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Effect Of The Implementation Of ISO 9001:2015 Quality Management System On The Performance Of Companies And Consumers In The Chemical Industry

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Abstract

Indonesia needs to improve in implementing a quality management standard system to ensure that the country can compete with other countries. The research aims to find out the significant factors that affect the success of chemical manufacturing companies in implementing ISO 9001:2015 quality management systems and the success of chemical manufacturing companies in implementing ISO 9001:2015 quality management systems that impact customers, which in this case is indicated by the company's performance. The population in this study was the company's employees in the Chemicals and Goods Industry of Chemicals which amounted to 15 companies, with the number of samples based on proportionate stratified random sampling as many as 103 samples. The data analysis method uses the Structural Equation Model-Partial Least Square (SEM-PLS) and Why-why analysis. The results found that implementing the ISO 9001:2015 quality management system has a positive and significant influence on customer impact and organizational performance. The variance accounted for (VAF) testing of the implementation of ISO 9001:2015 quality management system have an indirect-only mediation effect on the relationship between external auditing, employee involvement, finance, infrastructure, motivation, teamwork, top management commitment, training, and education, to impact to the customer. Implementing the ISO 9001:2015 quality management system mediates the relationship between external audits teamwork positively and significantly on organizational performance. Implementing ISO 9001:2015 quality management system has an indirect-only mediation effect on the relationship between employee involvement, finance, infrastructure, motivation, top management commitment, and training and education to organizational performance.

Keywords: ISO 9001:2015, Finance, Top Management Commitment, Infrastructure, Employee Involvement, Team Work, Training And Education, Audit External, Motivation, Organizational Performance, Impact To Customer, Chemical Industry Consumers, SEM-PLS, VAF.

1. Introduction

Rambe & Khaola (2021) define competitiveness as a set of institutions, policies, and factors that determine the level of productivity of a country. Global Competitiveness Ranking Study conducted by the World Economic Forum. The World Economic Forum (WEF) 2019 reports that Indonesia is in 50 ranks out of 141 countries and ranks 4th in ASEAN by all aspects of competitiveness, except economic size and macroeconomic stability components (Nadya et al., 2020).

Indonesia should maximize several advantages that have been proven to be good and improve the value that is still low in pushing Indonesia's position in facing the Global Competitiveness Index in the following years. Indonesia must establish a standard quality management system to compete with other countries in

maximizing excellence, one of which is the implementation of the ISO 9001:2015 quality management system as a quality assurance solution for competitive products.

ISO 9001 is a comprehensive part issued by the International Organization for Standardization (ISO), which is a quality management system in determining all requirements and recommending the design and assessment of a quality management system in ensuring products that meet the requirements and expectations of customers that have been set (Faizin & Sholehati, 2019). According to Kaur et al. (2021), the potential benefits of ISO 9001:2015 in its implementation in an organization are they have evidence of attaching importance to quality and regular audits with a commitment to increasing assurance on the organization, achieving higher operating productivity, improving organizational quality of manufacturing, services and increasing employee awareness, ensuring that processes are transparent, structure communication and responsibilities within the organization. Thus, it can increase employee engagement, improve the work atmosphere, and reduce work pressure. According to ISO (2019), 883,521 ISO 9001 certificates have been issued worldwide in 197 countries, and for Indonesia, 6,433 ISO 9001 certificates mean that 0.7% of organizations have ISO 9001 certification.

Based on ISO data for ISO 9001 certification, there is a tendency to increase the number of ISO 9001 certificates validated from year to year in the manufacturing industry. Quality Management Systems emphasizes the application of quantitative approaches with experienced resources to improve processes within an organization and exceed customer expectations (Alka & Palmes Paul C, 2018). Meanwhile, the total ISO 9001 certificates in Indonesia validated from 1993 - 2019 were 103,224. According to data from the Central Statistics Agency (2021), the number of companies in 2017 was 33,577 companies, in 2018, there were 30,115 companies, and in 2019 there were 30,072 companies. The total number of companies in the chemical industry sector decreased in terms of the number of companies. However, in terms of growth, the production of large and medium manufacturing industries in the fourth quarter of 2019 increased by 0.09 percent (q-to-q) in the third quarter of 2019 (bps. go. id, 2020).

Based on the Industrial Survey conducted by the Central Statistics Agency to calculate the growth rate of the manufacturing industry as the basis for calculating Gross Domestic Product, especially the manufacturing industry sector. Government support efforts, especially the Ministry of Industry, prioritize the development of the chemical industry because this manufacturing product can be used by other sectors, such as the electronics, pharmaceutical, and automotive industries. By improving the structure and competitiveness of the chemical industry, it is expected to build a globally competitive national manufacturing industry and reduce imports of basic chemicals. Therefore, the Ministry of Industry continues to attract investment, increase production capacity, and build its ability to become a net exporter and producer of specialist chemicals (Kemenperin.co.id, 2018).

In 2021, the British Standards Institution state that all companies with ISO 9001 certified will significantly benefit in the business sector after implementing it. According to other research such as Lushi et al. (2016) and Purwanto et al. (2020), companies with ISO 9001 result in benefits of performance and productivity in terms of quality as well as products, and also value to customers such as decreased customer complaints. Meanwhile, based on Anoye (2015), companies with ISO 9001 certification are not positively correlated to the company profitability.

2. Review of Literature Study

2.1 Concepts and Definitions of Quality

According to Evans & William M Lindsay (2013), quality is defined based on its marketing value chain in service or product development. The company must meet both types of quality in order to succeed.

2.2 Quality Management System

Based on Van Iswaarden et al. (2003), Quality management consists of three main aspects, which are customer orientation, process control, and continual improvement, and its purpose is to control organizational processes

and to improve and modify these processes in response to changes.

2.3 Quality Contribution

According to Garini & Alim (2018) explained that quality is beneficial for determining company reputation, Product Liability, and global implications. Quality leadership, modern quality technology, and organizational commitment are the three steps to quality. Employee training and education, statistical techniques to collect and analyze factual data, and teamwork as a basis for applying overall quality.

2.4 Quality Control Tools

According to Sulaeman (2014), Ishikawa's seven quality control tools include checksheets, checksheets, causal diagrams (fishbone diagrams), Pareto diagrams, scatter diagrams, flow diagrams, control diagrams.

2.5 Overview of ISO 9001:2015

ISO 9001:2015 uses a process approach that combines a Plan-Do-Check-Act (PDCA) cycle and a risk-based mindset. The process approach allows organizations to plan their processes and interactions. The PDCA cycle enables an organization to ensure that processes with resources are adequate and managed, and opportunities for improvement are determined and acted on.

Based on Lushi et al. (2016), the benefits of ISO 9001 certification companies impact the company's performance, namely financial performance, employee productivity, and providing added value to customers. The same thing was obtained from Jannah et al. (2020) that implementing ISO 9001 has a significant effect on financial performance.

The same results were obtained by Rahman (2001) in his research of West Australian companies on the impact of ISO 9001 on organizational performance between ISO 9001 registered companies and unregistered companies. Simões et al. (2016) could not see any difference in the performance levels of the two groups.

2.6 Success Factors for ISO 9001 Implementation and Organizational Performance

According to Doto et al. (2018), the implementation of QMS ISO 9001 positively impacts organizational performance, and organizational performance has a positive impact on customers. Top management commitments, employee engagement, training and education, communication, and teamwork have a significant influence on the effectiveness of the implementation of ISO 9001 QMS as well as organizational performance (improving the quality of products or services, increasing productivity, reducing production costs, and reducing customer complaints). The company's performance significantly impacts customers (customer satisfaction, attracting new customers, and repeat orders).

3. Methodology

The methodology used in this research is descriptive analysis, the research is carried out in quantitative. The data is collected using a pre-prepared questionnaire. As an addition, to validate the results then using the Partial Least Square – Structural Equation Modeling (PLS-SEM) application system and Why-why analysis. Operational variables in this research are finance top management commitment consists of 5 indicators, infrastructure consists of 2 indicators, employee involvement consists of 3 indicators, teamwork consists of 3 indicators, training and education consists of 3 indicators, external audit consists of 3 indicators, motivation with 1 indicator. Organizational performance consists of 4 indicators and impact to customer consists of 3 indicators.

The research population was the corporate's employees in the Chemicals Industry up to 15 corporation with 2855 employees. According to Umar, (2000) to determine the sample required of a population of 2855 then used the formula Slovin which summarize the sample size of 103 respondents. The sampling technique with stratified random sampling, respectively, involves collecting data on the number of employees in each department and then determining the required number of samples for each department. Based on Natsir (2003), the

formula for the number of samples of each section with the Proportionate Stratified Random Sampling technique with Proportionate Stratified Random Sampling the number of samples to be used in this study amounted to 103 samples.

4. Result

4.1 Research Data Analysis

The research design model uses the hierarchical component model (HCM) approach with a reflection measurement model that includes lower-order and higher-order construct. The Data Analysis using the Partial Least Square Structural Equation Modelling (PLS-SEM) method. The first step is performed by factor analysis which is to check if the repeated indicators used can confirm latent variables that have a second-order model while the second stage is done to analyze the structure of correlation between higher-order variables that will done at the research hypothesis testing stage.

Based on the results, it is known that all items have passed the requirements of outer loading values, then it will be analyze the average variance extracted (AVE) value above 0.50, so that it can be considered valid and can be used to measure each latent variable. From the analysist results, it is known that the entire measurement item / indicator which is a representation of each dimension is valid to measured and confirmed the variable construct of ISO 9001:2015 quality management system implementation variables.

The result of the Variance Inflation Factor (VIF) show all predicted constructs are less than 7, so according to Hair et al., (2014) colinearity is not an issue between construct dimensions. Confidence interval (CI) values of 2.5% and 97.5% of each dimension for variables with values less than or equal to 1.00 can be viewed in the table below, it is therefore concluded that each additional indicator does not have discriminant validity problems. The results of composite reliability tests show that all latent variable values have values of ≥ 0.70 and Cronbach's alpha and rho_A had a ≥ value of 0.60. Thus, all constructs are acceptable reliability.

Table 1 Results of The Significance of the Relationship Between Dimensions and Variables

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Audit External [LOC] -> Implementation of ISO 9001:2015 Quality Management System [HOC]	0.134	0.131	0.015	9.102	**0.000**
Employee Invlolvement [LOC] -> Implementation of ISO 9001:2015 Quality Management System [HOC]	0.194	0.195	0.018	11.024	**0.000**
Finance [LOC] -> Implementation of ISO 9001:2015 Quality Management System [HOC]	0.072	0.073	0.005	13.125	**0.000**
Infrastructure [LOC] -> Implementation of ISO 9001:2015 Quality Management System [HOC]	0.136	0.137	0.013	10.773	**0.000**
Motivation [LOC] -> Implementation of ISO 9001:2015 Quality Management System [HOC]	0.069	0.069	0.004	16.528	**0.000**
Team Work [LOC] -> Implementation of ISO 9001:2015 Quality Management System [HOC]	0.181	0.182	0.015	12.035	**0.000**
Top Management Commitment [LOC] -> Implementation of ISO 9001:2015 Quality Management System [HOC]	0.268	0.267	0.018	14.630	**0.000**
Training and Education [LOC] -> Implementation of ISO 9001:2015 Quality Management System [HOC]	0.149	0.148	0.008	17.646	**0.000**

Source: SmartPLS Output Results 3.3.3 (2022)

Based on the results of the second-order confirmation factor analysis test used to identify the dimensions of a structure and then determine how far each dimension can explain each variable, the entire lower-order construct forming a higher-order national culture construct is found to have a t-statistics value above 1.96 and a p-value below 0.05, it can be concluded that all lower-order dimension constructs are components to built higher-order variable.

4.2 Measurement Model Analysis

All measuring items met the outer loadings value testing requirements because the whole items were below 0.6. The entire measuring

items/indicators represent each valid latent variable to measure and confirm the construct of the intended latent variable. Confidence interval (CI) values of both 2.5% and 97.5% of each dimension against variables worth less than or equal 1.00 show that each supporting indicator does not have discriminant validity problems. Each latent variable has a good discriminant validity, while some latent variables still have a highly correlated meter with other constructs. All indicators must contain the highest values on related constructions by looking at cross-loadings. The results of cross-loadings show that the value of outer loadings on each intended construct is greater than the value of outer loadings with other constructs. The composite reliability tests showed that all latent variable values had a value of ≥ 0.70, and Cronbach's alpha and rho_A had a ≥ value of 0.60. Thus, all constructs are acceptable reliability. According to Hair et al. (2017), Cronbach's alpha is the lower limit, and composite reliability is the upper limit of internal reliability consistency.

4.3 Structural Model Analysis

After the model meets the criteria of the measuring model (outer model), the next test is the structural model (inner model). Based on Ghozali (2015), the evaluation of structural models aims to predict relationships between latent variables, and Hair et al. in Ramayah et al. (2017) suggest looking at the value of the coefficient of determination (R2), the value of effect size (f2), the fit model, and predictive relevance (Q2) to assess the structural model. The test results show that the R-Square (R2) value adjusted the customer construct of 0.518 and 0.608. The effect size (f2) calculation found that the entire path has a value range of 0.000 to 1,578. It means that one relationship had a significant influence (strong), and two other relationships had a moderate effect. In the predictive relevance (Q2) calculations, all values show values above 0.000, which means that the model has relevant predictive value. The fit model tests show that the model in this study had a good fit because it had a standard root mean square residual (SRMR) equal to 0.1. In contrast, other goodness of fit criteria is not raised by SmartPLS 3.0 software because the model in this research uses repeated-indicators models so that some of the goodness of fit criteria are undefined.

4.4 Hypothesis Testing Analysis

The test of hypothesis in this research is using Bootstrapping test with result concluded that all those paths are Implementation of ISO 9001:2015 Quality Management System have Positive and Significant Impact To Customer with original sample value of 0.347, T Statistics value of 2.150 and P Values of 0.032. Implementation of ISO 9001:2015 Quality Management System have Positive and Significant Impact To Organizational Performance with original sample value of 0.782, T Statistics value of 13.245 and P Values of 0.000. Audit External have Positive and Significant Impact To Customer through Implementation of ISO 9001:2015 Quality Management System with original sample value of 0.048, T Statistics value of 2.291 and P Values of 0.022. Employee Invlolvement have Positive and Significant Impact To Customer through Implementation of ISO 9001:2015 Quality Management System with original sample value of 0.064, T Statistics value of 2.113 and P Values of 0.035. Finance have Positive and Significant Impact To Customer through Implementation of ISO 9001:2015 Quality Management System with original sample value of 0.023, T Statistics value of 2.123 and P Values of 0.034. Infrastructure have Positive and Significant Impact To Customer through Implementation of ISO 9001:2015 Quality Management System with original sample value of 0.045, T Statistics value of 2.132 and P Values of 0.034. Motivation have Positive and Significant Impact To Customer through Implementation of ISO 9001:2015 Quality Management System with original sample value of 0.029, T Statistics value of 2.338 and P Values of 0.020. Team Work have Positive and Significant Impact To Customer through Implementation of ISO 9001:2015 Quality Management System with original sample value of 0.067, T Statistics value of 2.127 and P Values of 0.034. Top Management Commitment have Positive and Significant Impact To Customer through Implementation of ISO 9001:2015 Quality Management System with original sample value of 0.087, T Statistics value of 2.259 and P Values of 0.024. Training and Education have Positive and Significant Impact To Customer through Implementation of ISO 9001:2015 Quality Management System with original sample value of 0.055, T Statistics

value of 2.197 and P Values of 0.028. Audit External have Positive and Significant Impact To Organizational Performance through Implementation of ISO 9001:2015 Quality Management System with original sample value of 0.108, T Statistics value of 6.389 and P Values of 0.000. Employee Invlolvement have Positive and Significant Impact To Organizational Performance through Implementation of ISO 9001:2015 Quality Management System with original sample value of 0.145, T Statistics value of 14.477 and P Values of 0.000. Finance have Positive and Significant Impact To Organizational Performance through Implementation of ISO 9001:2015 Quality Management System with original sample value of 0.052, T Statistics value of 8.736 and P Values of 0.000. Infrastructure have Positive and Significant Impact To Organizational Performance through Implementation of ISO 9001:2015 Quality Management System with original sample value of 0.101, T Statistics value of 14.047 and P Values of 0.000. Motivation have Positive and Significant Impact To Organizational Performance through Implementation of ISO 9001:2015 Quality Management System with original sample value of 0.065, T Statistics value of 13.590 and P Values of 0.000. Team Work have Positive and Significant Impact To Organizational Performance through Implementation of ISO 9001:2015 Quality Management System with original sample value of 0.151, T Statistics value of 11.726 and P Values of 0.000. Top Management Commitment have Positive and Significant Impact To Organizational Performance through Implementation of ISO 9001:2015 Quality Management System with original sample value of 0.197, T Statistics value of 9.825 and P Values of 0.000. Training and Education have Positive and Significant Impact To Organizational Performance through Implementation of ISO 9001:2015 Quality Management System with original sample value of 0.124, T Statistics value of 14.039 and P Values of 0.000.

4.5 Why-Why Analysis

The why-why analysis is a tool from the Root cause analysis method used to solve problems that can help identify the root of the problem using literacy techniques by asking why and repeating up to a maximum of 5 questions. In this research, Why-why analysis was used to find the root cause of the decline in productivity previously brainstormed using Fishbone diagrams. Based on the results of data processing, there are three leading causes of discrepancies that occur in the quality management system consisting of people, tools, and methods which will then be searched for the root causes of nonconformities that occur in the quality management system using Why-why analysis which is defined in the following table.

Table 2 Why - Why Analysis From Man

Reason	**Why**	**What**	**Where**	**When**	**Who**	**How**
Non-conformances that occur in the quality management system	Lack of awareness of the quality of implementing SMM	SMM Practice	Chemical Industry and Chemical Products	5th of Jan, 2022	QC staff, Production Foreman, Kneading Operators, Extruding Operators	Increase the intensity of training and socialization to employees to be able to understand in more detail the importance of implementing SMM
Non-conformances that occur in the quality management system	Lack of socialization and training	SMM Socialization and Training	Chemical Industry and Chemical Products	5th of Jan, 2022	QC staff, Production Foreman, Kneading Operators, Extruding Operators	Increase the intensity of training and socialization to employees to be able to understand in more detail the importance of implementing SMM
Non-conformances that occur in the quality management system	There is no evaluation of the implementation of training	Training Evaluation	Chemical Industry and Chemical Products	5th of Jan, 2022	QC staff, Production Foreman, Kneading Operators, Extruding Operators	Conduct an understanding evaluation after every socialization and training is completed

Reason	Why	What	Where	When	Who	How
Non-conformances that occur in the quality management system	There is an assumption that only the QC/QA team is obliged to carry out SMM	SMM Executive	Chemical Industry and Chemical Products	5th of Jan, 2022	QC staff, Production Foreman, Kneading Operators, Extruding Operators	Changing the paradigm that only the QC/QA division is responsible for the implementation of SMM
Non-conformances that occur in the quality management system	Do not understand the function and purpose of SMM	Functions and Objectives of SMM	Chemical Industry and Chemical Products	5th of Jan, 2022	QC staff, Production Foreman, Kneading Operators, Extruding Operators	Conduct an understanding evaluation after every socialization and training is completed
Non-conformances that occur in the quality management system	Lack of information of SMM goals	SMM Information	Chemical Industry and Chemical Products	5th of Jan, 2022	QC staff, Production Foreman, Kneading Operators, Extruding Operators	Increase the intensity of training and socialization to employees to be able to understand in more detail the importance of implementing SMM
Non-conformances that occur in the quality management system	Lack of socialization of SMM goals	SMM Socialization	Chemical Industry and Chemical Products	5th of Jan, 2022	QC staff, Production Foreman, Kneading Operators, Extruding Operators	Increase the intensity of training and socialization to employees to be able to understand in more detail the importance of implementing SMM

Table 3 Why - Why Analysis From Tools

Reason	Why	What	Where	When	Who	How
Non-conformances that occur in the quality management system	There is no standard implementation	SMM Standard	Chemical Industry and Chemical Products	5th of Jan, 2022	QC staff, Production Foreman, Kneading Operators, Extruding Operators	Implementation regularly audits with more frequent intensity
Non-conformances that occur in the quality management system	There is no decision or direction yet from the head office	Company Decision	Chemical Industry and Chemical Products	5th of Jan, 2022	QC staff, Production Foreman, Kneading Operators, Extruding Operators	Implementation regularly audits with more frequent intensity

Table 4 Why - Why Analysis From Method

Reason	Why	What	Where	When	Who	How
Non-conformances that occur in the quality management system	Internal audit not implemented yet	Standard SMM	Chemical Industry and Chemical Products	5th of Jan, 2022	QC staff, Production Foreman, Kneading Operators, Extruding Operators	Implementation regularly audits with more frequent intensity
Non-conformances that occur in the quality management system	Lack of awareness from audit benefits	Keputusan Perusahaan	Chemical Industry and Chemical Products	5th of Jan, 2022	QC staff, Production Foreman, Kneading Operators, Extruding Operators	Implementation regularly audits with more frequent intensity

5. Conclusions

The results found that implementing the ISO 9001:2015 quality management system has a positive and significant influence on customer

impact and organizational performance. The variance accounted for (VAF) testing of the implementation of ISO 9001:2015 quality management system have an indirect-only mediation effect on the relationship between external auditing, employee involvement, finance, infrastructure, motivation, teamwork, top management commitment, training, and education, to impact to the customer. Implementing the ISO 9001:2015 quality management system mediates the relationship between external audits teamwork positively and significantly on organizational performance. Implementing ISO 9001:2015 quality management system has an indirect-only mediation effect on the relationship between employee involvement, finance, infrastructure, motivation, top management commitment, and training and education to organizational performance.

Researchers advise the Chemicals Industry companies to review in terms of providing resources so that the business can operate effectively with the implementation of ISO 9001 standardization in business and maintaining infrastructure with ISO 9001 standardization, encouraging employees to succeed the company targets with the implementation of ISO 9001, unite all employees as a team with ISO 9001 standards, establish special conditions to promote some positions which require skills and knowledge with ISO 9001 standards, find more solutions to find sources of discrepancies in the implementation of ISO 9001 standards other than external audits, review whether the implementation of ISO 9001 standards is effective because of the operational costs that still high, and the management should review whether the implementation of ISO 9001 standards for consumers.

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