Quality Costing and Supplier Social Sustainability as Antecedents of Supply Chain Performance: A Case of Rubber Industry of Indonesia

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Abstract **- The prime objective of the current study is to investigate the relationship between supplier social responsibility, quality costing and supply chain performance of firms in the Indonesian rubber industry. The research focuses on the Indonesian rubber industry, which is attracting the foreign investors recently. This has resulted in the entrance of several manufacturers in the Indonesian markets. The author has employed the SEM-PLS to answer the research question raised in the current study. The researchers have suggested that the Indonesian rubber industry has started working on the sustainability issues across the supply chains. This has been supported with the results of this research. The researchers have suggested that the Indonesian rubber industry has started working on the sustainability issues across the supply chains. This has been supported with the results of this research. The research focuses on the Indonesian rubber industry, which is attracting the foreign investors recently. This has resulted in the entrance of several manufacturers in the Indonesian markets. The competition has become intention between the Indonesian rubber companies and the managers are focusing on the standards such as quality, cost, flexibility, and delivery for sustaining in the competition.**

Keywords: *Social Responsibility, supply chain, Accounting, Indonesia*

1. Background

It has been suggested by the index of emerging economies that 10 percent of the global market capitalization is accounted by emerging markets [1]. Emerging economies serve as a manufacturing base across the world along with supplying their own market. There is increasing need for improving the SCP (supply chain performance) in the emerging countries including Taiwan, China, India, Malaysia, Thailand, South Korea and Indonesia [1, 2]. With the growth of manufacturing sector in these economies, it is important to focus on the supply chain performance in relation to the efficiency and profit. Manufacturing sector has started realizing the need for creating balance between the economic outcomes related to the social and environmental circumstances due to increased pressure from the government and consumers [3]. A crucial role is played by the emerging countries in the global supply chain. However, there is limited theoretical reflection and empirical evidences related to supply chain performance and future activities in literature [4]. Indonesia has gained wide recognition because it is an attractive destination for foreign direct investment. It attracts the top rubber industry from the world. Therefore, it is important to ensure sustainability in the supply chain management in the rubber industry of Indonesia for global supply chain management.

The rubber industry is one the leading as confirmed from the table 1that the export of rubber is around 11 billion US dollars. On average, the Indonesia is exporting around 20000tons of rubber per year.

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Table 1. Exports of Rubber in US dollars

	USD(Thousands)
2010	7329060
2011	11766242
2012	7864528
2013	6910663
2014	4744753
2015	3701478

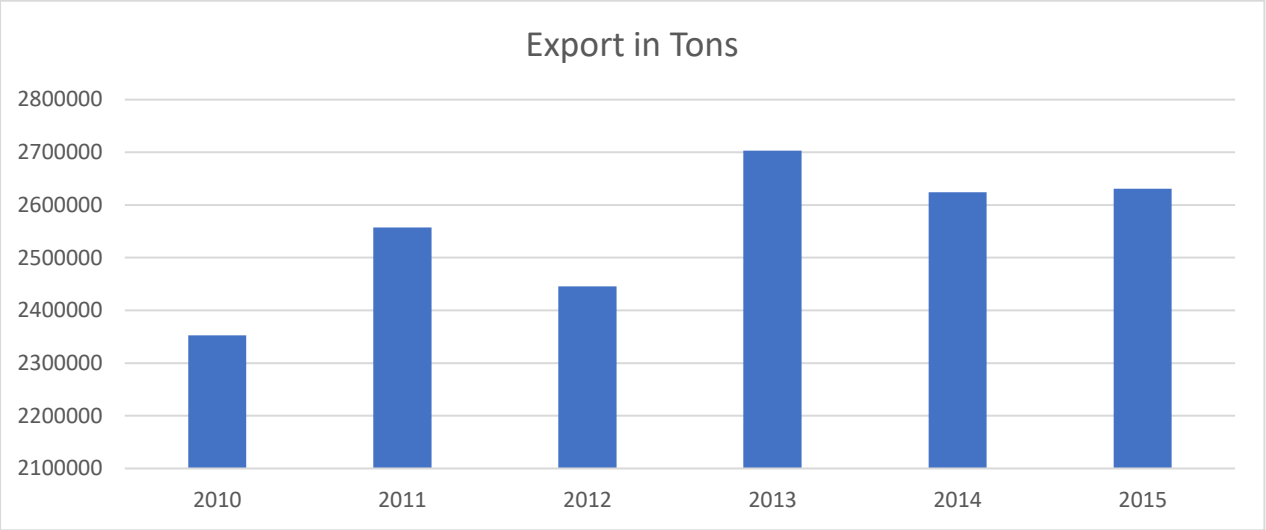

Figure 1. Exports of rubbers in tons

A crucial role is played by supply chain management for improving efficiency, effectiveness, profit and customer service in the manufacturing and service industries [5]. Increased attention is being received by scholars and practitioners regarding supply chain performance measurement. It is an effective tool for improving supply chain performance [6]. Firms are required to focus on the supply chain performance measurement, as it includes the interdependencies across the firms [7]. A framework was proposed by Gunasekaran, et al. [8] for measuring the strategic, tactical, and operational level of supply chain performance. Several studies related to supply chain performance measurement have been conducted from different perspectives [7, 8]. These studies are mostly empirical and conceptual in nature. A recent study conducted by Dey and Cheffi [9] suggested that there are constructs for green supply chain performance measurement and these cover the complete network of supply chain. Very few studies are related to the development of measurement index for supply chain performance i.e. SCPI, which incorporates the sustainability factor.

It has been analyzed by [10] about the structure of current measures of supply chain performance and the problems of their execution in the Indonesian automotive industry. The SCP measurement has been done for different industries without focusing on the sustainability factor. A significant growth has been seen in the Rubber industry, which signifies the importance of sustainability. Almost 10% has been contributed by this sector in the GDP of Indonesia. A limited number of studies have explored the variables creating an influence on supply chain performance in the rubber sector [11].

2. Hypothesis Development

2.1. Supply chain Performance and supplier sustainability

Planning is the initial step in any industry for acquisition or utilization of resources [12]. A plan is detailed in the resource planning including the resource identification for the success of business. An organization has some typical resources such as human resources, monetary resources, and equipment. The required resources are identified by the organization during the process of resource planning. The planning is done for the acquisition of required resources [5]. Another important decision is about the inventory planning that significantly influences the supply chain performance. The match between the demand of

customers and supply is difficult without proper planning for inventories [8, 9].

It has been revealed by several studies that the performance of supply chain partners and overall supply chain performance is significantly influenced by inventory planning [13]. In order to maintain the level of inventory at various stages in the supply chain, it is important to develop collaboration among the supply chain members. Lack of proper coordination between the members will make it difficult to achieve an effective flow of information, product, and cash across the supply chain [14]. Literature has offered different mechanisms of coordination to reflect the influence of coordination of supply chain performance [15]. The supply chain performance is positively influenced through the collaborative planning. In this regard, the following research hypothesis has been proposed:

The decision for sourcing is based on the issue of selecting and evaluating suppliers. The procurement of goods and services from the suppliers is supported by sourcing to fulfill the demand of customers. The research done by Costantino and Pellegrino [16] is highly resourceful, which offers extensive review of literature of this issue. In order to maintain a long buyer and supplier relationship, sourcing is a crucial factor. Researchers have demonstrated a clear need for the development of strong relationship between the buyer and suppliers. It has been reported by the United State food industry that the annual wastage of $30 billion is because of the poor relation between buyers and suppliers [5]. Several studies have claimed that supply chain performance improves with the increase in buyer and supplier relation. The sourcing performance is influenced through the purchase order cycle time, mutual assistance, supplier selection and buyer and supplier relation [12]. The competitiveness of a firm increases through the establishment of strong relation between the buyer and supplier as well as suitable selection of suppliers [17]. It has been that the supply chain performance and internal operations of firms are based on the activities of suppliers and decisions for better sourcing.

The manufacturer can become flexible and able to meet the customer demands through the selection of right supplier. Narasimhan and Das [18] analyzed the influence created by sourcing decision on the manufacturing performance. The results reveal the manufacturing cost is reduced by the sourcing decision along with improvements in the manufacturing flexibility. The manufacturing performance is positively influenced by the establishment of long lasting relation with the buyers and suppliers [18].

It is clear from literature review that a competitive advantage is attained by organizations through supply chain management. A greater importance has been received by the sourcing decisions, which influence the sustainability [19]. The supply chains' sustainability performance is based on the processes of upstream supply chain. The literature has extensive discussion about the achievement of competitive advantage through upstream supply chain. The triple bottom line of sustainability is positively influenced by the sourcing practices in the context of supply chain [20]. Therefore, the following research hypothesis has been developed:

In the process of manufacturing, raw material is transformed into final product. Manufacturer source input materials from supplier and transform them into final product [21]. For achieving good manufacturing performance, it is important to develop products with superior quality. This influences the supply chain performance [21]. Several studies have revealed that supply chain and manufacturing performance is positively influenced through reduction in production cost.

Another important factor, which enables the organizations to respond to the external changes and uncertainties in this competitive business environment, is flexibility. Moreover, it enables the achievement of economies of scale as well. It has been suggested by literature that flexibility is vital tool for the improvement of manufacturing performance [21]. Organizations are supported through flexibility in manufacturing process to provide different range of products or services [12]. It was found by Garavelli [22] that the companies can improve their supply chain performance through flexibility in manufacturing process. The manufacturing process is also influenced by several other factors including the efficient resource utilization, master production schedule and effective capacity utilization [23]. It was found by some researchers that there is positive relation between supply chain performance and effective resource utilization. According to Viswanadham and Samvedi [17], higher supply chain performance is achieved through better manufacturing performance.

Several organizations have started focusing on the implementation of sustainable business practices. Several factors lead to additional focus of organizations on sustainability such as external forces such as increased business regulations, changes in consumer preferences and internal forces including strategies and values of the firm (Haseeb, Hussain, Slusarczyk, & Jermsittiparsert, 2019; Haseeb, Hussain, Kot, Androniceanu, & Jermsittiparsert, 2019). The change in organizational focus is to create a balance between the environment and economic performance [24]. It has been mentioned by Sarkis [25] that sustainability is influenced through the manufacturing performance, which is a key factor. In terms of sustainability, the social, economic, and environmental factors are influenced. Different

initiatives of sustainability are adopted by firms particularly in the manufacturing area for improving the sustainability performance [20]. The following research hypothesis has been developed based on above information:

Final or finished products and services are provided to fulfill the demand of customer in the process of delivery. It includes effective distribution and transportation management. The cost of delivery is high for most of the organization is ranked as the second to the cost of sold goods [26]. The costs for delivery are about 12 percent of annual gross domestic product of world as per the statement of IMF (International Monetary Fund) [27]. The supply chain performance of an organization can improve through increased collaboration with the partners in trade including customers, distributors, and suppliers. Moreover, it reduces the cost of delivery (Baykasoglu and Kaplanoglu, 2007). It has been indicated by Viswanadham and Samvedi [17] that supply chain performance improves when right customers get the right products at right time. Several factors influence the performance of delivery performance such as cost of delivery, effectiveness of delivery, flexibility and delivery lead time, etc. [6]. SCP is positively influenced through the process of delivery. The qualities or attributes of delivery are applicable to all the supply chain partners. The SCP is positively influenced by the delivery process of manufacturer, supplier, retailer, and distributor [11]. It is important to consider the delivery system of supply chain partners rather than individual in order to influence SCP.

Priority should be given to the suppliers, who are closer to the manufacturing process. SCP is influenced by the internal and external delivery performance of goods and services [28]. Every day, billions of products are transited across the world. A significant amount of fossil fuels is consumed by the delivery of products. As the process of consumption, CO2 is emitted, which affects the human health and environment. The sustainability is influenced through the process of delivery as it can lead to about 75 percent of carbon footprint for the company. Several organizations have started estimating their carbon footprints because of internal policies and external pressures [29].

A firm can move to a third party for the provision of delivery service when they cannot stay below the desired amount of carbon footprint. This is done in order to achieve sustainability [30]. An important role is played by delivery process in the execution of sustainability strategy across supply chain [31]. It has been suggested by the Schwab [32] that the right delivery mode can result in lower emission of CO2 such as rail and ocean freight. A significant influence is created by the model of delivery on sustainability in terms of environment, social, and economic performance [26]. Based on this information, the following research hypothesis has been developed.

H1: The supplier social sustainability has significant positive impact on the supply chain performance.

H2: The supplier social sustainability has significant positive impact on the supplier performance

2.2. Supply Chain Performance and Sustainability performance

Every member of supply chain including downstream customers, suppliers, and sub-suppliers influence the sustainability performance of a company [33]. It has been showed by Carter and Rogers [34] that firms can reduce their cost through implementation of sustainability strategies. This reduction in cost is attributed to lower cost linked with health and safety, reduction in waste, improved product quality and reputation. Sustainability performance involves factors in three broad dimensions: economic, environmental, and social. The profit that a company earns by its supply chain partners is referred as economic performance. It is achieve by the host regions, communities or countries of the supply chain partners. Growth in revenue as well sales and cost reduction affect the economic sustainability. In managing environmental performance, an organization works at reduction of pollution, emissions, waste, and consumption of energy. The reduction and carbon footprint by the supply chain leads to the improvement in environment sustainability.

Environmental performance in a supply chain is affected by reduction of carbon dioxide, consumption of hazardous materials and waste. It has been found by Quarshie, et al. [35] that better performance is achieved by the supply chain, which measures environmental performance explicitly [1]. Alternatively, human capital in the supply chain is linked with social performance. Fair business practices are developed and implemented for improving sustainability performance. The implemented practices should be fair for the communities and labor. The health and safety initiatives are included in the social sustainability performance [1]. It has been found by Egels-Zandén [36] that social performance is better measure in all the dimensions of sustainability by a supply chain as compared with those, which cannot measure. In line with this, the following research hypothesis has been developed:

H3: The sustainability performance has significant positive impact on the supply chain performance

2.3. Mediation Effects

Several interesting questions are raised based on the literature findings and formulated hypothesis. The questions include about the direct influence of SCFs on SP or the relation is mediated through manufacturing performance or sustainability performance. Therefore, two mediating variables have been identified including sustainability performance and manufacturing performance. With the improvement in sourcing performance, the organization achieves flexibility, quality, and environment friendly products. Sustainability performance is achieved through better manufacturing. Therefore, the following research hypothesis is developed:

The basics SCFs include sourcing of inputs, manufacturing, and delivering to the end customers. The performance of the basic steps related to quality, cost, environmental, and social impact improves the SCP and sustainability performance. The perception of stakeholders and customers can be gained through improvements in sustainability performance. It reveals that the organization focus on profit generation along with social responsibility. Long-term customer base can be set with an improved perception and rapport of firms, which increased brand loyalty. This improves the supply chain performance. Therefore, the following research hypothesis has been developed:

H4: The supplier performance mediates the relationship between supplier social sustainability and supply chain performance.

2.4. Quality Costing as a Moderator

The purpose of quality costing is to improve quality within and across the organization in the supply chain. It is a crucial management accounting technique. The influence is created in two steps. The quality costs are reduced and quality offered to the end customers improves. The division of quality cost is made into conformance cost and non-conformance cost. The prevention and appraisal cost is included in conformance cost while the cost of external and internal failure is included in non-conformance cost. The purpose is to reduce the level of waste and eliminate poor quality through preventive measures. This will reduce the risk of failure costs and resultantly, customer experience will improve. A significant role is management accounting because the organizations are not aware of the failure costs. Therefore, it is important to consider management accounting when supply chain is extended. Techniques including value chain analysis and open book accounting can be used in addition to the quality costing. Competitive advantage can be gained through these techniques especially with regard to competition among the supply chains.

H5: The quality costing moderates the relationship between supply performance and supply chain performance.

3. Methodology and Measurements

A questionnaire survey has been developed to analyze the related between the constructs and related items. The purpose is to analyze the influence of related variables on supply chain performance. There are two parts of a questionnaire. In the first part, questions have been structured related to the demographic information of respondents including gender, experience, position, educational and turnover of the company, etc. in the second part, the questions are related to above mentioned constructs. Multiple items for every construct are included in the questionnaire for observing the constructs [37, 38]. Moreover, a 7-point likert scale has been used for measuring every item. Number 1 is designated to very poor and number 7 to excellent [39]. In the similar way, several pair wise comparisons are included in the questions for the respondents. For these questions, 9-point likert scale based on analytic hierarchy process has been used based on the importance of constructs [40]. In this scale, 1 is equally important to 3 and 5 is moderately important, while 7 is highly important whereas extreme importance is linked with 9. Moreover, intermediate values include 2,4,6,8.

Personal visits were made for collecting data through the questionnaire survey from different companies. The responses were collected from about 226 respondents. The survey was conducted across the automotive firms of Indonesia located in different parts of the country. An offline survey was collected in the form of personal visits or face-to-face interview. It was guaranteed to the respondents that their information would be kept private. Approaches such as personal contact, telephonic were used to make appointments. In order to response rate, personal visits were made after getting telephonic appointment. For checking the different between the data collected in the first and second part of time, a non-response bias test was done [41]. There was no significant difference found between the two data groups.

USE of PLS (partial least square method) has been made in this research as an alternative to covariance based structural modeling. This was used to determine the proposed relationships. The technique is suitable for sample size of small size. The missing values were handled in an efficient way and the technique is applicable on non-normal data [42]. By using a sample of 5000 bootstrap, the significance of t-values was computed through SmartPLS, V3.0.

4. Results

The constructs are modeled in a way that a construct is defined by all the items. The constructs were reflective unobserved variables and not formative. Indicator reliability was determined for measurement model including discriminant validity, convergent validity, and reliability tests of constructs as the variables were reflective in nature.

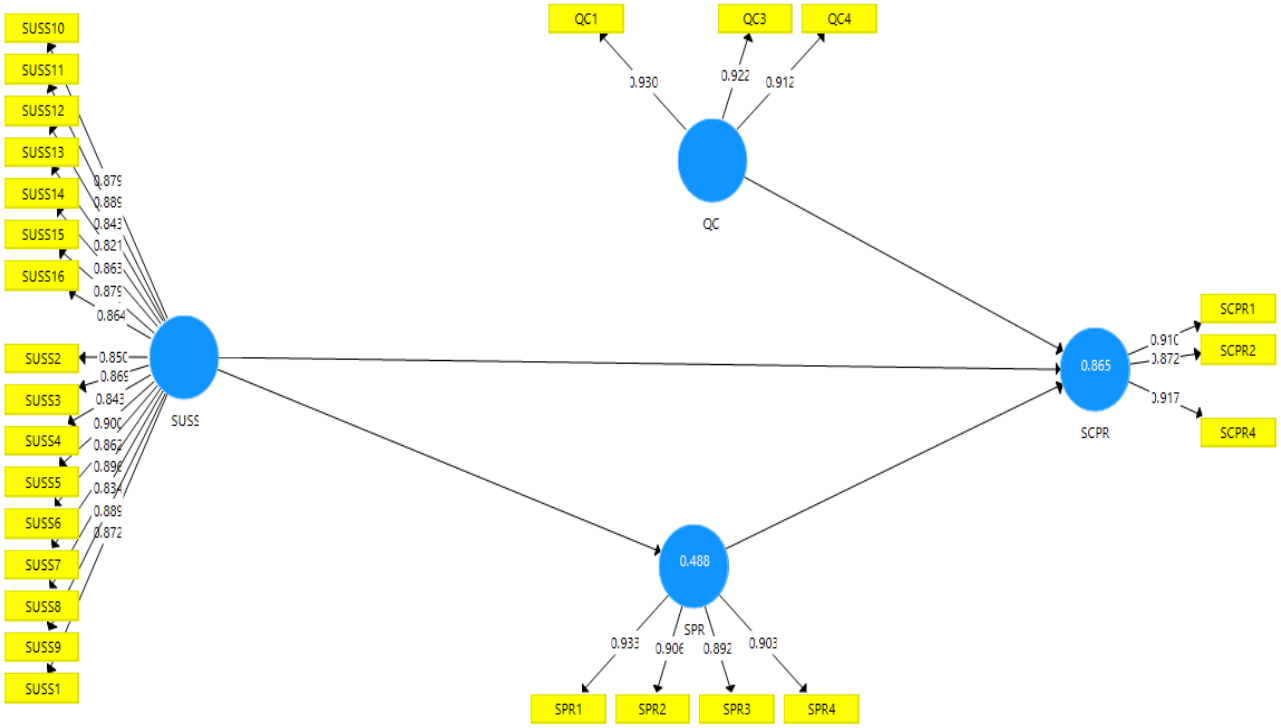

Figure 2. Measurement Model

4.1. Construct and Indicator Reliability

The loadings test has been done for analyzing indicator reliability. It has been determined whether the value for loading between the construct and items is greater than the standard value of 0.70. It has been suggested by Tenenhaus, et al. [43] that the value of loadings item should be at least 0.5 in order to be accepted. The results of the study reveal that the value for items loadings is greater than the recommended value. It suggests that the reliability of indictor is acceptable. Alternatively the construct reliability was determined using composite reliability (CR) and Cronbach's α and these should be greater than 0.7 [44]. The Cronbach's alpha and composite reliability values are greater than 0.7 for all the constructs in the model. Therefore, the reliability is suitable and is not an issue in this research.

Table 2. Construct and indicator reliability

	QC	SCPR	SPR	SUSS
QC1	**0.930**			
QC3	**0.922**			
QC4	**0.912**			
SCPR1		**0.910**		
SCPR2		**0.872**		
SCPR4		**0.917**		
SPR1			**0.933**	
SPR2			**0.906**	
SPR3			**0.892**	
SPR4			**0.903**	
SUSS10				**0.879**
SUSS11				**0.889**

SUSS12				**0.843**
SUSS13				**0.821**
SUSS14				**0.863**
SUSS15				**0.879**
SUSS16				**0.864**
SUSS2				**0.850**
SUSS3				**0.869**
SUSS4				**0.843**
SUSS5				**0.900**
SUSS6				**0.862**
SUSS7				**0.896**
SUSS8				**0.834**
SUSS9				**0.889**
SUSS1				**0.872**

4.2. Convergent validity and reliability

Items loadings are used to determine the composite reliability, AVE (average variance extracted), and convergent validity [44]. The value of these measures should be greater than 0.5 for acceptable. Table 3 shows the results of these measures. It is revealed that the items loadings, AVE, and composite reliability are greater than the standard value of 0.5.

Table 3. Reliability

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
QC	**0.911**	**0.917**	**0.944**	**0.849**
SCPR	**0.883**	**0.885**	**0.927**	**0.81**
SPR	**0.929**	**0.93**	**0.95**	**0.825**
SUSS	**0.978**	**0.978**	**0.98**	**0.75**

The level of difference between the constructs in the same measurement model is referred as discriminant validity [45]. The square root value of AVE has been compared with the association between reflective constructs to determine the discriminant validity.

It was suggested by Fornell and Larcker [44] that discriminant validity can be evaluated through AVE. The square root value of AVE should be greater than the value of correlation between the constructs as compared with the other constructs of the measurement model [42]. Table 4 shows the results in which a strong correlation has been shown by all the constructs with the related items as compared with other items of the constructs. Therefore, the requirement has been fulfilled by the model and it is valid and reliable.

Table 4. Discriminant Validity

	QC	SCPR	SPR	SUSS
QC	0.921			
SCPR	0.878	0.920		
SPR	0.864	0.912	0.908	
SUSS	0.712	0.700	0.698	0.866

The relation between the latent variables has been determined through structural model. In PLS method, endogenous variables have been examined in the structural model through goodness of fit and coefficient of determination i.e. R2 [42]. In order to ensure the validity of structural model, the value of goodness of fit and R2 should be greater than 0.1 [46].

Table 5. R-Square

	R Square
SCPR	0.865
SPR	0.488

These results have been depicted in Figure 3.

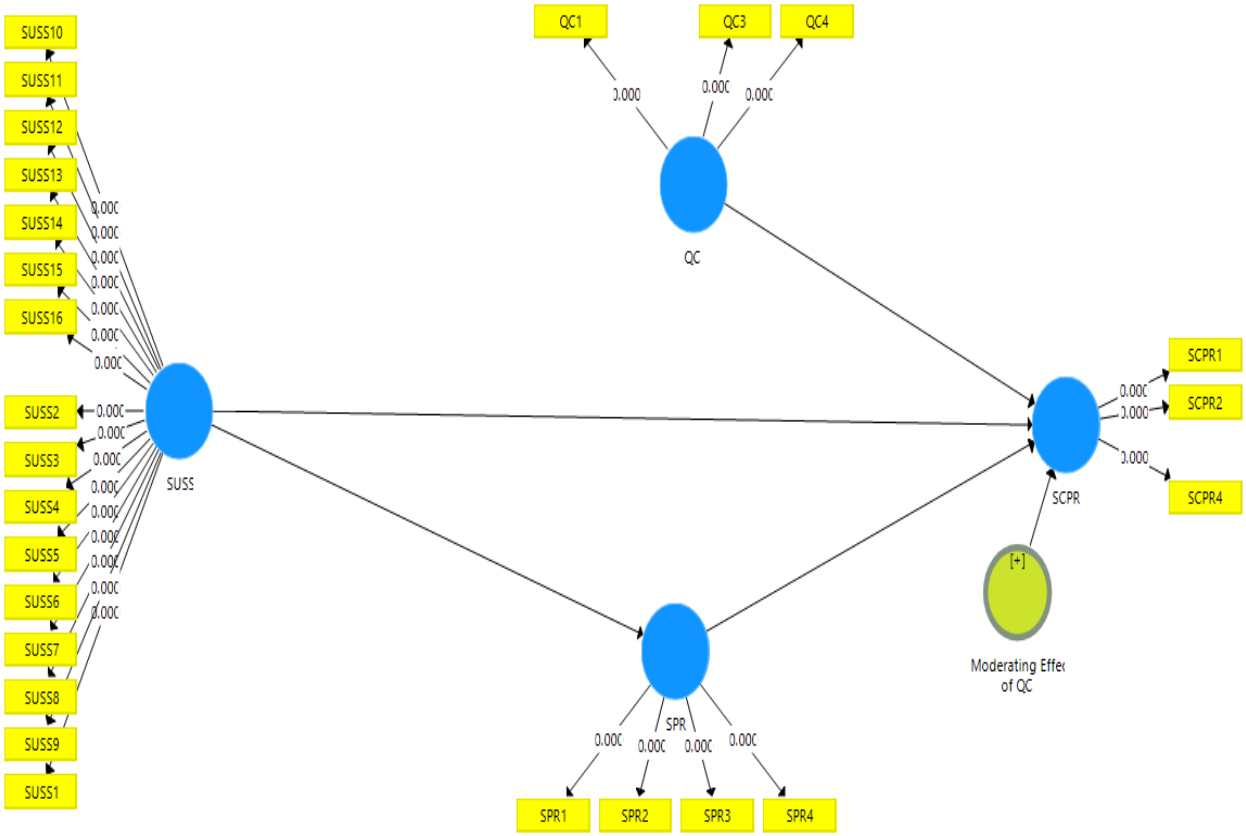

Figure 3. Structural model

The results of hypothesis testing and standardized path coefficient (β) have been presented in Table 5 and 6

Table 6 . Direct and moderation results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Moderating Effect of QC -> SCPR	0.015	0.013	0.019	3.760	**0.000**
QC -> SCPR	0.335	0.336	0.070	4.789	**0.000**
SPR -> SCPR	0.599	0.592	0.075	7.952	**0.000**
SUSS -> SCPR	0.468	0.468	0.074	6.361	**0.000**
SUSS -> SPR	0.698	0.699	0.068	4.299	**0.000**

Table 7. Mediation

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
SUSS -> SPR -> SCPR	0.418	0.413	0.062	4.715	**0.000**

In hypothesis 1, the relation between SCP and planning performance has been investigated. The second hypothesis H2 determines the relation between SCP and sourcing performance. The third hypothesis H3 investigates the relation between SCP and delivery performance. The fourth hypothesis investigates the relation between SCP and overall performance while H5 involves the testing of relation between sustainability performance and SCP. These hypothesis have been accepted with the level of significance as p<0.001, p<0.001, p<0.001, p<0.05, and p<0.05 respectively. It has been implied by the results that supply chain performance is positively influenced by the performance in sourcing, planning, manufacturing, delivery, as well as sustainability in the automotive industry of Indonesia. The all have been accepted at significance level of p<0.001. However, moderation and the mediation is supported at the value of p less than 0.05. It indicates that the manufacturing and sustainability performance is positively influenced through the sourcing performance. Moreover, it has been revealed that delivery and manufacturing performance has positive influence on the sustainability performance.

Meanwhile. the predictive relevance is shown in figure 3.

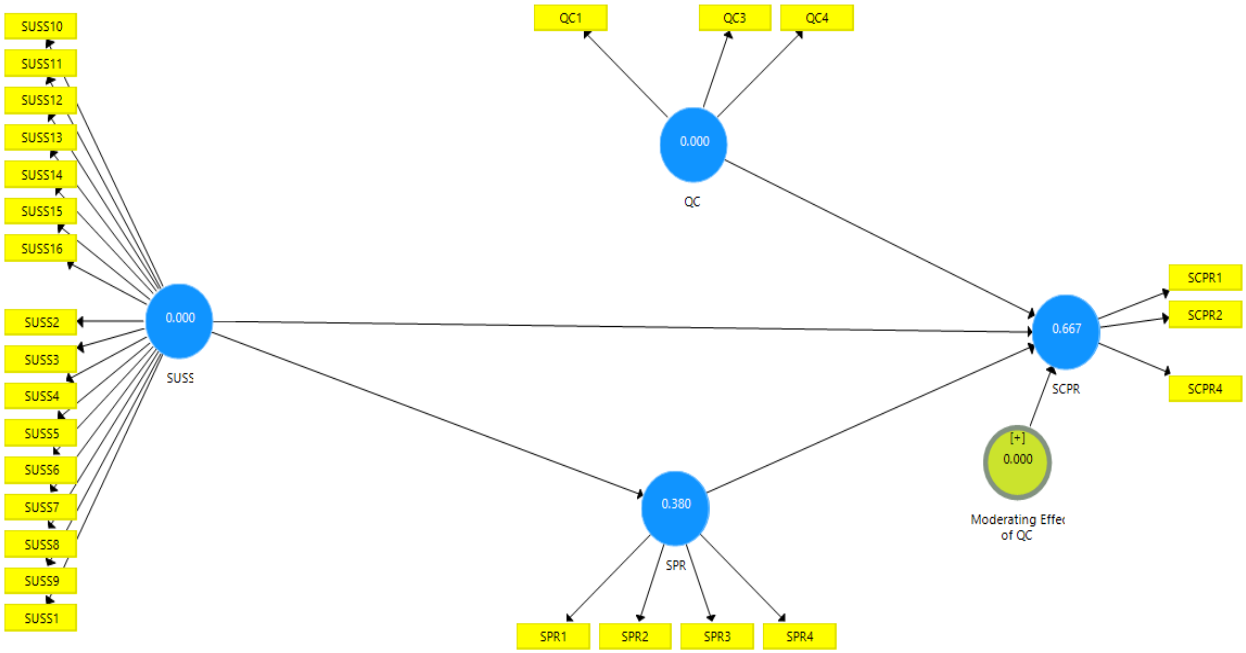

Figure 4. Predictive Relevance

Table 8. Q^2 (=1-SSE/SSO)

	Q^2 (=1-SSE/SSO)
SCPR	0.667
SPR	0.380

5. Discussion and Conclusion

A conceptual framework has been proposed in this research to analyze the relation between the variables identified and their influence on SCP in the rubber industry of Indonesia. The relation of the variables has been analyzed with SCP. It has been suggested in literature that SCF is mainly influenced through performance in sourcing, manufacturing, delivery, and sustainability. For time, a scale was formulated to determine supply chain performance. It is revealed through the results that the values of SCFs came out as

- Sourcing performance (β=0.352, p<0.001)
- Manufacturing Performance (β=0.149, p<0.05)
- Delivery performance (β=0.468, p<0.001)

These three performances are significant and linked with sustainable performance in a positive way. The large variance is explained by these three functions collectively (R2=72.3%), which reflects that the model has a good fit. Moreover, the results suggest that sustainability performance improves with sourcing (β=0.352) along with manufacturing (β=0.149) and delivery performance (β=0.468). The findings are in relation with the literature review [47, 48]. The researchers have suggested that the Indonesian rubber industry has started working on the sustainability issues across the supply chains. This has been supported with the results of this research. The positive relation between design, procurement and delivery performance with the environmental performance has been supported by Esfahbodi, et al. [3] in their

studies on China, Iran, and the USA. However, a positive relation has not been found for influence of sustainable design on financial performance in Iran and China.

The results of the study have revealed that there is strong association between manufacturing performance and sustainability in line with the study of Green Jr, et al. [49]. The association is even weaker when compared with delivery and sourcing. The weak association between the variables can be attributed to sourcing in which there is need to carry out sustainable operations in relation with the suppliers and it is less costly in comparison with the manufacturing performance. In manufacturing, there is need for heavy investments for cost-effective delivery, social friendly outcomes, and sustainability in environment.

In line the findings of this research, a positive relation been observed between environment performance and green purchasing performance [49]. In this research, the sustainable performance incorporates environmental, economic, and social performance in a single construct, which results in a balanced performance. For instance, a weak dimension can be compensated with a stronger one. The results of this research can be applied to Brazil and China, in which economic and environmental performance is influenced through GSCM practices.

5.1. Policy Implications

A rationale has been provided by this study for the firms to show responsiveness towards the external stakeholders in the emerging countries. The results reflect that the policy makers should incorporate the concerns of the stakeholders as it yields a win-win situation. The financial performance of the firm improves along with the operational performance of supply chain. The firm is placed in a better position in the market competition.

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