SUPPLY CHAIN MANAGEMENT: SOME INSIGHTS FROM INDIAN MANUFACTURING COMPANIES

Sanjay Jharkharia and Ravi Shankar
Department of Management Studies, Indian Institute of Technology Delhi
New Delhi-110 016 (India)
E-mail: sjharkharia@yahoo.co.in and ravi1@dms.iitd.ernet.in

ABSTRACT

Some issues such as inventory management, IT-enablement of supply chains, and buyer-supplier relationships are at the core of supply chain research. Some other issues such as postponement, top management commitment, and disparities in trading partners' capability influence these core issues. Some hypotheses have been proposed to assess such influences. Through a questionnaire-based survey for Indian manufacturing companies, these hypotheses have been tested. It is observed from this research that information sharing and top management commitment have important roles towards the effectiveness of a supply chain. The findings also establish relationships among many important issues of supply chain management. The paper ends with the discussion and implications of this research.

INTRODUCTION

For more than a decade, supply chain management (SCM) has received increased attention among the industries for achieving competitive advantage. Some of the benefits of SCM, which are predominantly discussed in the literature, include lower inventory levels (Closs et al. 1998; Pagel 1999; Stank et al. 1999; Quinn 2000), better responsiveness (LaLonde & James 1994; Stank et al. 1999), and lower throughput time (Stank et al. 1999).

Some issues such as IT-enablement of supply chains, buyer-supplier relationships, and inventory management are at the core of the supply chain research and have been given a lot of attention in the literature (e.g., Monczka 1996; Nielson 1998; Bensaou 1999; Pagel 1999; Handfield & Nichols 1999; Ballou et al. 2000; Handfield et al. 2000). There are, however, some other issues such as postponement (Anderson et al. 1997; Metz 1998), attitude of major stakeholder of the supply chain (Ballou et al. 2000; Munson et al. 2000), top management commitment (Higginson and Alam 1997), disparity in trading partners' capability (Kwan 1999; Sohal et al. 2001) etc., which influence these core issues. The literature on SCM has many references about these issues but lacks in providing enough empirical evidence of these relationships. Further, it is

also important to identify the relative influence of these issues on a SCM attribute. This is more relevant in the Indian context, where most studies on SCM either consist of case studies or descriptive statistics alone (e.g., Kadambi 2000; Sahay et al. 2003). Therefore, in this article few hypotheses have been proposed to test the relationships among common SCM issues. To test these hypotheses the authors conducted a survey of the Indian manufacturing companies.

The main objectives of this paper are:

i. to formulate some hypotheses which relate the common supply chain issues so that managers could develop strategies for increasing the effectiveness of their supply chain,

ii. to test the validity of these hypotheses and establish the relative importance of the relevant issues in influencing a supply chain attribute, and

iii. to discuss the implications of the research for practicing managers.

The remainder of this paper is organized as follows. The next section deals with the literature review and hypotheses development. This is followed by the research methodology and data analysis. Finally, we conclude with the implications of this research and the directions for further research.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

In this section, a review of the literature is presented. This follows the formulation of the hypotheses.

Buyer-Supplier Relationships

For the effective management of a supply chain, the buyer-supplier relationship has received increased attention during the past few decades. Many authors have discussed the issues, which contribute to the improved buyer-supplier relationship. For example, Daugherty et al. (1992) found that higher level of shared information and communications among the supply chain partners lead to improved collaboration and greater responsiveness in the supply chain. This observation is supported by many more researchers who observed that an information sharing mechanism among the partners of a supply chain is essential for the smooth functioning of these relationships (Ellram 1995; Nielson 1998; Ballou et al. 2000).

However, in most cases, one partner in a supply is so dominating that it may unilaterally dictate its own terms and conditions to the other partners. The major stakeholder in the supply chain may take some of the decisions at its own and forces the smaller partners to comply with these decisions (Munson et al. 2000). However, such dictatorial attitude can also be used in achieving cooperation among the organization. In that case, the dominant partners may help improve the cooperation in the supply chain (Ballou et al. 2000). Top management of the supply chain organization can play an important role in developing policies, which may lead to a healthy and collaborative relationship between the buyers and the suppliers (Andraski 1998; Akkermans et al. 1999; Kilpatrick & Factor 2000; LaLonde 2000). Further, the belief and commitment of top management in SCM practices (such as improved buyer-supplier relationships, information sharing, etc.) is a key component for the successful adoption of SCM (Higginson & Alam 1997; Moberg et al. 2002). These observations lead to the formulation of the hypothesis 1.

Hypothesis 1

The buyer-supplier relations in an organization are significantly improved by (i) information sharing, (ii) commitment of top management, and (iii) attitude of major stakeholder of the supply chain.

Inventory Management

Inventory reduction is one of the main objectives of SCM (Pagel 1999). It is also the most commonly shared data among the supply chain partners (Lee & Whang 2000). Therefore, several researchers have explored the ways to reduce the inventory in a supply chain. Many researchers (Kwan 1999; Pagel 1999) have noted that information sharing in the supply chain can play an important role in reducing the inventory level as it allows the companies to quickly respond to market changes thus requiring minimum inventory across the supply chain. Earlier, Loar (1992) examined the relationship between inventory levels and the information sharing in four major US industries. He observed that average inventory level had an inverse relationship with the frequency and volume of information sharing. However, besides information sharing there are some other enablers of inventory reduction in a supply chain, e.g. postponement of point of product differentiation (Metz 1998), reduction of suppliers base in the supply chain (Pagel 1999; Szwejczewski et al. 2001), and reduced order fulfillment time (Mohanty & Deshmukh 2001). Regarding order fulfillment, Sahay et al. (2003) observed that it was the second most important supply chain issue in Indian companies. Companies were paying maximum time and attention to improve order fulfillment.

Postponement is emerging as an important strategy in SCM. Delaying the final labelling, assembly or packaging until the last moment is known as the principle of postponement (Mohanty & Deshmukh 2001). The objective of postponement is to minimize the risk of carrying finished product inventory at various points in the supply chain by delaying product differentiation to the latest possible moment before customer purchase. Anderson et al. (1997) and Metz (1998) also stressed the need of postponement in SCM and observed that postponement cuts down the inventory in a supply chain.

Reduction of suppliers base (i.e., reducing the number of suppliers) is aimed at having few but reliable suppliers, who provide quality materials as per the schedule of the buyers. It leads to fewer uncertainties and hence reduction in the inventory level. The other benefits of reduced suppliers' base are: lower price of the product, lower administration cost and improved communications (Szwejczewski et al. 2001). Pagel (1999) explored the advantages of strategic supplier partnering and found inventory reduction as one of the advantages of the strategic supplier alliances.

Better planning and coordination within and beyond the boundary of a manufacturing organization can achieve reduction in order fulfillment time (Mohanty & Deshmukh 2001). Technology and human resource related issues also play a role in reducing the order fulfillment time. Reduced order fulfillment time implies that inventory is not lying idle for a long time. Hence, it may be assumed that reduced order fulfillment time leads to the reduction of inventory in an organization. These observations lead to the formulation of the hypothesis 2.

Hypothesis 2

Inventory reduction in an organization is influenced by (i) order fulfillment time reduction, (ii) reduction in supplier base, (iii) postponement of point of product differentiation, and (iv) collaborative information sharing. Each of these attributes has different level of influence on inventory reduction.

Integration of a Supply Chain

Many enablers support the integration of a supply chain. Information technology is one such enabler, which has received attention in the literature (e.g., Lee & Whang 2000; Li 2002). However, use of IT in a supply chain and as a result of that integration of a supply chain is subjected to some barriers such as disparity in trading partners' ability, fear of information system breakdown, and low level of supply chain integration (Kwan 1999; Kadambi 2000; Ayers 2001; Li 2002 etc.). It is aimed here to identify the barriers that significantly influence the supply chain integration.

Compatible and integrated information systems play important roles in integrating a supply chain. These information systems enable the supply chain members to share and use the data for common goals, which ultimately lead to greater integration in a supply chain. However, at the same time the fear of information system breakdown adversely affect the process of supply chain integration (Ayers 2001).

Further, there is a possibility of some disparity in the trading partners' information system capability. Sohal et al. (2001) and Kwan (1999) identified lack of compatibility of partners as a barrier in the integration of manufacturing supply chains. In the Indian context, Kadambi (2000) in his study on the manufacturing companies in India observed that weak infrastructure outside the organization and disparity in the size of the suppliers and distributors are the major inhibitors to have an integrated supply chain. Earlier, Angeles et al. (1998) and Closs et al. (1997) noted that the firms were more successful in upgrading their internal capabilities but less successful in external co-ordination due to some disparity in the capability of the trading partners. These observations led to the formulation of the hypothesis 3.

Hypothesis 3

Disparity in trading partners' capability, and fear of information system breakdown adversely affect the integration of a supply chain.

RESEARCH METHODOLOGY

The questionnaire-based survey methodology was adopted to test the proposed hypotheses. The various steps involved with the questionnaire development and its administration are discussed as follows.

Instrument Development

The questionnaire was designed on a five-point Likert scale. It contained many supply chain issues including those reported here. Respondents were asked to indicate the opinion of their organization on a five point Likert scale. A few questions on the profile of the company were also included in the questionnaire.

Structure and Content Validation of the Questionnaire

To ensure the content and construct validation, the questionnaire was subjected to a pre-testing. It was tested for two main types of validity: (i) content validity, and (ii) construct validity. Content validity primarily depends on an appeal to the

propriety of content and the way it is being presented (Nunally 1978). The instrument developed in this study demonstrates the content validity as the selection of measurement items was based on both, an exhaustive review of the literature and the comprehensive evaluations by academicians and practicing managers during pre-testing. The construct validity was verified by factor analysis.

For the questions reported in this study, all the items in these questions loaded with a minimum factor loading of 0.468. For example, in the first question (refer Table 1) all the three items loaded on a single component with factor loadings of 0.468, 0.661, and 0.719. In the second question, the items loaded on a single component with the factor loadings of 0.553, 0.567, 0.603, 0.732, 0.720, and 0.593. In the third question, the factor loadings for the three items on a single extracted component were 0.698, 0.609, and 0.539. These factor loadings are satisfactory and in agreement with Kim and Mueller (1978) who suggested the use of only those items, which have a factor loading greater than 0.40.

Target Industries for the Survey

Four sectors from the Indian manufacturing industry were selected for the administration of the questionnaire. These are: (i) auto, (ii) engineering, (iii) fast moving consumer goods (FMCG), and (iv) process sector.

Among these four sectors, the automobile sector is seen as a flagship bearer frequently regarded as a barometer measuring the current wealth of a nation's economy (Childerhouse et al. 2003). The extreme complexities and large bill of materials makes it an ideal case for the study of SCM. The companies selected for the survey in this sector includes both; the automobile manufacturers and the automobile component suppliers. The FMCG sector is characterized by the intense competition and low level of participation by suppliers (Sahay 2003). This sector is also characterized by the commodity-oriented business units. The need for food safety traceability and supplier responsiveness are the other important features of this sector. The products in this sector generally have simpler bills of materials (Kehoe & Boughton 2001). The companies selected for the survey in this sector include toiletries manufacturers, food products, and OTC (over the counter) products.

TABLE 1
SURVEY QUESTIONS RELEVANT TO THE HYPOTHESES

Survey questions	Scales				
Question 1. Please indicate the weightage given by your organization in addressing the following issues for the effectiveness of its supply chain.	No weightage			High weightage	
(a) Information sharing with supply chain partners	1	2	3	4	5
(b) Top management commitment	1	2	3	4	5
(c) Attitude of major stakeholder of the supply chain	1	2	3	4	5
Question 2. Indicate the level of improvement in the following supply chain attributes in your organization over the past two years.	Very low			Very high	
(a) Buyer supplier relationships	1	2	3	4	5
(b) Inventory reduction	1	2	3	4	5
(c) Order fulfillment time reduction	1	2	3	4	5
(d) Supplier base reduction	1	2	3	4	5
(e) Postponement of point of product differentiation	1	2	3	4	5
(f) Collaborative information sharing with supply chain partners	1	2	3	4	5
Question 3. Indicate the level of following barriers as perceived by your organization in the IT-enablement of your supply chain.	Very low			Very high	
(a) Low level of supply chain integration	1	2	3	4	5
(b) Disparities in trading partners capabilities	1	2	3	4	5
(c) Fear of information system breakdown	1	2	3	4	5

The engineering sector is recognized for long lead-time in product development and manufacturing (Dangayach 2001). The companies selected for the survey in this sector include light and heavy engineering industries, white goods manufacturers, and castings makers etc. The process sector is one of the largest industrial segments in India. It has a simpler bill of material. The companies selected for the survey in this sector include fertilizer, cement, paint, steel, aluminium, petrochemical and other such process companies. These four sectors from the manufacturing industries are highly diversified in nature and it may be assumed that these are the representative sectors of the entire manufacturing industry. These are the reasons for the selection of these four sectors in this study. Though no specific supply chains were targeted in this study, the sample companies together constituted many diversified supply chains. For example, in the auto sector the sample consisted of the auto manufacturers (OEM), first tier suppliers such as electronic components, steering, brakes and clutch, fasteners, glass suppliers etc. Some other first tier suppliers such as steel sheets and paints suppliers are part of the auto supply chain but due to the nature of manufacturing

operations these have been placed in the other sectors such as engineering and process sector. Similarly as per the nature of manufacturing operations, the tyre manufacturers may be put in the process sector but as their products are predominantly used in automobiles, we have placed these in the auto sector. Therefore, we have placed tyre manufacturers in the auto sector. Among the process sector companies, a paint manufacturer receives raw materials from the other process companies. However, for plants, machinery and its maintenance, it is dependent on the engineering sector. Customers of a paint manufacturer are both the auto and the engineering manufacturers. In the FMCG sector, the toiletries and food processing companies are dependent on the process sector for the raw materials and engineering industries for the installation and maintenance of the plant as well as for the containers.

On the basis of the above observations, it may be said that though the respondent companies in these four sectors do not constitute four separate supply chains these are certainly the parts of many different supply chains. Therefore, a study of the perceptions and practices of these companies on SCM related issues might provide a fair assessment of the supply chains in the Indian manufacturing industry.

Survey Administration

The postal survey method was used for the questionnaire administration. The randomized sample was selected from the Directory of ISO 9000 companies (2000) and India's 500 largest wealth creator companies (Gandhok et al. 2002). In the above referred two source of sampling, the second source (Gandhok et al. 2002) was chosen to make the sample more representative and also to include some of the leading Indian companies which were: (i) either big enough to figure among India's largest companies but not registered as ISO 9000 company, or (ii) were formed after the publication of the directory of ISO 9000 companies. It was attempted to ensure that the selected companies fulfill two minimum criteria: (i) the annual turnover is more than 1 million of dollars and, (ii) the employee strength is more than 100. Five hundred companies operating in India were identified for the survey. Questionnaires, including a covering letter and a self-addressed and stamped envelope, were mailed to the top executives such as Chief Executive Officer/Managing Director/Vice-President/General Manager etc.

DATA ANALYSIS AND TESTING OF HYPOTHESES

In this section, we first discuss the results of the survey in reference to the validity of the questionnaire and profiles of the respondent companies. In the later part of this section, we discuss the testing of the proposed hypotheses.

Non-Response Bias and Reliability of the Survey

One test for non-response bias is to compare the differences between the early and the late respondents of the survey on some variables of interest (Lambert & Harrington 1990). Therefore, comparing those responses, which were received without a reminder or after one reminder (63 in this case) versus the late responses, which were received after sending two or more reminders (45 in this case) can provide an indication of non-response bias. The results from the t-tests suggest that early responses do not significantly differ from the late responses. The questionnaire was subjected to a pre-testing to test its reliability and content validity. Later, Cronbach's coefficient (α) was calculated to test the reliability and internal consistency of the responses. Cronbach's coefficient, having a value of more than 0.5 is considered adequate for such exploratory work (Nunally 1978). The values of α in this study for the three reported questions were found to be 0.7604, 0.7932 and 0.8499, giving an average value of 0.8011. It implies that there is a high degree of internal consistency in the responses to the questionnaire.

Survey Responses and the Respondents' Profile

Of the 500 questionnaires sent, 112 questionnaires were received. Of these, four incomplete ones were discarded from further analysis. This gives a response rate of 21.6%, which is satisfactory for such surveys (Malhotra & Grover 1998). Of the 108 usable responses, auto and engineering sectors comprised 31.5% each, process sector 22.2%, and FMCG 14.8% (Figure 1).
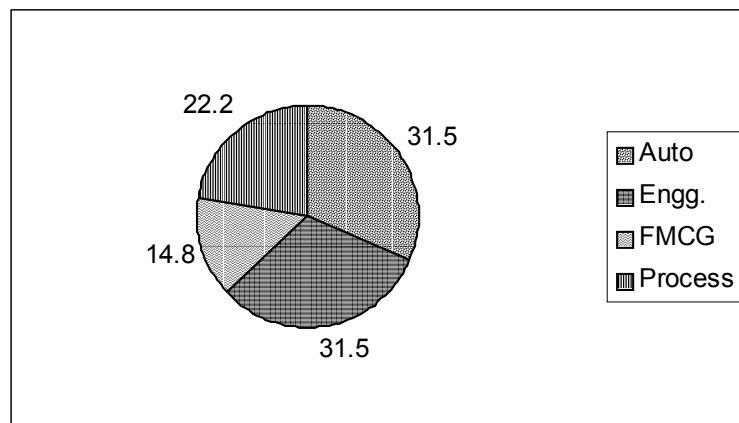

Figure 1. Sector-wise distribution of the respondents

Though the overall response rate was 21.6%, it varied across sectors. It was 27% for the automobile sector, 18% for engineering sector, 21% for process sector, and 23% for FMCG sector. On the zonal basis, 38% of the respondents were in Northern India, 33% in Western India, 21% in Southern India and 8% of the respondents were in Eastern India.

In most cases, the addressee filled the questionnaire at their own. However, in some cases other senior executives filled these questionnaires on behalf of the addressee. The majority of the respondents held upper level positions such as President, Vice-President, Chief Executive Officer (CEO), Managing Director, General Manager etc.

Of the 108 respondents, seven had less than 100 employees; thirty-one in the range of 101–500; nineteen in the range of 501–1000; twenty-eight in the range of 1001–3000, and twenty-three with more than 3,000 employees. In terms of turnover, 10.2% of the respondents had annual turnover of less than five million of dollars; 14.8% with a turnover in the range of 5–20 million dollars, 38% in the range of 20–100 million dollars and 37% with more than 100 million of dollars (Figure 2).
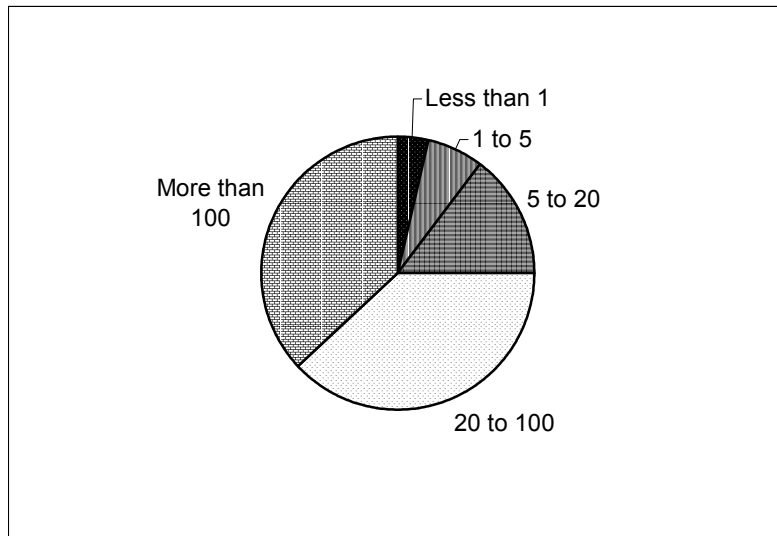

Figure 2. Turnover of the respondent companies in millions of dollar per annum

Testing of Hypotheses

Multiple linear-stepwise-regression analysis was conducted to test the proposed hypotheses on the SPSS version 10.00 software. For quick reference each of the three hypotheses is reproduced before testing its validity.

Hypothesis 1

The buyer-supplier relations in an organization are significantly improved by (i) information sharing, (ii) commitment of top management, and (iii) attitude of major stakeholder of the supply chain.

In the testing of this hypothesis (refer Table 2), the dependent variable is "improved buyer-supplier relationships", and the independent variables are: information sharing at all levels of the supply chain, commitment of top management, and attitude of major stake holder of the supply chain.

TABLE 2
REGRESSION ANALYSIS FOR HYPOTHESIS 1

	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. error	Beta		
(Constant)	0.577	0.464		1.243	0.217
Information sharing with supply chain partners	0.388	0.070	0.436	5.569	0.000
Top management commitment	0.349	0.079	0.344	4.402	0.000
Attitude of major stakeholder of the supply chain	0.177	0.048	0.287	3.693	0.000

$R^2 = 0.412$
Dependent variable: Improved buyer-supplier relationships

The model derived from the analysis is:

Improved buyer-supplier relationships = 0.577 + 0.388 information sharing at all levels of supply chain + 0.349 commitment of top management + 0.177 attitude of major stake holder of supply chain.

As the two independent variables included in the model influence the dependent variable at a high significance level (p values less than 0.05) this hypothesis is accepted.

Hypothesis 2

Inventory reduction in an organization is influenced by (i) order fulfillment time reduction, (ii) reduction in suppliers base, (iii) postponement of point of product differentiation, and (iv) collaborative information sharing. Each of these attributes has different level of influence on inventory reduction.

In the testing of this hypothesis (refer Table 3), inventory reduction in an organization of a supply chain is taken as the independent variable. The dependent variables are: reduction in order fulfillment time, reduction in suppliers base, postponement of point of product differentiation, and collaborative information sharing.

TABLE 3
REGRESSION ANALYSIS FOR HYPOTHESIS 2

	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. error	Beta		
(Constant)	0.194	0.455		0.427	0.671
Order fulfillment time reduction	0.497	0.105	0.402	4.751	0.000
Reduction in suppliers base	0.256	0.081	0.277	3.137	0.002
Postponement of point of product differentiation	0.181	0.078	0.193	2.307	0.023
Collaborative information sharing	0.151	0.066	0.178	2.277	0.025

R^2= 0.484
Dependent variable: Inventory reduction

The model derived from the analysis is:

Inventory reduction = 0.194 + 0.497 order fulfillment time reduction + 0.256 reduction in suppliers base + 0.181 postponement of point of product differentiation + 0. 151 collaborative information sharing

From the above equation, it is clear that the coefficient of "order fulfillment time reduction" is 0.497, which is higher than the coefficients of other factors. Therefore, it has maximum influence on the inventory reduction. However, in order to assess the usefulness of each predictor in the model, one cannot simply compare the coefficients to see the unique contribution of each factor. Beta coefficients are an attempt to make the regression coefficients more comparable. From the table it is clear that the "order fulfillment time reduction" (Beta = 0.402) is a better contributor than the other factors. The t-statistics in the results provide some clues regarding the relative importance of constant and each factor in the model. The corresponding t values for order fulfillment time reduction (4.751) and reduction in suppliers base (3.137) are considerably higher than the other t values. For this model with four independent factors, R^2 is 0.484. This value of R^2 explains 48.4% variability of the inventory reduction. All the independent variables are affecting the inventory level at a high significance level (p values less than 0.025) therefore the hypothesis is accepted.

Hypothesis 3

The variables "disparity in trading partners capability", and "fear of information system breakdown" adversely affect the integration of a supply chain.

In the testing of this hypothesis (refer Table 4), the independent variable is low level of supply chain integration, and the dependent variables are: disparity in trading partners' capability and fear of information system breakdown.

TABLE 4
REGRESSION ANALYSIS FOR HYPOTHESIS 3

	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. error	Beta		
(Constant)	0.732	0.285		2.569	0.012
Disparity in trading partners' capability	0.468	0.087	0.468	5.408	0.000
Fear of information system breakdown	0.277	0.084	0.285	3.295	0.001

R^2= 0.448
Dependent Variable: Low level of supply chain integration

The model derived from the analysis is:

Low level of supply chain integration = 0.732 + 0.468 disparity in trading partners' capability + 0.277 fear of information system breakdown.

As the two independent variables included in the model influence the dependent variable at a high significance level (p values less that 0.05) the hypothesis is accepted. It is further observed from the results that due to higher values of t and significance level, the disparity in trading partners' capability has more impact on the supply chain integration as compared to that of fear of information system breakdown.

DISCUSSION AND IMPLICATIONS FOR MANAGERS

This study is important because it empirically examines the relationships among some common supply chain issues. These relationships have been tested in the Indian context. Earlier studies in the Indian context were either based on low sample size or limited to descriptive statistics (e.g., Kadambi 2000; Sahay et al. 2003). The present study establishes the relative importance of independent variables, which influence a key issue in SCM. For example, buyer-supplier relationship is an important issue in SCM, and many variables may promote the buyer-supplier relationships. However, a manager would be more interested to find out the variables, which could play a dominating role in improving these relationships. It is observed from the hypothesis 1 that of the three independent variables used in this hypothesis, "information sharing at all levels of the supply chain" and "commitment of the top management" are the two important issues, which positively influence the buyer-supplier relationships.

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This study has several implications for the management too. In all the three hypotheses, there is a role for the top management. Therefore, the commitment of top management is an important issue which should be given due consideration in SCM.

Results from the study further indicate that information sharing and IT have a pivotal role in SCM whether it is related to buyer-supplier relationships (hypothesis 1), inventory reduction (hypothesis 2), or integration of the supply chain (hypothesis 3). Therefore, long-term strategies should be formulated to boost information sharing among the supply chain partners. Information technology is a facilitator to information sharing; therefore, a high priority should be accorded to build up IT capability in the supply chain organizations. To provide more insights on the implications of this study, each of the hypotheses is now discussed separately.

In hypothesis 1, three enablers, which reportedly help in achieving improved buyer-suppliers relationships, are tested. It is observed that all the three enablers significantly improve the buyer-suppliers relationships. The test results also provide the relative importance of each of these enablers. It is observed that "information sharing at all levels of the supply chain" is the most important contributor to the buyer-supplier relationships and it is closely followed by the "commitment of the top management". It is to be noted further that the top management has an important role to play in improving the buyer-suppliers relationships as it is the top management alone which is capable of taking the policy decisions of strategic nature such as "information sharing at all levels of the supply chain".

In hypothesis 2, four variables, which have been discussed in the literature as the major contributors to the inventory reduction, have been tested. These variables account for 48.4% of the total variability in the inventory reduction. It means that inventory reduction is dependent on few more issues, which need to be explored. The two important variables which significantly contribute to inventory reduction are: (i) order fulfillment time reduction, and (ii) reduction in suppliers base. Better planning and coordination among the supply chain partners may facilitate the reduction in order fulfillment time. Use of improved technology (say IT and advanced manufacturing technologies) and good human resource policy may also contribute to the reduction of order fulfillment time. Reduction in supplier base may lead to a limited number of reliable suppliers who are aware of the manufacturers' planning and support them in providing a just-in-time (JIT) environment, which may ultimately lead to reduced level of average inventory. It is to be further noted that among all the variables discussed, "reduction in order fulfillment time" is an attribute of special importance as it assists in reducing the inventory. At the same time, there might be various other ways to reduce the

order fulfillment time. Therefore, the management of a company should further explore the various ways to reduce the order fulfillment time. For example, in addition to SCM some other management strategies such as total quality management (TQM) and business process reengineering (BPR) may also play an important role in reducing the order fulfillment time.

In hypothesis 3, both the independent variables adversely affect (at a p value of less than 0.001) the process of supply chain integration. However, the management of the organization has limited options to control the first variable, "disparity in trading partners' capability". At the same time, management can certainly do something to remove the fear of information system breakdown from supply chain linkages.

LIMITATIONS OF THE WORK AND DIRECTIONS FOR FUTURE RESEARCH

This research has some limitations. In this section we identify these limitations and offer some suggestions for future research.

A significant limitation of this research is the relative homogeneity of the managers in the response sample. The managers who responded to the survey represent the top management level, with most respondents serving at high level posts in their organizations. While a homogeneous response sample is acceptable in such exploratory studies, the lack of variety in the firms and managers in the sample may explain some of the non-significant results. For example, high-level managers may be the best source of the strategic information that is exchanged with the trading partners, but lower level managers in the field are the employees most involved in exchanging operational information. Therefore, a better indication of the operational information exchange may come from lower level managers who were not included in the sample. Therefore, future research should include lower level managers when collecting the operations related information.

Another limitation of the study is the absence of the other variables that may be relevant in the present study. For example, the variables such as organizational culture, risk-taking propensity etc. may also be considered in the future studies.

Though all the proposed hypotheses are supported, the amount of variance (R^2) is less than 100% in these hypotheses. This indicates that there are few more issues that contribute to the variance but were not considered in this study. Future research should attempt to identify these issues that have some significant bearings on these hypotheses.

CONCLUSION

The findings of the study contribute to the body of literature on SCM. The hypothesized findings not only validate some important and widely discussed aspects of SCM but also set out interrelationships among many of these aspects. In regression analysis, used for testing the hypotheses, the relative importance of each variable is obtained. From a practical perspective, the analysis reveals that placing emphasis on information sharing and improving buyer supplier relationships can benefit the firms across industries. The research results demonstrate that SCM implementation improves competitive performance by lowering inventory levels. These evidences support the concept of SCM as a comprehensive and vital manufacturing strategy that can build and sustain competitive advantage and ultimately lead to better business performance.

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