

## THE IMPACT OF TOTAL QUALITY MANAGEMENT, SUPPLY CHAIN MANAGEMENT PRACTICES AND OPERATIONS CAPABILITY ON FIRM PERFORMANCE

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**Abstract:** The main objective of the study is to examine and explain the structural relationship between and among the operational capability, Total quality management, supply chain practices, and operational performance. Enterprise can achieve a high level of performance, depending on their internal capabilities. The result is crucial as it not just supports managers in recognizing the way to leverage their internal capabilities through establishing relationships with partners in the supply chain but also signifies the need to sharpen these capabilities for expertise. Inimitable resource base could be created through the support of key partners and integration of internal capabilities. This resource base is crucial for achieving competitive advantage. Empirical support has been provided by this study about the mediating influence of TQM on the relation of supply chain operations capability and performance. The findings are in line with the competence-based, resource-based perspective of the firm and resource advantage theory (linked with the success of manufacturing). Firms are allowed by SCM practices to benefit from manufacturing capabilities by coordination with key supply chain members and leveraging expertise. The SEM-PLS is used as an analysis tool, which is among the most robust structural equation modelling technique. The study has used the survey-based methodology to achieve the objectives of the current study. The random sampling is used, and the response rate is 54 percent which is considered higher than the minimum response rate. The findings reveal that sustainable competitive advantage could be achieved through supply chain management. Further, evidence has been provided by the study for the direct influence of SCM practices and operations capability on the firm's performance.

**Key words:** total quality management, firm performance, supply chain management, operational capabilities.

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### Introduction

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The integration of value-creating activities in a seamless way across the boundaries of an organization is emphasized by SC management. Through SC management, the firm becomes able to eliminate its waste, manage sufficient inventory level, and leverage synergies. Moreover, the firm can compete in the global market effectively. In this way, an initiative of the management to integrate value-creating activities within the organization and across its boundaries represents a strategic focus in SC management. The strategy, which is implemented, is based on several factors such as type of product, integration level, industry, etc. the basic purpose is to develop spanning relationships within and across the organizational boundary (inter and intra). These inter and intra relationship development within the SC support in leveraging the capabilities of workers and integration of activities. Companies trying to implement practices of SC management have not been successful internationally. The companies could not achieve positive outcomes in several cases, regardless of the extensive use of resources. It is mainly because of the lack of emphasis on relationship development within SC and integration of practices. Moreover, companies lack focus on other elements of operations capabilities portfolio of a firm.

According to the resource-based view, the capabilities, and resources provided by the SC members in a specific environment help in the creation and sustaining of competitive advantage (Gupta, Tan, & Phang, 2018). These resources/capabilities are the primary sources of success for a firm (Mikalef & Pateli, 2017). Several types of research are based on the theoretical foundation that difference in the resources of organizations result in differentiation of competitive advantage for a firm (Lenuwat & Boon-Itt, 2019). To produce products at a low price and high quality, there is a need for firms to integrate their operational activities with several SC members. Integration of operational activities in this competitive market has become a need and source of achieving positive results. The core resources must be developed and used by firms to develop capabilities that cannot be imitated by the rivals (Hirunyawipada & Xiong, 2018). It has been shown by research that different performance level can be possessed by firms having similar operational capabilities in the same market sector. The operational capability of a firm creates value for the suppliers, customers, and the firm (Varelas & Georgopoulos, 2017). However, extensive research exists on operations capability at a firm level, but there is limited evidence about the influence of SC management on firm performance and operations capability (e.g., (Golini, Gualandris, & Kalchschmidt, 2016; Netland & Frick, 2017; Tesfaye & Kitaw, 2017; Utami, Sumaji, Susanto, Septina & Pratama, 2019). Moreover, the results are not conclusive. This gap has been addressed by the current research through analyzing the influence of operations capability and practices of SC management on the performance of the firm. Based on the literature, it can be said that SC management practices are supported by operations capability. Moreover, the relation between performance and operations capability is mediated through practices of SC management. The

research hypotheses and conceptual model has been presented in the following section. The next section involves research methodology, statistical analysis, findings, and discussion. The discussion is followed with limitations and future implications of the study.

### **Literature review**

It has been revealed by several studies that there is an association between the activities of NPDD (new product design and development) and SC management. It was proposed by Moon, Johnson, and Cullen (2018) that involvement of supplier and purchasers in NPDD can result in the achievement of competitive advantage. It was shown by Prester and Palčič (2017) that intensity of NPDD and revenue percentage generated is linked directly to the level of sourcing across the globe. It was demonstrated that significant improvements could be achieved through the involvement of the supplier at earlier stages in NPDD. These improvements could be seen in terms of reduced time cycle, cost, and improved quality (Toleikienė & Juknevičienė, 2019).

In the context of SC management and product innovation in food processing and distribution sector, it was concluded that long term relations between customers, firms, and suppliers could become essential and widespread through use of information-sharing networks in the competitive environment (Kot, Haque, & Baloch, 2020). The relation between characteristics of product demand and initial SC investments was examined by Govindan and Fattahi (2017) during market entry. It was revealed by results that characteristics such as product variety, uncertainty, growth of the market, and contribution margins are accounted for by firms while considering investments in SC. The organizational theory was used by Borge and Bröring (2017) to develop a conceptual model based on the factors influence product technology transfer in a successful manner. It was proposed by researchers that when there is a match between transferred technology and interactions of an organization between the source and recipient, the product technology transfer is highly effective (Sarwari, 2017).

The focus of organizations has shifted to core competencies in this competitive and intense global market competition. Therefore, organizations make efforts to achieve competitive advantage through managing supplier relationships and purchasing activities (Ik & Azeez, 2020; Bezecný, et al., 2019). The way in which processes, capabilities, and technologies of suppliers are used by firms to achieve competitive advantage is referred to as supply base management (Henry, 2017). Further, how materials, transportation, logistics, and manufacturing activities are aligned within organizations is involved in supply base management (Kovács and Gubán; 2017; Petrikova and Trebuna, 2017; Nowicka-Skowron, et al., 2018). The supply base has been reduced by several firms for effectively managing relations with key suppliers. Suppliers are considered as a virtual extension by the purchasing firms. Purchasing firms develop relationships with suppliers, which are

mutual benefits for both (Kemboi, 2016). By development of coordinating and mutually beneficial relationships, the purchasing firms increase their dependence on suppliers.

The supplier performance and competency could affect the purchasing firm's performance because of increased dependence. Therefore, problems may come across, such as missed shipping dates and low levels of quality. However, for other companies, the performance or capability of supplier can result in increased quality and integration of advanced technologies through the involvement of supplier at earlier stages (Hwang et al., 2019; Lubis et al., 2019). Earlier participation can be made by suppliers in the process of product design for making it cost-effective and make alternative solutions, choosing the best technology and support the assessment of design (Liu, 2018). There is a need for high reliance on the external supplier for focusing on internal competencies. This helps in supporting the non-basic requirements in engineering and design support. Therefore, it can be released by firms that the need for specific competencies has been replaced by another for managing suppliers' relationships effectively.

In this research study, ten practices have been identified for managing supply base and improve the performance of the supplier (Appendix I, part III). These practices include the implementation of quality assurance programs to overview/control the products and processes of suppliers, information sharing with suppliers, and visits to the site. Literature has several interpretations of SC management. It is regarded as the integration of activities in the SC with the purpose of value addition for the customers. Irrespective of the fact that there is a need for integration of logistics, transportation, and purchasing activities with the process of manufacturing, SC management has specifically reflected supply base or logistics management.

As per the logistics, SCM is considered as the coordination of logistics activities in the value chain (Agrell, Lundin, & Norrman, 2017). Organizations can respond to the uncertainty of demand by pulling materials within SC to fulfil demand and pushing them out for prediction. In this way, the uncertainty of demand could be managed in an effective manner, along with inventory management (Ye and You, 2016; Köteles et al., 2018; Straka et al., 2019). This is similar to the concept of integrated systems of logistics. The supply focus is similar to the supply base rationalization and suppliers' integration into manufacturing activities and product development.

It is implied by SC management that supplier base must be streamlined to supplier the supplier relationship management (Lutende, 2018). It includes the development of strategic relations with suppliers and ensures the achievement of set goals along with the involvement of suppliers in early PDP. Firms can use their existing resources and become agile, with an increased focus on core competencies and outsourcing non-core activities. Agility enables the firm to respond to the changes in need of customers. Moreover, the expertise, efficiencies, capabilities, and technologies of suppliers could be used by the firm (Gregory et al., 2019)

There are several examples of firms in literature, who downsized the focus on core competencies and attained competitive advantage. The supply base was reduced by these firms for managing strategic relationships with suppliers to achieve mutual benefits. The lead-time in product development could be reduced through improved supplier capability. Moreover, it can enhance the integration of the latest technologies and improve quality (Chang, 2017). Increase of outsourcing activities can increase the dependence of these organizations on their partners. Therefore, SCs must be effectively managed to remain competitive. The study has proposed the following hypothesis

H1: Operational capabilities have a significant impact on organizational performance.

H2: Operational capabilities have a significant impact on supply chain practices.

H3: Supply chain practices have a significant impact on organizational performance.

H4: Supply chain practices Mediates the relationship between operational capabilities and organizational performance.

The literature-based on TQM is extensive. However, most of the research is anecdotal or descriptive. Therefore, it gives less guidance on the deployment of programs for quality management. No attempt was made until the end of 1980s to identify the determinant of quality management (Otley, 2016). The relation between quality and performance has been examined by several studies over the last few years. It was identified that internal and external coordination, visionary leadership, employee fulfilment, and process management are key variables that influence quality management.

The researchers showed that these variables also determine customer satisfaction. Other studies have identified similar constructs, which have a positive relationship with the quality of product (Otley, 2016; Popp & Woratschek, 2017; Nugroho et al., 2020; Małkus and Tyrańska, 2019). There is limited evidence on the influence of quality management practices on the performance of a business. It was demonstrated by Wilson and Collier that the quality management system is driven by leadership is valid (Malcolm Baldrige National Quality Award (Parast & Golmohammadi, 2019; Saragih et al., 2020). It has been shown by studies that a valid representation of variables is not only provided by the MBNQA framework, but it also gives a valid representation of the variables of TQM. However, the constructs are in line with the findings of other research studies.

It was stressed by Kawalla, Ligarski, and Hoeck (2019) that firms need quality certification to compete. Quality is a strategic variable, which must be managed and considered within the entire SC. The relation between quality assurance practices of supplier and buyer were explored between the suppliers of automotive component. The significance of commitment to quality assurance was highlighted for every firm in SC. The relation between SC management and TQM was examined by (Tizroo, Šaparauskas, & Mozaffari, 2017) including performance

measurement and operational flexibility. Future research can be conducted in any areas, including SC management, quality management, etc.

The relation between SC management and TQM was analyzed by Ameer (2018). The researchers found that the inadequacies of current SC management's models are due to lack of considering the influence of TQM programs.

The inherent relation between practices of SC management and quality management was highlighted by X. Peng, Prybutok, and Xie (2020). The basis for the relationship between the TQM of a firm and SC management is clear. Competent suppliers are selected by a firm with the latest quality management capability. Relationships are developed with competent suppliers, and they are allowed to participate in the designing and development of the product. Alternatively, the firm with lower capability, credibility for the suppliers, and the need for improvement could be invited as well. The association between the performance of a firm and TQM is clear in the literature (Anil & Satish, 2019; Gutierrez-Gutierrez, Barrales-Molina, & Kaynak, 2018; Zeng, Zhang, & Zhao, 2017). The relationship between TQM and firm's performance has been analyzed from different aspects. According to the resource-based view, the association is the outcome of competencies and unique resources, which are developed by the adoption of TQM. Such competences result in the achievement of competitive advantage and improved firm performance.

The neoclassical aspect of the impact of a competitive environment for developing an integrative TQM framework was used by. The findings revealed that higher customer satisfaction in a competitive environment could be achieved through significant investments in quality. A behavioral science perspective was taken by Andrade, Mendes, and Lourenço (2017). The research concluded that management, leadership, and customer focus significantly determine the firm's operational performance. It was shown by (Peng, Zhang, & Dubinsky, 2016) that quality dimensions, capability, and the equivalence of business strategy are essential for the performance. Based on the above discussion, the following hypothesis has been developed:

H5: Operational capabilities have a significant impact on organizational performance.

H6: Operational capabilities have a significant impact on total quality management.

H7: Total quality management has a significant impact on organizational performance.

H8: Total quality management mediates the relationship between operational capabilities and organizational performance.

## Methodology

The main objective of the study is to examine and explain the structural relationship between and among the OPC, TQM, SCP, and OP. The study has used the survey-based methodology to achieve the objectives of the current study. The random sampling is used, and the response rate is 54 percent which is considered higher than the minimum response rate recommended by the Dikko (2016). All the manufacturing firm that is listed in the stock exchange are the population of the study, while sample consists upon the manufacturing industries that are engaged in export activities. The questionnaire method was used and are distributed among the manufacturing firms which are listed in the Indonesian stock exchange by the personal visit in January 2020. The SEM-PLS is used as an analysis tool, which is among the most robust structural equation modelling technique. The results of the data analysis are shown in the next section. The variable such organizational performance (OP) has fifteen items, operational capabilities (OPC) has ten items, supply chain practices (SCP) also has ten items, and total quality management (TQM) has twelve items.

### Study Results

The SEM-PLS is comprised of two components, namely the measurement model (MM) and the structural model (SM). MM explains the reliability and validity of the conceptual framework used in the current study. The MM model, which is also entitled as the outer model, is mapped in the figure below.

The convergent validity of the items used in the study that describe the relationship among the items is shown in Table 1. The item loading of all the items is above 0.70, which, according to Basheer, Siam, Awn, and Hassan (2019) is a threshold value of outer loading. The reliability analysis of the current study show three criteria's, namely the Cronbach's alpha, CR and AVE are below the threshold value. All of the figures are cross the standard and confirm that items are highly correlated and valid convergent validity.

**Table 1: Convergent validity**

Items	Loadings	Alpha	CR	AVE
OP1	0.765	0.969	0.972	0.712
OP10	0.919			
OP11	0.883			
OP12	0.871			
OP13	0.843			
OP14	0.880			
OP15	0.879			
OP2	0.769			
OP3	0.744			
OP4	0.812			
OP6	0.827			

OP7	0.833			
OP8	0.885			
OP9	0.880			
OPC10	0.882	0.970	0.973	0.769
OPC11	0.890			
OPC2	0.857			
OPC3	0.876			
OPC4	0.846			
OPC5	0.902			
OPC6	0.873			
OPC7	0.895			
OPC8	0.845			
OPC9	0.896			
SCP1	0.866	0.948	0.958	0.765
SCP10	0.821			
SCP2	0.838			
SCP4	0.920			
SCP5	0.906			
SCP6	0.920			
SCP9	0.846			
TQM1	0.812	0.943	0.951	0.661
TQM10	0.827			
TQM11	0.760			
TQM2	0.765			
TQM3	0.845			
TQM4	0.863			
TQM5	0.804			
TQM7	0.826			
TQM8	0.816			
TQM9	0.809			
OPC1	0.882			

The study has used the criterion recommended by the Tzempelikos and Gounaris (2017) to establish the validity of the current study. The discriminant validity describe about the correlation among the variables and there is two method to check the discriminant validity one is Fornell Larcker and Heterotrait Monotrait ratio (HTMT) and this study used the Fornell Larcker criteria. The results revealed the fact that there is no issue of validity as all the diagonal values are greater than the lower values.

**Table 2: Discriminant validity**

	OP	OPC	SCP	TQM
<b>OP</b>	0.894			
<b>OPC</b>	0.730	0.897		
<b>SCP</b>	0.820	0.814	0.895	
<b>TQM</b>	0.827	0.793	0.866	0.813

After the assessment of the MM, the next step is the determination of the structural model, which explains the structural relationships between and among the variables. The bootstrapping procedure is used to measure the path coefficients. The results of the direct paths are shown in Table 3. All the direct paths namely OPC -> OP, OPC -> SCP, OPC -> TQM, and SCP -> OP are significant and positive because positive sign associated with beta while t-statistics are larger than 1.64 and probabilities values are lower than 0.05.

**Table 3: Path analysis**

	(O)	(M)	(STDEV)	( O/STDEV )	P Values
<b>OPC -&gt; OP</b>	0.704	0.707	0.048	14.697	<b>0.000</b>
<b>OPC -&gt; SCP</b>	0.714	0.716	0.066	10.871	<b>0.000</b>
<b>OPC -&gt; TQM</b>	0.893	0.895	0.019	46.999	<b>0.000</b>
<b>SCP -&gt; OP</b>	0.403	0.406	0.124	3.251	<b>0.001</b>
<b>TQM -&gt; OP</b>	0.466	0.465	0.120	3.894	<b>0.000</b>
<b>OPC -&gt; SCP -&gt; OP</b>	0.288	0.291	0.094	3.056	<b>0.001</b>
<b>OPC -&gt; TQM -&gt; OP</b>	0.416	0.416	0.108	3.846	<b>0.000</b>

### Results Discussions

It has been shown by significant path relationships for new product design and capability development that both influence performance of the firm (direct and indirect). The basic reason for manufacturing companies is to involve in the designing of new product and development. The life cycle of products is reduced in this competitive business environment. Soon after the expiring of patent protections, generic alternative products are produced after years of testing, discovery, and development. It is essential to introduce high-quality, innovative products in the market before rival firms to stay in a competitive position.

The significant role of effective SC management should not be overlooked by the firms trying to nurture the new design of product and capabilities development. The internal firm practices, including part simplification, concurrent engineering, and value analysis, can create a positive influence on a firm's performance. Expertise, willingness to take the risk, significant capital, and specialized knowledge are required for new technologies. Moreover, it becomes difficult for

firms to introduce innovative products in a competitive and timely manner to the market because of customer expectations and increased product offerings. The firms become highly dependent on the early involvement of the key suppliers in designing and development of products. It is therefore implied that relationships should be developed with suppliers having requisite knowledge. By aligning expectations, strategies, and goals, firms can make commitments. These findings are matched with the results of Kot, Goldbach, and Ślusarczyk (2018) who also found a positive association among supply chain practices and firm performance. Therefore, the interpretation of results could not be made to suggest that internal quality should be focused on by firms. It has been suggested by previous studies that by focusing on needs of customers and supplier quality can create a positive influence on firm's performance (Anil & Satish, 2019; Baraniecka, 2016; Gutierrez-Gutierrez et al., 2018; Zeng et al., 2017). For instance, the essential elements in the QM program are the efforts in product development, certification of products/processes of suppliers, participation of customers in product development, and strategies to improve customer satisfaction.

### **Conclusion**

There are some limitations of the study as well. The conceptual model proposed in this study has not considered performance in various aspects. For example, the variables, including market structure from the literature on industrial organization, ownership structure from the literature on finance, and corporate governance from the literature on organizational behavior have not been considered. The short and long-term influence of variables in the model could be determined through the use of longitudinal data (Foged & Peri, 2016). Moreover, the way in which specific variables influence performance could be examined by longitudinal data. Moreover, there is a need to analyze the influence of operations capability in broader aspect such as SC (Eckstein, Blome, & Henke, 2015). This study recommended to the policymakers that they should enhance their focus towards the supply chain and quality management of the organization that improves the firm performance. This study will be implicated in the manufacturing organization that is associated with the export activities and get benefit by using this study in terms of supply chain and quality management practices influence on the firm performance.

Impressive outcomes can be found by using a model with changes in determinants (operations capabilities) and the result (performance). Because of the dynamic formulation of the model, the influence of variables with stable levels over time is eliminated. The causation is pinpointed in the model by a lagged relation among the variables with time. There is a need for future studies to analyze the additional facets of operations capability, including purchasing capability and logistics. Organizations can react to intense competition across the globe through improvement in the quality of products and processes. However, organizations

need to work more than just improving quality. Organizations cannot work individually, and this makes them a critical part of the business chain. This notion is supported and confirmed by the results that customers, manufacturers, and suppliers are three significant components of SC. These components should be integrated effectively to achieve growth and financial objectives. Additionally, the study reflects a relation between specific practices and the firm's performance. However, when business practices are not coordinated, or limited financial resources are directed to initiatives for positive outcomes, this may not occur.

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### WPLYW TOTALNEGO ZARZĄDZANIA JAKOŚCIĄ PRAKTYK ZARZĄDZANIA ŁAŃCUCHEM DOSTAW I ODPOWIEDZIALNOŚCI OPERACYJNEJ NA JEDNOLITE WYNIKI

**Streszczenie:** Głównym celem badania jest zbadanie i wyjaśnienie strukturalnego związku między zdolnością operacyjną, zarządzaniem całkowitą jakością, praktykami łańcucha dostaw i wydajnością operacyjną. Przedsiębiorstwo może osiągnąć wysoki poziom wydajności, w zależności od ich wewnętrznych możliwości. Wynik jest kluczowy,

ponieważ nie tylko wspiera menedżerów w rozpoznaniu sposobu na wykorzystanie ich wewnętrznych zdolności poprzez nawiązywanie relacji z partnerami w łańcuchu dostaw, ale także oznacza potrzebę zaostrzenia tych umiejętności w celu uzyskania wiedzy specjalistycznej. Niepowtarzalną bazę zasobów można stworzyć dzięki wsparciu kluczowych partnerów i integracji wewnętrznych możliwości. Ta baza zasobów ma kluczowe znaczenie dla osiągnięcia przewagi konkurencyjnej. Badanie to zapewniło wsparcie empiryczne dotyczące pośredniczącego wpływu TQM na stosunek zdolności i wydajności operacji łańcucha dostaw. Ustalenia są zgodne z opartą na kompetencjach, opartą na zasobach perspektywą firmy i teorią przewagi zasobów (związaną z sukcesem produkcji). Firmy mogą dzięki praktykom SCM korzystać z możliwości produkcyjnych poprzez koordynację z kluczowymi członkami łańcucha dostaw i wykorzystanie wiedzy specjalistycznej. SEM-PLS jest wykorzystywany jako narzędzie analityczne, które należy do najbardziej niezawodnych technik modelowania równań strukturalnych. W badaniu wykorzystano metodologię opartą na ankiecie, aby osiągnąć cele obecnego badania. Wykorzystywane jest losowe próbkowanie, a odsetek odpowiedzi wynosi 54 procent, co uważa się za wyższe niż minimalny odsetek odpowiedzi. Ustalenia pokazują, że trwałą przewagę konkurencyjną można osiągnąć poprzez zarządzanie łańcuchem dostaw. Ponadto badanie dostarczyło dowodów na bezpośredni wpływ praktyk SCM i zdolności operacyjnych na wyniki firmy.

**Słowa kluczowe:** kompleksowe zarządzanie jakością, wydajność firmy, zarządzanie łańcuchem dostaw, możliwości operacyjne.

#### 全面质量管理, 供应链管理实践和运营能力对企业绩效的影响

**摘要:** 该研究的主要目的是检查和解释运营能力, 全面质量管理, 供应链实践和运营绩效之间的结构关系。企业可以根据其内部功能获得高水平的性能。结果至关重要, 因为它不仅支持经理认识到通过与供应链中的合作伙伴建立关系来利用内部能力的方式, 而且还表明需要提高这些能力的专业知识。可以通过关键伙伴的支持和内部能力的整合来创造独特的资源基础。该资源基础对于获得竞争优势至关重要。这项研究为TQM对供应链运营能力与绩效之间的中介影响提供了经验支持。研究结果与企业基于能力, 基于资源的观点以及资源优势理论(与制造成功相关)相一致。通过与主要供应链成员进行协调并利用专业知识, SCM实践允许企业从制造能力中受益。SEM-PLS用作分析工具, 是最强大的结构方程建模技术之一。该研究使用基于调查的方法来实现当前研究的目标。使用随机采样, 响应率为54%, 这被认为高于最小响应率。调查结果表明, 可持续的竞争优势可以通过供应链管理来实现。此外, 该研究提供了证据, 表明供应链管理实践和运营能力对公司绩效的直接影响。

**关键词:** 全面质量管理, 公司绩效, 供应链管理, 运营能力。