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How TQM Mediates JIT in Improving Operational Performance of Industrial Companies

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Indonesian industries face difficult challenges. Companies are required to be able to increase competitive excellence, both in domestic and global markets. The companies are trying to implement various management systems, including Just in Time (JIT) and Total Quality Management (TQM) in improving Operational Performance (OP). This research aims to determine and analyze the effect of JIT on TQM and operational performance. This research type is causal associative by applying primary data with interval measurement scales. The sampling used non-probability sampling category with purposive sampling technique. The number of samples used were 270 and processed by applying AMOS program. The research results are able to prove the presence of correlation between JIT and TQM in improving operational performance. The implementation of TQM makes JIT implementation to be more optimal in improving operational performance. The implication is that JIT and TQM implementation policies prioritizing flexible workforce, improvement, and cost effectiveness are the right choices in facing world-class competition.

Key words: *Just in Time, Total Quality Management, Operational Performance, SEM-AMOS.*

Introduction

Indonesian industry faces difficult challenges. Companies are required to be able to increase competitive excellence, both in domestic and global markets. On the other hand, the increase in production costs experienced by many industrial companies is unavoidable. The high increase in

workers' salaries, increasing raw materials, and fluctuating energy tariffs make industrial companies must find ways to survive in the era of intense competition. The companies are trying to implement various management systems, including Just in Time (JIT) and Total Quality Management (TQM) to improve the performance.

Consumer demands for high quality goods and affordable prices are difficult tradeoff for manufacturers to avoid. Product quality is a crucial factor for customer satisfaction. The products delivered must be corresponding to the desired specifications and have a good level of reliability. Various industrial companies are looking for ways to produce high quality products with efficient production costs. Efficiency in planning and production processes is a way that can be used by industrial companies. Various methods are made to reduce production costs, ensure that there are no damaged/defective items, prevent waste, and eliminate work that has no added value. These are performed so that the costs incurred can be effective and efficient. In addition to competitive prices, consumers also demand that products delivered are corresponding to the predetermined time, because late delivery will have a negative impact on consumers. JIT is a system that can be applied in every industrial company to improve company performance by eliminating waste in every process. It starts from the process of goods procurement, the process of production, and the process of delivery finish goods to consumers. JIT production is a production process producing more products with less people, less equipment, less time, and less space (Womack & Jones, 2013).

Most organizations want lean manufacturing/JIT to meet their needs. They strive to improve business competitiveness by reducing costs while improving quality and responsiveness to customers, including meeting delivery times. According to (Keitany & Riwo-Abudho, 2014), there are three main of JIT as follows: increasing profitability (26%), increasing flexibility of manufacturing (21%) and increasing competitiveness and efficiency (18%). In addition, Nekoueizaidah and Esmaeili (2013) state that JIT and TQM contribute to cost reduction (10%), profit increase (7%) and product quality (7%).

Several research state that the successful implementation of JIT and TQM in companies can improve the quality of products and services, reduce operational costs, increase customer satisfaction and improve performance (Beshkooh, Dehghan & Garousi, 2013; Truong *et al.*, 2014; Sidiwanto, 2018). However, in previous studies, researchers have not found a model that directly connects the effect of JIT on TQM which is then associated with operational performance. Based on this research gap, the researchers are interested to see the correlation of JIT and TQM in affecting operational performance, both directly and indirectly, so that the total effect can be determined. The research was conducted by taking a sample of industrial companies of PT.

Panasonic manufacturing, one of the most reputable industrial companies in Indonesia. This company manufactures electronic products both for national and international markets.

Literature Review

Just in Time

JIT is a philosophy about solving problems strictly and continuously to eliminate waste and unexpected deviations. With JIT, supplies and components are managed in a system. The goods arrive exactly when needed, so that it can eliminate the storage cost. The advantage of JIT system is mainly in its contribution to the fast response strategy and low cost. The basic concept of JIT is to reduce waste and activities that do not add value. JIT is a production system that is designed to gain the best quality, cost, and delivery time, by eliminating all waste in the internal process, so that it is able to deliver the product ordered according to the consumers expectation in a timely manner (Heizer & Render, 2011).

Causal associative research using SEM AMOS, conducted by (Barkhodari & Denavi, 2017), concludes that JIT has a positive relationship to operational performance. JIT can eliminate waste and optimize the use of resources throughout the supply chain. In line with this, research conducted by (Chen & Tan, 2013) supports that JIT implementation has a positive and significant relationship on operational performance. Research conducted by (Zidan, 2014) by sampling a manufacturing company in Egypt concludes that JIT system can improve operational performance through increased investment, marginal profit, and storage turnover. By examining the case on industries in Jordan (Haraisa, 2017) concludes that JIT (equipment layout, supplier quality, time reduction, and pull production) has a positive impact on operational excellence. In line with this, modeling that examines the effect of JIT on supply chain and operational performance of organization concludes that the effect of JIT on operational performance is indirectly through the supply chain (Green Jr., Inman, Birou, & Whitten, 2014). Similarly (Belekoukias, Garza-Reyes & Kumar, 2014), by using a quantitative SEM approach, it concludes that JIT has the highest effect in improving organizational performance. The implementation of JIT has a positive effect on the performance of manufacturing companies which also stated by (Hadioetomo, 2009; Utama & Radhi, 2009). An empirical research conducted by (Othman, Sundram, Sayuti, & Bahrin, 2016) on Automobile Industry (supplier of automotive manufacturers) in Malaysia concludes that the integration of supply chains, JIT purchases and JIT manufacturing have direct and significant advantages for logistics performance. A research conducted by (Serang & Surachman, 2012) by sampling manufacturing companies in Makassar concludes that JIT implementation can improve company performance directly and indirectly.

Total Quality Management

Total Quality Management (TQM) is a philosophy to meet quality that satisfies customer expectations (Othman, Norfarahhanim Mohd Ghani & Woon Choon, 2019). Quality is a crucial element in producing goods to win the competition. Japan considers quality as a "vision" that must be performed by organizations and prioritizes quality above all functions. Quality is the responsibility of top management, and involves all parties including suppliers, consumers, and the wider community. Quality according to (Crosby, 1979) is conformance to requirement, which is as required or standardized. A.V. Feigenbaum in (Slack & Lewis, 2008), defined TQM as a system for integrating quality development, quality maintenance, and effective improvement efforts from various parties in the organization, so as to enable production and service at the most economical level. The management principle related to the Quality Management System is set out in ISO 9001. This research examines the quality based on the standards contained in ISO 9001, 2015. This principle is a general or individual truth that is used as a guide in considering and acting. The Seven Principles of ISO 9001 Quality Management; 2015 are Customer Focus, Leadership, Engagement of People, Process Approach, Improvement, Evidence Based Decision Making, and Relationship Management.

A research conducted by (Al-Damen, 2017) examining case on oil and gas companies in Jordan concludes that TQM has a positive effect on organizational performance and operating efficiency. Similarly, a research conducted by (Faritsy & Suseno, 2014) examining case at MSMEs in Indonesia concludes that TQM has a positive effect in improving business performance. The effect of TQM on operational performance of telecommunications companies in Iran investigated by (Nekoueizaidah & Esmaeili, 2013) concludes that TQM has an effect on quality performance, innovation, and organizational performance. Similar research conducted by (Widjaya & Suryawan, 2014) examining case at PT. Bridgestone Tire Indonesia concludes that there is a positive effect of TQM on the company performance. A research on the effect of TQM implementation through employee productivity on company performance conducted by (Putriama, Arina & Ekawati, 2013) concludes that TQM has a positive effect on employee productivity and company performance. Also a research of (Alhudri & Heriyanto, 2015) on the effect of TQM implementation on employee performance at PT. PLN (Persero) by applying SPSS application concludes that TQM has a positive effect on employee performance. A research on the effect of TQM implementation on performance in Pakistan by (Akhatar, Zameer & Saeed, 2014) concludes that TQM can improve company performance, both for manufacturing, services and public service organizations, and private sector. There are no restrictions in applying TQM for every business field. TQM provides positive results in organizational performance. Research results by (Mawih & Sulistyowati, 2019) also concludes that TQM has a positive effect in improving the operational performance of

industrial companies in Indonesia. Besides being able to improve company performance, TQM is also believed to be able to mediate human resource management in increasing competitive excellence, in the case of electricity industry companies, (Alkhallidy, 2020). Case study of universities in Thailand, using SEM-PLS analysis (Yama, Mukem & Jermsittiparsert, 2019) concludes that TQM directly or indirectly has a positive effect on organizational performance. As for the case of private universities in Indonesia, TQM affects performance through service quality (Fatihudin, Firmansyah & Mukarromah, 2020). The same results are obtained when examining case at secondary school in Iraq (Kadhim & Ahmad, 2019) in which TQM has significant effect on the performance. This research examines the implementation of TQM in school supply chains. The implication is that the Iraq government should strive to improve the quality of information, material and financial flows in schools through the implementation of TQM.

Operational Performance

Company performance is company's ability to handle challenges, customer satisfaction, order fulfillment, product innovation, inventory costs, market penetration, product costs, quality costs, profitability, productivity, response to consumer demand, and timely delivery (Slack & Lewis, 2008). Operational performance according to (Dessler, 2011) focuses on: 1) quality, in which the results of activities performed come near to perfect in the sense of adjusting several ideal ways or meeting the expected goals, 2) quantity, amount produced in units, number of activity cycles completed, 3) timeliness, level of an activities are completed at the desired time, 4) coordination with output results and optimize the time available for other activities, 5) effectiveness, the level of organization's human resources utilization to increase profits or reduce losses from resource utilization, 6) independence, the level at which the employees can perform their job without asking for guidance from the supervisor or asking the supervisor to intervene in order to avoid unexpected results. Companies focusing on customer needs can increase customer satisfaction. The after effects can have a positive impact on customer loyalty (Malun & Sulistyowati, 2019). Loyal consumers will contribute positively to company's performance. Similar research conducted by (Rogo, Shariff & Hafeez, 2018) uses sampling from all Small and Medium Enterprises (SMEs) in the state of Kano, Northwest Nigeria. The results show that there is a positive effect on market orientation and TQM on the performance of SMEs.

A preliminary research that look at the direct effect of JIT and TQM using SEM analysis, AMOS cases on industrial companies, states that there is a direct effect of JIT and TQM implementation on company performance (Sidiwanto, 2018). However, in his research, he only looks at the direct effect of these two variables on company performance. In line with this research, (Pratama & Sulistyowati, 2019) conclude that there is a correlation of quality management and operational

performance. Cases in private hospitals in Istanbul/Turkey find that TQM affects financial performance directly and indirectly through non-financial performance (Turkyilmaz, Bulak & Zaim, 2015). By sampling in electronics industry in Thailand, (Jermsittiparsert, Namdej & Somjai, 2019) conclude that total quality management practices play an important role in determining performance. This research investigates the role of TQM practices in mediating practice of green supply chain management (GSCM) for sustainable performance in Thailand. A research conducted by (Setyadi, 2019) concludes that there is a correlation between TQM and ERP in improving performance of supply chain organizations. It is found that the excellence of supply chain organizations supports to transfer positive effects of TQM and ERP on supply chain organization performance in Indonesia. In line with this, TQM is also believed to have a positive effect on improving business performance, both directly and indirectly through Total Preventive Maintenance (TPM) (Ahmad et al., 2019). This research is conducted by sampling at the Federation of Malaysian Manufacturers (FMM) and lists of foreign companies' directory in Malaysia. For cases in small and medium enterprises (SMEs) in Malaysia, (Ahmad et al., 2019) also conclude that there is a significant effect of TQM tools and organizational performance in Malaysia. Research conducted by (Nugroho, Christiananta, Wulani, & Pratama, 2020) investigates the supply chain management (SCM) correlation, timely and quality management, as well as their impact on organizational performance. The findings show that at all strategic and functional levels have correlation between JIT, TQM, and supply chain management, in improving the company's operational performance. This research shows that dedication to the quality and dimensions of supply chain management has the greatest effect on company's operational performance. Research conducted by (Phan, Nguyen, Nguyen, & Matsui, 2019) shows that performance flexibility can be built by implementing TQM and JIT production practices. TQM is considered as a platform to optimize the effect of JIT production on performance flexibility. Based on the theoretical concepts and the results of previous research, several hypotheses drawn are as follows:

H1 = JIT has a positive effect on TQM.
H2 = TQM has a positive effect on operational performance.
H3 = JIT has a positive effect on operational performance.

Thinking Framework

This research has three latent variables including JIT, TQM, and Operational Performance (OP). JIT has six dimensions which are limited number of suppliers, minimum inventory, and improvement of factory layout, setup time reduction, integrated quality control, and flexible workforce. TQM has seven dimensions which are customer focus, leadership, relationship of management, engagement of people, improvement and decision making. While Operational Performance has six dimensions which are quality, manufacturing flexibility, lead time, inventory,

productivity and cost (Dessler 2011; Slack & Lewis 2008). For more information, the thinking framework can be seen in Figure 1.

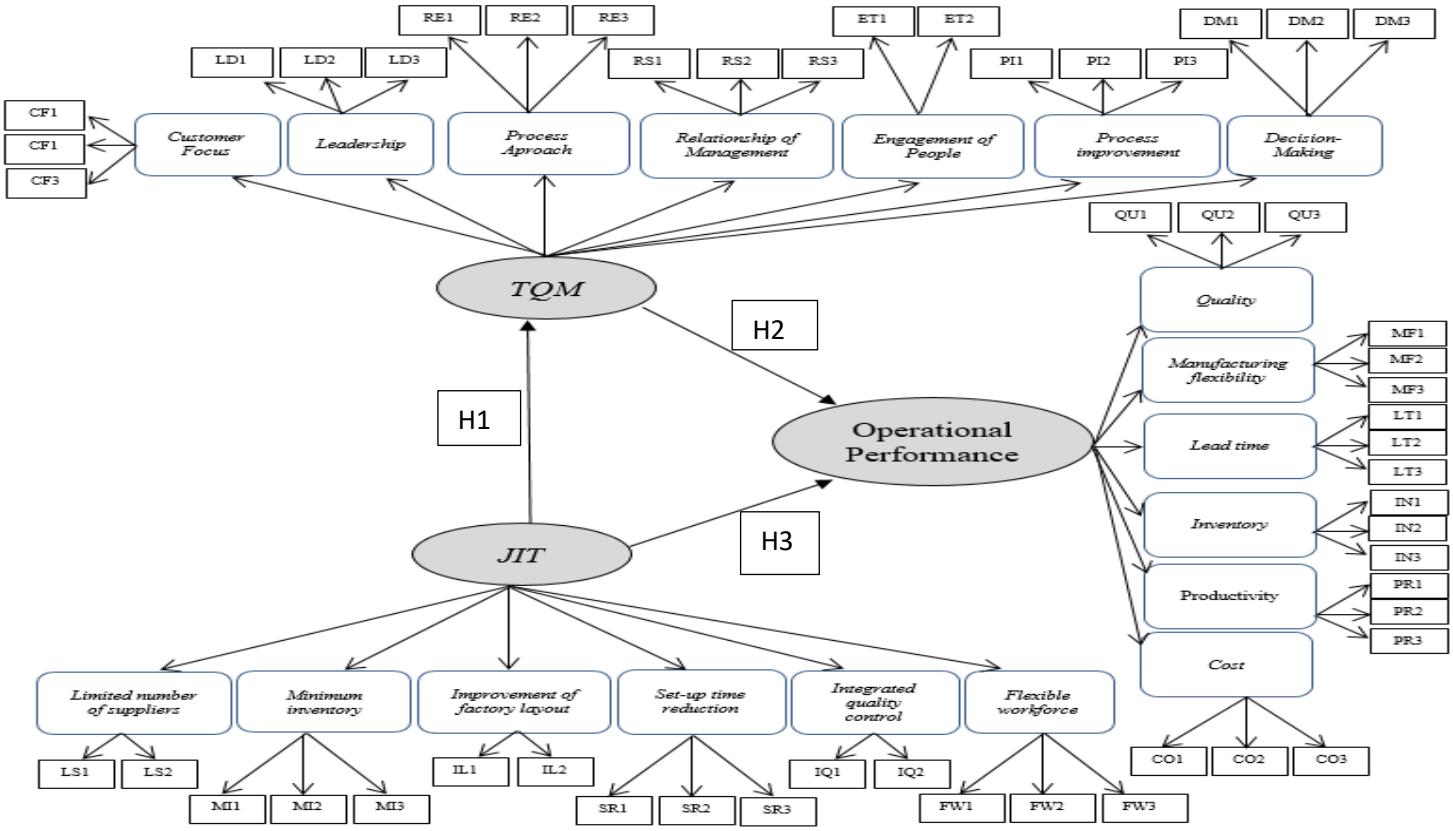

Figure 1. Model of JIT Effect on TQM and Operational Performance

Figure 1 explains that JIT is expected to have a positive effect in improving operational performance. Through TQM, JIT is also expected to positively affect operational performance. TQM makes JIT effect on operational performance to be more optimal.

Research Method

The research was conducted at PT. Panasonic Indonesia, an industrial company that manufactured electronic products, in Jakarta, Indonesia. The company was established in 1960 and now has produced six types of electronic products, namely water pumps, air conditioners, refrigerators, laundry systems, audio, and electrical fans. This company is one of the major companies in Indonesia that has implemented JIT and TQM. Therefore, it is suitable to be used as a locus for

this research. The populations were company employee with supervisor-level positions, section heads, managers, business unit managers and directors. The sampling was included in the category of non-probability sampling with purposive sampling technique. The samples used were 270, where the minimum sample in the Structural Equation Modeling (SEM) analysis was 100 (Joe F. Hair, Sarstedt, Ringle, & Meda, 2012) The scale of data measurement used interval scale (semantic deferential). In this research, the researchers used SEM-AMOS as the analysis method.

Operational Definition and Variable Measurement

Just in Time (JIT)

The dimensions of JIT according to (Heizer & Render 2011) are the limited number of suppliers, minimum inventory, improvement of factory layout, set-up time reduction, integrated quality control, and flexible workforce. For more details, dimensions and indicators used to measure JIT can be seen in Table 1.

Table 1: Operationalization of JIT Variables

Variables	Dimensions		Indicators	Codes
Just in Time	Limited number of suppliers	1	Selection of suppliers	LS1
		2	Selected suppliers are quality certified suppliers	LS2
	Minimum inventory	1	Making a purchase when there is an order	MI1
		2	Raw materials produced must not be more than ordered	MI2
		3	There are no buffer stocks in the warehouse	MI3
	Improvement of factory layout	1	Improving the layout of the factory in facilitating the product movement	IL1
		2	Adjacent layout	IL2
	Set-up time reduction	1	Reduction of setup time to minimize the number of buffer stocks	SR1
		2	Skill in performing setup time	SR2
		3	Reduced setup time to save inventory storage costs	SR3
	Integrated quality control	1	No defective parts and raw materials	IQ1
		2	Responsibility of the supplier to carry out initial inspection	IQ2

		3	Responsibility of the employees in the production department for the product manufactured.	IQ3
	Flexible workforce	1	Special training for employees	FW1
		2	Employees can repair and maintain engines	FW2
		3	Every employee is responsible for the output produced.	FW3

Source: Heizer & Render (2011)

Total Quality Management (TQM)

TQM was measured by the quality criteria contained in ISO 9001 in 2015 consisting seven dimensions, as described in Table 2.

Table 2: Operationalization of TQM Variables

Variables	Dimensions		Indicators	Codes
Total Quality Management	Customer focus	1	Customer role	CF1
		2	Customers provide suggestions for product design	CF2
		3	Consumer satisfaction evaluation	CF3
	Leadership	1	Establishing a clear vision	LS1
		2	Establishing targets, goals or objectives	LS2
		3	Providing resources and intervals training for employees	LS3
	Process Approach	1	Employees are given autonomy and responsibilities according to their expertise	PA1
		2	Supports for employees	PA2
		3	Providing information in product evaluation	PA3
	Relationship of Management	1	Supplier involvement in identifying supplier needs	RM1
		2	Input from suppliers in accordance with the company criteria.	RM2
		3	Communicating and sharing information with suppliers	RM3
	Engagement of People	1	Training for employees to improve product quality	EP1
		2	Opportunity to take formal education.	EP2
	Improvement	1	Continuous training at every step of the work process	PI1
		2	Information system utilization for every process	PI2
		3	When one of the engines stops operating, the operator is not idle.	PI3
	Decision-making	1	Conducting data collection and testing	DM1
		2	Use of statistical techniques	DM2
		3	Following up on each decision according to analysis and experience.	DM3

Source: ISO 9001 (2015)

Operational Performance

The company's operational performance is an aspect that can satisfy customer needs. The company's operational performance was measured using six dimensions, namely: Quality, Manufacturing flexibility, Lead time, Inventory, Productivity, and Cost (Dessler 2011; Slack & Lewis 2008), for more details, it can be seen in Table 3.

Table 3: Operationalization of Operational Performance Variables

Variables	Dimensions		Indicators	Codes
Operational Performance	Quality	1	Activities to repair defective products	QU1
		2	Product defect rate in Ratio Reject process.	QU2
		3	Number of customer complaints monthly.	QU3
	Manufacturing flexibility	1	Ability to change production volumes on demand.	MF1
		2	The ability to change the model in case of engine breakdown	MF2
		3	Flexibility in assignments to production operators	MF3
	Lead time	1	The duration between ordering and receiving goods purchased from suppliers	LT1
		2	Engine setup time.	LT2
		3	The waiting time for an item to move to the next operational.	LT3
	Inventory	1	Storage room requirements	IN1
		2	Total inventory of raw materials that must be stored.	IN2
		3	Total inventory of finished goods	IN3
	Productivity	1	Increased productivity due to less engine breakdown.	PR1
		2	Increased productivity due to the short process duration	PR2
		3	Increased productivity due to more efficient setup process.	PR3
	Cost	1	The average cost of internal harm (such as costs of defective products, scrap, rework, process failures, and engine breakdowns).	CO1

		2	Average cost of external harm (such as cost of product returns, guarantee demand, price reductions, and lost sales).	CO3
		3	Labor costs.	CO3

Source: Dessler (2011), Slack and Lewis (2008)

Structural Equation

Structural Equation Modeling (SEM) is a multivariate statistical technique combining factor analysis and regression analysis. SEM aims to examine the correlation of complex variables to find a comprehensive description of the entire model. The model in this research used two structural equations as follows:

$TQM = \beta_1 JIT + e_1$ .....(1)

$OP = \beta_2 JIT + \beta_3 TQM + e_2$.....(2)

The signs expected: $\beta_1, \beta_2, \beta_3 > 0$

Where : OP = *Operational Performance*

TQM = *Total Quality Management*

JIT = *Just in Time*

Results and Discussion

Test of Confirmatory Factor Analysis

Output Regression Weight of JIT, TQM and Operational Performance variables showed that the probability value of all indicators and dimensions was 0.001 (***). The loading factor value (estimate) above 0.5, indicates that all indicators and dimensions can explain JIT, TQM and company performance variables. All indicators and dimensions of JIT, TQM and Operational Performance variables are declared valid (Alhudri & Heriyanto 2015).

Reliability Construct Test

There are two test methods that can be used, namely composite (construct) reliability (CR) and variance extracted (VE). The cut-off value of construct reliability is at least 0.70 while the variance extracted is at least 0.50 (Ghozali, 2017). All dimensions and indicators of the research construct had a factor value of Construct Reliability test results for more than 0.7 and Variance Extract for more than 0.5 meaning that all indicators and dimensions in this research were reliable.

Test of Normality and Outlier Assumption

Multivariate normality analysis was carried out using critical ratio (C.R.) criteria of multivariate in kurtosis. Normality test results showed that there was still a value of C.R. greater than ± 2.58. To meet the normality assumption, outlier data were deleted. Outlier data were obtained by comparing the mahalanobis distance value with Chi-square table at a significant of 0.001. In this research, the Chi-square table was 77.418 and the chi-square value was 4628.853. This showed that the chi-square table> chi-square count, so the d-square mahalanobis values greater than 77.418 were declared as outlier data and had to be deleted (there were 35 outlier data). After the outlier data were deleted, a normality test was carryout again and obtained a value of 28.668. It means that multivariate data is not normal. To overcome this according to (Ghozali, 2017), the effect test can be performed by implementing bootstrapping techniques.

Goodness of Fit Test

The test results of complete model structure and model modification obtain Goodness of Fit (GOF) data as listed in table 4.

Table 4. Goodness of Fit

Goodness of Fit	Required acceptance limit*)	Results after modification of the model	Decision
CMI	< 2.00	1.554	Good Fit
GFI	> 0.90	0.885	Marginal Fit
NFI	> 0.90	0.936	Good Fit
IFI	> 0.90	0.976	Good Fit
TLI	> 0.90	0.972	Good Fit
CFI	> 0.90	0.976	Good Fit
RMR	< 0.05	0.057	Good Fit
RMSEA	< 0.08	0.052	Good Fit
PRATIO	> 0.90	0.918	Good Fit

*) **Source:** Ferdinand (2014); Ghozali (2017)

GFI test results obtained value of 0.885, GFI values ranging from 0 to 1. The closer to 1, the model can explain the phenomenon better. Values close to 1 indicate that the model can be considered as fit. The RMR test aims to calculate the residual or difference of the sample covariance with the covariance estimate. Here, the RMR test results obtained a value of 0.057. The smaller RMR results indicate the closer the sample number to its estimation. RMSEA values obtained 0.052 or below 0.08, then the model could be considered as fit (Santoso, 2018).

Incremental Fit Indices is a test comparing certain models with null models (baseline models), i.e. models with the assumption that all indicators do not correlate with each other. NFI, CFI, IFI and TLI measuring devices have a range of values ranging 0 to 1. In general, a value above 0.9 indicates the model that is fit. NFI obtained a value of 0.936. CFI of 0.976. IFI of 0.976 and TLI of 0.972. With a high number close to 1 even some above 0.9, the incremental fit indices of the model could be considered as fit.

Parsimony Fit Indices is a test comparing complex models with simple models. The model is considered as fit if the numbers of PRATIO, PNFI, and PCFI are in the range of saturated models and independence models. PRATIO obtained a value of 0.901, PNFI = 0.701, and PCFI = 0.854. From these results, the model was considered as fit because it was in the range of values 0 to 1 (Santoso, 2018).

Goodness of Fit can be assessed based on a minimum of five criteria that are met (Ghozali, 2017; Joseph F. Hair, Black, Babin, & Anderson, 2014), so it can be concluded that the overall model is considered feasible and can be continued with hypothesis testing. In the complete structural model that has been modified and declared as fit, then a hypothesis test can be made using the bootstrapping technique. Hypothesis testing was performed by using bootstrapping technique, because after removal of 35 outlier data, it remained showing multivariate abnormal distribution. Bootstrapping is a resampling procedure, in which the original sample is processed as a population. Multiple sub-samples with the same sample size as the original sample were then taken randomly with replacement from the population. By this method, the researchers could create multiple samples from the original data base (Ghozali, 2017).

Discussion

The step after the data was declared as valid, reliable, and a good fit model, then the hypothesis test was carried out. Hypothesis test results about the effect of latent variables and the correlation of latent variables with their dimensions can be seen in Table 5.

Table 5: Results of Hypothesis Test Outputs

			Estimate	S.E.	C.R.	P
TQM	<---	JIT	.815	.070	9.143	***
OP	<---	JIT	.530	.184	4.333	***
OP	<---	TQM	.509	.217	4.489	***
CF	<---	TQM	.611			

			Estimate	S.E.	C.R.	P
LS	<---	TQM	.726	.139	9.924	***
PA	<---	TQM	.908	.134	11.370	***
RM	<---	TQM	.712	.126	9.761	***
EP	<---	TQM	.824	.133	8.250	***
PI	<---	TQM	.912	.173	9.023	***
DM	<---	TQM	.802	.224	6.101	***
MI	<---	JIT	.445	.247	6.269	***
LS	<---	JIT	.732	.057	10.911	***
FW	<---	JIT	.862			
SR	<---	JIT	.610	.064	9.918	***
IQ	<---	JIT	.201	.206	3.478	***
IL	<---	JIT	.775	.062	11.848	***
QU	<---	OP	.841			
CO	<---	OP	.911	.059	13.973	***
PR	<---	OP	.692	.058	10.243	***
IN	<---	OP	.895	.066	15.021	***
LT	<---	OP	.384	.227	5.927	***
MF	<---	OP	.801	.050	12.199	***

Source: Data Processing Results.

Table 5 shows that hypothesis 1 is accepted, that JIT has a positive effect on TQM with a significant level of 0.001. This research is in line with research conducted by (Phan et al., 2019). The greatest correlation of JIT was explained sequentially by the dimensions of flexible workforce (0.862), improvement of factory layout (0.775), limited number of suppliers (0.732), Setup Time Reduction (0.610), Minimum Inventory (0.445), and Integrated Quality Control (0.201). The greatest JIT correlation is explained by the flexible workforce dimension. In contrast to traditional industrial concept which emphasizes job specialization, in the advanced industrial concept, the ability of a flexible (interdisciplinary) employees is needed more. Therefore, training for employees is essential.

The analysis shows that hypothesis 2 is accepted, that TQM has a positive effect on operational performance. This results support the research results conducted by (Mawih & Sulistyowati 2019); (Yama, Mukem, & Jermsittiparsert 2019); (Sidiwanto, 2018); (Al-Damen, 2017); (Faritsy & Suseno, 2014); (Nekoueizaidah & Esmaeili 2013). The greatest correlation of TQM variables was explained successively by improvement (0.912), process approach (0.908), engagement of people (0.824), decision making (0.802), leadership (0.726), and relationship management (0.712) and

Customer focus (0,611). This research supports the concept of advanced industry, which prioritizes continuous improvement in improving product quality. Companies should focus on continuous improvement in the production process, therefore the use of technology and a good information system is required.

The analysis results show that hypothesis 3 is accepted, that JIT has a positive effect on operational performance. These results support the research conducted by (Barkhodari & Denavi 2017); (Belekoukias, Garza-Reyes, & Kumar 2014); (Zidan, 2014); (Chen & Tan 2013); (Hadioetomo, 2009). The greatest correlation of operational performance variables was explained by the cost dimension with the loading factor value (0.911), then inventory with the loading factor value (0.895), the quality dimension with the loading value (0.841), the manufacturing flexibility dimension with loading factor value (0.801), then the productivity dimension (0.692) and the weakest is the lead time dimension with the loading factor value (0.384). These indicate that production efficiency as a result of the elimination of non-value added activity is the best way in facing the world class competition. Furthermore, the indirect effect of JIT on operational performance through TQM can be seen in Table 6.

Table 6: Indirect Effect

Variable X	Mediator	Variable Y	Coefficient
JIT	TQM	Operational Performance	0.414

Source: Data Processing Results

Table 6 indicates that JIT has an indirect effect on operational performance through TQM by 0.414. It was lower if compared to the direct effect of JIT on operational performance by 0.530. This meant that there was a total effect by 0.944. The total effect making the implementation of JIT and TQM simultaneously can have a greater impact on operational performance. The implementation of JIT which is able to provide a flexible workforce, supported by good technology and information systems, can encourage the achievement of optimum operational performance. Eliminating activities that do not add value, in which the responsibility for quality is a burden for all employees from the beginning to the end of the production process, can result in quality and cost effective products.

Conclusions and Policy Implications

This research aims to determine the correlation of JIT, TQM and operational performance in industrial companies. The results prove that JIT and TQM are able to have a positive effect in improving operational performance. The effect of JIT on operational performance is direct and indirect, resulting in a great total effect. JIT directly has a positive effect in improving operational

performance. Indirectly, JIT has a positive effect on operational performance through TQM, although it is not as much as its direct effect, thus all hypotheses are accepted.

The implementation of TQM makes JIT implementation becomes more optimal in improving operational performance. JIT and TQM implementation policies that prioritize flexible workforce, process improvement, and cost effectiveness are the right choice in facing the world class competition. The implications which are: employee training, modern technology and information utilization, along with eliminating non-value added activities, are the key to the company policy. The implementation of advanced industrial concepts such as JIT and TQM is the right choice for companies and practitioners in decision making. Theoretically, this research can increase insight into the theory, implementation of models, propose dimensions, become conceptual framework about JIT, TQM, and operational performance. The future research is suggested to further explore the model by adding variables related to the advanced industrial concepts in a simultaneous equation model, so that it will enrich the treasury of science.

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