

# Determinants of Supply Chain Responsiveness among Firms in the Manufacturing Industry in Malaysia

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**Abstract** — The purpose of this study is to verify the significance of supply chain strategies (lean and agile supply chain, strategic supplier partnership and postponement) on achieving supply chain responsiveness. By applying the strategic-choice theory and the resource-based view of firms to the supply chain, this study has attempted to develop a research model. The model demonstrates the premise that by implementing proper supply chain practices to support and execute supply chain strategy, this will enhance the responsiveness of the supply chain. For that purpose, this study utilizes survey data from manufacturing firms in Malaysia. By applying multiple regression analysis, this study finds that all supply chain strategies, namely, the lean, agile, strategic supplier partnership and postponement have a positive relationship towards the supply chain responsiveness. For supply chain practitioners, the results indicate that firms benefit greatly if they consider the strategies of their supply chain and that such a matching would yield to improve the supply chain responsiveness. The paper theoretically develops logic for and empirically shows that all of the supply chain strategies are appropriate practices to enhance supply chain responsiveness. Furthermore, these relationships indicate a contribution to theory that explains how supply chain strategy can result in supply chain responsiveness, through the concurrent deployment of appropriately matched supply chain practices. This research was conducted using a small sample of 89 respondents.

**Keywords**— Supply chain responsiveness, Manufacturing industry

## 1. Introduction

As modern day business environment becomes almost borderless, the advent of cutting-edge supply chain strategies becomes relevant. A supply chain is defined as a network of linked and inter-reliant organizations, which are communally and co-operatively collaborate to control, manage and improve the movement of materials and information from suppliers to end users [2].

Responsiveness in the context of supply chain is the ability to react persistently and within an apt period to client's demand or changes in the marketplace, besides to generate or sustain a competitive advantage as the way forward. Presently, supply chain management is viewed as a strategic tool in surging the competitive advantage of many companies [3]. The concept of supply chain strategy encapsulates this view.

### 1.1 Problem Statement

Supply chain is considered a vital part in any business organization [18, 28]. A flaw in any of the supply chain network may affect the whole chain in the supply network. Supply chains have become multifarious than before, so that explains the ruthlessness and occurrence of supply chain

disruptions that are increasing. Organizations that do not practice responsive supply chain strategies may be affected badly due to the above-mentioned conditions. With the existing economic chaos in the country, it has become crucial to be resourceful in terms of cost and time [5]. Therefore, any form of wastage due to internal or external incidence, is sure to cause huge amount of expenditure in terms of time and money. This can be improved through more efficient supply chain responsiveness [25]. Thus, the experts in the industry need to have a thorough review of the issues and work to solve them by adhering to the supply chain activities and strategy so that at the end of the day they can achieve supply chain responsiveness.

## 2. Literature Review

### 2.1 Supply Chain Responsiveness

The related literature discloses some important gaps in this context. Supply chain responsiveness is defined in two parts. The first part is regarding the interval at which both the flow of information and goods in a supply chain occur. The latter part is about product demand transparency in a supply chain. Catalan and Kotzab (2003) proposed four theoretical evaluation variables (time effectiveness, postponement strategies, the existence of the Bullwhip effect and information sharing) that were beneficial in analyzing each of the three constructs in the SCM analysis model (supply chain structure, supply chain processes and supply chain relationships).

A supply chain network, which is necessary to provide quick responses to customer demands and preferences, affords the leverage for companies to become competitive in the ever-changing marketplace [13]. According to [13], apart from establishing an extended enterprise to boost cooperation, firms are working towards becoming more responsive to the market atmosphere. This is made possible by systematizing and reshuffling organization structure, and amalgamate information technologies that can employ knowledge within and beyond the organization.

### 2.2 Lean and Agile Supply Chain Strategy

According to [11], agility is essential to enhance the ability of the supply chain to respond faster to changes in customers' demand; thus improving the responsiveness of the supply chain. It would be beneficial for organizations if they contemplate the resources of their supply chain, such as postponement and strategic supplier partnership along their supply chain strategy. This is due to the corresponding yields that could increase supply chain responsiveness and firm performance [15]. Besides that, lean supply chain generates value by cutting down waste in the value stream chain. Waste

is described as any interference to the steady flow of production [16].

### 2.3 Strategic Supplier Partnership and Postponement

Firms cultivate strategic relationships with suppliers to lessen costs, increase quality and develop competitive advantage [21]. On another note, there will be performance variance between the partners and the rest of the strategic group when there is a formation of strategic partnerships among affiliates of a strategic group. This variation within a strategic group is attributed to network effect, specifically the influence of supply chain, strategic alliance, and network affiliates on organization behavior, process, and practices that affect organization performance [14].

The principle of postponement proposes that a processed product remains nonspecific, and that the final processing to tailor the product is postponed until demand is acknowledged [10]. The advantages of postponement comprise decreasing inventory levels across the supply chain while refining customer responsiveness [26].

## 3. Research Model and Hypotheses

The research framework in Figure 1 depicts the relationship between respective supply chain strategy and supply chain responsiveness. Next, we describe the rationale for the development of the research hypotheses. Figure 1 illustrates the relationship between H1, H2, H3 and H4 and supply chain responsiveness.

### 3.1 Relationship between LSC and SCR

Lean imparts to ideal use of the expertise of the workforce by giving workers more than one job, by assimilating direct and indirect work and by encouraging unceasing enhancement activities. Consequently, lean production produces a larger diversity of goods and services, at cheaper costs and greater quality, with less of every input, compared to traditional mass production. Thus, lean supply chain strategy revolves around minimal use of labor, space, investment and development time [17]. This will create a responsive supply chain network as a whole. The philosophy of lean focuses on the interrelationships of these practices in order to enhance overall standards of quality, productivity, assimilation and waste reduction in manufacturing, over functional areas (R&D, accounting), and along the supply chain [17]. Based on these, the following hypothesis is constructed:

*H1:* There is a relationship between lean supply chain strategy and supply chain responsiveness.

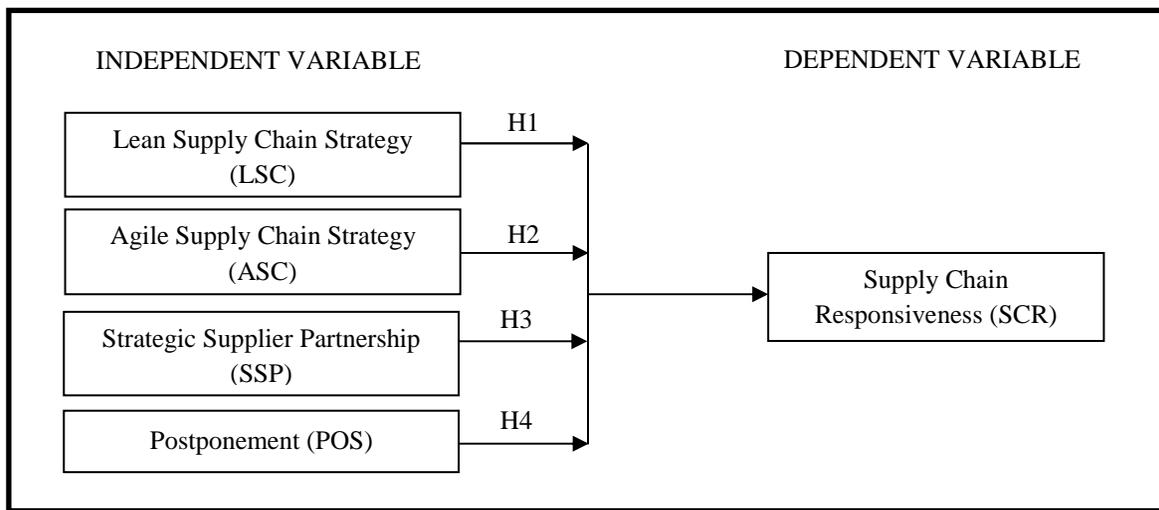


Figure 1. Theoretical framework

### 3.2 Relationship between ASC and SCR

Supply chain agility is a strategic ability that supports firms to promptly sense and launch a response. Meanwhile, supply chain flexibility is an operational ability that assists firms to create change internally and/or across their main affiliates, against internal and external reservations readily [9]. Specifically, for a supply chain to sustain and progress in an environment of turmoil and volatile markets, agility is considered as one of the primitive characteristics to be practiced [1]. Occasionally, firms are exposed to widespread social, political, economic and behavioral discrepancies in their functioning environments. These circumstances would necessitate on improving external collaboration with affiliates to cope and boost organizational and supply chain agility [9]. Therefore, it is hypothesized that:

*H2:* There is a relationship between agile supply chain strategy and supply chain responsiveness.

### 3.3 Relationship between SSP and SCR

A partnership provides a number of advantages enabling the achievement of supply chain responsiveness. At the same time, supply chain schemes emphasize interdependence among firms that are working hand in hand to attain productivity in supply chain activities [14]. Well-nurtured strategic supplier relationships connect clients, manufacturers and suppliers. These relationships play an imperative role in the lasting well-being of the overall supply chain [12]. Thus, in the context of a strategic coalition, the conceptualization of buyer-supplier quality is the first step towards improving our comprehension of quality practices within a supply chain [14]. Therefore, it is hypothesized that:

*H3:* There is a relationship between strategic supplier partnership and supply chain responsiveness.

### 3.4 Relationship between POS and SCR

Practitioners have always noted postponement has the potential to create significant improvement in supply chain [7]. The evolution of supply chains from traditional forecast-driven push to demand-driven pull systems have paved path for postponement to play a major role in a supply chain [27]. Furthermore, postponement is said to be a vital characteristic in the current and competitive supply chains [26]. Therefore, it is hypothesized that:

*H4:* There is a relationship between postponement and supply chain responsiveness.

## 4. Research Methodology and Result

### 4.1 Questionnaire Design, Pilot Study and Sampling

The feat of a research work depends on the quality of the questionnaire developed, therefore it is crucial to follow the format given in order to develop an effective questionnaire [4,24]. A fieldwork was conducted to collect data on supply chain responsiveness. The questionnaire comprises 26 items that measure supply chain responsiveness. The items elaborates the key content of the definition of the constructs. For instance, regarding lean supply chain, we ask the respondent to answer questions considering cost reduction in their supply chain whereas regarding agile supply chain, we request the respondent to answer questions considering pliability in their supply chain. All the items are measured using Likert-type scales and the response option ranged from 1 (strongly disagree) to 7 (strongly agree).

The pilot study was conducted by distributing sample questionnaires to 30 selected respondents to validate all the constructs. We ask senior executives for their understanding

of the content of the questionnaire [23]. They assessed all the items except for the items in the demographic profile. The results were then analysed using the SPSS on the reliability analysis test. All item scores represented an excellent level of agreement since a number of them were considered as scores that are greater than 0.50, which was tolerable [6, 22].

Probability sampling comprises of either unrestricted (simple random sampling) or restricted (complex probability sampling) in nature [19]. For this study, the proportionate stratified sampling was adopted. The above statement reveals that the members represented in the sample from each stratum is proportional to the total number of elements in the representative strata [20].

## 4.2 Data Collection

The questionnaires were distributed to the respondents by using the self-administered questionnaire, that is, the e-mail. Low-cost distribution and processing fees, faster turnaround time, more pliable and less paper chasing were seen to be the plus points of this method [20]. From 1000 managers, 200 managers completed the survey in two rounds, representing a response rate of 15 percent. To ensure completion of the survey, phone calls and e-mail reminders were sent promptly one week after the first attempt to contact them. A token of appreciation was arranged in the form of cash worth RM20 to encourage participation in the survey.

## 4.3 Hypothesis Testing and Results

Data analysis and interpretation of the results to derive the findings begin after all the data and information have been gathered through data collection method [6]. The first step in testing the hypothesis is to examine the direct effect of lean and agile supply chain strategy, strategic supplier partnership and postponement on supply chain responsiveness. Table 1 presents the mean values, standard deviations and the number of items for each variable. For the independent variables, Agile Supply Chain yielded the highest mean (5.1071),

followed by Lean Supply Chain (4.8886), Postponement (4.8500) and lastly Strategic Supplier Partnership (4.8133). Since agile supply chain yielded mean value more than 5, one can conclude that the respondents' perceptions in relation to this variable are mostly favourable. Table 1 also shows the Cronbach's alpha values for the independent and dependent variables in this research. The result indicates that Cronbach's alpha value range from 0.710 to 0.872. The value for Cronbach's alpha of 0.7 or higher is considered acceptable. Thus, the data on these variables are reliable and consistent with research standards.

**Table 1.** Mean and reliability of variable

ID	Mean (n=100)	SD	Number of Item	Cronbach's Alpha
SCR	5.4400	.69921	5	.710
LSC	4.8886	.94162	7	.872
ASC	5.1071	.82613	7	.826
SSP	4.8133	1.06923	3	.756
POS	4.8500	.99620	4	.783

From Table 2,  $R=0.876$  and  $R^2$ -value= $0.768$ . This means that 76.8 per cent of the variation in Y can be explained by all the four predictors (or accounted for by) the variation in X. The results also showed that the maximum Mahalanobis Distance value is 16.971. Cook's Distance is at a good condition when the data is  $< 1.00$ . Coincidentally, the data is 0.103. Thus, the data is valid.

**Table 2.** Multiple regression analysis (R and  $R^2$ )

Mode	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson	Mahal Distance	Cook's Distance
1	.876	.768	.760	.25322	1.340	16.971	.103

- Predictors: (Constant), LSC, ASC, SSP, POS
- Dependent Variable: SCR

The results in Table 3 show the details of the estimated coefficients:  $b$  (constant) is  $1.090E-13$ ,  $b_{LSC}$  is  $-2.800$ ,  $b_{ASC}$  is  $2.800$ ,  $b_{SSP}$  is  $0.600$  and  $b_{POS}$  is  $0.400$ . The results also show that all four variables are significant at 0.05 significance level (0.05). This indicates that there is a linear relationship

between the dependent variable (supply chain responsiveness) and the predictor variables (lean supply chain strategy, agile supply chain strategy, strategic supplier partnership and postponement). Table 3 shows the path model with beta coefficients and the significant levels.

(0.05). All four independent variables are significant, that is, in favour of supply chain responsiveness.

**Table 3.** Regression coefficients

Model	Coefficients <sup>a</sup>			T	Sig.
	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta		
(Constant)	0.76	.000		.000	1.000
LSC	2.80	.000	3.771	6.970	.000
ASC	2.85	.000	3.308	6.259	.000
SSP	0.60	.000	.918	3.074	.000
POS	0.40	.000	.570	3.922	.000

Dependent Variable: Supply Chain Responsiveness

Assumptions:

Linearity: Confirmed by the analysis of partial regression plots.

Homoscedasticity: Confirmed by the analysis of partial regression plots.

Independence of Residuals: Durbin-Watson test, score = 1.340.

No Collinearity and Multicollinearity problems confirmed by Correlation coefficients.

## 5. Discussion and Significance of the Study

The following is the summary of the results. Firstly, the results show the impact of lean supply chain; agile supply chain; and strategic supplier partnership and postponement on supply chain responsiveness. All the four factors improve the supply chain's capability in enhancing its responsiveness towards the chain network. With regard to a higher level of abstraction, these relationships show a contribution to the theory that defines how supply chain strategy can build or create supply chain responsiveness through its concurrent deployment in the industry.

Secondly, the results show that agile supply chain strategy contributes greatly to constructing supply chain responsiveness, as shown by the significant result of hypothesis H2. Lean supply chain strategy also incurred significant result for H1. The result infers that the higher the level of agility in the supply chain, the higher is its responsiveness. Agility call for firms to be ready for fresh trials and to respond to them promptly and with accountability. Agile firms will always be up-to-date in satisfying customers' requirements, leading to probably a constant competitive advantage. The data from this study implies that the planned choice of agility is an indispensable strategy to conserve supply chain responsiveness. A part from supply chain agility, lean supply chain practices is also equally essential to build an effective supply chain collaborative effort. As a result, this value chain effort improves the overall level of productivity, waste reduction and strong partnering integration in manufacturing, across the supply chain [17].

Third, a firm that deploys specific partnership based

resources such as strategic supplier partnership will identify a pathway to supply chain responsiveness through strategic supplier partnership. This type of collaboration consents sharing of vital information, cooperative upgrading activities, and integration. Thus, it leads to better responsiveness of the supply chain as specified by hypothesis H3. Therefore, this study suggests that for firms trying to nurture supply chains responsiveness, making a commitment to collaborate with the right partners will increase their ability to respond effectively. These findings provide an interesting extension of the results by suggesting that processes that encapsulate close relationships with suppliers such as joint problem solving and quality monitoring form the pathway through which supply chain activities can be responsive to customer demands.

Fourth, the results of hypothesis H4 indicates that postponement will directly affect its relationship with supply chain responsiveness. The results indicate that postponement has highlighted the significance of hypothesis H4. The coexisting presence of the postponement strategy will enhance the relationship, in that it creates a pathway to supply chain responsiveness. On the same note, postponement heightens the level of pliability and responsiveness of the supply chain. Responsiveness and pliability lead to a better understanding of customers' needs and thus enhances supply chain responsiveness. Even though past studies have stressed on the significance of supply chain responsiveness [15], the role of postponement in improving it was not mentioned.

Lastly, this study shows the significance of supply chain strategy in attaining supply chain responsiveness. In particular, the research has shown that in order to enhance supply chain responsiveness, firms must deploy supply chain strategies in order to build responsive supply chains. Hence, the study suggests that supply chain strategy play a significant role to support the execution of supply chain network, which enhances supply chain responsiveness.

## 6. Conclusion

Although previous research have examined different supply chain strategies and their impact on supply chain responsiveness, this does not provide theoretical or empirical guidance of how supply chain strategies can be used effectively and boost their impact on supply chain responsiveness. This study has taken the challenge by filling the gap in showing how four supply chain strategies (lean supply chain strategy, agile supply chain strategy, strategic supplier partnership and postponement) have impacted in achieving supply chain responsiveness). Thus, when such a situation takes place, it introduces a theoretical perspective of potential deployment of supply chain strategies as a means to achieve supply chain responsiveness.

## 6.1 Managerial Implications

From a manager's viewpoint, this study will aid in deciding which supply chain strategy should be deployed through detailed consideration of all strategies discussed. It is vital for managers to cultivate strategic relationships among suppliers and downstream retailers to boost their confidence before forming or deploying a supply chain strategy.

This research holds important benefits for supply chain managers, especially for those who are aiming to construct strong supplier relationships. It is necessary for managers to understand the importance of relationship factor in supply chains. Managers should concentrate on partnership relationships among selected suppliers besides working on improving efficacy from cost reduction and waste exclusion through lean supply chains. This is because positive partnerships will influence beneficial collaboration and provide resources that would be difficult to mimic by rivals.

## 6.2 Limitations and Future Research

This study faced a number of limitations that suggest caution in deducing its findings and the directions for future research. Firstly, this study has taken place at an organizational level, so a person from each organization responds to the survey. A single respondent is questioned about supply chain issues he/she is dealing with and strategies deployed. Although the respondent is either a senior purchasing manager/director, or supply chain manager/director, it is comprehended that a single person in an organization is not in charge of the entire supply chain. Therefore, future research may benefit from having multiple respondents from each organization to participate in a similar study.

Secondly, this study is considered comparable to other recent studies on supply chain management, although the response rate is low [15]. Future research should consider other liable factors such as demand uncertainty or type of industry. With this regard, in industries where the demand is relatively stable and predictable or in industries that have short product life cycles, other productive combinations of supply chain strategies may dominate. Research investigating such patterns would be able to obtain insights into broad industry specific templates relating to supply chain strategy. Similarly, service industries, given their high degree of labor content and customer contact may have different supply chain strategies.

Finally, future research could examine the fit between supply chain strategy and the responsiveness. This is because such investigation would provide insights into possible generalization and extension of the current results.

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