

Supply Management Orientation and its Effect on Buyer/Supplier Performance: Some Insights from Automobile Industry in India

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Abstract: The supply chain management literature emphasises the need and importance of Supply Management Orientation (SMO) and its impact on Supplier Performance (SP) and Buyer Performance (BP). In this paper, we study these hypotheses in Indian automobile industries taking up the companies that are closely associated with an automobile giant in India. We study the confirmatory analysis of these constructs of the SMO impacting SP and BP in the first phase. In the second phase, we expand the scope of the constructs and variables as encountered in the present study and verify all the hypotheses relating to SMO, BP and SP using structural equations modeling. In the third phase, we study the buyer-supplier relationships with behavioural variables and study the dimensions on which the relationships can be strengthened.

Best practices in supply chain management emphasise that companies that work in close partnership with their key vendors are able to take advantage of their suppliers' special competencies, leveraging them to achieve significant operational, economic and productivity benefits. Not surprisingly, many high performing companies employ supplier partnerships as a tool to help expand both market share and market size. By working together across the supply chain, these companies are able to pool talents and resources, yielding substantial gains in cost, quality, flexibility, system responsiveness, and overall performance.

The positive impact of the supply chain management on a firm's performance has been reported from many industries. P&G has generated more than US\$325 million in supply chain savings by using Continuous Replenishment Program and Efficient Customer Response. In the automobile industry, Chrysler launched Supplier Cost Reduction Effort (SCORE), a supplier involvement program and announced that it achieved more than US\$1.2 billion in cost savings through 1997 due to the SCORE program. Also, Honeywell Industrial Automation and Control reported a 90% reduction of product defect rates based on its supply management program during the period of 1990 through 1996 (Shin et al., 2000).

BRIEF LITERATURE SURVEY ON SUPPLY MANAGEMENT

Considerable research has been conducted on buyer-supplier relationship management or supply management, but most of these studies are conceptual in nature or based on a few case studies. Although innumerable articles/papers are available in the literature, in this section, a brief literature review that is directly pertinent to the current research is presented.

Supplier Management is organising the optimal flow of high quality, value-for-money materials or components to manufacturing companies from a suitable set of innovative suppliers and has been an important aspect of supply chain management. The term 'supply chain' or 'supply chain management' is widely used in the literature even **when the procurement side of manufacturing is the primary interest** (Choi and Hartley, 1996; Forker et al., 1997). From a purely tactical exercise, it has now become strategic function since "external suppliers now exert a major influence on a company's success or failure" (Monczka et al., 1993). To obtain a competitive advantage, companies are streamlining the number of suppliers from which they purchase. The reduced supplier base means that closer, longer-term relationships can be established with a few (sometimes single source) suppliers who then play a critical role contributing to new product design (Lyons et al., 1990), significantly reducing costs and constantly improving quality (Monczka et al., 1993).

Considering the importance of this area has become imperative due to many manufacturers concentrating on their core competencies moving away from vertical integration, to gain a competitive edge from the supply side of their operations (Leenders, 1994). Good suppliers can help manufacturers during the development of new products and processes with long-term quality improvements and cost reductions and can provide enhanced delivery performance (Monczka et al., 1993). For manufacturers the challenge is to maximise (supplier) performance better than competitors do. For companies spending a high percentage of their revenue on parts and materials, savings are particularly important. In these cases, a saving of 1 percent on purchasing costs can have the same effect on profit as an 8-10 percent increase in sales will (Sandelands, 1994). Close cooperation with suppliers quickly brings lower unit costs and, longer-term, even greater quality at lower cost (Burt, 1989; Larson, 1994).

Much of the research in supplier base management (and supply chain management in general) has focused on the automotive industry and stems particularly from the work of Lamming (1993). He first recognised the competitive advantages gained by the Japanese car companies through their use

of close, long-term relationships with suppliers and developed a four phase descriptive model of the car industry's move towards closer buyer-supplier relationships and partnerships. He has also published (rare) empirical data demonstrating the reduction in the number of suppliers used by automotive manufacturers. The drive to focus on supplier management comes from the fact that all car factories are already highly efficient and so the search for a competitive edge has had to shift (Economist, 1996).

During 1990s, the shift was from adversarial to cooperative with greater emphasis on information sharing, single sourcing, and supplier partnerships. Companies began to work with suppliers to improve performance and capabilities and found that their suppliers' quality and delivery performance improved as a direct result of the buyers' supplier development activities. In a study of automotive suppliers in Great Britain by Lascelles and Dale (1989) it was observed that poor communication and suppliers' lack of understanding of the buyer's requirements were barriers to quality improvements.

Existing literature inadequately addresses empirically what improving supply management really means in practice and how it is related to the companies' operational performance. In the literature, many authors have discussed supplier management. With the exception of the automotive industry, the evidence of the trend towards fewer suppliers is largely anecdotal. There is a need for wider empirical evidence. Still too little is known about the experiences of companies which have reduced their supplier base. Although experiences are there for the other automotive industries in the world, the literature on the experiences of not only the Indian automotive world but also the other industries is still not known adequately. Questions that are of interest from the literature are:

1. In transition to a smaller supplier base, what is the best way to manage the change in buyer-supplier relationships?
2. Fewer suppliers means that more time is available for each supplier but how should this extra time be best invested?
3. The exact level of emphasis placed on price by purchasing companies needs to be understood better.
4. A broad range of supplier performance measures are used in contemporary supplier management. But has the focus been entirely removed from price? Studies in UK show that non-automotive companies do expect their suppliers' prices to decrease over time.
5. They all focused very strongly on back-up suppliers. Is this

fear of single-sourcing widespread outside the automotive sector? This needs further investigation.

Present Status

The past decade saw companies becoming more interdependent due to increased outsourcing, supply base reduction, and consolidation. While importance of supplier management increased, systematic studies to explore the relationship between supplier management practices and performance have just begun. Most of them again explored the relationship between a firm's supplier quality management practices and its own performance without exploring the suppliers' performance as a moderating factor. Moreover, the existing literature fails to address empirically what improving supply management really means in practice and how it is related to the companies' operational performance.

Reference Study for the Present Study

Study in the US Automotive Industry:

Shin, H, Collier, D A, and Wilson, D D (2000). Supply management orientation and supplier/buyer performance. *Journal of Operations Management*, 18, 317-333.

The primary objective of this research was to test the impact of a supply management orientation (SMO) on the suppliers' operational performance and buyers' competitive priorities - cost, quality, delivery and flexibility. Three major research hypotheses associated with SMO, Supplier Performance (SP), and Buyer Performance (BP) are tested using a confirmatory structural equation modeling approach. An attempt was made to answer the following questions.

1. Does an improved SMO improve the supplier's performance?
2. Does an improved supplier's performance improve the buyer's performance?
3. Does an improved SMO improve internally the buyer's performance internally as well?

The SMO is the driver (exogenous latent variable) of the structural equation model developed in this study. By doing so, it shows how SMO and SP affect the buyer's performance in each of the competitive priorities. Based on the structural model, it tested the theory that "if a manufacturer buyer adopts an improved SMO, then the adoption of SMO improves both SP and BP."

Motivation for the Current Research Study

The findings of the Supplier Management practices and orientation in the US automobile industries are yet to be verified in the context of Indian automobile industry. In order to verify these hypotheses and the constructs, the present study was conducted on an automobile giant in India. The details are outlined below.

From the literature and studies in the area of Supply Chain Management, it is quite evident that the Indian Supply Chain Management still has a long way to go. At this stage, it is very essential that we understand the dimensions of the Supply Management Orientation, which are critical for improving the performance levels of the suppliers and the buyers along with impacting the overall competitiveness. The case under study was chosen as a representative of the larger domain of the Indian supply chains. As the automotive industry is the most visible, widely networked, relatively matured with a vast supply base, it was chosen for analysis.

A major Indian automotive industry OEM player having a diverse network of suppliers and well-established export business was chosen for this study. This OEM has a rapidly growing supply chain with a well established SMO. We adapt the term Supply Management Orientation (SMO) to describe the management efforts or philosophy necessary for creating an operating environment where the buyer and supplier interact in a coordinated fashion (Shin et al., 2000).

The study was carried out with the suppliers of this manufacturer and their SMO was evaluated. We looked at the Supply Management Orientation tendency of the suppliers of this OEM and tried to establish correlation with the different aspects of the supplier and buyer performance. The OEM under consideration has about 650 parts supplied by about 70 odd suppliers widely spread geographically, the major concentration being in Pune, Delhi and Chennai. The major challenge to this supply chain comes from the diversity of the technologies and the limitations of the Indian infrastructure.

Being a multinational joint venture, producing an international product much ahead of its competition (in terms of technology and quality) has set high expectation of performance. In this study, though the supply side is complex with various suppliers, the delivery side is rather simple with only one customer to cater to. The supply management orientation is very strong with extensive interaction between the suppliers and the OEM. The communications level is extremely good with intranet facility providing online database sharing option. Suppliers are partners with significant involvement in major product designs, developments, and even sourcing decisions. The OEM has elaborate supplier development programs including annual training sessions, supplier conference, regular audits, and prompt feedback systems. Though the SMO of the OEM is strong, it is limited to the tier-1 supplier only and it has not percolated to the next layer.

Basic Research Problems

We have undertaken this study to address the following questions:

1. What are the dimensions representing the Supply Management Orientation which influence the supplier's performance?
2. What are the dimensions representing the SMO which influence the buyer's performance?
3. What are the dimensions representing supplier's and buyer's performance?
4. Does an improved Supply Management Orientation of the manufacturer/buyer improve supplier's performance?
5. Does an improved supplier's performance improve the manufacturer's/buyer's performance?
6. Does an improved Supply Management Orientation improve internally the manufacturer/buyer's performance as well?

PHASE I

This research was aimed at finding the dimensions representing the key constructs - SMO, SP (Supplier Performance), and BP (Buyer Performance) - of supply management and to confirm the dimensions found in the earlier paper by Shin et al. (2000). *This paper is referred to as the reference study for our study through out this paper* for understanding the same in the Indian automotive industries. As the content validity is established for the instruments used by this reference paper, we have tried to stick to this instrument only. The instrument was then expanded by addition of few more variables to see their role on other constructs.

The SMO is characterised by constructs like (1) long-term supplier-buyer relationships; (2) supplier participation in new product development; (3) quality criteria in supplier selection; and (4) reduced supplier base.

The Buyer Performance (BP) is characterised by (1) process flexibility, (2) product cost, (3) serviceability, (4) delivery cycle time, (5) delivery reliability, (6) production lead time, (7) production cost, (8) product features, (9) product conformance to specification, (10) volume flexibility, and (11) on time delivery.

The Supplier Performance (SP) is characterised by (1) flexibility, (2) environment friendliness, (3) multiple sourcing, (4) cost, (5) quality, (6) delivery reliability, (7) technology, (8) design upgradation, (9) USP, (10) lead time for new product development, (11) number of iterations for a new product approval, and (12) on time delivery.

Data Collection

The target respondents were the middle level managers at the manufacturing plants. The survey instrument was administered to about 60 suppliers by email. The companies chosen were very diverse in nature ranging from castings, forgings, machining (ferrous and non-ferrous), plastics, rubber, sub-assembly units, proprietary parts, functional assemblies, piping, etc. Out of the 60 suppliers approached, responses from 43 were received, which amounts to about 73%, which is quite satisfactory. The companies were of different sizes and strengths and were associated with the parent OEM for at least three years.

The instrument used in the reference study consisted of 22 questions. Few more questions, thought to be critical in our study were also included to make it more extensive. In the modified questionnaire, 35 questions were answered by the suppliers out of which 4 were related to general information, 8 were related to SMO dimensions, 13 were related to the Supplier Performance and 13 focused on Buyer Performance. Likert scale was used and the questionnaire was made so as not to visibly classify the dimensions as per the constructs. The scales were standardised and the direction of the scale was adjusted in order to maintain uni-dimensionality of the scale within the construct. As the instrument was proven for the content validity tests, no further checks were found required and hence were not conducted.

For the Phase I research questions, factor analysis was done for obtaining the dimensions. Confirmatory factor analysis was done with the original 22 variables in the reference study and exploratory factor analysis was done for the original variables as well as the modified 30 variables with the following as three scenarios.

1. Factor analysis with 22 variables with 6 forced factors
2. Factor analysis with 22 variables with eigen value of at least 1
3. Factor analysis with 30 variables with eigen value of at least 1

Factor Analysis with the 30 Variables (Exploratory)

We confined our analysis to the instrument with 30 variables. The overall Cronbach standardised alpha value was 0.69 which is quite satisfactory and the alpha values ranged from 0.65 to 0.71 for the individual constructs which are again quite satisfactory. The factor analysis with 8 factors resulted in the following dimensions:

1. Delivery performance - *Delivery speed, delivery reliability, on time delivery, time for new product development.*
2. Production lead time - *Production lead time, cycle time.*

3. Unique product features - *USP, design development, serviceability.*
4. Sourcing cost - *Product cost, lead time, multiple sourcing.*
5. Lean supplier base - *Small number of suppliers.*
6. Supplier selection - *Quality criteria for supplier selection, cost.*
7. Supplier involvement - *Involvement in new product development, long-term relationship.*
8. Contemporary product - *Environment friendliness, durability of product.*

This analysis led to the following interesting observations:

1. Addition of variables has resulted in regrouping of variables and has led to the emergence of different dimensions.
2. The variables such as unique product features and product contemporariness have emerged as separate dimensions. In the Indian scenario, where the products are in the stage of high growth and intense competition, these factors adding to the product differentiation are highly appreciated (like product USP and the contemporariness in automotive industry Euro II, etc.).
3. This redistribution of variables is found very much relevant, as these are the factors, which do influence the supplier and buyer performance and provide orientation to the SMO itself.
4. Another interesting dimension emerging from this analysis is the sourcing cost. This dimension consists of variables like multiple sourcing, supplier productivity and lead times. These are very critical variables in the Indian context where the suppliers are not standardised and the SMO performance is influenced by these critical factors.
5. Though the instrument tried was useful, it was not found to be directly applicable in the Indian context as the different variables have different value propositions and this influences the inter-variable relationships.

Our findings do not match completely with the reference paper, as the constructs of the supplier and buyer performance have not emerged as completely independent identities with a different set of variables. In our analysis, it has clearly emerged that supplier and buyer performance are interlinked and are governed by variables across the groupings. For example, some dimensions were found to have variables from both the supplier and buyer performance variables set. This indicates close interactions between the buyer and supplier variables. These interactions need to be studied further to do independent analysis of all the variables.

PHASE II

To understand the structural models linking the SMO, SP and BP, the following are the hypotheses we have set for our present study for Phase II.

H1: SMO is positively associated with SP (i.e. $\tilde{a}_1 > 0$ in Figure.1)

H2 to H5: SP is positively associated with BP (i.e. $\hat{a}_1, \hat{a}_2, \hat{a}_3, \hat{a}_4 = 0$ in Figure:1 for all BP components respectively)

H6 to H9: SMO is positively associated with BP (i.e. $\tilde{a}_2, \tilde{a}_3, \tilde{a}_4, \tilde{a}_5 > 0$ in Figure 1 for all BP components)

To test the causal relationship among the constructs, four covariance structure models - quality, delivery, cost and flexibility - as in the reference study are considered here too. Each of the four hypothesised structural equations models represents the following covariance structures:

$$y_1 = \tilde{a}_1(x_1) + \varepsilon_1$$

$$y_2 = \hat{a}_1(y_1) + \tilde{a}_2(x_1) + \varepsilon_2$$

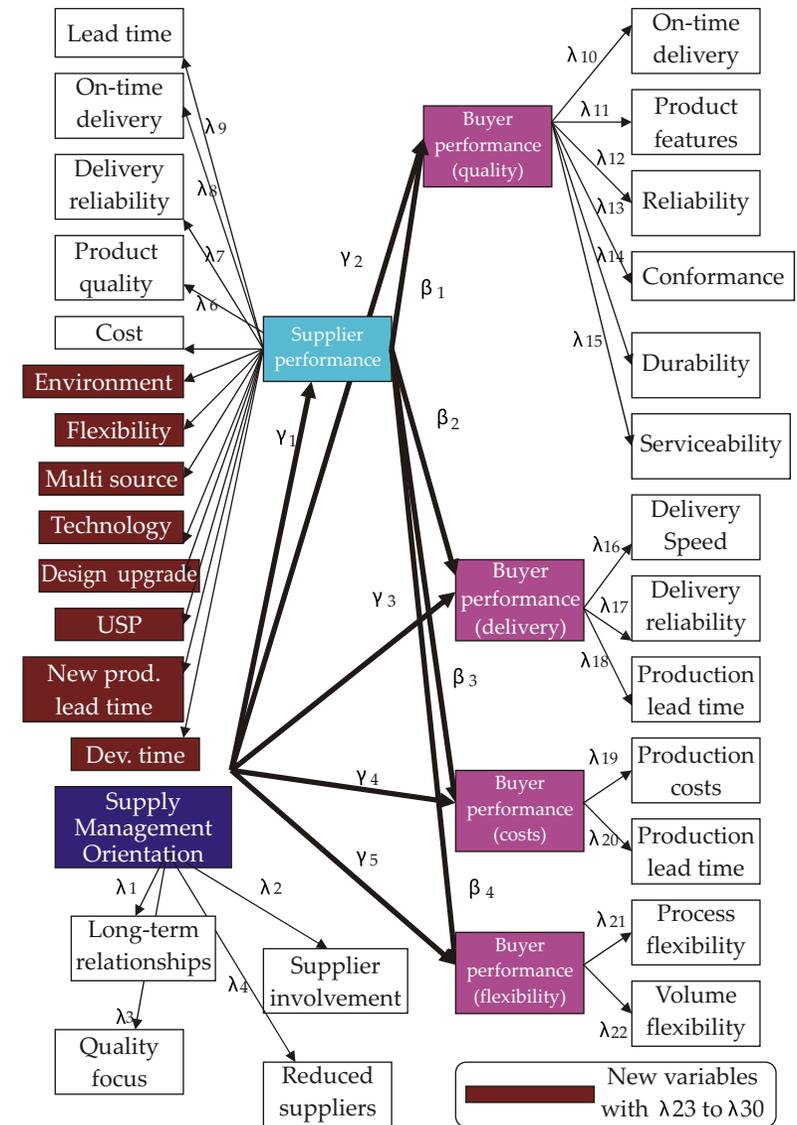
$$y_3 = \hat{a}_2(y_1) + \tilde{a}_3(x_1) + \varepsilon_3$$

$$y_4 = \hat{a}_3(y_1) + \tilde{a}_4(x_1) + \varepsilon_4$$

$$y_5 = \hat{a}_4(y_1) + \tilde{a}_5(x_1) + \varepsilon_5$$

where $x_1, y_1, y_2, y_3, y_4, y_5$ represent SMO, SP, and BP(Q), BP(D), BP(C) and BP(F) respectively. The model is assumed to be additive, linear and recursive. The conceptual model of these approaches is given in Figure 1.

FIGURE 1
Phase II Conceptual Model



While studying the covariance models of SMO, SP, BP (Quality), BP (Cost), BP (Delivery) and BP (Flexibility), we attempted various combinations of the constructs to see if they converge and the models become significant, using LISREL software. Some of the structural equations model combinations using LISREL and their results are given in Table 1.

TABLE 1
Some Model Combinations Using LISREL

Models	Type of Model	CFI	NNFI	RMSEA	Model Description
1	Confirmatory Factor Analysis	0.855	0.805	0.051	SP BPQ BPD BPF BPC
	Structural Modelling	0.771	0.721	0.097	BPQ BPD BPF BPC=SP
2	Confirmatory Factor Analysis	0.885	0.838	0.054	SP BPQ BPD BPF (BPC removed)
	Structural Modelling	0.814	0.762	0.092	BPQ BPD BPF =SP
3	Confirmatory Factor Analysis	0.915	0.872	0.057	SP BPQ BPD BPF, V16 removed
	Structural Modelling	0.829	0.774	0.089	BPQ BPD BPF =SP
4	Confirmatory Factor Analysis	0.942	0.920		SP BPQ BPF BPC (BPD removed)
	Structural Modelling	0.941	0.924		BPQ BPF BPC=SP

CFI: Comparative Fit Index NNFI: Non Normed Fit Index
RMSEA: Root Mean Square Error of Approximation

CONCLUSION

Looking at the CFI and NNFI, we found that the Model 4 above seemed to converge and give the overall best fit and results. We also found that Hypotheses HI and H6 through H9 were not significant as none of the SMO constructs were significant to establish any structural modelling with the other constructs. This may be due to the fact that it is early in Indian contexts to study the impact of SMO as the supply chains are yet to understand the initiatives and implication of such orientation. Hence, our analysis was confined only to the constructs combining the Supplier Performance and Buyer Performance.

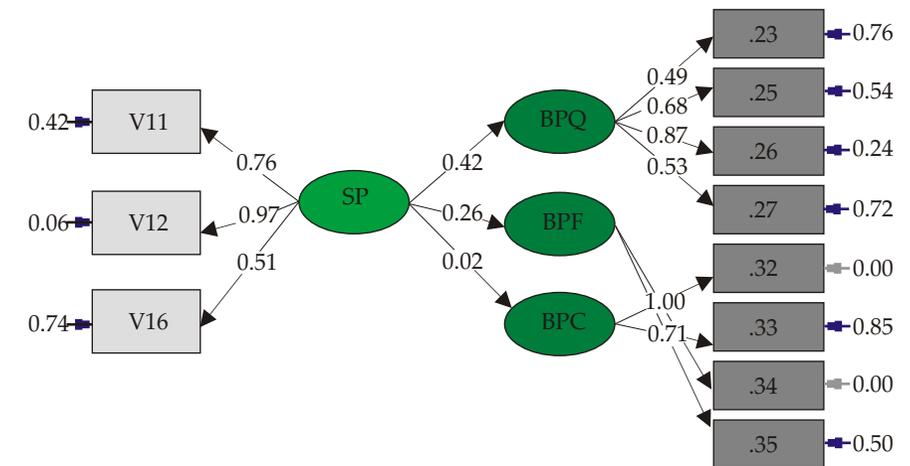
The final structural model of the Model 4 is shown in Figure 2 with the legends of the variables and the constructs. As can be seen, the path coefficients of SPBP(Q), SPBP(F) and SP BP(C) are positive. Among them, SPBP(Q) is highly significant and SPBP(F) is somewhat significant and SPBP(C) is not significant. This indicates that the Supplier Performance manifesting in On-time Delivery, Delivery Reliability and Flexibility affects the Buyers' Performance with respect to their Quality in terms of their On-time Delivery, Delivery Reliability, Conformance to

their specifications and Durability of the product very significantly. Additionally, it affects the Buyer Performance with respect to Flexibility in terms of Process and Volume Flexibility, although not very significantly. Surprisingly, Supplier Performance as indicated above does not affect the Buyer Performance with respect to Cost in terms of Production Cost and Lead time indicating that most of the performance of buyers in cost stem mostly from their own efforts.

FIGURE 2
Structural Equation Model for Supplier Performance

Legends for Variable Labels:

- | | |
|--------------------------------|--|
| SP Supplier Performance | BPQ Buyer Performance (Quality) |
| V11 On-time Delivery | V23 On-time Delivery |
| V12 Delivery Reliability | V25 Reliability |
| V16 Flexibility | V26 Conformance to Specifications |
| | V27 Durability of Product |
| | BPF Buyer Performance (Flexibility) |
| | V34 Process Flexibility |
| | V35 Volume Flexibility |
| | BPC Buyer Performance (Cost) |
| | V32 Production Cost |
| | V33 Production Lead Time |



Chi-Square = 42.09, df = 43, P-value = 0.51077, RMSEA = 0.000

The results indicate that in Indian contexts, the SMO strategies are yet to find their importance as Supplier Relationship Management initiatives have begun very recently. From working as independent organizations without getting integrated, the supply chains are moving towards some integration with the results above showing that the linkages of suppliers' performance are linked with the buyers' performance but mostly in quality and flexibility rather than in cost and delivery. The results are to some extent limited by the small sample size and probably more insights can be drawn if a sufficiently large sample is studied and studies are done across industries.

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