

The Influence of Customer and Technology Supply Chain Integration on Social Sustainable Performance with Moderating Role of Organizational Structure

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Abstract---Supply chain management has taken attention of research scholars and emerging concept of greening supply chain activities in response to environmental concerns and social sustainable performance. The study aims to determine the relationship between supply chain integration and sustainable performance of automotive industry of Thailand. The study aims to determine the relationship between supplier integration, customer integration, and technological integration to determine sustainable social performance. The study also entails the moderating role of organizational structure between supplier, customer and technological integration and dependent variable sustainable social performance. The data was collected from automotive manufacturing industry of Thailand and analyzed by using SMART-PLS by measurement model and structural equation modeling techniques. The findings of the study demonstrated that all direct relations between independent and dependent variables were accepted, moderating role of organization structure was also observed, but the results found to be insignificant between customer integration and social sustainable performance at automotive manufacturing industry of Thailand.

Key words: Supply Chain Integration, Social Sustainable Performance, Organizational Structure

1. Introduction:

Research scholars have given much attention to supply chain management to incorporate in strategic planning and design. Scholars have shed light on

importance of supply chain management its maintenance, operations and process. Firms have gained various benefits and achieved various successful improvements by implementing effective activities of supply chain management. Previous research has focused various outcomes and issues related to supply chain management, but still lack in exploring environmental issues as global warming and ecological concerns has increased since a decade and termed as greening the environment. Authority bodies and governments of various countries have developed their regulations for environmental protection [1, 2]. Firms incorporate environmental concerns related to their business operations to comply with regulations and environmental obligations as organizations have recognized that it is not easy to operate in isolation or negate regulations. Companies has to answerable and charged for their environmental liabilities for related business partners and stakeholders [3]. The environmental obligations, rules and regulations don't only address to organizational activities or boundaries but also to stakeholders such as entire supply chain actors for assuring sustainable performance of companies [4].

Organizations considered as sustainable with their performance as they continuously create value for their stakeholders and respond to environmental concerns [5]. Organizations struggle to perform better and competitive in their operations and develop

innovative corporate culture by integrating various activities [6]. Better performance and outcomes can be achieved through effective culture by optimum utilization of resources to influence economic, environment and society [7]. First strive to gain environmental, social and economical sustainability for ensuring satisfaction among stakeholders, suppliers, employees, customers and society at large. Significant attention has been taken by greening the business activities and supply chain to respond the environmental and climate change at global level and form their business operations and supply chain to be green and environmental friendly [2]. Greening the supply chain is considered as an important and crucial management tool for improving sustainable performance in manufacturing or services sectors. Supply chain management as green aspect has referred as to comply with all environmental rules and regulations for protection of environment from any damage by any business activity [8]. Integration of green aspect in supply chain activities in response to environmental compliance must be incorporate including raw material suppliers and customers [9, 10]. The integration of supply chain activities among stakeholders encourage cooperation and influence sustainable performance [10].

Quality is not enough in highly competitive international market as dynamic changes have been incorporated in business operations. Effective supply chain of any firms entails timely delivery, appropriate place and cost effective elements also found to be critical for business success and to gain competitive advantage [11, 12]. Research scholars have stated that competition among business firms are not only limited to their product, service or operations but extended to efficiency and effectiveness of supply chains [13, 14]. Therefore, supply chain management along with quality management practices have been found to be influential in enhancing organizational performance among companies. The utilization of both challenges at the same time found to hard as number of resources required to be consumed for incorporation of quality and supply chain management. The utilization of both highly effective systems of quality management and effective supply chain bring greater benefits to the firms; on failure of system may cause huge loss and serious damages to the firms [15].

Research scholars have identified various opposing differences between quality management practices and supply chain practices such as customer

relationship management and supply chain forum [16, 17]. The automotive industry of Thailand is considered in present study to determine sustainable social performance, because automotive supply chain stated as one of complex supply chain and Thai automotive industry is active in supply chain management and quality management, another reason to conduct study on supply chain activities of Thai automotive industry is that Thai automotive industry found to be globally competitive industry.

The current study entails supplier, customer and technological integration to determine sustainable social performance with moderating role of organizational structure.

1.1. Thai Automotive Industry:

Thai automotive industry contribute 12% in GDP, as industry employed 550,000 people and stated as one of huge manufacturer of vehicles and auto-parts in Thailand. Thailand's automotive industry produced 1.9 million cars and sold domestically and exported. Thai automotive industry produced 1.8 million motorcycles and domestically sold 1.6 million and exported 350,000 units in 2015 [18].

Car (units)	Production	Domestic Sales	Export
Passenger Cars	76,845	46,998	40,350
Commercial Vehicles	121,976	56,166	77,358
Total	198,821	103,164	117,708

Motorcycle (units)	Production	Domestic Sales	Export
	183,424	167,777	43,690

Fig 1: Thailand Automotive Statistics 2019

In 2019; it is expected the fuel prices will remain higher than usual, so firms has invested and focused on development of electric vehicles and fuel efficient hybrid vehicles. The domestic industry of automotive Thailand may face contract by 2% to 5% but on the other hand 76% to 83% increase in electric vehicles and will expected to remain higher in demand and impressive. The technological based electric vehicles expected and believed to be supportive for industry. Government has given special attention to industry for production of elective vehicles and given incentives to eco car manufacturers for developing eco elective vehicles and hybrid types vehicles [19].

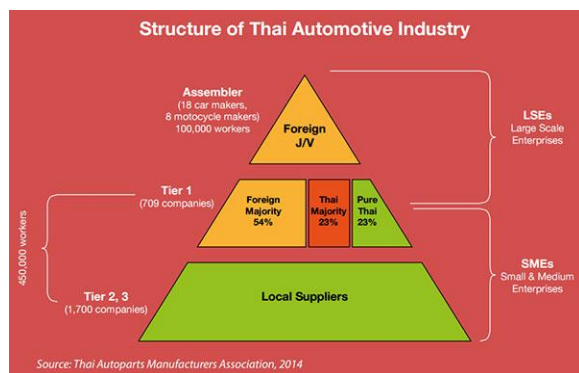


Fig 2: Structure of Thai Automotive Industry

The government of Thailand showed and their will and encourage private sector to develop automotive supply chain towards value chain. The prime objective of government is to develop Thailand as production base for green and eco friendly automotives for enhancing value and environment preservation for export and domestic markets [18].

Firms and countries are facing pressure from regulatory authorities to develop and conduct supply chain activities according to eco friendly requirements since the environmental issues have been considered [20, 21]. Manufacturing industries found to be responsible as compare to any other industry for consuming large amount of resources and produce waste and damage environment globally. Manufacturing industry creates emission of 36% of carbon dioxide (CO₂) and held responsible for environmental pollution according to International Energy report since 2009 to date[22]. Therefore, research scholars have found that manufacturing industries have more negative impact on environment and held responsible for damage to environment with respect to product and process [23, 24].

Therefore, researcher intends to conduct study on automotive industry of Thailand, as they are progressive and updated their supply chain activities towards value creation by incorporating supplier, customer and technological integration in business operations; the objectives of the studies are i) examine the influence of supplier, customer, and technological integration on sustainable social performance of automotive industry of Thailand, another objective of the study is to examine the moderating effect of organizational structure to determine the sustainable social performance towards environmental concerns of automotive industry of Thailand.

2. Literature Review:

The current chapter entails literature review on key constructs of the study and explains the relationships between independent and dependent variables with moderating effect as well. The review of relevant literature has presented in the study to discuss from manufacturing perspective and environmental issues for sustainable performance towards greening and effective supply chain management. The activities of green supply chain included supplier, customer and technological integration to be influential for sustainable social performance of automotive industry of Thailand. Firms use raw material, various components and parts to transform their finished goods, as in automotive industry various components and raw material is being used for production and referred as manufacturing business and sell their commodity to consumers [25, 26].

2.1. Social Sustainable Performance:

Ongoing value creation for customers and stakeholders by any organization considered as sustainable performance of business. Meanwhile, firms focus on environmental concerns and issues [5, 27]. The sustainability of firm includes performing well for environment and society and keeping customers and stakeholders satisfy and happy with business operations. Research scholars have referred sustainability as actions of firms that have some impact on social life or organization, maintenance ability and renew viability and protection of environment, maintain welfare in society to solve issues, freedom and humanity for present and future generations [7].

Sustainability is referred as way to perform effective and successful business, transition toward enterprises sustainability for innovation and constructive organizational culture. Research scholars have identified societal, environmental and economic outcomes as high performance firms produce while effective utilizing their resource embedded in healthy and high performance work culture [7]. On the other hand, researchers have identified and pointed out economic, environmental and social sustainable performance as three major criteria for sustainable performance [6]. The strategy for sustainable development emphasized importance of social consistency, protection for environment safety and economic growth [28]. Sustainable SCM has referred as modern management of pattern emphasizing the

integration of economy, environment and society by integrating process of business including procurement, producing, packaging, transportation, storage, consumption and disposal of product's life; with prime objective to perform better and achievement of goals of economy, environment and society [29].

Previously studies have been conducted to determine the sustainability performance as different dimensions including economical and environmental performance dimensions [5]. Research scholars have depicted and focused on three pillars of sustainability including environmental, economical and social sustainability for successful business operations [30, 31]. Business firms have huge responsibility towards their social aspect to develop eco friendly products and to take care and be responsive for employees and societies. Research scholars have defined social sustainability performance 'evaluation of organization to determine working environment, commitment towards social responsibility and participation in societal initiatives for education and training and development of human resource [32, 33]. Further, social performance of corporate from perspective of consumers increases and management focus on responsibility for implementation of ethical programs for enhancement of social welfare. Research scholars have depicted several domains including human resource, corporate governance, human rights and environmental concerns that must be evaluated and assess properly [34]. Other research scholars have defined social sustainable performance as creation of social welfare by firms for their stakeholders, their integration with suppliers, employees and customer with society which resulted as operational benefits [5].

Management of firms has stood responsible for implementing social participation programs and initiatives which fulfill the commitments of firms towards their social liability. The policies developed for social administration, HR policies and working environment of firm must be in-line in incorporating and fulfilling the social responsibilities. Further, social responsibility also entails the concerns and issues of employees and their benefits, relationship with their staff members, development of talent, working conditions, public welfare, social concerns and response must be focused for successful business operations [35]. The focus of firms towards their social sustainability and performance assist firms to

achieve their mission and vision as well as be competitive in highly turbulent business market.

Green supply chain integration is referred as involvement of supply chain partners for being green and considered as approach to green supply chain. The strategic collaboration of business partners of supply chain for managing operational and environmental impacts of supply chain considered as green supply chain integration; as coordination takes place at intra and inter organizational processes [31]. The integration at supply chain management contributes for better performance and sustainable business competitive advantage [36]. Effective coordination and communication among supply chain partners and business partners considered as environmental collaboration [31]. Lack of supply chain integration can damage collaboration and communication level among partners which negatively affect performance of business. Integration of supply chain positively influence cooperation and effective communication for environmental concerns [37, 38].

2.2. Supplier Integration and Sustainable Social Performance:

The facilitator of manufacturer for providing raw material, components or parts, services and goods considered as suppliers [39, 40]. The integration of supplier defined and addresses the issue of environmental coordination and collaboration among firms and their suppliers for implementing management practices [41, 42]. Supplier integration phase focuses on upstream supply chain nodes to collaborate with suppliers and manufacturers [43, 44]. The integration of supplier in supply chain for being green and effective encourage them to implement environmental practices in terms of material management procedures and purchasing processes [3, 45]. Manufacturing firms focus on supplier's performance and initiatives towards environment for ensuring equipment and raw material according to eco friendly processes and standards [3, 45].

Previously, research scholars have empirically found that integration of suppliers in supply chain for being green positively influential to organizational sustainability and performance [8, 41, 42, 46]. Research scholars have depicted influential association due to effective collaboration of suppliers for improvement of sustainable performance

economically and environmentally [41]. Collaborative relations and development of strategies for enhanced collaboration with suppliers found to be favorable for affective adoption and implementation of green supply chain management which contribute for social aspect [42, 47]. Research scholars have emphasized on relationship between supplier integration and sustainable performance by identifying lack of supplier collaboration caused reduction in sustainable performance among manufacturing industry [8]. Based on literature following hypothesis have been proposed:

H1: Supplier integration positively influence sustainable social performance at automotive industry of Thailand

2.3. Customer Integration and Sustainable Social Performance:

Customer is considered as an important node of supply chain as they receive finished goods or services with ability to choose appropriate product and suppliers [39]. The customer is referred as retailer, wholesaler, consumer, merchandiser and online retailer in supply chain actors [48]. Research scholars have defined integration of customers as collaboration environmentally between focal firm and its customers that aims to fulfill customer eco friendly requirements and products according to green supply chain perspectives [41]. Customer node is related to downstream supply chain, as customer integration addresses the issues of adoption green management, planning and to find solution for environmental problems and concerns [10].

Studies have been conducted to identify various opportunities in assessing environmental integration from customers' perspective. Firms focus to avail opportunities in building long term relationships with customers which play key role in successful implementation of environmental initiatives and practices [8]. Previous studies have been conducted on manufacturing industry and found drivers in improvement of environmental practice stated as pressure from customers. Previous studies have indicated that customers from USA, UK and Australia or any other developed nation willing to cooperate with their manufacturers to achievement of environmental aspects as they prefer to buy eco friendly products and purchase environmentally responsible firm [1, 48].

Studies have been conducted on examining relationship between customer integration and performance of firm towards being green and found positive correlation, further, green-oriented customers focuses on attributes of products or services for purchasing eco-friendly products. Organizational performance got affected by various indicators and influential factors in terms of economic, environmental and social aspect of sustainable performance [1]. Researchers have emphasized on interaction between customers and manufacturer which found to be improvement in sustainable performance [49]. Further, level of customer's collaboration found to be positively related to environmental and social sustainable performance. Therefore, following hypothesis is proposed.

H2: Customer integration positively influence sustainable social performance among Thai automotive industry

2.4. Technological Integration and Sustainable Social Performance:

Research scholars have defined technological integration in supply chain as practices adopted by firms in environmental context of technology usage to conduct business activities such as buying and selling between suppliers and customers, utilization of latest available technology for product development, process, reengineering and technical training [10]. Definition of technological integration defined as structural, product and process related changes but also includes managerial aspect as technique and expertise [41]. Integration of technology in green supply chain activities has become necessity in manufacturing industry due to rapid movement in green technology [50]. Researchers have depicted that sustainable development can be achieved the innovative green technology and may be helpful in decrease bad impact on product life cycle towards environment [51]. Integration of technology in supply chain activities and business operations stated as important part of green supply chain integration and firms strive to avail and utilize green manufacturing technologies [10].

Previously, studies have been conducted to discuss and analyze usage of technology in supply chain activities to contribute in effective communication, unique production and dynamic information

processing [52]. The utilization of technology aims to become customer centric and rapid information sharing, cost reduction, flexibility and increased effective coordination [53]. The integration of technology in green supply chain assists firms to track progress which found to be influential towards achievement of goals [54]. The involvement of supplier and customer has their own importance and these factors play crucial role in success of technological integration for product design, training, improvement in firms' economy and environmental and social performance of organizations [42]. Several empirical studies have been discussed the issue of environmental concerns and performance of firms, research studies have been depicted that performance of firm and integration of technology found to be interconnected [13, 53, 54].

However, according to researcher of present study there is lack of empirical studies to determine and analyze social sustainable performance aspect of manufacturing industry as automotive industry of Thailand has been chosen in present study. There is lack of empirical studies to investigate the relationship between supplier, customer and technological influences to determine sustainable social performance with moderating role of organizational structure. The studies have been conducted to conceptualize relationship between sustainable performance and supply chain integration [10], but there is still need to investigate affect or influence of supply chain integration factors to determine the sustainable social performance. Therefore, next hypothesis have been proposed.

H3: *Technological integration has positive influence on sustainable social performance at Thai manufacturing automotive industry.*

2.5. Moderating Role of Organizational Structure:

Effective organizational structure is one of important factor which play role in performance of firm and decision making as less time required to take decisions in flat structured organizations [55]. Organizational structure varies organization to organization as in large scale firms may include twelve to eighteen levels between employees and board of directors [56]. The higher the level in organization between employees and decision making authorities takes longer to respond to external changes and affect supply chain. The important principle of firms is to reduce waste during

production process and known as lean. Firms strive to develop culture to fix issues and problems in short time and quick response must be in place for effective management [57]. Lean manufacturing reduce the waste material during production process, and organizational structure incorporate lean practices to influence sustainable performance. Various issues has to face during production process including quality and effective and timely decisions has to be taken in response to these issues, complex organizational structures may delay to take decisions to quality problems. Firms encourage employees to come up with innovative ideas to improve their process, as leadership behavior found to be an important factor which communicate with staff for incorporating innovative changes [58].

Leadership of firms encourages and influence employees to be innovative and through effective communication management incorporate and initiate the change and develop innovative culture [59]. Organizations must be able to understand benefits of effective communication and must be able to place appropriate system to connect with employees in order to be more effective and responsive. Effective management and control at workplace create harmony and trust among co-workers which influence the sustainable performance of firm. Management play significant role in overcoming fear of conflict; increased commitment as accountability focus for results as sustainable performance [60][65]. Researchers believed that effective management and organizational structure strengthen supply chain. Clear understanding must be in place that how organizational structure affects internal supply chain that necessary to obtain input from personnel involvement. On the basis of above discussion researcher assume that organizational structure influence the sustainable performance and moderate the relationship between supplier, customer and technological integration with dependent variable sustainable social performance. Therefore, following hypotheses are proposed.

H4: *Organizational structure moderate relationship between supplier integration and sustainable social performance*

H5: *Organizational structure moderate relationship between customer integration and sustainable social performance*

H6: *Organizational structure moderate relationship between technology integration and sustainable social performance*

2.6. Research Framework:

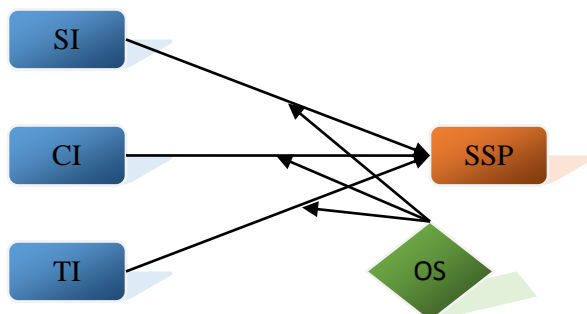


Fig 3: Proposed Framework

Abbreviations:

SI (Supplier Integration); **CI** (Customer Integration); **TI** (Technology Integration); **SSP** (Social Sustainable Performance); **OS** (Organizational Structure)

3. Research Methodology:

3.1. Measurement Scales of study:

For data collection measurement scale was adopted from previous research papers; and data was collected from automotive industry of Thailand. The questionnaire was developed on the base of measurement scale of each construct to investigate the relationship among constructs of proposed framework. All items of each scale were measured on 5-point Likert scale; where 5 represents strongly agree and 1 represent strongly disagree; as the scale was adopted from previous literature[62][63][64].

Structured questionnaire was used for data collection from automotive manufacturing industry of Thailand. Questionnaire consists of 5 measurement scales, including supplier, customer, technology integration and social sustainable performance; moderating effect was examined by organization structure. The measurement scale for customer, supplier and technology integration was adopted from the study of Canning and HnmerLloyd (2001), Wu (2013) and Vachon (2012); and supplier integration scale consist of 5 items, customer integration scale consist of 4 items and technology integration consist of 7 items. The dependent variable 'social sustainable performance' consists of 5 items [10, 37, 41]. The scale was adopted from the study of Brent and

Labuschagne (2004) [5]. Moderating variable of the study 'organizational structure' was used in proposed framework and measurement scale was adopted from the studies of Li et al, (2006) and QrunFleh, (2011); consist of 9 items.

Researcher examined the cronbach alpha (α) of each construct and observed that cronbach alpha for supplier integration was observed as 0.81; customer integration 0.83; technology integration 0.79; sustainable social performance 0.912 and for organizational structure 0.762; all measurement scale were accepted as their value remain higher than 0.60 (Hair et al., 2006).

2.7. Sampling:

The current research was conducted on Thai automotive manufacturing industry to determine social sustainable performance influenced by supplier, customer and technology integration with moderating role of organizational structure. The population of the study was whole automotive manufacturing industry. The data was collected from firms' official and from supply chain manager for responsible for greening the activities. Researcher selected to collect data from 80 firms to analyze the data based on Hair et al, (2017) [61].

4. Statistical Analysis:

4.1. Analysis and discussion:

In first phase the study demonstrate the measurement model procedure to conduct analysis on collected data. The collected data was analyzed by using SAMRT-PLS, while Measurement Model and Structural Equation Modeling technique was used in phases respectively.

4.2. Measurement Model:

The first phase of analysis shows 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#	Construct	CR	AVE
1	Supplier Integration	0.811	0.771
2	Customer Integration	0.831	0.871
3	Technology Integration	0.791	0.861
4	Social sustainable Performance	0.912	0.892
5	Organizational structure	0.762	0.701

4.3. Discriminate Validity:

The characteristics of discriminate validity were suggested in the study of Fornell and cha, (1994); Fornell and Lacker, (1981). Discriminate validity and shared AVE is demonstrated in table below.

Table 2:

S#	Construct	SI	CI	TI	SSP	OS
1	SI	0.824				
2	CI	0.801	0.80			
3	TI	0.721	0.78	0.84		
4	SSP	0.412	0.65	0.75	0.79	
5	OS	0.662	0.55	0.67	0.61	0.81

5. Structural Equation Model:

5.1. Hypothesis test: Direct effects:

The second phase of analysis examines the direct relationships between constructs. The results are presented in table 3; the relationship was examined on statistical grounds, the first hypothesis H1 was examined by examining the influence of supplier integration on social sustainable performance on Thai automotive manufacturing industry. The results of PLS shows that $\beta = 2.212$, $p < 0.01$; and t-value 2.99 as positive; hence, H1 was supported. The second hypothesis H2 investigate relationship between customer integration and social sustainable performance; the results depicted that $\beta = 2.401$, $p < 0.01$ and t-value was 2.021; hence H2 supported. The third hypothesis H3 investigates relationship between technology integration and social sustainable performance. The results shows that $\beta = 3.093$ and $p < 0.01$ whereas t-value noted as 3.451; therefore, H3 was supported. The Table below demonstrated the direct relationships of the study.

Table 3:

H#	Relations	β	t-value	Remarks
H1	SI \rightarrow SSP	2.212	2.991	Supported
H2	CI \rightarrow SSP	2.401	2.021	Supported
H3	TI \rightarrow SSP	3.093	3.451	Supported

4.4. Moderating Role of GHRM: Indirect Relations

Moderating role of organizational structure was examined in current part of study between supplier integration and dependent variable sustainable social performance at Thai automotive manufacturing industry. The statistical data shows that $\beta = 3.123$, $p < 0.01$; whereas t-value was observed as 1.99; therefore H4 was supported because organizational structure positively significantly moderate the relationship between constructs of proposed framework. Hypothesis H5 was examined moderate relationship between customer integration and sustainable social performance by organizational structure. The results shows as $\beta = 1.136$, $p < 0.15$; whereas t-value was found as 1.09; hence H5 was rejected as it shows that β value dropped less than direct relation and t-value less than cutoff point and observed as 1.09; therefore, H5 was rejected. Hypothesis H6 was examined as moderating role of organizational structure between technology integration and sustainable social performance. The results shows that $\beta = 3.92$, $p < 0.01$; t-value was observed as 2.891; which is higher than 1.96; therefore, H6 was accepted on statistical grounds.

Table 4:

H#	Relation	β	t-value	Results
H4	SI*OS \rightarrow SSP	3.123	1.99	sig
H5	CI*OS \rightarrow SSP	1.136	1.09	In-sig
H6	TI*OS \rightarrow SSP	3.921	2.891	Sig

6. Conclusion:

The study was conducted on automotive industry of Thailand, to determine the social sustainable performance of manufacturing industry. The study proposed the framework based on relationship between supply chain integration and sustainable performance. The study incorporated supplier integration, customer integration and technological integration in their supply chain and business operations to determine the sustainable performance. The study is unique in determining the relationship between technological integration and social sustainable performance, as in present study dependent variable social sustainable performance an important dimension of sustainable performance. Moreover, moderating role of organizational structure was examined between independent and dependent variables.

The data was collected from 80 automotive units of Thailand and was examined by measurement model and structural equation modeling to determine the relationship. The results of the study showed that direct hypothesis between supplier, customer, technological integration and dependent variable social sustainable performance named H1, H2, H3 were statistically accepted. Moderation role of organizational structure was examined between independent and dependent variables, and found that H4, and H6 were positivity moderated the relationship but H5 was rejected on statistical grounds, as the results shows in-significant moderation affect. The study provides assistance to automotive manufacturing industry of Thailand to integrate important factors supplier, customer an technological integration in the supply chain to gain sustainable social performance.

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