Implementation of Supply Chain Management and Strategic Processes in Total Quality Management to Improve Operational Performance

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ABSTRACT

Purpose: This research aims to empirically determine how much influence supply chain management, strategic process, and total quality management have on the company's operational performance, both partially and simultaneously.

Methodology/Approach: The study involved eight manufacturing companies in Bandung and focused on 104 operational employees. It used descriptive and verification analysis with a path analysis approach, and data were collected through questionnaires via purposive sampling and the Slovin formula.

Findings: The results show that 1) Supply Chain Management (SCM) and Strategic Processes (SP) positively impact total quality management and operational performance, 2) Total Quality Management (TQM) negatively affects operational performance, and 3) supply chain management has the greatest influence on both.

Research Limitation/Implication: Future research should expand the sample size or include companies from different regions and industries to improve external validity.

Originality/Value of paper: This study emphasises the importance of supply chain management, strategic processes, and TQM in operational performance, with supply chain management being the most crucial factor for quality management and improved performance.

Category: Research paper

Keywords: supply chain management; strategic process; total quality management; operational performance; Slovin´s formula

Research Areas: Quality Management; Strategic Quality Management

1 INTRODUCTION

Currently, the era of world trade has entered the free market era. Free markets are a result of the globalisation of the world economy. The free market is the implementation of the economic market through free competition, that is, everyone will be faced with open competition and competition so that those who succeed in winning the competition or competition will be able to survive in the global market. Companies must be able to utilise their capabilities in order to win the competition and obtain the maximum possible profit, which is one of the objectives of establishing the company.

Throughout the history of supply chain management, several technologies have emerged in an attempt to transform traditional practices and improve their effectiveness. The aim of such technologies is to build supply chain network resilience and transparency by techniques such as maintaining additional safety stock, doing business with multiple diverse suppliers, optimising network structures, creating supplier development plans, and providing higher visibility to data and product flow across the supply chain (Raja Santhi and Muthuswamy, 2022). In addition, in the last few years, industries have started embarking on the "Industry 4.0 technologies", an expression that is used to collectively denote the advanced digital, computing, and networking technologies such as Artificial Intelligence (AI), Machine Learning (ML), automation and robotics, Internet of Things (IoT), cloud computing, Big Data Analytics, and blockchain that have the potential in modernising the traditional supply chain into a digitally managed and connected infrastructure (Li and Zobel, 2020). Hence, a holistic approach to digitalising and relooking at the current operational practices is required to manage the supply chain efficiently and mitigate the associated risks. The technologies work together by automating all the processes, placing sensors in every machine, creating a network, and collecting and analysing the data generated to achieve the highest operational effectiveness and improve the quality of the manufactured parts. In other words, modern technologies work in sync to convert a traditional supply chain into a data-driven digital supply chain, a supply chain 4.0 ecosystem.

The lack of development of infrastructure facilities such as roads and ports for the industrial sector is very influential, especially in terms of distribution and logistics systems. This, of course, has an impact on the company's operational costs. High operational costs have the potential to weaken the competitiveness of national industry because product selling prices become high. Another obstacle is related to a more mass transportation system. Even so, the industrial world in Indonesia still has the opportunity to increase its competitiveness. There are several strategies to increase competitiveness through a comprehensive, integrated and measurable energy resource management system which prioritises national interests.

Often there are problems in terms of raw materials because they are limited in quantity, and it is not uncommon for obstacles to occur, for example a lack of raw material supplies, purchasing raw materials at high prices, errors in determining the purchase of raw materials, and so on. Meanwhile, currently consumers need

products that are not only high quality, but must be relatively cheap. To solve this problem, management's role is needed in planning for the company's survival by optimising its resources so that the company can run efficiently and effectively and increase profits.

According to recognition from company management that researchers obtained, the availability of products to support the above activities is not always available in a timely manner, quality and at competitive prices. for example, commodities often have to be imported from abroad which depends on availability in regional markets and of course requires high mobilisation and demobilisation costs. Long lead times for strategic products that support industrial activities are also a very crucial obstacle. For example, pipe products for certain types and sizes have a manufacturing to delivery time of around 6-8 months from the time they are ordered. Delays in the flow of raw materials and delivery of goods, shortages of raw materials, or lack of stock of goods are problems that often occur.

Other problems that occur include relatively few machines, both in terms of type and number, capital to develop a business that is difficult to obtain, and a limited number of workers who are considered skilled. Making decisions is one of the functions of the management role. Management is always faced with the problem of making decisions about what products to sell, what production methods to use, whether to make the necessary components themselves or to buy them, what the selling price of the company's products will be, what distribution channels will be used, and so on. Decision-making is usually a task that is not easy because there are various complex problems with various alternatives available and a lot of data that must be processed, even though only some of it is relevant. Many operational management paradigms and practices have emerged in recent years in the face of various competitive pressures in business that demand improved product quality, increased responsiveness, and lead-time that tends to be minimal, but at lower costs. There are 3 variables that have received special attention from both academics and practitioners, namely (1) Supply Chain Management (SCM), (2) Strategic Process and (3) Total Quality Management (TQM).

2 LITERATURE REVIEW

2.1 Supply Chain Management (SCM)

Supply Chain Management is an integrated process or utilisation of suppliers, manufacturers, warehouses and retailers to produce and deliver good products at the right time and quantity, according to consumer needs at minimum cost. Supply chain management is an approach used to efficiently integrate various organisations from suppliers, manufacturers, distributors, retailers and customers. This means that goods are produced in the right quantities, at the right time and in the right place with the aim of achieving minimum overall system costs and also achieving the desired service level (Suhardi et al., 2019).

Driven by new technologies (push) and the need for adapting to constantly changing markets (pull), Industry 4.0 provides a new platform for smart manufacturing and brings manufacturers close to customers (Lasi et al., 2014). Industry 4.0 can provide a cyber-physical system to integrate the customer needs into the different stages of manufacturing. Horizontal integration across the entire value creation network is one character of Industry 4.0 (Saucedo-Martínez et al., 2018). This entire value creation network is typically coincident with the supply chains. Thus, supply chain management is an important factor that impact the performance of the smart manufacturing under Industry 4.0. Supply chains should keep pace with Industry 4.0. Zhang, Yang and Yang (2023) indicated that smart manufacturing needs smart or even smarter supply chains for support since the supply chains affect the availability of the input for manufacturing, the interaction of multiple functions of production, the efficiency of the finished goods delivery to customers, and responsiveness of the network.

Supply Chain is a crucial part of every business organisation because it connects suppliers, manufacturers, and end customers in a network that is essential for creating and delivering goods and services. Managing a Supply Chain requires a process, namely, the process of planning, implementing and controlling Supply Chain operations. The goal of Supply Chain management is to align demand and supply as effectively and efficiently as possible. The main problems in SCM are related to Stevenson and Chuong (2013):

- Determining the appropriate level of outsourcing.
- Manage the purchase/procurement of goods
- Manage suppliers
- Manage customer relationships
- Identify problems and respond to problems quickly
- Manage risks

The transformation of industrial practices into new techniques dominated by the technologies available at that time is the Industrial Revolution. The world has so far witnessed three industrial revolutions. The first industrial revolution began in the middle of the 18th century when steam-powered engines and mechanisation were introduced, which made the people leave their villages and migrate to nearby cities to work in factories. The mechanisation of agriculture, textile industries, railroads, machinery, internal combustion engines, and electric power were the technologies behind the second industrial revolution that started in the middle of the 19th century. The third industrial revolution began in the 1950s and was driven by the invention of transistors and microprocessors that also introduced computers and electronic devices into the factories. Currently, we are living to see the fourth industrial revolution, or Industry 4.0, slowly unfolding around us. This revolution can be called the computerisation of manufacturing, in which advanced digital technologies are married to industrial machines and processes to achieve

operational efficiency, productivity, and automation to the highest possible extent. The foundation of Industry 4.0 was built over four important modern technologies as Networking, data, and computational (Smart sensors, IoT, Blockchain, and cloud computing), Analytics and Intelligence (Artificial Intelligence, Machine Learning, and Big Data Analytics), Human-machine interaction (Automation, Robotics, COBOTS, and Drones), and Advanced manufacturing (Additive manufacturing)., Given that the fourth industrial revolution would radically change the entire production process, it is also expected that supply chain and logistics functions would undergo a drastic transformation (Aslan, 2020).

An integrated supply chain there are processes (1) Strategic Supplier Partnership, (2) Customer Relationship, and (3) Information Sharing. What is meant by customer relationship is a strategy carried out by companies or market players to build, manage and strengthen good relationships between potential customers or existing customers with the company (organisation) concerned, with the aim of building consumer loyalty to the products offered. In practice, this strategy includes all aspects of service for consumers, including call center services, sales services, marketing strategies, technical support, and field workers who are in direct contact with consumers. Therefore, the Customer Relationship indicator is not used in this study because the supply chain that the researcher discusses does not concern relationships with customers but is sufficient from the upstream supply chain to the company only.

Strategic supplier partnerships are resource-intensive investments, involving both financial risk and strategic management. Suppliers extensively in SCM, organisations can achieve faster product development cycles, lower input costs and higher final product quality. However, developing a Supply Chain Partnership involves significant investment in specific assets of the partner companies such as warehouse locations, or special layouts and facilities, and machinery and other equipment. Companies need to invest in this infrastructure in order to support the partnership objectives. Physical infrastructure provides the interface for managing the day-to-day issues in the partnership value creation process. Partners can improve the quality of partnership outcomes by continually working on improving strategic and operational management, as well as the culture between partners (Stanton and Futrell, 1987). They suggested that improvement can be aided if partnering organisations can measure and benchmark where they stand as desirable partners, compared to other companies in their industry.

In the Strategic Supplier Partnership indicator, researchers developed that there are elements that form this, namely (1) Material Flows and (2) Commitment to Just in Time. Information Sharing can be defined where there is peppara copy of a piece of information held by someone who has certain authority to access it, and information sharing is usually done through a particular business unit, a division or outside the division within a company or with external companies (Ward and Peppard, 2002). The two types of knowledge in the form of tacit knowledge and explicit knowledge can be converted through four types of conversions which are

also called SECI (Socialization Externalization Combination Internalization) Process (Tobing, 2007).

Information sharing refers to the extent to which important information is communicated to a company's business partners (Monczka et al., 2007). Information sharing between business partners can include strategic tactics, general market conditions, and customer information. By exchanging information between members of the Supply Chain, the information can be used as a source of competitive advantage. According to Stein and Swet, business partners in the Supply Chain Management series who exchange information regularly can work as one unit and together they can better understand the needs of end customers and the company is able to respond to market changes more quickly.

2.2 Strategic Process

The definition of strategic process (SP) or strategy process is a process (or transformation) strategy that is an organisation's approach to transforming resources into goods and services (Alarcon and Moreno, 2014). Process strategy or transformation strategy is an organisational approach to transforming resources into goods and services. The purpose of process strategy is to find a way to produce goods and services that meet customer requirements and product specifications within cost constraints and other managerial constraints. The process chosen will have a long-term impact on efficiency and production, as well as flexibility, cost, and quality of goods produced (Render, Griffin and Heizer, 2011).

Four dimensions in the strategy process include (1) Process Focused (2) Repetitive Focused (3) Product Focused (4) Mass Customization Focused (Render, Griffin and Heizer, 2011). Process Focused is a production facility organised around processes to facilitate low-volume production, but high diversity in a place called a "job shop". In a factory, the existing processes might be departments that handle welding, polishing, and painting. In an office, the existing processes might be the accounts payable, sales, and payment departments. In a restaurant, the processes might be the bar, grill and bakery. Existing facilities are focused on the process in terms of equipment, layout, and supervision. They provide a high level of product flexibility as products move momentarily between existing processes. Each process is designed to perform a variety of activities and deal with changes that often arise. Therefore, this process is also called a momentary process.

Repetitive Focused is a production process that uses product-oriented modules. Modules are pre-prepared parts or components that are often in a continuous process. Repetitive process lines are similar to classic assembly lines. The lines used extensively in almost all automobile and household appliance assembly, are more structured and therefore less flexible than a process-focused facility.

Product Focused is a facility organised around the product, a high-volume, low-variety product-oriented process. This process is also called a continuous process because it has a very long and continuous production line. Products such as glass, paper, tin foil, light bulbs, beer and bolts are made through continuous processes.

A product-focused facility produces products with high volume and low variety. Facilities with this special nature usually have high fixed costs. However, facilities with low variable costs can produce high facility utilisation.

Mass Customization Focused is the manufacture of products and services that can meet increasingly unique customer desires quickly and cheaply. However, mass customisation is not just about product diversity, but also about economically knowing what customers want and when they want it. Mass customisation gives us the product diversity that low-volume (process-focused) manufacturing can usually provide at the cost of high-volume, standardised (product-focused) manufacturing.

There are 3 indicators in measuring the strategic process, including (1) strategic decision-making participativeness, defined as the extent to which the company's operational activities and strategic decisions are made on the basis of the company's official commitment by executives, (2) strategic formation mode, defined as whether the company uses a strategy that emerges over time or a strategy that is planned in advance from the actions taken, and (3) strategic learning from failures, defined as the company's reported ability to identify strategic errors or failed strategies, the causes of failures, and lessons from failures (Covin, Green and Slevin, 2006).

2.3 Total Quality Management

Total Quality Management is an integrated approach to obtaining and maintaining high quality output, focusing on maintenance, continuous improvement and failure prevention at all levels and functions of the company, in order to meet or exceed consumer expectations (Flynn, Schroeder and Sakakibara, 1994). The concept of TQM in addition to being a philosophy and principles of management, is also a set of strategies and practices that can be used to improve the competitiveness and performance of a company by meeting customer needs and satisfaction. In a global market that is constantly changing, in addition to fast delivery, product quality is also an important element for companies to be able to compete (Gaspersz, 2001). TQM is an approach that today's companies should take to improve product quality, reduce production costs and increase productivity. The implementation of TQM also has a positive impact on production costs and company revenues.

Total Quality Management requires total commitment from management where this commitment must be disseminated to all employees and at all levels or departments in the organisation. The success or failure of TQM implementation is largely determined by the competence of the company's human resources to realise it. Thus, it can be concluded that TQM is a tool used by the management of a company that involves all personnel in the company in making continuous improvements to products, services, the environment related to the company's products, and company management through innovative scientific methods.

The principles in the TQM system must originate from the top down and operate from the bottom up if everything is to run effectively. Some of the principles in

TQM are general, meaning they can be applied anywhere. But many things in TQM are unitary and unique. There are four main principles in the TQM system (Tjiptono, 2011). The four principles are as follows:

- Internal and external customer satisfaction
- Respect for others
- Management based on facts
- Continuous improvement.

The implementation of the TQM system must be guided by six basic principles as its reference (Besterfield et al., 2012). The six principles are:

- Management's willingness to involve all organisational supporters
- Focus on internal and external customers
- Involving and effectively using all organisational strengths
- Continuous improvement of business and production processes.
- Treating suppliers as friends (partners)
- Determining the success of process performance.

There are 8 criteria for measuring TQM performance, namely Top Management Support, Quality Information, Process Management, Product Design, Workforce Management, Supplier Involment, Customer Involment, Employee Empowerment (Flynn, Schroeder and Sakakibara, 1994). However, in this study, the process management indicator will be included in the supply chain management indicator. The following is an explanation of each TQM indicator (Martínez-Lorente, Dewhurst and Dale, 1998):

- Top Management Support. Top management commitment is one of the main determinants of the success of TQM implementation. Top management is always a pioneer in the implementation and driving force of the TQM approach. Top Management is always fully responsible for the products or services offered to customers. Top Management is always a leader who can provide motivation to all employees
- Quality Information. Information about quality must be available and the information must be part of the management system. Records of quality indicators must be kept, including scrap, rework and quality costs.
- Product Design. All departments must participate in the design process and work together to achieve a product design that meets customer expectations, within the company's technical, technological and cost constraints. Product design will not be used as an indicator of TQM in this study.
- Workface Management. Workforce management has guidelines on the principles: training, employee empowerment and teamwork. Adequate

plans for employee recruitment and employee training must be implemented and workers have the skills or abilities to participate in the improvement process.

- Supplier Involvement. Quality is a more important factor than price in selecting suppliers. Long-term relationships with suppliers should be established and companies should work with suppliers to help improve product/service quality.
- Customer Involvement. Customer needs and their satisfaction should always be kept in mind by all employees. This is necessary to identify customer needs and satisfaction levels. In this study, the customer involvement indicator was not used.
- Employee Empowerment. Specific measures of employee empowerment include the degree to which cross-departmental (cross-functional) and teamwork is used; the degree of employee autonomy in decision making, the degree of employee interaction with customers, and the extent to which an employee suggestion system is used (Powell, 1995).

Supply chain management and Strategic process both have a role in increasing the competitiveness of the organisation. In the ever-changing global market, product quality alone is no longer enough. The new challenge today, focuses on the supply of goods to determine the right time and place for product delivery. International business competition is no longer limited to organisations but includes the supply chain. Although TQM and SCM are very important for organisational performance, they are rarely considered together. Basically TQM includes the involvement of all components of the company to achieve total quality so as to create customer satisfaction in the end.

Although TQM and SCM share the same ultimate goal, namely customer satisfaction, their primary goals are actually different, as implied by the emphasis on “quality and supply.” Better quality and faster delivery always lead to lower costs. In some cases, there may be a trade-off if there is a conflict between quality and delivery performance, and this is where the difference in primary goals can present potential problems in implementing an integrated TQM and SCM approach. On the other hand, there is synergy in the ultimate goals, therefore a strategic process element is needed to support the synergy between the two. Basically, good SCM practices and the right strategic process will be able to support TQM.

From the explanation above, it can be concluded that SCM supports TQM in terms of managing the quality of the flow of goods from upstream to downstream, while the strategic process supports the most appropriate strategy in terms of material handling and handling within the company in achieving appropriate TQM with a process orientation and optimality.

2.4 Operational Performance

Operational performance management is the alignment of all business units within an organisation to ensure that they are working together to achieve core business goals. Operational performance or Operational Performance is the alignment of all business units within an organisation to ensure that they work together to achieve the core business goals. Operational performance is when aspects of the company are able to measure performance when available information related to opportunities already exists but has not been realised financially (Carton, 2004). This operational performance can be measured using measurements such as market share, new product launches, quality, marketing effectiveness, and customer satisfaction (Carton, 2004).

90% of improvements in employee relations, operational procedures, customer satisfaction, and financial performance can be achieved by implementing total quality management (Kurniawati et al., 2022). However, 95% of the failure rate was due to the implementation of total quality management (Burrows, 1992). A negative impact on company performance (Eskildson, 1994). In achieving high product quality and to achieve successful TQM implementation, it is very dependent on top management support. TQM is a new way for company management to improve the quality and performance of the organisation, especially operational performance. TQM is a dynamic process, and is a step to carry out continuous improvement without time limits or time targets and the TQM process has become a way of life towards quality (Mehra and Ranganathan, 2008). There is a relationship between the implementation of TQM and performance quality (Brah, Tee and Madhu Rao, 2002). A positive relationship exists between TQM practices and organisational performance (Lakhal, Pasin and Limam, 2006). The influence produced by Total Quality Management on company performance means that if the implementation of Total Quality Management is better, it will result in better company performance.

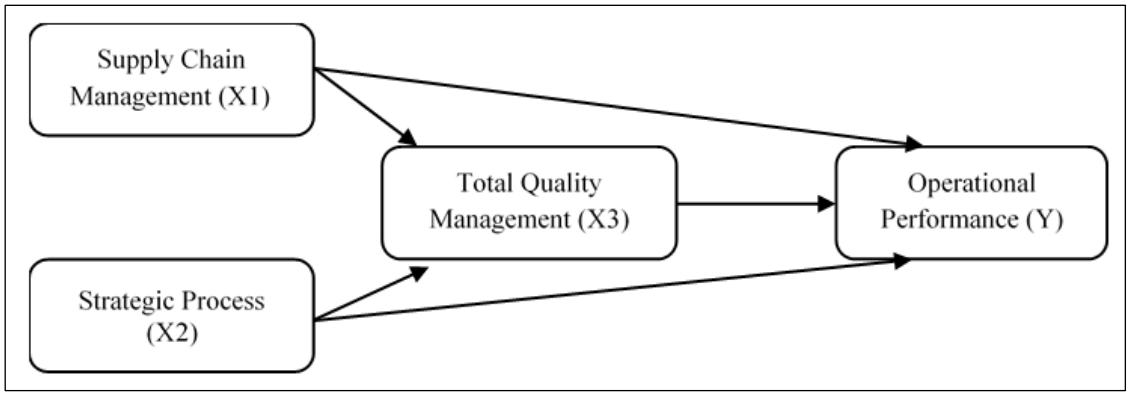

Figure 1 – Thinking Framework

The image above shows that variable X1 is supply chain management with indicators (1) Strategic Supplier Partnership which consists of sub-indicators of material flows and commitment to just in time, (2) Information sharing, (3) Process management and (4) Supplier involvement. Furthermore, variable X2 Strategic Process consists of indicators (1) Strategic decision making participativeness, (2) Strategy formation mode, and (3) Strategic learning from failure. Variable Y is a moderating variable which is formed from SCM and strategic process, namely Total Quality Management consisting of 5 indicators, (1) Top management supports, (2) Quality Informations, (3) Products Design, (4) Workforce Management and (5) Employee Empowerment. For variable Z itself is Operational Performance and is an indicator of company performance. Several research hypotheses that will be presented are as follows:

- H1: Supply Chain Management (SCM) has an effect on Total Quality Management (TQM).
- H2: Supply Chain Management (SCM) has an effect on operational performance (KO)
- H3: Strategic Process (SP) has an effect on Total Quality Management (TQM).
- H4: Strategic Process (SP) has an effect on the company's operational performance.
- H5: Total Quality Management (TQM) has an effect on operational performance (KO).
- H6: Supply Chain Management (SCM) and Strategic Process (SP) have an effect on Total Quality Management (TQM).
- H7: Supply Chain Management (SCM), Strategic Process (SP), and Total Quality Management (TQM) have an effect on Operational Performance (KO)

3 METHODOLOGY

The study was conducted by taking samples of operational employees from 8 textile manufacturing companies in Bandung who are still actively working. The population in this study were employees in 8 industries in Bandung totaling 2765 people. By using the Slovin formula and an error rate of 10% or 0.1, figure 96.5 is rounded up to 96 respondents to be used as a sample plus 8 people from each company with a middle manager position level so that the total respondents as a sample are 104 people. The division into each company is by using proportionate stratified random sampling. Stratified random sampling is usually used in populations that have a tiered or layered structure (Margono, 2004). This technique is used when the population has members/elements that are not homogeneous and are stratified proportionally (Sugiyono, 2016).

The research method used by the author in compiling this research is a descriptive and verification method with a survey or questionnaire approach as a data source. By using the research method, a significant relationship will be known between the variables studied so as to produce conclusions that will clarify the picture of the object being studied.

The verification analysis used in this study uses path analysis, but before conducting the path analysis, data normality testing is carried out first through classical assumption tests (validity tests, reliability tests, normality tests, multicollinearity tests), Goodness of Fit Tests, and hypothesis testing.

4 RESULT AND DISCUSSION

4.1 Descriptive Analysis

The analysis shows that most respondents tend to be neutral regarding the supply chain management variable, reflecting an overall average response indicating a moderate or neutral stance. The general assessment of supply chain management performance shows it falls within the "sufficient" category. This suggests that respondents find the company's supply chain management less than satisfactory, signalling a need for the company to emphasise improving its supply chain management capabilities.

Similarly, the results indicate that respondents generally maintain a neutral perspective on the strategic process variable. The average evaluation of the strategic process also falls within a less-than-satisfactory range, suggesting that the company should focus on enhancing its strategic processes to better align with performance expectations.

For the TQM variable, respondents again exhibit a neutral or moderate level of satisfaction. The overall assessment places TQM in the "sufficient" category, which implies that the company's quality management efforts are not fully meeting expectations. This highlights the necessity for the company to pay closer attention to improving its total quality management practices.

Lastly, the average response for the operational performance variable tends to be more positive, with respondents generally agreeing that the company's performance reaches a sufficient level. However, there remains room for improvement in enhancing overall operational efficiency.

4.2 Verification Analysis

The analysis shows that of the 24 supply chain management (SCM) instruments, 9 strategic processes instruments, 15 TQM instruments, and 15 operational performance (KO) instruments in the data validity test, all of them meet the validity test with a calculated r value of 0.162. Each variable, namely SCM, SP, TQM, and

KO, has a Cronbach's alpha number > 0.6 to meet the reliability criteria and is said to be reliable.

Based on the classical assumption test, the data is normally distributed, as evidenced by the data image centered on the median, and the average value follows a bell-shaped curve. The Asymp also reinforces this. Sig. (2-tailed) value > 0.05 so that the data is said to be expected. From the VIF value, each variable meets the criteria for no symptoms of multicollinearity, as evidenced by the VIF value <10 and tolerance > 0.10.

Table 1 – Correlation Coefficient

	SCM	**SP**	**TQM**	**KO**
SCM	1	0.904	0.932	0.737
SP	0.904	1	0.883	0.743
TQM	0.932	0.883	1	0.645
KO	0.737	0.743	0.645	1

Table 1 shows the strength of the very strong correlation relationship between SCM and SP, SCM and TQM and SP and TQM. While the strength of the strong correlation relationship between SCM and KO, SP and KO and TQM with KO. Based on the Goodness of Fit Test conducted for all variables obtained the correlation value between SCM and TQM is 86.86%, between SCM and KO is 54.31%, between SP and TQM is 77.96%, between SP and KO is 55.2%, and between TQM and KO is 41.6%.

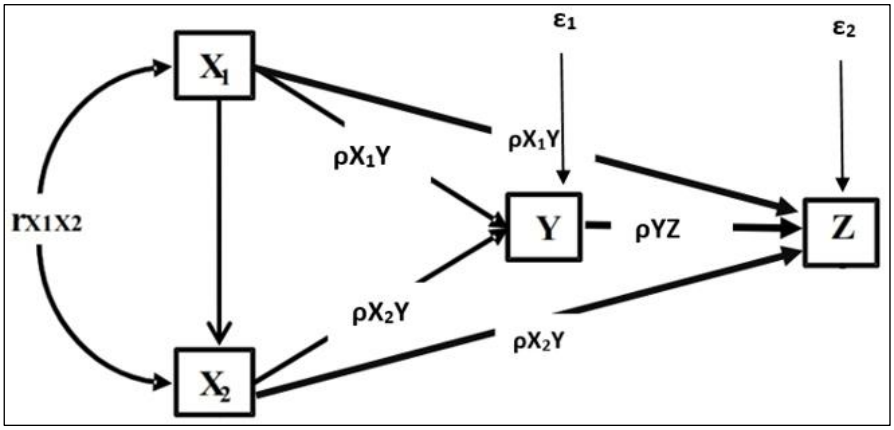

Figure 2 – Path Diagram

The path diagram image, as seen above, has been formulated and can be formulated into 2 forms of structural equation models as follows.

- 1st Substructural (SCM and SP to TQM)

$$Y = \rho YX_1 + \rho YX_2 + \varepsilon_1 \quad (1)$$

- 2nd Substructural (SCM, SP, TQM to KO)

$$Y = \rho ZX_1 + \rho ZX_2 + \rho ZY + \varepsilon_2 \quad (2)$$

Table 2 – Path Coefficient, t, p, R2, and F

Model		Path Coefficient	t	p	R^2	F
1st Substructural (SCM and SP to TQM)	SCM	0.734	9.035	0.000	0.878	363.033
	SP	0.220	2.705	0.008		
2nd Substructural (SCM, SP, TQM to KO)	SCM	0.709	3.588	0.001	0.604	50.775
	SP	0.527	3.459	0.001		
	TQM	-0.481	-2.671	0.009		

where:

$\varepsilon_1 = \sqrt{1 - 0.878} = 0.349$

$\varepsilon_2 = \sqrt{1 - 0.604} = 0.629$

4.2.1 Substructural 1

Simultaneously, supply chain management and strategic process have a positive and significant effect on total quality management. The magnitude of the simultaneous effect is 0.878 or rounded to 87.80% which is the contribution of the SCM and SP variables to TQM. While the remaining 12.20% is the influence of other factors outside the model. This simultaneous model occurs significantly. This can be seen from the probability (sig) or <0.01. Further significance testing is continued with individual testing through the t statistical parameter. The results of individual testing also show a significant effect. By considering the acquisition of sig <0.01 on the X1 path, sig <0.01 on the X2 path. This certainly explains that simultaneously and partially supply chain management and strategic process can be used as variables that influence total quality management. Furthermore, the empirical causal influence between the variables (X1) supply chain management and (X2) strategic process can be described through the sub-structural equation (1).

$$Y = 0.734X_1 + 0.220X_2 + 0.715\varepsilon_1 \quad (1)$$

Partially, supply chain management has a positive and significant effect on total quality management. The magnitude of the partial and direct effect of supply chain management on total quality management is 0.734 or rounded to 73.40%. Thus, the high and low total quality management is influenced by supply chain management by 73.40%, while the remaining 26.60% is explained by other factors outside the model.

Partially, strategic process has a positive and significant effect on total quality management. The magnitude of the partial and direct effect of strategic process on total quality management is 0.220 or rounded to 22%. This means that the high

and low total quality management is influenced by strategic process by 22%, while the remaining 78% is explained by other factors outside the model.

4.2.2 Substructural 2

Simultaneously, the influence of X1 X2 and Y on Z is 0.604 rounded to 60.40%. The remaining 39.60% is influenced by other factors outside the model. The simultaneous model is significant. By considering the F probability of 50.775 at sig 0.000 <0.01. After the simultaneous model is proven significant, a partial influence path is conducted. Of the three variables placed as predictors, all have a sig value <0.05 so that it can be said that all predictors partially influence Z.

Directly, supply chain management has a positive and significant effect on operational performance. The magnitude of the direct influence of supply chain management on operational performance is 0.709 or rounded to 70.90%. This means that the high and low operational performance can only be influenced by supply chain management by 70.90% while the remaining 29.1% is influenced by other factors outside the model.

Directly, the strategic process has a positive and significant effect on employee performance. The magnitude of the partial and direct influence of strategic process on operational performance is 0.527 or rounded to 52.70%. This means that the high and low operational performance can only be influenced by the strategic process by 52.70%, while the remaining 47.30% is explained by other factors outside the model.

Total quality management directly has a negative and significant effect on operational performance. The magnitude of the effect of total quality management on operational performance is -0.481 or rounded to 48.1% in a negative direction. This means that if total quality management increases, it will decrease operational performance, and vice versa, while the remaining 51.9% is influenced by other factors outside the model. Of the three variables used as predictors of operational performance, the supply chain management variable is also identified as the strongest variable that influences operational performance compared to the other two variables, namely strategic process and total quality management. Overall, the influences formed from sub-structural 2 can be described through structural equation (2):

$$Y = 0.709X_1 + 0.527X_2 - 0.481Y + 0.629\varepsilon_2 \quad (2)$$

From the conclusions of the 2 sub-structurals above, an empirical path diagram for the Z model can be described as follows:

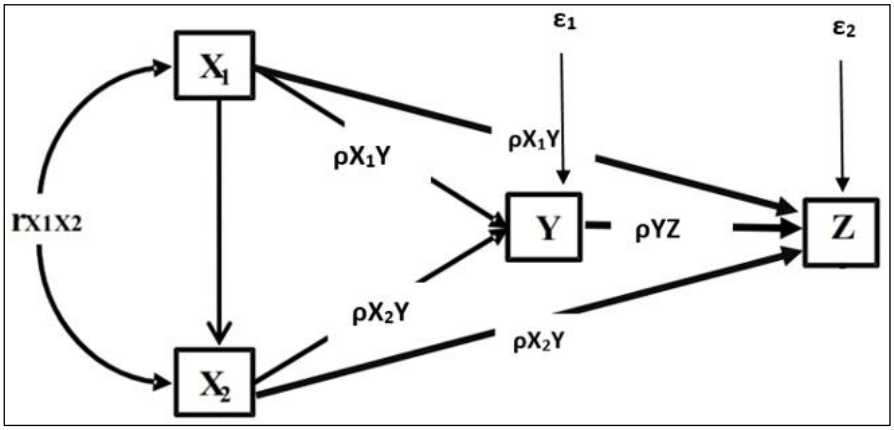

Figure 3 – Empirical Path Diagram

Based on the diagram above, the direct and indirect effects of the 2 structural equations can be determined.

4.2.3 Indirect Effect and Total Effect

- Indirect effect, SCM to KO through TQM

  $Z = \rho Y X_1 \times \rho Z Y$

  $Z = 0.734 \times (-0{,}481) = -0.353$

  Thus, the total effect is as follows.

  Total effect $= \rho Z X_1 + IE$

  Total effect $= 0.709 + (-0.353) = 0.356$

- Indirect effect, SP to KO through TQM

  $Z = \rho Y X_2 \times \rho Z Y$

  $Z = 0.220 \times (-0.481) = -0.106$

  Thus, the total effect is as follows.

  Total effect $= \rho Z X_2 + IE$

  Total effect $= 0.527 + (-0.106) = 0.421$

From Table 2 the path coefficient obtained the magnitude of the influence of supply chain management on total quality management is 73.40% and has a correlation of 0.932 which is in the very strong category. The level of significance shows the number 0.00 where <0.05 so it can be said that the influence of SCM on TQM is significant. Judging from the t-test value, t count> t table, 9.035> 1.66 so that the first hypothesis stating H01 = μ ≥ 0 Supply Chain Management (SCM) has a positive effect on TQM can be accepted and Ha is rejected.

Supply chain management has a positive and significant effect on total quality management, that there are similarities and close relationships between the two that can support each other (Waldman, 1994; Hellsten and Klefsjö, 2000; Chan and Qi, 2003; Kannan and Tan, 2005; Vanichchinchai and Igel, 2009). Supply chain management has a positive and significant effect on operational performance both directly and indirectly.

In Table 2, the direct influence of supply chain management on operational performance is 70.9% and has a correlation of 0.737 which is in the strong category. The significance value is 0.001 where <0.05 so it is said to have a significant effect. The t-test value can also be concluded t count> t table, 3.588> 1.66. The indirect effect of supply chain management through total quality management on operational performance shows a figure of 0.356 or 35.60%, so the second hypothesis stating H02 = $\mu \geq 0$, namely Supply Chain Management (SCM) has a positive effect on the company's operational performance can be accepted and Ha is rejected. Effective supply chain management has the potential to be a strategy to maintain competitive advantage and improve organisational performance because the current competition is in the competition between supply chain management used by companies (Li, et al., 2006). This study is conceptualised and uses five dimensions in supply chain management (strategic supplier partnership, customer relations, level of information sharing, quality of information sharing, and postponement) and a test of the relationship between competitive advantage and organisational performance is carried out. The data used in this study by collecting 196 organisations and the test using structural equation modeling. And the results of this study, with the use of intensive supply chain management, can produce good competitive advantage and improve organisational performance, and competitive advantage positively impacts company performance. Three variables, namely SCM, TQM and Just in Time (JIT) have a positive and significant influence on company performance (Kannan and Tan, 2005). In addition, the study also shows that the largest contribution to supporting company performance comes from the SCM variable. So that Vijay R. Kannan's research is in line with this study. There are 3 dimensions in measuring company performance, namely financial performance, operational performance, and market share (Jahanshahi et al., 2012). This study only uses the operational performance dimension where there are 5 dimension indicators. However, from the results above, it can be concluded that supply chain management has a positive impact even though it is only on operational performance. This means that the better the company's supply chain management, the better its operational performance.

The results of the study in Table 2 state that there is an influence of strategic process on total quality management which shows a figure of 22.20% and a correlation of 0.883 with a very strong category. The level of significance is 0.008 <0.05 which means it has a significant effect. The t-test value can also be concluded that t count > t table, 2.705 > 1.66, so that the third hypothesis stating

H03 = μ ≥0, namely Strategic Process has a positive effect on TQM can be accepted and Ha is rejected.

"The strategic impact and implementation of TQM" found that first, there is inconsistency in TQM terminology, especially in relation to the integration of TQM with the strategic planning process. Second, TQM is only articulated as a means to achieve targets that have been set at the strategic level. Finally, the results show that TQM plays a key role in the implementation of strategy, which is different from strategic formulation, in the organisation. This means that it can be concluded that TQM elements will be formed after the strategic process is formed by the strategic level. Entrepreneurial Orientation is the orientation to achieve consumer targets and there is a significant influence with a positive direction between strategic process and entrepreneurial orientation (Covin, Green and Slevin, 2006). TQM is a target orientation in line with the research of Denis Leonard and Jeffrey G. Covin. This study shows that there is a direct influence with a positive and significant direction between strategic process and company operational performance, which is 52.70% and a correlation level of 0.743 with a strong relationship category. The level of significance shows the number 0.001 <0.05 so it is said to have a significant effect. The calculated t value> t table, 3.459> 1.66 so that the fourth hypothesis stating H04 = μ ≥ 0, namely Strategic Process has a positive effect on the company's operational performance is accepted and Ha is rejected. The indirect effect of strategic process on operational performance through total quality management is 42.10%. it can be concluded that with a positive and significant direction this is in line with the research of Covin (2006). The effect of Entrepreneurial Orientation and the level of performance of a company depends on the strategic process variable, the results of the study show that there are positive and significant results between strategic process and company performance (Covin, Green and Slevin, 2006).

There is a positive and significant influence between the variables SCM, TQM and JIT on company performance and the results obtained TQM on operational performance has a negative effect (Kannan and Tan, 2005). Company performance is assessed based on 3 dimensions, namely financial performance, operational performance, and market share (Jahanshahi et al., 2012). With the reason that the research field is specifically operational management, the researcher focuses on operational performance only. So this is what is suspected to be the trigger for the negative influence which shows a figure of -48.1% and is significant. The correlation results also show a figure of 0.645 which is in the strong category. The level of significance is at 0.001 <0.05 so it is said to have a significant effect. The calculated t value <t table, -2.671 <1.66, the fifth hypothesis which states Ha5μ <= 0, namely TQM does not have a positive effect on the company's operational performance is accepted and H0 is rejected.

4.3 The Influence of Supply Chain Management and Strategic Process on Total Quality Management

Simultaneously, supply chain management and strategic process have a positive and significant effect on total quality management. The magnitude of the simultaneous effect is 0.878 or rounded to 87.80% is the contribution of the SCM and SP variables to TQM. While the remaining 12.20% is the influence of other factors outside the model. By considering the F probability of 363.33 at sig 0.000 <0.01. F count> F table, 363.33> 2.69 (α 0.05, df1 3, df2, 101). Of the three variables placed as predictors, all have a sig value <0.01 so that it can be said that all predictors simultaneously, namely Supply Chain Management and Strategic Process, have an effect on Total Quality Management. The sixth hypothesis which states H06 = $\mu \geq 0$ Supply Chain Management (SCM) and Strategic Process have a positive effect on TQM can be accepted and Ha is rejected. Partially, the factor with the greatest influence or the variable with the greatest contribution is supply chain management, which is 73.40%.

4.4 The Influence of Supply Chain Management, Strategic Process, and Total Quality Management on Operational Performance

Simultaneously, the influence of supply chain management and strategic process and total quality management on operational performance is 0.604 rounded to 60.40%. The remaining 39.60% is influenced by other factors outside the model. The simultaneous model occurs significantly. By considering the F probability of 50.775 at sig 0.000 <0.01. F count> F table, namely 50.775> 2.46 (α 0.05, df1 4, df2, 100). Of the three variables placed as predictors, all have a sig value <0.05 so that it can be said that all predictors, namely supply chain management, strategic process, and total quality management simultaneously affect operational performance. The seventh hypothesis which states H07 = $\mu \geq 0$ Supply Chain Management, Strategic Process and Total Quality Management have a positive effect on Operational Performance can be accepted and Ha is rejected. Of the three predictors, namely supply chain management, strategic process, and total quality management, the supply chain management variable provides the largest contribution to improving operational performance, namely with a figure of 70.9%.

5 CONCLUSION

Based on the statistical data analysis and discussion conducted with the title Supply Chain Management and Strategic Process as a Form of Total Quality Management Implications to Improve Company Operational Performance, it can be concluded that.

- Partially, supply chain management has a positive effect on total quality management. The test results state that supply chain management has a significant effect on total quality management, meaning that supply chain

management in the company will be able to improve the implementation of the company's total quality management.

- Partially, supply chain management has a positive effect on operational performance, both directly and indirectly through total quality management. The test results state that supply chain management, both directly and through total quality management, has a significant effect on total quality management, meaning that supply chain management in the company will be able to improve the company's operational performance.
- Partially, strategic process has a positive effect on total quality management. The test results state that strategic process has a significant effect on total quality management, meaning that strategic process in the company will be able to improve the implementation of the company's total quality management.
- Partially, strategic process has an effect on operational performance, both directly and indirectly through total quality management. The test results state that the strategic process, both directly and through total quality management, has a significant effect on total quality management, meaning that the strategic process in the company will be able to improve the company's operational performance.
- Partially, total quality management has a negative effect on operational performance. The test results state that total quality management has a significant effect on operational performance, meaning that the more the company improves total quality management in the company, the lower the company's operational performance will be, and vice versa.
- Simultaneously, supply chain management and strategic process have an effect on total quality management. Based on the test results, it states that supply chain management and strategic process have a significant effect on total quality management, meaning that good supply chain management implementation and good strategic process can support the improvement of the company's total quality management implementation.
- Simultaneously, supply chain management, strategic process, and total quality management have a positive effect on the company's operational performance. Based on the test results, it states that supply chain management, strategic process, and total quality management have a significant effect on the company's operational performance, meaning that good supply chain management implementation, supported by good strategic processes and high total quality management implementation will result in good company operational performance.

The survey results show that supply chain management, strategic process, total quality management, and operational performance are in the less than satisfactory category. For companies that are the objects of research, it is expected to be able to improve the implementation, make the flow of supply chain management, total

quality management effective and efficient and supported by a good strategic process. If this can be met, it will be able to improve the company's operational performance so that it will have an impact on better company performance. Companies are also expected to be able to run quality development programs in order to get a response from consumers that consumers are very satisfied with the quality of the company's products and services. The survey results stated that all respondents implemented logistics management, but not all companies had their own logistics department. It is expected that companies will have their own logistics department so that they can optimise the flow of goods from suppliers to the packaging process. With optimal operational performance, it will also increase the value of the company which has a good impact on the survival of the company.

It is hoped that further research will not be fixated on the 3 factors in this study, namely supply chain management, strategic process, and total quality management, but can add other factors that may be able to improve the company's operational performance, such as just in time, lean manufacturing, and business process re-engineering. Also not separated from the operational performance factor, further research is expected to develop this aspect of performance, both in terms of financial performance, market value performance or the level of competitive advantage of the company. In order for the results of this study to be widely used, for further researchers the research object is also not only limited to the 8 companies that are the objects of this study, but can also add their research objects. Future studies should replicate our study when the implementation of emergent Industry 4.0 technologies is more advanced. Another possible research line would be to examine some moderating factors such as IT competence and relational capability in the proposed model, among others. Finally, it would be interesting to have a deep understanding of the relationship between Industry 4.0 adoption and integrety supply chain that considers the mediating role of supply chain ambidexterity. This future research line would contribute to closing the current debate on the Industry 4.0 adoption- integrety supply chain. The study shows that Industry 4.0 technologies can give agility, transparency, and resilience to the supply chain, making it customer-centric, demand-driven, and automated. In addition, the review shows that although the benefits of implementing Industry 4.0 technologies into supply chains are well recognised, the application, related research, and real-life use cases are still scarce. However, it is clear that businesses that fail to embrace the technologies would eventually cease to exist.

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Conceptualisation, A.R.S.; Methodology, A.R.S.; software, A.R.S.; Validation, A.R.S.; Formal analysis, A.R.S.; Investigation, A.R.S.; Resources, A.R.S.; Data curation, A.R.S.; Original draft preparation, A.R.S.; Review and editing, A.R.S.; Visualization, A.R.S.; Supervision, A.R.S.; Project administration, A.R.S.; Funding acquisition, A.R.S.

CONFLICTS OF INTEREST

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.