboratory experience					
	9	Employ project method					
	10	Demonstrate a manipulative skill					
	11	Individualize instruction					
	12	Encourage learning motivation and high curiosity					
Instructional Evaluation	13	Establish student performance criteria					
	14	Assess student performance (knowledge, attitudes, and skills)					
	15	Evaluate teacher's instructional effectiveness					
Instructional Management	16	Project instructional resource needs					
	17	Organize the vocational laboratory					
	18	Manage the vocational laboratory					
	19	Provide for student safety					

Teacher Performance	No	Performance Components	Level of Performance				
			1	2	3	4	5
Vocational Guidance	20	Gather student data					
	21	Use conferences to help meet student needs					
	22	Provide information on educational and career opportunities					
	23	Assist students in applying for employment or further education					
Vocational Student Organization	24	Establish a student vocational organization					
	25	Prepare student vocational organization members for leadership roles					
	26	Assist student vocational organization members in developing and financing a yearly program of activities					
	27	Supervise activities of the student vocational organization					
	28	Guide participation in student vocational organization contests					
School-Community Relations	29	Develop a school-community relations plan for teacher's vocational program					
	30	Develop brochures to promote teacher's vocational program					
	31	Give presentations to promote teacher's vocational program					
	32	Work with members of the community					
	33	Obtain feedback about teacher's vocational program					
Professional Development	34	Keep up-to-date professionally					
	35	Joint/participate actively in professional organization					

APPENDIX B: HUMAN SUBJECTS REVIEW APPROVAL LETTER

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Exempt Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Andreas Kuncoro**

Date: **July 25, 2013**

Dear Researcher:

On 7/25/2013, the IRB approved the following activity as human participant research that is exempt from regulation:

Type of Review:	Exempt Determination
Project Title:	• An empirical study of the effect of ISO 9001 on the performance of administrators and teachers in the Indonesian vocational education system
Investigator:	Andreas Kuncoro
IRB Number:	SBE-13-09164
Funding Agency:	
Grant Title:	
Research ID:	N/A

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Signature applied by Patria Davis on 07/25/2013 01:55:04 PM EDT

IRB Coordinator

APPENDIX C: DESCRIPTIVE STATISTICS OF SURVEY DATA

Table C-1: Descriptive Statistics of ISO indicators

No	Indicator	Mean	Std. Deviation	Skewness	Kurtosis
1	Q11	4.2	0.614	-0.443	0.891
2	Q12	4.29	0.659	-0.635	0.439
3	Q13	4.19	0.678	-0.357	-0.367
4	Q14	3.95	0.752	-0.654	**1.021**
5	Q25	4.13	0.672	-0.722	**1.374**
6	Q26	4.15	0.666	-0.524	0.633
7	Q27	4.34	0.647	-0.724	0.664
8	Q28	4.2	0.698	-0.693	0.729
9	Q39	4.26	0.62	-0.38	0.119
10	Q310	4.21	0.697	-0.52	-0.063
11	Q311	4.12	0.731	-0.802	**1.517**
12	Q412	4.15	0.624	-0.399	0.716
13	Q413	4.27	0.634	-0.561	0.684
14	Q414	3.98	0.661	-0.578	**1.097**
15	Q415	3.75	0.787	-0.504	0.404
16	Q516	4.17	0.693	-0.959	**2.557**
17	Q517	4.07	0.696	-0.604	0.794
18	Q518	3.99	0.642	-0.513	**1.088**
19	Q519	4.01	0.642	-0.393	0.708
20	Q620	4.14	0.726	-0.934	**2.017**
21	Q621	4.1	0.681	-0.67	**1.122**
22	Q622	4.07	0.677	-0.855	**2.513**
23	Q723	4.03	0.648	-0.159	-0.159
24	Q724	3.83	0.695	-0.464	0.452
25	Q725	4	0.638	-0.793	**2.882**
26	Q826	3.97	0.724	-0.499	0.364
27	Q827	3.82	0.777	-0.645	0.758
28	Q828	4.11	0.693	-0.866	**2.292**

Table C-2: Descriptive Statistics of Quality Culture's Indicators

No	Indicator	Mean	Std. Deviation	Skewness	Kurtosis
1	C11	4.22	0.649	-0.75	**2.383**
2	C12	4.15	0.69	-0.617	0.715
3	C13	4.34	0.62	-0.387	-0.653
4	C14	4.26	0.656	-0.569	0.417
5	C15	4.32	0.632	-0.651	0.771
6	C16	4.36	0.567	-0.18	-0.735
7	C27	4.08	0.592	-0.52	**1.856**
8	C28	4.09	0.675	-0.329	0.011
9	C29	4.03	0.738	-0.826	**1.615**
10	C310	4.14	0.646	-0.269	-0.108
11	C311	3.87	0.667	-0.533	0.797
12	C312	4.01	0.774	-0.685	0.868
13	C313	4.13	0.732	-0.303	-0.792
14	C314	3.65	0.762	-0.621	0.923
15	C315	3.97	0.751	-0.673	**1.077**
16	C416	4.18	0.737	-0.634	0.182
17	C417	4.22	0.624	-0.482	0.759
18	C418	4.4	0.651	**-1.003**	**1.528**
19	C419	4.25	0.662	-0.566	0.339
20	C420	3.98	0.674	-0.537	0.86
21	C421	4.25	0.629	-0.392	0.054
22	C522	4.26	0.657	-0.453	-0.166
23	C523	4.08	0.642	-0.46	0.876
24	C524	4.28	0.672	-0.853	**2.046**
25	C525	4.24	0.658	-0.542	0.37
26	C626	4.08	0.642	-0.33	0.397
27	C627	4.16	0.595	-0.229	0.442
28	C628	4.25	0.625	-0.233	-0.605
29	C629	3.81	0.747	-0.833	**2.178**
30	C630	4.06	0.713	-0.749	**1.66**
31	C631	3.99	0.664	-0.339	0.356
32	C632	4.26	0.604	-0.348	0.254
33	C633	4.35	0.614	-0.685	**1.036**
34	C634	4.22	0.603	-0.292	0.293
35	C635	4.08	0.62	-0.2	0.16
36	C636	3.9	0.619	-0.52	**1.162**
37	C637	4.03	0.652	-0.401	0.615

Table C-3: Descriptive Statistics of Administrator Performance Indicator

No	Indicator	Mean	Std. Deviation	Skewness	Kurtosis
1	A11	4.33	0.606	-0.302	-0.637
2	A12	4.43	0.636	-0.923	**1.051**
3	A13	4.41	0.651	-0.779	0.131
4	A14	4.33	0.696	**-1.173**	**2.795**
5	A25	4.41	0.568	-0.297	-0.801
6	A26	4.36	0.597	-0.49	0.288
7	A27	4.32	0.595	-0.409	0.292
8	A28	4.43	0.619	-0.593	-0.569
9	A39	4.17	0.654	-0.561	0.866
10	A310	4.31	0.62	-0.319	-0.642
11	A311	4.49	0.613	-0.797	-0.344
12	A312	4.5	0.595	-0.727	-0.431
13	A313	4.28	0.646	-0.464	-0.071
14	A414	4.49	0.622	**-1.097**	**1.517**
15	A415	4.29	0.623	-0.3	-0.64
16	A416	4.54	0.553	-0.662	-0.641
17	A417	4.31	0.665	-0.682	0.418
18	A518	4.36	0.606	-0.369	-0.655
19	A519	4.35	0.622	-0.547	0.143
20	A520	4.24	0.649	-0.654	**1.065**
21	A621	4.46	0.602	-0.611	-0.552
22	A622	4.32	0.614	-0.468	0.169
23	A623	4.49	0.613	**-1.066**	**1.582**
24	A724	4.3	0.652	-0.39	-0.719
25	A725	4.49	0.594	-0.692	-0.475
26	A726	4.36	0.66	-0.656	-0.053
27	A827	4.3	0.58	-0.328	0.41
28	A828	4.25	0.597	-0.148	-0.495
29	A829	4.29	0.603	-0.222	-0.584
30	A930	4.27	0.616	-0.386	0.156
31	A931	4.25	0.6	-0.163	-0.515
32	A1032	4.3	0.634	-0.612	0.712
33	A1033	4.28	0.618	-0.399	0.139

Table C-4: Descriptive Statistics of Teacher Administrator Indicators

No	Indicator	Mean	Std. Deviation	Skewness	Kurtosis
1	T11	4.3	0.538	0.094	-0.586
2	T12	4.36	0.587	-0.623	**1.351**
3	T13	4.42	0.579	-0.57	0.416
4	T14	4.42	0.559	-0.448	0.438
5	T25	4.31	0.594	-0.885	**4.195**
6	T26	4.12	0.585	-0.192	0.602
7	T27	4.08	0.606	-0.036	-0.268
8	T28	4.05	0.622	-0.176	0.123
9	T29	3.8	0.677	-0.394	0.371
10	T210	4.36	0.633	-0.604	0.094
11	T211	4	0.664	-0.703	**2.185**
12	T212	4.28	0.644	-0.457	-0.065
13	T313	4.12	0.691	-0.471	0.248
14	T314	4.3	0.643	-0.754	**1.268**
15	T315	4.03	0.639	-0.426	0.839
16	T416	4.08	0.638	-0.339	0.456
17	T417	4.2	0.622	-0.448	0.783
18	T418	4.22	0.587	-0.089	-0.401
19	T419	4.25	0.601	-0.328	0.293
20	T520	4.37	0.6	-0.518	0.293
21	T521	4.16	0.714	-0.72	0.777
22	T522	4.4	0.623	-0.673	0.224
23	T523	4.31	0.699	-0.822	0.598
24	T624	4.34	0.812	**-1.549**	**3.102**
25	T625	4.18	0.681	-0.561	0.49
26	T626	4.07	0.712	-0.672	**1.412**
27	T627	3.96	0.696	-0.77	**1.92**
28	T628	4.14	0.669	-0.969	**3.075**
29	T729	4.07	0.652	-0.686	**1.577**
30	T730	4.02	0.746	-0.369	-0.238
31	T731	3.94	0.742	-0.665	**1.143**
32	T732	4.07	0.677	-0.524	0.711
33	T733	3.85	0.692	-0.631	0.846
34	T834	4.05	0.676	-0.284	-0.052
35	T835	4.11	0.668	-0.355	0.104

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