Exploring the Association among Just in Time, Total Quality and Supply Chain Management Influence on Firm Performance: Evidence from Indonesia

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Abstract- **Various methods are under current debate among academia to strengthen the efficiency of the operations. In general, three of them have gained significant recognition in the literature i.e. just in time, supply chain management and quality control. This research investigates the associations among supply chain management (SCM), just in time and quality management and also their impact on organizational performance. Findings suggest that at all strategic and functional levels, there are associations among just in time (JIT), TQM, and supply chain management and are perceived as a significant role in the operational course of actions of the firms. Statistics also demonstrate that dedication to quality and supply chain management dimensions have the highest impact on performance.**

Keywords; *Just in time (JIT); operating performance (OP); supply chain (SC); firm performance (FP), production performance (PP)*

1. Introduction

In recent years, various operational methodologies, actions and procedures have developed in reaction to increased competition to enhance better product quality, agility and reduced delivery times, but at low costs. The significant consideration is gained by the business structures are JIT, TQM, and SCM. The JIT approach recommends waste management by streamlining the manufacturing cycles. Improvements in time management associated with manufacturing, attempting to control materials handling process and are perceived as measures to reduce or eliminate excess inventory, and helping to make a more efficient allocation of resources. TQM discourse demands for the development and implementation of culture at the corporate level that emphasizes consumer perspective, continued improvement, equality among the workforce and data-driven policymaking. Product design alignment with consumer needs and quality management at all phases of development and manufacturing operations are considered as the prime approach to strengthening product quality and hence enhances FP. SCM emphasizes on the assimilation of decision-making among buyers and manufacturers with the objective of trying to improve the quality products across the SC. Effective lead times, cost of materials, and advanced product quality and flexibility are the main characteristics of SCM. At firm-level, the efficiency and effectiveness of operational activities can be improved by alternate solutions such as JIT, TQM, SCM. All these factors are significant and have distinctive features, and the negligence to their association with FP is a narrow sightedness at the organizational level. JIT and SCM try to obtain quality products by improving manufacturing operations while the latter by incorporating innovation and manufacturing activities within the SC. The practical applicability of JIT relies on the collaboration with the manufacturer in terms of material management to improve product quality and reliability of the distribution process.

This can be assumed that even though the three methods have all such quantifying attributes, they are components of an integrated operational policy. In [1-10] concluded that both JIT and TQM have similar features therefore it is a complex process to bifurcate them. The phenomenon of operational strategies integration approaches are not new [20-25]. Key strategic potential provides the mechanism of integrated management process including JIT, technological developments and quality control practices [26]. Standardized automated value-added practices are currently unaffected by transporting, holding or redesign ' was also assumed to be compliant with objectives of cost-saving [27].

Whereas the concept of integrating factors of various organizational philosophies into an operating strategy is significant, specifically statistical confirmation of the effectiveness of such an approach on FP is limited. In [29] revealed that just-in-time and total quality management

activities are equally beneficial and that makes a significant contribution to the PF. They also identified that similar infrastructure variables impact FP positively. In [30] also investigated that both JIT and TQM are required to enhance the manufacturing efficiency, whereas TQM has a significant influence on the FP. Moreover, [31-33] demonstrated that TQM has impacts on FP, but JIT approaches have no effect. In [34] indicated that JIT approaches only influence performance if there is an appropriate quality structure is available. In [35] claimed that total quality management should be introduced in accordance with efforts to validate the supplier foundation to enhance FP.

The explicit relationships between just-in-time, total quality management and supply chain management approaches give rise to two concerns that must be answered, including the factors specified by these three approaches are compatible and in what way they impact FP? The purpose of the research was to address those concerns.

2. Literature Review

2.1 Just in time (JIT) Approach

Adoption of JIT was a complex process and it was evaluated by the Kanban analysis, and its fundamental components such as time management associated with manufacturing, coercive repair in the plant and machinery, and small-batch manufacturing were discussed in earlier researches [36-40]. Those include an association between JIT as well as other production methods, and of the supplier and consumer association, and the execution of JIT [41-45]. The effect of the JIT approach on FP was also the topic of interest for several researchers. Most have frequently indicated that the application of JIT techniques is associated with improvements in quality, productivity and profitability; Numerous researchers have discovered the facts about increased FP affiliated with the usage of JIT practices. Improvements have been reported in both financial and market performance [11, 37, 38, 41, 43].

2.2 Total Quality Management (TQM) Approach

Whereas the TQM literature foundation is comprehensive, previously much of it has been analytical or circumstantial in essence and assist very little in the implementation and execution of TQM initiatives [9]. It was not until the early 1990s that attempts had been made to categorize the TQM paradigms [4]. Nevertheless, numerous researches have investigated the relationships between performance and quality within the last three decades. Teoman and Ulengin (2018) [40] suggest that inter-organizational or intra-organizational management and employee satisfaction, as primary imperatives for managing the quality standards. Furthermore, they have revealed that these variables are satisfaction driving factors for consumers. Various concepts have been described in other studies and have been demonstrated to have a significant impact on the quality of product and PP standards [40, 44]. The influence of quality management techniques on FP is much rarer [15, 23]. Peng, Prybutok, and Xie (2020) [34] indicates that governance is necessary for the quality management mechanism, that improves FP. Findings had already demonstrated that the QoE-SME methodology not only offers a legitimate recognition of the variables commonly referred to TQM, but also that the variables in line with those discovered in other studies [8, 29].

2.3 Supply chain management (SCM) Framework

Although numerous interpretations of supply chain management have been instituted, the assimilation of procedures across the supply chain is a fundamental concept behind the ultimate objective of value addition to the consumer. Although this emphasizes on the necessity to assimilate, logistical support and procurement activities with production processes in practical terms. SCM has traditionally been illustrated as logistical management or supplier management. The logistics recognize SCM as the integration of the product-related logistical activities [19]. Dragging goods through the supply chain in accordance with market trends instead of moving them in accordance to estimates, facilitates firms to adapt demand variability inside the supply chain, and control inventories more efficiently [18, 31], the theory of integrated logistics systems are interchangeable with that [28]. Supply focus is interchangeable with supply level simplification and modernizing and supplier cooperation into product development and distribution practices. Controlling the SC means decreasing and optimizing the supplier stronghold to expedite the management of supplier relations, improving strategic partnerships, planning to work with suppliers to make sure that goals are being achieved and including manufacturers in the initial process of product design in order to gain benefits from their skills and competence [13, 17]. It illustrates an increasing acknowledgement that subcontracting and concentrating on core competencies not only facilitates them to make good use of their own assets and stay more flexible to market trends but also enables them to use their suppliers ' competencies, skills, innovations and efficiencies. Both the logistical support and SCM literature offer sufficient findings regarding the influence of SCM on FP. The research work on logistical support demonstrates that inter-relationship among [16], operational assimilation, e.g. transport or procurement operations [30], customer-centric logistical support [16], and logistical planning, as an interconnected operation [16] are all associated significantly to operating performance. From the supplier point of view, supplier growth, supplier collaborations, supplier participation and competitive purchasing all positively in the efficiency of procurement activities [27, 42]. Furthermore, supplier

relationships, supplier growth and supply chain consistency all have a significant influence on FP [10, 26, 39].

3. Research Methodology

Organizations not only follow operating policies to enhance OP but also to include these developments to accelerate overall FP indicators. Nevertheless, whilst it is clear that JIT, TQM and SCM activities and approaches influence OP collectively, how they integrate and how they impact FP is not completely explained. Five generally utilized industry and product reliability strategies have also been presented in (Appendix 1). for every element, a Likert scale point (5 = high) was formulated. Questions have been formulated with a purpose to obtain a higher standard of information reliability and decreasing the probability of common method bias. 40 senior procurement executives evaluated the tools accordingly, as well as where required, rephrased the questionnaires. Senior operational and procurement executives in Indonesia were the sample group for the research.

650 questionnaires have been received from the 2780 questionnaires sent to the different corporations in Indonesia. Corporations lie in the range of 100 to 2000 workforce and the median is 100 personnel. Further to check reliability analysis was conducted by making use of Cronbach's Alpha in order to make sure that components used to operationalize just-in-time, total quality management, supply chain management and performance were evaluated to check that the components are from statistical errors [32]. Whereas the study suggested that certain items should be dropped, ideals for the consequent measurements are more than 0.70, that has shown its reliability, as it can be seen in Table 1.

3.1 Analysis

First, the analysis was performed to decrease the just in time, total quality management and supply chain management constructs into groups to a lower the values. Principal Components Testing was utilized to classify variables with a significance level of 1, and Varimax rotation was implemented for improved interpretation of factor loadings [36]. In the context of spherically symmetric and discriminating reliability, only products that had a factor loading of at least 0.50 and had no loading surpassing 0.40 on a secondary variable have been maintained [32,45].

Table 1. Reliability analysis

Scale	Items		Notes	
JIT	10	0.892	Item 9 was dropped resulting in a value	0.893
TQM	16	0.919	Items 1 and 14 were dropped resulting in a value	0.923
SCM	15	0.913	Item 3 was dropped resulting in a value	0.915
FP	5	0.746		

Table 2. Factor analysis—Just in Time (JIT)

Factor	Scale item	Factor loading
JIT1: material	Reducing lot size	0.818
	Reducing setup time	0.779
	Increasing delivery frequency	0.700
	Buying from JIT suppliers	0.549
JIT2: commitment to JIT	Increasing JIT capabilities	0.858
	Helping suppliers increase their JIT capabilities	0.838
	Selecting suppliers striving to promote JIT principles	0.582
JIT3: supply management	Selecting suppliers striving to eliminate waste	0.857
	Reducing supplier base	0.596
	Preventive maintenance	0.568

Table 3. Factor analysis— Total Quality Management (TQM)

Factor	Scale item	Factor loading
TQM1: product design	The modular design of component parts	0.869
	Using standard components	0.797
	Simplifying the product	0.741
	Designing quality into the product	0.656
	Considering manufacturability and assembly in product design	0.650
TQM2: strategic commitment to quality	Employee training in quality management and control	0.855
	Empowerment of shop operators to correct quality problems	0.831
	Top management communication of quality goals to the organization	0.803
	Emphasizing quality instead of price in supplier selection	0.572
TQM3: supplier capability	Considering commitment to quality in supplier selection	0.803
	Considering process capability in supplier selection	0.768
	Considering commitment to continuous improvement in supplier selection	0.715

The JIT measurement resulted in three determinants:factor loadings below 0.50 and were therefore ignored. Four resource engagement to JIT and SCM (Table 2). The variablesSCM variables illustrating incorporation of the supply chain, accounted for 61% of cumulative variance. It identified threecommunication, growth and data sharing were attained (Table TQM variables, design and development, executive managerial4). These four determinants illustrated 59% of cumulative structures that support the TQM, and supplier ability. 60% ofvariance. Four elements (1, 12, 14, and 16) had a the cumulative variance was described by these threefactor loading lower than 0.50 and were therefore excluded. determinants (Table 3). Four elements (1, 3, 9, and 13) had

Table 4. Factor analysis—SCM

Factor	Scale item	Factor loading
SCM 1: supply chain integration	Seeking new ways to integrate supply chain management activities	0.870
	Improving integration of activities across the supply chain	0.794
	Reducing response time across the supply chain	0.774
	Establishing more frequent contact with supply chain members	0.641
	Creating a compatible communication/info system for supply chain members	0.541
SCM 2: supply chain coordination	Communicating customers' future strategic needs throughout the supply chain	0.755
	Communicating your future strategic needs to your suppliers	0.752
	Creating a greater level of trust among supply chain members	0.689
	Identifying additional supply chains where can establish a presence	0.551
SCM 3: supply chain development	Participating in sourcing decisions of suppliers	0.780
	Extending supply chain membership beyond immediate suppliers/customers	0.759
SCM 4: information sharing	Using formal information sharing with suppliers and customers	0.775
	Using informal information sharing with suppliers and customers	0.750

Table 5. Correlation, Analysis, JIT, TOM, SCM factors

	TQM1: product design	TQM2: strategic commitment to quality	TQM3: supplier capability	SCM1: supply chain integration	SCM2: supply chain coordination	SCM3: supply Chain development	SCM4: information sharing
JIT1: Material	0.431*	0.277*	0.047	0.228*	0.115	0.058	0.182*
JIT2: Commitment to	0.090	0.165*	0.090	0.198*	0.087	0.209*	0.125*

JIT							
JIT3: supply management	0.362*	0.170*	0.435*	0.147*	0.344*	0.327*	0.193*
TQM1: Product design				0.235*	0.224*	0.203*	0.183*
TQM2: Strategic Commitment to quality				0.092	0.216*	0.122*	0.110
TQM3: Supplier capability				0.144*	0.278*	0.108	0.288*

*Denotes significant at α = 0:0

Table 6. Correlation analysis: performance

Factor	Market share	Return on assets	Product quality	Competitiveness	Customer service
SCM.1: supply chain integration	0.105	0.098	0.134*	0.121*	0.055
SCM.2: supply chain coordination	- 0.043	- 0.026	0.052	0.032	0.211*
SCM.3: supply chain development	0.029	0.072	0.121*	0.116*	0.069
SCM.4: Data sharing	0.004	0.101	0.168*	0.134*	0.118*
JIT.1: material flow	0.113	- 0.021	0.063	0.039	- 0.003
JIT.2: commitment to JIT	0.048	0.052	0.097	0.039	0.070
JIT.3: supply management	- 0.010	0.080	0.170*	0.026	0.159*
TQM.1: product design	0.011	0.034	0.126*	0.094	0.075
TQM.2: strategic commitment to quality	0.140*	0.084	0.153*	0.175*	0.201*
TQM.3: supplier capability	0.004	0.079	0.133*	0.046	0.160*

Denotes significant at α= 0:05.

3.2 Correlation analysis

Multivariate regression analysis was conducted to determine that JIT, TQM and SCM variables correspond with each other (Table 5) and with the measurements of FP (Table 6). Additionally, relationship variables were evaluated to determine that JIT, TQM, and SCM variable triads effectively demonstrated.

Table 7. JIT, TQM, SCM triads

JIT factor*	TQM factor*	SCM factor*
Material (1)	Product design (1)	Supply chain integration (1)
Material (1)	Product design (1)	Information sharing (4)
Commitment to JIT (2)	Strategic commitment to quality (2)	Supply chain development (3)
Supply management (3)	Product design (1)	Supply chain integration (1)
Supply management (3)	Product design (1)	Supply chain development (3)
Supply management (3)	Product design (1)	Information sharing (4)
Supply management (3)	Strategic commitment to quality (2)	Supply chain development (3)

Estimates in parentheses reflect variable number. Correlation between all triad pairs (i.e., JIT.1–TQM.1, JIT.1 –SCM.1, TQM.1–SCM.1, Table 7).

4. Results and Findings

The relationships inside a triad of just in time, total quality management, and supply chain management variables have been substantial in 7 out of thirty-six findings. Persistently important relationships inside the triads of resource transfer (just in time.1), product development (total quality management.1), and SCM (supply chain management.1) and exchange of data (supply chain management.4) indicate that collaborating with supply chain associates and developing goods with production requirements are compatible with strategies to modernize material movement. Whereas distinctive features of just in time model are the applicability of strategies such as installation time and lots-size decrease

to strengthen resource transfer, these activities can be supported by providing information on timelines of SC participants and integrating processes to build an interconnected resource flow network. It extends further than the first-tier distributors, mostly analyzed in the framework of the JIT, to incorporate further inbound and outbound supply chain participants. Product development is important to this method, as cost-efficient product development can minimize component development needs and thereby streamline material circulation.

The early participation of the manufacturers in the research and development phase is associated with the enhancement of the product design. This, in addition, enables to understand effective substantial commonalities inside the SCM (just in time.3), Product development (total quality managemment.1), SC integration (supply chain management 1), SC Development (supply chain management 3) and Data sharing (supply chain management 4) triads. Controlling the SC and collaborating it with manufacturers is supported by modernizing the supplier base and identifying suppliers devoted to sustainable manufacturing standards. The important relations between contribution to just in time (just in time 2), executives' willingness to the TQM (total quality management 2), and integration of the SC (supply chain management 3) are of considerable importance. This supports the theory that JIT, TQM, and SCM are associated at a tactical stage. It is impossible to hypothesize if this is the outcome of rational manifestation on the aspect of higher management or an unexpected result. Even though the aforementioned context is necessarily the case, it offers practical advice for those responsible for the development of operational policy and dispatching materials. Careful investigation serves for observations on the consequences of different JIT, TQM and SCM activities. All JIT variables strongly interact with the operational engagement of quality (total quality management 2), SC management (supply chain management 1), and data communication (supply chain management 4).

Although a performance policy has many aspects, the implementation of JIT approaches is a way to achieve the objectives of the strategic plan at a functional stage. The study further indicates that the implementation of a JIT approach implies that organizational goals and priorities be compatible with those of supply chain participants. It does not restrict the implementation of explicit JIT techniques irrespective of strong relations to the supply chain. For instance, administrative actions to strengthen material distribution by minimizing installation times do not involve or are influenced by, comparable relations to the supply chain. Furthermore, in order to execute an effective just in time approach, the SC partners ' demands and abilities must be compliant and cooperative of domestic JIT measures and vice versa. All TQM determinants are substantially associated with SC integration (supply chain management 2) SC management (just in time 3), and all SCM techniques are associated with SCM (just in time 3) and quality model (total quality management 1) governance.

These statistics are an objective measure of the significance of an efficient resource management approach and of assuring that the SC responds to consumer requirements. It also clearly acknowledges the importance of supply chain participants to be involved in the product design phase. A strategic devotion to quality tends to become the most reliable factor of FP and is considerably associated with all performance measures apart from investment returns. Exchange of data (supply chain management 4) substantially associates with 3 performance indicators and 4 variables, SC integration (supply chain management 1), SC innovation (supply chain management 3), SCM (just in time 3), and supplier Ability (total quality management 3) each considerably associate with two performance indicators. All these findings demonstrate that whereas an organizational contribution to quality has the highest effect on the efficiency of any single variable, SCM is a key component of FP. Among the six characteristics that substantially correlate with minimum two performance indicators, three are SCM variables and two more contribute to supply chain management. In addition, none of the two existing just in time variables, resource flow (just in time 1) and just in time engagement (just in time 2), are exponentially associated with FP. Whereas this is compliant with the outcomes of past research works that conclude that just in time has little impact on FP, it will be short-sightedness to hypothesize that just in time strategies are insignificant [12, 43]. Inman et al. (2011) [20] concluded that several JIT and TQM activities may be overlapping. Which finds it challenging to differentiate JIT and TQM's specified performance inputs. In fact, emphasizing on corporate success seemed to have the influence of prohibiting JIT from becoming completely recognized because of its importance. The Impact of just in time should have been more explicit regarding performance measurements like transfer time and stock throughput. For the 5 performance indicators identified, the quality of the product is frequently influenced by the triad. Thus, 3 variables, SCM (supply chain management 2), material movement (just in time 1), and engagement to just in time (just in time 2) did not substantially associate with the quality of the product.

Consumer satisfaction and quality strongly associate with five and four variables, collectively. All these variables also represent explicitly or implicitly the relationships of the supply chain and an organizational effort to quality management. These findings endorse one of the strongest conclusions proposed by SCM, especially that associating supply chain participants ' priorities and abilities across a common goal of consumer-value is a

factor of quality of product and the potential to satisfy consumer expectations. In addition, customer base and investment returns indicate considerable associations with one and zero variables. Hypothesis is supported when just in time, total quality management and supply chain management may have an effect on FP indicators with a strong amount of control over operational activities, they might not be reliable variables of larger and more diverse FP initiatives. Moreover, it does not imply that all these performance indicators do not impact the operating strategies of the business. Performance strategies like investment returns and profitability are significantly impacted by a sizeable number of non-operational variables. It might have the consequence of reducing the effects of operational variables on these measurements. It must be observed, nevertheless, that a strategic determination to TQM is the only variable that coincides with market share.

5. Conclusions

This research will establish three implications. At a strategic stage, JIT, TQM and SCM have significant relationships. Some firms may comprehend the fundamental association between the three and exploit the benefits of the implementation of all three, whereas, other firms may ignore its benefits. By incorporating JIT, TQM and SCM activities directly and adequately into the organizational plan, the possibility remains for adding value and appropriately positioning itself to adapt to market challenges. Just in time, total quality management, and supply chain management approaches can be implemented simultaneously at a strategic level to add value. The magnitude at which different activities converge with one another and outcomes is an indication that although the three could have distinctive features and targets, there are certain attributes of each that can be supported by each other effectively. Eventually, recognizing SC collaborations is not just an emphasis on quality but also a primary factor of FP. Either through cooperation and assimilation of operations across the SC or by the acknowledgement of the skills of direct manufacturers, recognizing the aspects of the SC has a positive effect on FP. Moreover, the shift towards subcontracting and concentrating on main business activities are increasing, firms will be under additional stress to consolidate supplier and consumer relations effectively. The research indicates that this will be an important factor in firm growth. Moreover, this research is conducted in Indonesia so it would be attracting to test this in other developing countries. Moreover, policymakers should focus on the encouragement of the firms to introduce efficient manufacturing through JIT and TQM to improve performance from all aspects.

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