

Determining the Operational Performance in Supply Chain with Moderating Role of Information Quality: A Case of Thai Textile Industry

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Abstract- The prime objective of the current research is to determine the operational performance of textile units of Thailand. The study was conducted on the Thai textile manufacturers as this industry is one of important and backbone for economy. The study aims to determine the operational performance predictors and investigated the relationship between technology integration and logistics integration. The information possesses the central importance in management of supply chain and play vital role in supply chain activities as decision making based on information quality and accuracy. Inaccurate information will mislead the firm to take inappropriate decision in highly competitive environment. The study examined the moderating role of information quality and found interesting results that technology and logistics integration positively significantly influence the operational performance. The moderating effect was observed in technology integration and operational performance but no moderation effect was found between logistics integration and operational performance.

Keywords; Technology Integration (TI), Logistics Integration (LI), Operational Performance (OP), Information Quality (IQ), Supply Chain Management (SCM)

1. Introduction and Background

Supply chain management (SCM) emerged during 60s and gained attention of research scholars in 80s with increased importance due to its significance as key role in success of organization [35-37]. Technological development changed the business environment rapidly due to intensive usage and extensive benefits. The significance of supply chain increased with the passage of time as it directly effect the performance of firm and literature has discussed various influential phenomenon [1]. The competitive business environment has encouraged firms to emphasize on all functions from raw material handling to finished goods, in short effective supply chain management must be incorporated for organizational success and performance [2].

Several studies have been conducted to determine the influence of effective supply chain as it has direct effect on performance of firm [3]. Due to importance of supply chain it has become prime concern of researchers and practitioners as it plays significant role in gaining competitive advantage by various means. The increased

attention towards effective supply chain is in response to changing business environment and scale to multinational and then global level as firms gets opportunities to extend their boundaries. The increased set up and increased number of participants in terms of business expansion SCM has become more complex and sensitive, so therefore, supply chain gains central importance for smooth running and success of business. The all functional activities must be integrated in one chain for effective functioning and achievement of goals to gain competitive advantages [4]. Currently, trend and basis for competition has changed and it is no more related to production or functional process only but depends largely on supply chain management. The effective supply chain contributes significantly in success and performance of firms to gain competitive edge. The importance of supply chain found to be different in diverse industries, such as in textile industry [3].

The management focus on efficient utilization of resources for effective function of supply chain as their planning concerns with information flow, logistics management, capital flow, acquisition of knowledge, sharing of knowledge and coordination among nodes of firms for supply chain effectiveness. Effective supply chain enable firm to improve their response rate and speed of work to avoid uncertain delay in supplies [5].

The technology plays important role in effective utilization of supply chain and majority advancements associates with technological development. The operational performance depends upon effective supply chain as efficient logistics management contributes for reduction in cost. Technology aids in achievement of goals for effective supply chain including range of participants for communication and coordination [6]. Through effective utilization of technology produces lot of benefits including reduction in cost, efficiency and collaboration among stakeholders and participants of business at operational level [7].

The supply chain perspective entails the raw material management while maintain effectiveness and timely availability of material as and when required [8]. The key concern for strategic development addresses the need for effective supply chain management for business operations and operational success largely depends upon SCM. It has emerged to integrate suppliers, stakeholders, sellers, customers and other relevant entities for information sharing and coordination for effective and

smooth running of tasks. The capability of firms to utilize and implement supply chain strategies that produces benefits for cost reduction, production incline, flexible, introduce innovation, strengthen the association and relation between stakeholders must be incorporated at each level for accomplishment of goals [9-11]. Supply chain management must be capable of adding values to each operational step while considering strategic management goals.

Literature embarked on effective supply chain must be capable of bringing changes at operational level for effective decision making through information provided by supply chain as and when required. The flow of appropriate information on required parameters considered as efficient and play role in effectiveness of supply chain at operational level by reduction in cost and saving time. The delay in information for decision making found to be harmful and useless for firm as on time decision based on the timely availability of firms. [5]. The role of IT play important role as discussed earlier in operational performance by sharing information on time and valuable information assists for appropriate decisions. The supply chain addresses and integrates inter-org activities that include suppliers, manufacturers, transporters, traders, customers and service providers.

The performance of firms also depends upon supply chain as it play role in performance improvement. The performance of firm defined as a process of elaborating efficiency and effectiveness at operational level that shows its presence in actions. Further, it is considered as set of metrics that used for quantify the efficiency of actions [5]. The research scholars and practical participants detect issues and problems in supply chain efficiency for improvement at operational level. The strengths and weakness of firm must be realized at each level to allow management to take appropriate measures for success of operational actions. The correct and in time availability of information enable firms to take managerial decision on time for effective improvements in decision making and operational performance [12].

Various studies have been conducted on tourism industry of Thailand and addressed the activities in detail associated with supply chain among participants (Jermisittiparsert, Joemsittiprasert, & Phonwattana, 2019). The related activities include suppliers that provide similar services and clients at the end. The studies have been focused services sector and marketing efforts for tourism industry. The tourism industry has been discussed in SCM perspective that entails hotel industry, restaurants, entertainment and transport industry [13]. The integrated supply chain system is need for time for any industry as it has been described in tourism industry to communicate among participants on time for various issues of inventory of business and delivery time. The supply chain performance consists of financial performance and operational performance and that can be achieved through effective management of supply chain by lowering time, quantity and management through effective communication [14].

The largest manufacturing industry of Thailand is textile that comprises on manufacturing unit and fabric unit (spinning and finishing) since decades. The industry

has introduced various upgraded innovations in terms of latest machinery that produced best quality fabric. Textile is considered largest scale industry of manufacturing and the processes included from upstream supply chain to downstream supply chain. The growing sector of textile comes across new challenges and issues including hazards, waste management, supply line issues, inventory management, logistics and value additions. There are approximately 65 various different suppliers and various issues occur as there are movements and hazards textile industry has to face challenges and issues [15].

The supply chain of textile industry has wide operations which start from raw material, ginning, spinning and extrusion processes, facilities, weaving and knitting sectors further it continuous to manufacturing of garments and distribution channels. The supply chain of textile considered as most diverse supply chain due to nature of raw material, technology and production of final product. The nature of product manufacturing causes complexity of supply chain, domestic and international supply chain networks [16]. The expansion of business across the border and complex supply chain has to be handled to respond dynamic environment [16, 17].

The basic supply chain flow chart of textile and apparel industry is demonstrated in figure 1 below.



Figure 1. Textile Supply chain

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he synchronization of all supply chain activities must be align and integrated for coordination to fulfill the requirement and to become competitive. Research scholars have come up with two terms in supply chain to be enforced namely quick response and accurate response as an integral part of any business system [18]. Quick response addresses with development in business for improvement in competitive edge through implementation of technologies in supply chain. The product lead time shorten can be backed by quick response for delivery. Accurate response addresses the integration to forecast, planning and production that allow manufacturer for postpone decisions due to uncertain situations [18].

The current study entails to determine the operational performance of effective supply chain influenced by technological advancements and logistics integration with moderating role of information quality in textile sector of Thailand.

2. Literature Review

Operational performance of supply chain in literature is discussed as result of strategic, systematic and quick coordination among business activities inside and external entities that involved in process of production from raw material to finished goods [19]. Research scholars have stated four elements that include supply chain reliability, responsiveness, agility and cost of supply chain for measuring supply chain operational performance to depict complete performance scenario. Operational performance is different and distinct than other performance scale due to its specific concern as it doesn't focus and emphasize

on financial aspect or performance of firms. The reliability of supply chain can be determined through the quality of performance and fulfillment of orders and delivery according to required parameters. Responsiveness is one of important factor in supply chain and defined as speed of providing products, services or information to members for supply chain. The agility is defined as ability to get adjusts quickly in operations of supply chain in response to market changes. The cost associated with supply chain referred as supply chain cost [20].

The research scholars have argued that for determining the operational performance of supply chain can be done through reliability, flexibility, response time, cost and management of assets [21]. The study focuses on operational performance and reliability, flexibility and responsiveness and cost defined as dimensions of supply chain operational performance. The operational performance associated with non financial performance and side of the supply chain. The financial matters including asset management has excluded from the study of operational performance. The efficiency of supply chain depends upon the delivery of goods and services to customers, reduction in cost and keeping the quality higher. The researchers have defined the firms may face critical situation and failure due to un-awareness of success factors for keeping cost low in supply chain. The supply chain cost must be kept lower, quality as reliability must be higher to be certain, flexibility should be incorporated and responsiveness considered as quick response time to address the market issues or changes [22].

The prime objective of supply chain management considered as increase in operational efficiency and financial performance of each node and participant in managing global supply chain [23]. The standard of performance can be described level of efficiency and effectiveness, whereas efficiency is used for describing internal standards of performance and effectiveness is associated with external standards to determine the performance. The firms in textile or any other sector crucially concerned with efficiency and effectiveness of modern supply chain management [22]. The effectiveness and efficiency of any operation can be accessed on the base of six components including reliability of product, fulfillment from workforce, fulfillment customer needs, delivery time, profitability and efficient work [24]. The efficiency of operations of supply chain can be achieved by JIT production system, and effectiveness can be achieved by meeting customer's need and introducing innovative products [5].

Previously, measurement of performance was taken on the basis of profit and cost, but later it has added operational aspect and services. The global and expanded business or increased participants of supply chain must be integrated and evaluated according to their functions and skills. The firms has to relay on skills required for efficient supply chain to reduce cost and improve benefits and quality [3].

According to researchers and literature has described that performance can be categorized as environmental performance, financial performance and operational performance; as it can be underpinned by Resource Based

View theory. The categorization has been discussed previously by [25]. The operational performance found to be influential for performance of firm overall since it has been characterized. Researcher scholars have stated that various activities of supply chain associated with transformation of raw material, manufacturing and at the end finished goods [5].

Therefore, the purpose of present study is to determine only operational performance of supply chain and influential predictors of operational performance in textile sector of Thailand.

2.1. Technology Integration and Operational Performance of Supply Chain

The integration of latest available technology in business operations is considered as need of time and required for excellence and to gain competitive edge. The business environment is changing rapidly due to inclusion of technological advancements in business operations for innovation and efficiency [16]. The performance of business depends on technology integration and innovation they introduced to meet the market need. The products must be export for profit maximization and to maintain presence and market share in global market. [26]. The information technology utilization assists firms to gain higher level of flexibility in designing of garments and improvement in quality of international standards [27].

The technology integration plays crucial and decisive role in operational performance as utilization of technology improve the practices and functions by efficiency and effectiveness from raw material to finished goods by communication and coordination among different participants of supply chain. Through technology firms re-engineer and re develop their business operations and support technical aspect [28]. The integration of technology in textile firms of any business contribute for changes at every level to improve the existing techniques of doing business while enhance the expertise by structural changes. Technological changes are investable in highly competitive environment now and became necessary element of supply chain. Innovation has significant role to play in any business to re-engineer or re-organize business activities as in supply chain innovation and technological integration considered as key drivers for achievement in strategic goals and sustainable performance. The integration of technology must be incorporated at manufacturing level from raw material to end product to keep the cost lower and improve the business functions [28]. The lack of knowledge about technological integration will result in lack of operational efficiency and performance. The firms should strive to acquire knowledge about latest available technological advanced equipment that can generate benefits at large scale for firms [5].

There are various challenges have been faced by industry associated with textile in terms of lack of knowledge and implementation of latest technology and operational performance decreased and firms suffered at every level of performance and for survival. These important and crucial factors have been described by researchers to be incorporate appropriate level of

technology implementation for operational excellence. Lack of electric supply will cause failure at textile unit and affect negatively the growth of firms. The production will receive negative affect and damage the business by increased cost and lack of operational activity that sacrifices the quality of product and break the entire supply chain [29]. Another factor that negatively affects the operational performance of supply chain has occurred in literature as integration facility of technology at various levels of firm to increase the productivity. The lack of integration of technology in textile operations will affect the productivity and quality of product that negatively influence the sustainable growth market share in global competitive market [30]. The supply chain of textile sector is one of the complex supply chains which is long and fragmented on various elements. The raw material to manufacturing unit and then finished fabrics for shipment to required units include various complex issues and challenges due to its time frame which spans over 50-60 days. To survive and be successful in such a complex and crucial supply chain manufacturers must focus on integration of technology for operational excellence by penetrating IT into supply chain activities to enhance the overall performance and improvements [16].

Based on the above discussion of integration of technology in business activities and supply chain, following hypothesis is derived:

H1: *Technology Integration positively influence the operational performance of textile supply chain in Thai textile sector*

2.2. Logistics Integration and Operational Performance

Logistics management is considered as one of important and backbone of supply chain effectiveness. Effective and efficient logistics management play role in success of firms and logistics management addresses the planning, implementation and controlling of goods from one point to another [31]. The logistics integration is defined as inclusion of supply chain practices that relates to supplier and customers for management of raw material handling and information flow within participants of supply chain. The movement of material, goods and people from one point to another and flow of information can be described as logistics too according to research scholars [5].

The literature has give attention to need of effective logistics management as speedy and timely delivery of goods must be incorporated for achievement of operational performance. The superior flow of information among supply chain participants ensure and assist appropriate decisions by management. [32]. The supply chain performance and logistics management has prime concern with time, accuracy and cost. The logistics integration involve supplier and customers, efficient output, reduction in cost and accurate information [32]. The logistics management play important role in explaining and determining the operational performance and technology being adopt in logistics management. Various manufacturing units face challenges in overcoming their collaboration and cooperation deficiency while logistics transfer among different participants of supply chain.

The research scholars have reported that logistics management influence the operational performance by affecting positively to operational efficiency, reduced cost, reduce on wastage material, resource utilization and fulfill social aspect of environmental friendly aspect [33]. Further, the literature embarks about selection of effective and efficient transportation that reduce environmental damage and reduce cost [32]. The research scholars have depicted that efficient logistics management improve the operational performance and overall influence the performance of firms by reducing cost and efficient utilization of resources [5]. The logistics integration is ensured by involvement of suppliers, manufacturers, customers and other relevant departments and their aligned goals and operational parameters influence the efficiency and operational performance. The valuable conversation and information sharing with quality perspective among supply chain partners predict operational performance.

On the base of above discussion following hypothesis is derived:

H2: *Logistics Integration positively influence the operational performance of Thai Textile industry*

Moderating Role of Information Quality

The prime concern of present study is to determine the operational performance of textile industry of Thailand; the study entails to determine the influential factors of operational performance and examined the role of technology integration and logistics integration. The study intends to investigate the valuable link and association of information quality as moderating role, whole supply chain primarily focus on information sharing and coordination. The study will produce interesting results in determining the moderating role of information quality in influencing the operational performance.

The studies have been conducted to determine the performance of supply chain influenced by various factors in diverse industries and regions. The study conducted on Indonesian tourism industry and hotel management to determine the supply chain efficiency and found positive significant influence of strategic supplier partnership, information sharing and quality and supplier's performance on hotel industry supply chain. The purpose of supply chain is to ensure the effective and timely quality information sharing between different participants of firms, if the supply chain doesn't fulfill the purpose of information sharing the outcomes will be affected negatively due to lack of decision making on time. Hence, it is required to ensure information quality as accurate information sharing among required nodes for long term and successful decision making [34].

To investigate the moderating effect of information quality following hypothesis is derived:

H3: *Information Quality moderate the relationship between technology integration and operational performance*

H4: *Information Quality moderate the relationship between Logistics integration and operational performance*

2.3. Research Framework

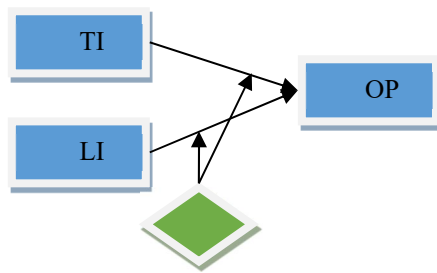


Figure 2. Proposed Framework

3. Research Methodology:

The study was cross sectional in nature and qualitative analysis was conducted on textile industry of Thailand. The study determined the operational performance of textile firms influenced by technology and logistics integration. The textile firms of Thailand as organizational units were respondents of the study. The data was collected from the supply chain managers of textile firms through questionnaires. The data was collected from 143 textile units of Thailand based on convenience sampling technique to determine the operational performance. The measurement scale of each construct was adopted from the previous studies and was determined on 5 point scale.

3.1. Measurement Development

The scales of all constructs were adopted from previous studies. The operational performance (DV) was measured on the base of reliability (7 items), responsiveness (6 items), agility (6 items) and cost (5 items). The total items of the construct were 24 to measure the operational performance and was adopted from the study of [20]. The 6 items measurement scale to determine technology integration was adopted from the study of [5]. The 5 items scale of logistics integration was also adopted from the study of [5]. The 4 items scale to determine the moderating role of information quality was examined and adopted from the study of [34].

3.2. Analysis of study

The current study analyzed of collected data as by using SMART-PLS. The Measurement Model and Structural Equation Modeling techniques are used for data analysis.

3.3. Measurement Model

The measurement model demonstrates the cronbach alpha (α), results of convergent validity as suggested by Gefe, Straub and Boudreasu (2000); the resulted values of both measure convergent and composite reliability must be higher than 0.7 and AVE must be higher than 0.5. The analysis is shown in the table below.

Table 1.

S#	Variables	Alpha α	CR
1	OP	0.814	0.791
2	TI	0.791	0.751
3	LI	0.761	0.763
4	IQ	0.818	0.823

3.4. Discriminate Validity:

The table 2 demonstrates the discriminant validity as suggested by Fornell and Lacker, (1981). Discriminate validity and shared AVE is demonstrated in table below.

Table 2.

S#	Variables	OP	TI	LI	IQ
1	OP	0.919			
2	TI	0.691	0.872		
3	LI	0.761	0.543	0.877	
4	IQ	0.518	0.781	0.612	0.823

3.5. Structural Equation Model:

3.5.1. Hypothesis test: Direct effects:

The current phase of the study investigates the relationship between variables of proposed framework. The table 3 below demonstrates the analysis of direct relations between the constructs of the study. The hypothesis H1 investigates the relationship between technology integration and operational performance and found that β value was observed as 2.345 with $P < 0.000$ and t-value 4.543; therefore on the base of statistical figures H1 is accepted; that technology integration influence the operational performance. The second direct hypothesis demonstrates the relationship between logistics Integration and operational performance at textile industry of Thailand. The results demonstrates the β value as 4.556, whereas $p < 0.000$ and t-value as 6.231. The statistical figures of t-value and β -value shows significant positive results of hypothesis H2, hence H2 accepted on statistical grounds. The table 3 below presents the summary of results.

Table 3.

H#	Relations	β	t-value	Remarks
H1	TI \rightarrow OP	2.345	4.543	Supported
H2	LI \rightarrow OP	4.556	6.231	Supported

3.6. Moderating Role of Information Quality: Indirect Relations

The current phase of the study examined the moderating role of information quality between independent and dependent variables of the proposed framework of the study by bootstrapping method of PLS. hypothesis H3 examined the moderating role of IQ between TI and OP; the analysis of data depicted that β value as 2.121 and $p < 0.001$; and t-statistics as 2.321; therefore it is found that H3 accepted and information quality moderated the relationship. The next moderating role of IQ between LI and OP was determined on the base of collected data. The results of the analysis shows that β value was observed as 0.212 and $p < 0.005$; whereas t-

value found to be lower than cut off point 1.231; therefore H4 was rejected on statistical grounds and found that information quality don't moderate the relationship.

Table 4.

H#	Relation	β	t-value	Results
H3	TI*IQ→OP	2.121	2.321	sig
H4	LI*IQ→OP	0.212	1.232	In-sig

4. Conclusion:

The prime concern of the study was to determine the operational performance of textile industry units of Thailand. The study determined the influence of technology integration on operational performance and result of the analysis depicted that technology integration has central importance and play important role in operations of supply chain. The study found positive significant relationship between the constructs of hypothesis H1. The study also determined the relationship between logistics integration and operational performance. The logistics management is most important factor in whole supply chain as it relates to the movement of material and goods from one point to another, so efficient supply will ensure the performance and efficiency of operational performance. The results of the study found that logistics integration is essential for successful execution of operations in the firms as textile industry has most complex supply chain activities. Therefore hypothesis H2 was accepted on statistical grounds. The study also determined the moderating role of information quality and found that information quality moderated the relationship between technology integration and operational performance but information quality didn't moderate the relationship between logistics integration and operational management. The hypothesis H3 was accepted on statistical grounds but H4 was rejected. The study suggested to textile industry to maintain the technological advanced equipment and enhance logistics management and more IT oriented for successful operational outcomes.

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