The Impact of various Dimensions of SCM Practices in Indian Oil and Gas Sector

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ABSTRACT

The Indian oil and gas sector is one of the core industries in India and has very significant forward linkages with the entire economy. India has been growing at a decent rate annually and is omitted to accelerate the growth momentum in the years to come. The paper investigates the complex relationships between the six dimensions of supply chain management practices (strategic relationship, customer's relationship, information sharing, postponement, delivery dependability, time to market) in oil and gas sector. An empirical study of 309 respondents in oil and gas industries were taken for empirical study, SPSS- 16 software were used for analysis, out of six factors three factors were selected through factor analysis and further correlation was done among the selected variables, reveals that strategic relationship, customer relationship and information is positively correlated with Supply chain management(SCM) practices. The oil and gas sector in India presents a significant opportunity for investors and is exhibited to demonstrate robust growth in line with the growth of the Indian economy. The lack of available supplies has so far hindered the growth of this segment.

KEYWORDS

	Supply chain		**Oil sector**
	Gas sector		**Flexibility**
	Customer Relationship		**Information Sharing**
	Strategic Relationship		**SCM**

PREAMBLE

Supply chain management can be defined as the configuration, coordination and continuous improvement of an organized set of operations. Its goal is to provide maximum customer service at the lowest cost possible, where a customer is anyone who uses the output of a process. Since the goal of a company is to maximize profits, it must weigh the benefits versus the costs of its decisions along the supply. Very few industries can benefit more from maximizing supply chain efficiencies than the oil and gas companies. As competition in the 1990s intensified and markets became global, so did the challenges associated with getting a product and service to the right place at the right time at the lowest cost. Organizations began to realize that it is not enough to improve efficiencies within an organization, but their whole supply chain has to be made competitive. The understanding and practicing of supply chain management (SCM) has become an essential prerequisite for staying competitive in the global race and for enhancing profitability. The study is concentrated only on the above mentioned factors and their relationships.SCM practices are defined as the set of activities undertaken by an organization to promote effective management of its supply chain (Suhong Li, 2004)

OIL SECTOR IN INDIA: AN OVERVIEW

A typical oil industry supply chain includes exploration of new petroleum (crude oil) reservoirs, drilling of crude wells, crude extraction at onshore and offshore platforms, its transport to the refineries, the refining of the crude oil (raw material) in the refineries in order to produce the final products (petroleum derivatives), such as gasoline and diesel, the transport of those products to distribution terminals where they are dispatched to distribution companies, and finally the delivery of the derivatives to the final customers (e.g. gas stations). There are different types of crude, with distinct qualities.

Each of them has a specific production profile, yielding definite proportions of each derivative product. As to the transport of crude and its derivatives, it is carried out by ships, trains, trucks, and mainly by-pipelines. Oil supply chain management is intrinsically associated with integrated planning. First, it is concerned with functional integration of acquisition of raw material (crude oil), manufacturing (refining), transportation, and warehousing activities . In the oil industry supply chain, an important component in supply chain analysis is the choice of performance measures, which are used to determine the efficiency of a system, or to compare alternative ones. The literature categorizes these measures as either qualitative or quantitative. In general, quantitative measures are related to monetary values, as cost and profit, whereas qualitative ones are based on customer satisfaction.

GAS SECTOR IN INDIA: AN OVER VIEW

Natural Gas has emerged as one of the most preferred fuel due to its environmentally benign nature, greater efficiency and cost effectiveness. At present, the main producers of natural gas are Oil and Natural Gas Corporation Limited (ONGC), Oil India Limited (OIL) and the Joint Ventures of Panna Mukta & Tapti, and Ravva. Out of the total production of around 96 MMSCMD, after internal consumption, LPG extraction and unavoidable flaring, around 73 MMSCMD is available for sale to various consumers. In addition, around 7 MMTPA of re-gasified LNG (about 23 MMSCMD) is also being supplied to domestic consumers. GAIL (India) Limited, is India's flagship Natural Gas company, integrating all aspects of the Natural Gas value chain (including Exploration & Production, Processing, Transmission, Distribution and Marketing) and its related services (Source-infraline).

The Government has introduced attractive fiscal terms and conditions in the oil and gas exploration policy. This has facilitated the major gas discovery by Reliance; however, apart from the discovery by Reliance, wells have been drilled by other players but without major success. Apart from the gas find by Reliance, the gas reserves being discovered are small in size and require advanced technologies and attractive fiscal terms & conditions to be commercially viable. Gas produced by ONGC and OIL from the existing nominated blocks was earlier sold at administered prices fixed by the Government. As against a total allocation of 150 MMSCMD of gas, actual supply under APM is presently around 53 MMSCMD.

The total estimated gas supplies in India based on the projection by Working Group of XI 5 year plan is as under: Table 1

Sources	2008-09	2011-12
ONGC + OIL	57.19	51.08
Pvt. / JVs (As per DGH)	22.21	57.22
LNG Supply	33.6	83.13
Additional Domestic Gas Anticipated	40.0	90
Import through Trans Border Route	0	0
Projected Domestic Supply - Conservative	153.00	281.43
Additional Gas Anticipated(GSPC)	-	6.5
Total Projected Supply - Optimistic	153.00	287.93
DEMAND SUPPLY GAP	43.0	-8.0

(Source:British Gas 2009-10)

DEMAND

Natural gas is not a renewable source, since there is a fixed volume amount of it trapped in the Earth. The price of natural gas is quite comparable with the prices of alternative fuels/raw materials (based on the thermal equivalence of substitute fuels).

This factor, along with other advantages, has led to a sharp increase in the demand for natural gas. The demand for natural gas (allocated so far) in India, at about 120 mmscmd, is over one-and-a-half times the current gas supply of about 70 mmscmd.

The demand for natural gas is from industries like power, fertiliser, sponge iron and glass/ceramics. However, currently the main supplies are made to the fertilizer and power sectors because of the shortage of gas. Further, according to the India Hydrocarbon Vision 2025 Report, the demand for natural gas is expected to show a sharp rise in future because of its environment friendliness and cost competitiveness.

The total estimated gas demand outlook in India based on the projection by Working Group of XI 5 year plan is as under: Table 2

Sector	2008-09	2011-12
Fertilizers	42.89	76.26
Power	91.2	126.57
City Gas	12.93	15.83
Industrial	16.05	19.66
Petrochemical / Refineries / Internal Consumption	27.15	33.25
Sponge Iron / Steel	6.42	7.86
Total	196.64	279.43

(Source:British Gas 2009-10)

SUPPLY CHAIN MANAGEMENT IN OIL & GAS SECTOR

The supply chain in oil and gas consists of operators (oil & gas companies), main contractors, subcontractors and suppliers. Procurement is performed during the development and abandonment of oil and gas fields and during operation of fields (production). During development, the majority of procurement is structured as project execution tasks (Chima C.M, 2007). oil/gas companies are big and getting even bigger – mostly through mergers; oil/gas prices fluctuate greatly; and oil/gas companies are subject to various political pressures (Shapiro JF, 2006.). Large operators interface with governmental entities worldwide and some are closely linked to governments themselves. Main contractors are often traditional engineering/construction/service companies, some of which have been nurtured under years of protective development policies.

The structure of the paper is a follows, in section 2 research methodology which is followed by hypothesis and later in section 4 model identification which is followed by the correlation among variables and in later section results and conclusion. A detailed correlation matrix is given in appendix A and the results of factor analysis are also provided in the same appendix .

RESEARCH MODEL AND HYPOTHESIS

Figure1 displays the conceptual basic relationship model between supply chain management (SCM) practices. The conceptual model, as shown in Figure 1, shows the expected links between the dimensions of supply chain management (SCM) practices.

SUPPLY CHAIN MANAGEMENT PRACTICES

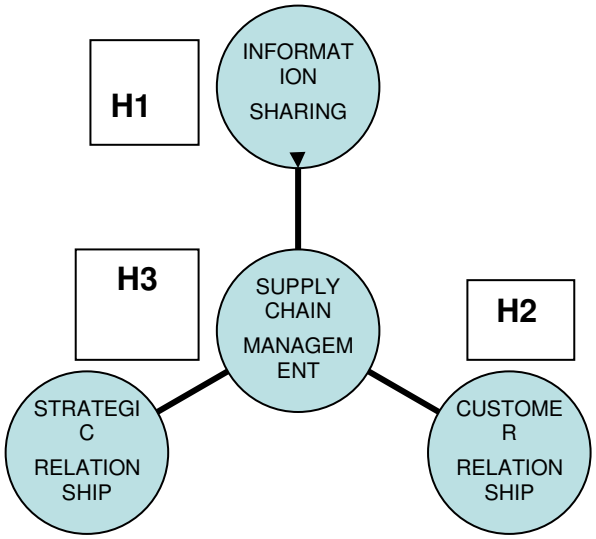


Figure1: Basic Supply chain practices model (Haleem-2009)

H1: There is a positive association between information sharing and supply chain management practices

H2: There is a positive association between Strategic relationship and supply chain management practices

H3: There is a positive association between customer's relationship and supply chain management practices

RESEARCH METHODOLOGY

This study focuses upon 309 respondents in oil and gas sector and the study is entirely based on NCR region. The industries in these two sectors frequently introduce new products and continuously develop new technologies. Therefore, these two sub-sectors are primarily chosen for this study. A questionnaire was designed to measure the constructs in the model.

QUESTIONNAIRE RESPONSE RATE

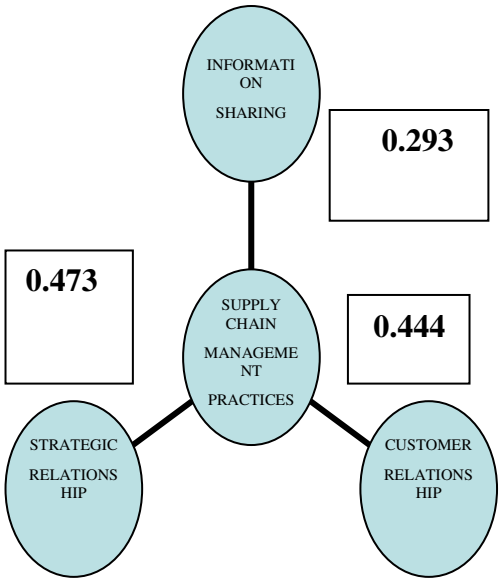
The research objectives were translated into hypotheses, which were then defined as relationships of guiding variables. The guiding variables were further divided into micro variables and translated into specific questions or statements. Rensis Likert has developed Likert type scale where the respondents are asked to express their position on a scale, which has two extremes. Here 5 point Likert scale (1-5) is used starting from "very low to very high" as two extremes of continua, which have been divided in five intervals for measurement. In addition, the approximations were used in terms of numbers and/or percentages, obtained for measurement. To convey the intent quickly, question description has been kept short and precise.

The questionnaire was sent to the oil and gas sector within the NCR region. The survey was done through sending the emails ,personal interviews

Non Response bias: Table 3

Designation	No. of respondents Received
General Manager	8 % (25 responses)
Deputy General Manager	4% (15 responses)
Chief General Manager	10% (28 responses)
Senior Manager	24% (75 responses)
Manager	11% (31 responses)
Deputy Manager	18% (55 responses)
Senior officer	12% (35 responses)
Executive Trainee	3% (10 responses)
Others	8% (25 responses)
No information	3% (10 responses)

MODEL IDENTIFICATION



Validated Model for Relationship of Supply Chain Practices (Beta Values).

	INFOSHAR	CUSTRLSH	STRAGLSH	SCMPRT
INFOSHAR	1			
CUSTRLSH	.280**	1		
STRAGRLSH	.379**	.328**	1	
SCMPRT	.293**	.444**	.473**	1

Table:4 Correlation among Selected Variables

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

RESULTS ANALYSIS

The respondents were asked to indicate the importance of various items, which measured different dimensions of supply chain management(SCM) practices in their industry. The results in Table 4 indicates that both Strategic relationship and customers relationship are positively correlated with supply chain management(SCM) practices whereas information sharing is less positively related in supply chain management(SCM) practices as compared to strategic and customer relationship. The results show that the strategic relationship is most important factor in SCM practices in oil and gas sector which effects the supply, so the industry always focus on long term relationship supply as these are the continuous line production and after that the next important aspect is customers relationship which is again strongly related with SCM practices as the variation between the two is less, both are the major factors of SCM practices.

CONCLUSION

Strategic relationship and customer relationship are vital and play crucial role in SCM practice. The validated model so developed shows the relationships among the selected variables. A relationship between information sharing, strategic relationship approach and customer relationship was developed in SCM practices has been observed. From the model analysis we have not observed any significant direct relationship between six dimensions of SCM practices .Strategic relationship and Customer relation has been observed to be directly linked with SCM practices and not by any other variable.

This observation has emerged from the statistical analysis of the data collected from questionnaire based survey. Information sharing are directly affected by SCM practice. In the perception survey research, the variables are correlated to each other at 99% and 95% confidence levels. SCM practices have emerged as the most influential variable in the perception of the respondents. Organizations need to involve users in the initial stages in order to have their participation and there by commitment. This may help in SCM practice and in maximizing output from the process. The results show that both strategic and customer relationship can undertake effective SCM practices . The study is only a modest attempt to bring out the significant variables and factors affecting the SCM practices. These findings need to be applied in the industry and based on the learning; it can be further refined, evolved and reapplied.

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APPENDIX A- CORRELATION MATRIX Table 5

		STRATRELNP	CUSTRENLP	INFORMSHAR	POSTPONMT	DELEVRYDEP	TIMEMARKT
Correlation	STRATRELNP	1.000	.328	.070	.004	.026	.038
	CUSTRENLP	.328	1.000	.280	-.032	-.011	.031
	INFORMSHAR	.379	.280	1.000	.203	.087	.089
	POSTPONMT	.004	-.032	.203	1.000	.299	.160
	DELEVRYDEP	.026	-.011	.087	.299	1.000	.404
	TIMEMARKT	.038	.031	.089	.160	.404	1.000
Sig. (1-tailed)	STRATRELNP		.000	.109	.474	.323	.254
	CUSTRENLP	.000		.000	.287	.425	.296
	INFORMSHAR	.109	.000		.000	.063	.059
	POSTPONMT	.474	.287	.000		.000	.002
	DELEVRYDEP	.323	.425	.063	.000		.000
	TIMEMARKT	.254	.296	.059	.002	.000	

EXTRACTION METHOD: PRINCIPAL COMPONENT ANALYSIS.TABLE 6

	Component	
	1	2
STRATRELNP	.271	.629
CUSTRENLP	.324	.767
INFORMSHAR	.505	.362
POSTPONMT	.590	-.263
DELEVRYDEP	.703	-.377
TIMEMARKT	.644	-.283