Impact of Supply Chain Capabilities on Supply Chain Performance: A Case of Thai Electronic Industry

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Abstract- **The present study empirically investigated the supply chain capabilities to determine the supply chain performance in electronic industry of Thailand. Globally, competition has increased due to business expansion and global phenomenon. The study investigated the relationship between supply chain capabilities as measured by supplier partnership and innovativeness in turbulent and highly competitive environment. The current study is conducted on electronic industry of Thailand, to investigate the influence of supplier partnership and supply chain performance and influence of innovation on supply chain performance. The study is unique in determining the moderating role of technology adoption for supply chain between independent variable and dependent variable. The analysis of the study suggested that supplier partnership influence supply chain performance, similarly innovation influence the supply chain performance, moreover moderating effect was also reported and demonstrated in analysis phase of the study by significant change in the effect of independent variables on dependent variables.**

Keywords; *Supply Chain Performance (SCP), Supplier Partnership (SP), Innovativeness (Inno), Technology Adoption (TA)*

1. Introduction and Background

The supply chain management emerged in 60s and literature discussed phenomenon in 80s with rapid changes in business environment. Research scholars have given attention to SCM due to its importance and significance. Supply chain has gained incredible attention for researchers and practitioners for its vital role in organizational success and performance [1, 32-33]. The significance of SCM to influence the performance of firm in any sector contributes to gain competitive edge. The firms emphasize on supply chain activities to improve the performance [2]. Researchers have argued and empirically investigated that supply chain activities has significant direct relations with performance of organizations [3].

Currently in highly competitive environment supply chain has gained much more importance for successful business and firms have special interest in improvement of their supply chains to gain advantages over their competitors. The trend in business these days found to be opportunistic for expansion and to become multinational operator. The expansion of business instigates competition due to its wider scale and more tough competition has to face, therefore complexity of supply chain also increases [4]. The competition has increased its wings to the suppliers of firms as well; this is argued in research studies that competition now isn't only among two competitors but extended up to integration of suppliers. The most effective supplier will found to more contributive for performance and efficiency. Managers play crucial role in successful implementation of supply chain system as they need to take decision on operational activities every day and they need to organize, plan, coordinate and control all sensitive information required, flow of capital, knowledge utilization and information processing [5].

The business expansion and presence in international market instigate the competition and various factors of business play role in accomplishment of goals and to gain competitive advantage especially to sustain competitive edge. The importance of SCM in industries such as for manufacturing has become centrally important for cooperation to maintain common goals to minimize the delivery cost, reduction in cost of raw material handling and increase in quality and time. Improvement in response time, flexibility and increase in accuracy for ensuring the profitable transactions and to satisfy customers considered as prime concern of supply chain management and effectiveness [5, 6]. The failure in SCM will cause serious consequences including damage to competitive advantage and sustainability of market position. The largest supply chain found in textile industry that includes various participants from raw material to finished goods from textile unit and so on. It is very tough to manage large and complex supply chain that needs extensive managerial efforts and planning for effective utilization of resources and for successful execution of SCM practices at each node of chain. To address the complex supply chain firms strive to ensure the effective supply chain activities with quick response and better control to gain competitive advantage and ultimately to sustain performance level associated with supply chain activities [7].

The research scholars have argued that performance of firm directly associated with supply chain management

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which is largely influenced by logistics management and performance. The definition of supply chain has evolved since 60s and research scholars have discussed various emerging issues that firms has to face during their business operations [8]. Further, discussion about supply chain development has included the advanced issues related to technology implementation in supply chain activities; outsource options, challenges in global expansion and collaboration among various nodes of supply chain needed to be integrated [9]. The research has been conducted since 2 decades on supply chain and improved in defining its activities and to determine the impact of SCM on performance of organization [10]. The determination of supply chain performance depends upon financial and non-financial factors; for assessing the performance of supply chain it is focused that cost, time, quality, flexibility and various other qualitative factors [11].

Previously, research scholars have developed various tools including cost and performance to develop the measure the supply chain [12]. In previous studies improved research has been observed to determine the supply chain performance in absence of collaboration as described by [13]. Further it was explained that supply chain performance must be measure and evaluated according to collaboration aspect because it affect the performance as a whole. Majorly supply chain performance used to be measured through financial and non-financial measures but it was evident after research that collaboration aspect also has an impact in performance [14]. The research scholars depicted that performance of supply chain collaboration focuses on delivery, quality and flexibility within firm. The effective supply chain based on technological advancements by implementation and integration of technology must be incorporated in supply chain system to be competitive. The implementation of right technology at right time and place assist firms to gain competitive edge and to become successful in highly competitive environment [15].

The complex supply chain needs lot of resources including financial resources and specifically time required to manage supply chain activities effectively. Large firms such as conglomerate units needs to manage their tough and complex supply chain through acquisitions across border and time becomes more crucial and important for incorporating supply chain system [16]. The failure of supply chain management can be resulted in huge loss and risk that initial investment can be vanished and lose of competitive advantage. The large and financially stronger firms acquire enough resources and budget to acquire required technology and equipment for successful implementation of supply chain [2]. The cost reduction is one of main purpose of supply chain effectiveness while increase the accuracy and speed and control flexibility. The agility consider as dimension of supply chain performance and it required to be at higher degree within whole supply chain [17]. The power of supply chain must be recognize by experts that technology adoption is necessary to facilitate the issues faced by firms to reduce cost and improve efficiency. The technology requirement in supply chain needed to be implemented at production point, procurement stage and delivery stage and it must be integrated for timely information sharing. The utilization of internet tech and communication among supply chain actors communication must be efficient to fulfill the core objective of implementation of technology. The integration of supply chain enables firms to share information and data whenever required with combination of monitoring and performance while forecasting the demand and limited interaction of human being. The prime aim of SCM manager is to integrate whole data among all participants of supply chain as government has advised industries to automate their operational process for efficiency [18].

Innovation is considered as key point for organizational success as firms strive for innovative solutions but there are just few evidences of technological adoption for effective supply chain in various firms such as Walmart, Toyota and Dell. The highly innovative firms got higher potential to progress and gain extraordinary benefits while reducing the supply chain cost. Research scholars have stated various obstacles that cause failure of supply chain especially for technology adoption and innovation that include limited information, involvement level and short time emphasize on technological adoption and innovative initiatives [19]. There are various reasons of lack of adoption of technological advancements including reduction in cost, manual working situation, lack of standards and security issues as reported by [20].

In recent years, technology has emerged as critical success factor for SME for improvement in operations and performance. Firms therefore strive to access and implement the technological innovations for competition in business at large scale and to sustain competitive edge. The capability to implement IT assists firms to innovate and to improve performance of supply chain. The role of information technology is evident in supply chain efficiency as experts train their employees for utilization of technology at right time that influence the performance due to effective supply chain. The competition has increase in recent years as technology has changed the basis of competition and business has expanded across the borders [6]. The dramatic and rapidly changing environment has been observed in productivity at organizational level; information technology has gained must more importance and become crucial for success of business and customer satisfaction. The information technology has assisted firms to reduce their cost, enhance quality of service and products, increase efficiency of supply chain and communication among participants of supply chain that allow to communication and establish direct connection with suppliers and customers for their satisfaction and it helps in cost reduction, optimize inventory level and shorter lead time [6].

Thailand has emerging and strong electric industry that significantly contributes in economic growth. The industry overall exports 29.2 billion $ since a decade with 60% of total exports consists of computer accessories. The supply chain of industry found to be very complex and tough to mange as various issues has been faced by manufacturers including cost, skill availability, technological advancements and to sustain competitive advantage [21]. Thai electronic industry faced lot of issues and obstacles for waste management, recycling, lack of infrastructure,

limited incentives and lack of knowledge about IT with less aware community cause reduction in effectiveness of supply chain that influence sustainable performance [22, 23].

The current study intends to empirically examine the relationship between supplier integration and innovation capability to determine the supply chain performance with mediating role of technology adoption among Thai electronic manufacturing firms.

2. Literature Review

The current part of the study explains the supply chain performance and predictors that play role in performance. The relationships between dependent and independent variables are explained in present phase of the study along with hypothesis development.

2.1. Supply Chain performance

There are several definitions given by research scholars to define supply chain management in recent years. The supply chain management has been described as under:

"SCM encompassing the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities which includes coordination and collaboration with channel partners such as suppliers, intermediaries, third-party service providers, and customers. In essence, SCM integrates supply and demand management within and across companies."

Further other scholars have explained supply chain practices as under:

"SCM is defined as collaboration and integration of key business processes from purchasing of raw material, manufacturing and distribution to end users along with information that add value for consumers and stakeholders" [23].

The performance of supply chain considers as one of most important phenomenon to observe to emphasize on minimization of cost and increase in performance. The supply chain includes five steps for achievement of excellent outcomes with real value to hire appropriate talent, technology, collaboration and managing change. Currently, the competition has increased in market and extended to supply chain of participants. Effective supply chain management is considered as source of competitive advantage in highly competitive environment. Improvements in supply chain activities and increase the performance of supply chain at each level influence the overall performance of firm and contribute for market position [6]. The studies have been conducted to determine the level of supply chain practices and found positive influence to gain competitive advantages. Various firms have been using supply chain as competitive edge and improved their performance [24]. Research scholars have stated that there is different between supply chain performance and organizational performance. The performance of supply chain related to intra-organizational aspect and internal-org results; whereas organizational performance referred as intra-org or individual actual results [7].

2.2. Supply Chain Capabilities (supplier partnership) and Supply Chain Performance

Supply chain of complex industries such as textile or electronic needs more focus and technological equipped system to perform well. Unique capabilities of firms contribute for sustainable performance and assist to improve supply chain activities. The effective supply chain contributes for innovation and increase overall performance of firm [25]. The importance of SCM must be recognized as capabilities such as supplier partner's integration play its role in improvement of supply chain activities. Previous studies described the relational capability, information capability and organizational culture as major elements that influence the supply chain performance and their level of interaction causes the improvements in supply chain. In supply chain management business activities entail various practices; such as information sharing, information quality, customer and supplier' presence that influences the supply chain performance. Research scholars have reported influence of information sharing and information quality on supply chain performance as timely and accurate information influence the supply chain performance.

Suppliers are one of most important participant of supply chain; the efficiency of suppliers contributes in efficiency of supply chain and then influence the overall performance. The supply chain performance has extended beyond the individual supply chain but also included the supplier's supply chain as well. Suppliers' integration considered as most critical factor for success of firm for quick response for changing environment of market. The research scholars have argued that capability of supplier and strong relationship with suppliers influence the quality, information and relation with customers have significant association with supply chain performance. [26].

The argument of scholars discuss the strength of relation between suppliers and firm, the stronger relation will enable to acquire raw material JIT and with better quality, the strong relation with supplier provides competitive edge, so therefore, firms must establish long term strong relationship with supplier and integrate them with supply chain system to gain higher level of performance. The research scholars have argued that successful supply chain based on various capabilities and suppliers' integration is one most striking factors that influence the performance of supply chain.

On the base of above discussion following hypothesis is derived:

H1*: Supplier partners positively influence the supply chain performance*

2.3. Organizational Capability (Innovation) and Supply Chain Performance

The key to success of organization in literature is stated as innovation capability. Innovativeness enables firms to bring unique changes in production, services and improve practices to perform well and sustainability of competitive advantage. The innovation is source of competitive advantages as it assists for continuous improvements in products/services [27]. Innovation contributes for

openness for new ideas and organizational culture and enables firms to gain and sustain competitive position through introducing innovative initiatives; meanwhile innovation assists firms to overcome difficulties and challenges faced in managing supply chain effectively. The wider sense of innovation can be explained at method of new technologies for performing business, and can be viewed as unique practice that influence the initiation of new product, processes or policies on the base of knowledge that directly influence the supply chain performance [7].

The willingness of firm to be innovative utilizes the information and all types of resources for capitalize on valuable opportunities to gain competitive advantages. Currently, firms utilizes various technological advancements for utilization of supply chain effectively to reduce the cost, enhance the quality, achievement of customer satisfaction and to gain competitive edge through core capabilities of innovation [5]. In highly competitive environment innovation is stated as critical for performance of firm and is gains much more importance due to its role in effectiveness of supply chain to gain competitive position. The critical necessity of firm in today's business world is the ability to quickly development of innovative business process to respond to rapidly changing environment of industry. Innovation also entails the amalgam of technological advancements and system to influence the supply chain performance.

On the basis of above following hypothesis is derived:

H2: *Innovativeness positively influence the supply chain performance*

2.4. Moderating role of Supply Chain Technology adoption

The technology utilization is considered as one of important and critical for any industry to maintain the success factor and competitive edge in highly competitive business environment. The adoption of technology found to be influential for three major factors including technological, organizational and environmental context [28]. The factors identified in literature found to be significant by utilization of RFID in manufacturing industries such as textile, garments and electronic. The studies have been argued that internal and external competitive environmental factors, partners, infrastructure and broader educational and cultural environment influenced by effectiveness of supply chain by adoption of technological advanced equipment. The capability of firm to adopt technology to integrate suppliers for information sharing brings benefits and improvements in effectiveness of supply chain performance. The scholars have described that technology adoption assists firms to integrate supplier, customers and other entities for information sharing and collaboration effectively and efficiently [7].

The above discussion derives the hypothesis as under:

H3: *Supply chain technology adoption moderate the relationship between supply chain capability (supplier) and supply chain performance*

H4: *Supply chain technology adoption moderate the relationship between supply chain capability (Innovation) and supply chain performance*

3. Research Framework

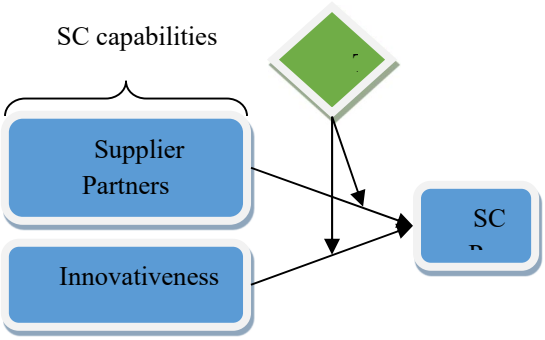

Figure 1. Framework

3.1. Research Methodology:

The present study was conducted on electronic sector of Thailand and cross sectional in nature and was conducted on electronic industry of Thailand. The study determined the supply chain performance of electronic industry influenced by supply chain capabilities including supplier and innovativeness.

3.2. Sampling procedure:

The sample of the study consists of firms having standard certifications. The list of certified companies in electronic industry was available and taken from Thai Industrial Standards Institute (TISI). The list is available at website of the concerned authority. Data collection was done through tool of questions based on previous studies and adopted from and used in various studies. The questionnaire was sent to their Supply Chain Management (SCM) associated department and technology department.

The questionnaire was sent to 200 listed companies and only 103 valid and useable questionnaire were received with response rate of 51% for assessing the relationship between supply chain capabilities and supply chain performance.

4. Measurement Development

The scales to measure and examine the relations of constructs were adopted from previous studies. The measurement scale for supply chain capabilities 'supplier partnership' was 06 items scale and adopted from the study of [29]. The measurement scale for examining innovation was adopted from the study of [30] and 06 items scale. The measurement scale to determine supply chain performance was adopted from the study of [7] as 13 items scale related to responsiveness and reliability. The moderating variable 'technology adoption' was examined on the base of 12 items scale adopted from [31]. The technology adoption was measured on 5 point scale whereas 1 represent as 'not adopted'; 2 as 'little extent, 3 as 'moderate'; 4 as 'considerable' and 5 as 'full extent'.

5. Analysis and discussion

The collected data was analyzed by using SMART-PLS through the Measurement Model and Structural Equation Modeling techniques.

6. 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. The analysis is shown in the table 1 below.

Table 1.

S#	Constructs	α Alpha	CR
1	SCP	0.834	0.788
2	SP	0.762	0.634
3	Inno	0.711	0.532
4	TA	0.791	0.591

6.1. Discriminate Validity:

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

Table 2.

S#	Variables	SCP	SP	Inno	TA
1	SCP	**0.914**			
2	SP	0.462	**0.871**		
3	Inno	0.511	0.543	**0.781**	
4	TA	0.691	0.432	0.543	**0.591**

6.2. Structural Equation Model:

6.2.1. Hypothesis test: Direct effects:

The present study examined the direction relationship between supply chain capabilities' factors including supplier partnership and supply chain performance; and innovativeness and supply chain performance. They hypothesis H1 and H2 were examined through bootstrapping technique in PLS and found that H1 has β value as 1.145 with P<0.000 and t-value 2.443; therefore on the base of statistical figures H1 is accepted. The second direct hypothesis demonstrates the relationship between innovation and supply chain performance at electronic industry of Thailand. The results demonstrates the β value as 3.156, whereas p<0.000 and t-value as 3.131. 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	SP→SCP	1.145	2.443	Supported
H2	Inno→SCP	2.443	3.131	Supported

Moderating Role of Technology adoption: Indirect Effect

The present phase of study investigated the moderating role of technology adoption between independent and dependent variables of the proposed framework. Bootstrapping method of PLS was used for investigation. Hypothesis H3 examined the moderating role of TA between SP and SCP; the analysis of data shows that β value as 1.321 and p<0.001; and t-statistics as 2.121; therefore it is found that H3 accepted and technology adoption moderated the relationship. The next moderating role of TA between Innovation and SCP was determined on the base of collected data. The results of the analysis shows that β value was observed as 1.112 and p< 0.005; whereas t-value found to be 0.131; therefore H4 was rejected on statistical grounds and found that technology adoption don't moderate the relationship.

Table 4.

H#	Relation	β	t-value	Results
H3	SP*TA→SCP	1.321	2.121	sig
H4	Inno*TA→SCP	1.112	0.131	In-sig

7. Conclusion:

The prime objective of the study intends to examine the supply chain performance of electronic industry of Thailand. The study examined the influence of supply chain capability as supplier partners on supply chain performance and result of the analysis depicted that supplier partnership and relations play important role in supply chain. The study found positive significant relationship between the constructs of hypothesis H1. The study also determined the relationship between innovativeness and supply chain performance. The innovation is an important factor for supply chain performance and efficiency. The results of the study found that innovation is essential for successful supply chain operations and performance. Therefore hypothesis H2 was accepted on statistical grounds. The study also determined the moderating role of technology adoption and found that moderated relationship between supplier partners and supply chain performance but technology adoption didn't moderate the relationship between innovation and supply chain management performance. The hypothesis H3 was accepted on statistical grounds but H4 was rejected. The study suggested to electronic industry to maintain the relationship with supplier, updated technology adoption and innovation in product or services for effective supply change management.

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