

Causal Linkages Among Supply Chain Management And Organizational Performance

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Key Words:

1. Supply chain concerns clusters
2. manufacturing firm
3. Partial Least Square (PLS)-Structural Equation Modeling (SEM)
4. Organizational performance

Abstract

In this research paper we explore the causal linkages among supply chain management (SCM) and its impact on organizational performance of manufacturing firm. We have proposed a conceptual model and tested with primary data collected from 255 manufacturing firms located in Union Territory of Puducherry, India. The research question addressed in this research work is: What is the impact of critical components of SCM on the performance of the supply chain per se and also on the organizational performance through moderating variable of supply chain concerns clusters. The results depict that 49 percentage of variance in organizational performance are explained by critical components of supply chain in the moderate supply chain concerns clusters.

INTRODUCTION

Supply chain integration has received a great deal of attention from researchers and practitioners alike. Dell, Amazon, and Ford are examples of firms that have attempted to operationalize supply chain integration with varying degrees of success in their respective industries. Research on supply chain management has tended to focus on individual functions and their responsibilities. This research work has examined the causal linkages and processes that comprise the supply chain and organizational performance of manufacturing firms. Despite the growing use of the concept of supply chain management in many manufacturing firms, little empirical research dealing with aspects of critical components of supply chain and its effect on organizational performance exists. This study is concerned with the central question being: What are the vital variables of supply chain that impact the effectiveness of organizational performance? To address this question, we propose a conceptual model of supply chain and organizational performance. In our view, the discussion of supply chain must center on causal linkages among supply chain management and organizational performance of manufacturing firms through moderating variable of supply chain concerns

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clusters. This paper is organized as follows. First, the relevant literature is reviewed and a framework of supply chain management and organizational performance is presented. Next, the conceptual model and the data used for testing the causal linkage are introduced in three level model based on supply chain concerns level of manufacturing firms that is low, high and moderate supply chain concerns firms. The results from the structural equation modeling analysis are discussed and followed by conclusions and implications of the present research work. Finally, some discussion on limitations and suggestions are offered for future research.

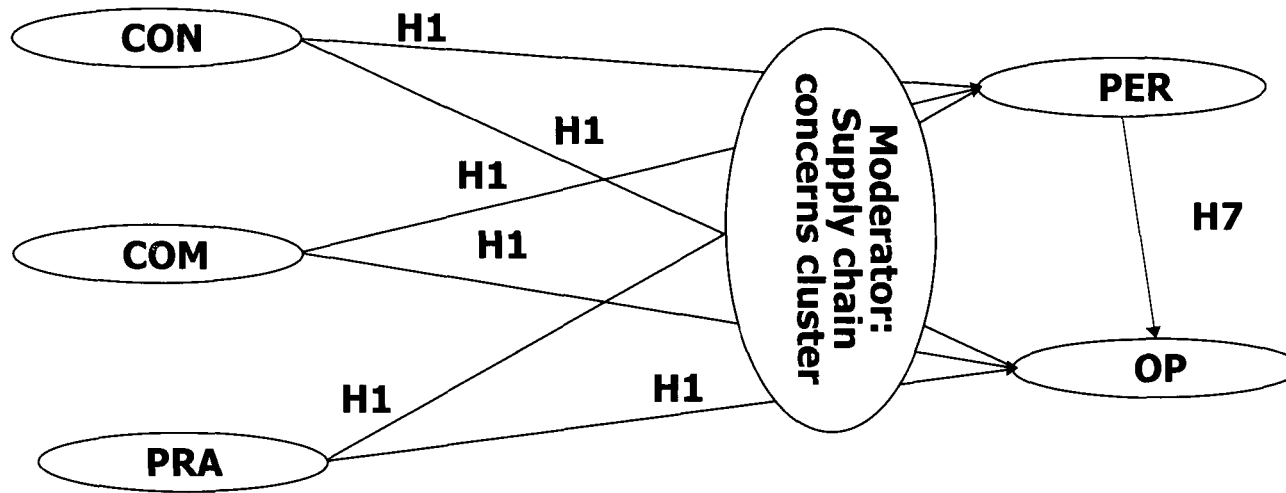
REVIEW OF LITERATURE

To better understanding the antecedences and consequences of SCM, three constructs of supply chain, supply chain performance and organizational performance construct have been identified through a comprehensive literature review. A research framework is then developed that depicts the causal relationships between these constructs. Tan (2002), Kuei and Madu (2001), Knolmayer et al (2002) has described Supply chain concerns are the issues that prevent an organization from achieving the full potential of their supply chain management.

According to Li et al. (2005), Li et al. (2006), Koh et al. (2007) SCM practices may be defined as a group of activities targeting at an improvement of the supply chain performance. Studies have been conducted on many variables related to SCM practices. However, majority of the researchers have concentrated on some twelve variables of SCM practices in a common manner. This study focuses on these twelve variables of Close partnership with suppliers,

Figure 1 Conceptual model

Note: CON-Supply Chain Concerns, COM-Supply Chain Competence, PRA-Supply Chain Practices, PER-Supply Chain Performance, OP-Organizational Performance, H-Hypothesis.



Close partnership with customers, Just in time (JIT) supply, Strategic planning, Supply chain benchmarking, Many suppliers, Holding safety stock, Subcontracting, E-procurement, Outsourcing, Third Party Logistics (3PL) and Few suppliers and Kuei et al (2005), Allvine and Gore (2003) and Knolmayer et al (2002) has described Supply chain competence is a portfolio of organizational, managerial, technical, and strategic capabilities and skills developed by enterprises over time. Rohit Bhatnagar and Amrik S. Sohal (2003) proposed a conceptual framework that impact of location factors, uncertainty and manufacturing practices on supply chain performance. Result shows that firms should calculate their performance both for indices as well as individual measures. In this study, Organizational performance refers to how well a firm achieves its market-oriented goals as well as its financial goals (Yamin et al., 1999). Li et al., (2006) measured firm performance through its market share, return on investment, the growth of market share, growth of sales, growth in return on investment, profit margin on sales and overall competitive position. Based on the study of Chow et al (2006), the following three SCM constructs like supply chain concerns, supply chain practices and supply chain competence are used in their study and also that study find out the impact of those critical supply chain components on organizational performance of US and Taiwan Manufacturing industries. In sum, this literature review part discussed the theoretical foundation of SCM and organizational performance constructs. In the next part, we will present the conceptual framework that depicts the relationships between these constructs and research hypotheses in figure 1.

RESEARCH METHODOLOGY

The research design of the proposed research work is causal in nature. The research work has been conducted mainly based on primary data.

MEASUREMENT INSTRUMENT

The survey instrument is developed with items validated in prior research to measure each construct for our conceptual research model using a five-point scale. The questionnaire' content validity was tested by administering it to subject experts and the feedback was used to determine any ambiguous items that needed to be revised to enhance the readability and quality of the survey items.

DATA COLLECTION

A random sample of firms based in Union Territory of Puducherry was selected from list of firms collected from Department of Industry and Commerce, Government of Puducherry. The structured personal interview was conducted to the selected manufacturing firms. As a result, 255 firms' data were collected.

DATA ANALYSIS METHODOLOGY

In order to analyze the measurement and structural model, our study uses a Partial Least Square (PLS) approach, specifically the SmartPLS software, which is not based on covariance but rather variance. PLS is the most appropriate analytical technique for our study for some reasons. First, in PLS, constructs may be measured by a three items or questions whereas in covariance-based approaches, at least four items or questions per construct are required. Second, PLS is optimal because it does not require any

Table 1: Type of Industry

Industry	Frequency	Percentage
Agro-based	12	4.7
Chemical	37	14.5
Food	25	9.8
Furniture	7	2.7
Electronics	36	14.1
Plastic	24	9.4
Automobile	20	7.8
Textile	15	5.9
BuildingMaterials	22	8.6
Metal	27	10.6
Pharmaceutical	8	3.1
Others	22	8.6
Total	255	100.00

normality assumptions and handles non-normal distributions relatively well. The first step of analysis will test whether reliable and valid measures of the constructs are used before conclusions of the constructs relationships. In the second step, the structural model is tested by assessing overall model fit like R Square, estimating the paths between the constructs in the model and determining their significance as well as the predictive ability of the model.

RESULTS AND DISCUSSIONS

This section presents the results of descriptive statistics, cluster analysis and structural equation modeling. The supply chain concerns factors of manufacturing enterprises are studied with the help of variables such as supply chain coherence, geographical proximity and competition concerns. Results of k-mean cluster analysis of supply chain concerns variable and causal linkage of supply chain management and organizational performance based on the low, high and moderate level of supply chain concerns firm are described in detail in the forthcoming sections.

PROFILE OF MANUFACTURING INDUSTRY

The profile of the sample manufacturing firms studied is portrayed in this section. The profile of manufacturing industries includes nature and type of industry to which the units belong, number of employees in the units and total capital invested by the units.

Table 2: Number of Employees

No. of Employee	Frequency	Percentage
Less Than 100	128	50.2
100-300	61	23.9
300-600	24	9.4
600-900	17	6.7
900-1200	18	7.1
More than 1200	7	2.7
Total	255	100

Table 3 Quantum of Capital Invested

Capital Invested	Frequency	Percentage
Less than 50 Lakhs	87	34.1
50 Lakhs to 1 Crore	73	28.6
1 Crore to 50 Crores	60	23.5
More than 50 Crores	35	13.7
Total	255	100

Type of Industry

Based on the nature of business carried on by the units studied, the sample units may be categorized as those engaged in agro-based business, plastics, chemicals, metal manufacturing, food, furniture, construction materials, Automobiles, Electronics, and Textiles has been portrayed in Table 1.

It can be inferred from Table 4.1 that majority of the manufacturing units in The Union Territory of Pondicherry are engaged in the manufacture of Chemicals, followed by Electronics, and Metal manufacturing. Units engaged in the manufacture of building materials and plastics also occupy a sizeable portion of the respondents.

Number of Employees

The number of employees employed by a business unit signifies the size of the unit, as a large unit shall be invariably employing large number of employees. The units studied have been categorized based on the number of employees as those employing Less than 100, those employing 100-300, 300-600, 600-1200, and those employing more than 1200 has been shown in Table 2.

It can be inferred from Table 2 that a simple majority of the business units studied (50.2%) are employing less than 100 employees, while a shade under quarter of them (23.9%) of them are employing 100 to 300 employees. A shade under one-tenth of the units (9.4%) are employing 300 to 600 employees, while those employing 600 to 900 and 900

Table 4: Kind of Manufacturing

Kind of Manufacturing	Frequency	Percentage
Product	149	58.4
Process	51	20.0
Both	55	21.6
Total	255	100

Table 5: Final Cluster Centers

Cluster			
Supply Chain Concerns	1	2	3
Supply Chain Coherence	2.55(III)	3.51(I)	2.58(II)
Geographical Proximity	1.88(III)	3.68(I)	3.61(II)
Competition	2.80(II)	3.96(I)	2.58(III)
Average	2.41	3.71	2.91

Table 6: Number of Cases in each Cluster

Cluster	1	93	37%
	2	89	35%
	3	73	28%
Valid		255	100%

to 1200 employees are almost identical in number with very marginal difference (6.7 and 7.1% respectively). A very few units are engaging more than 1200 employees (a mere 2.7%).

Quantum of Capital Invested

The volume of capital employed by a business unit is another indicator of the size of a business unit. A large business unit shall be invariably employing quite a huge amount of capital. Manufacturing business units are invariably required to invest sizeable amount of capital as huge investment is required to be made in plant and machinery and land and buildings. The units studied have been grouped into categories based on the quantum of capital invested as those which have invested less than Rs. 50 Lakhs, those which have invested Rs. 50 Lakhs to One crore, Rs. 1-50 crores, and those which have invested more than Rs. 50 crores has been portrayed in Table 3.

It can be observed from Table 3 that a shade above one-third of the units studied (34.1%) have invested less than Rs. 50 Lakhs, while a shade above one quarter of them (28.6%) have invested Rs. 50 Lakhs to One crore. Table 4.3 further reveals that a shade under quarter of the units

studied (23.5%) have invested Rs. 1-50 crores, while the least number of units (13.7%) have invested more than Rs. 50 crores. It can be hence concluded that majority of the manufacturing units in UT of Puducherry are employing capital in a small volume.

KIND OF MANUFACTURING

Business units may be engaged in the manufacture of products or processes or both products and processes. Depending on the nature of manufacturing activities of the sample units surveyed, they have been grouped into three categories and the frequency of units falling under each group is displayed in Table 4.

Table 4.10 portrays that more than half of the sample units surveyed (58.4%) are engaged in the manufacture of products, while exactly one-fifth of them (20%) are engaged in the manufacture of processes. The balance 21.6% of the business units are engaged in the manufacture of both products and processes. Hence, it may be said that majority of the business

CLUSTER ANALYSIS

Manufacturing units may be grouped based on the three factors of supply chain concerns namely coherence,

Table 7: Factor loading of indicators for low, high and moderate concerns firms

Constructs	Indicators	Low Concerns firms Factor Loadings	High Concerns firms Factor Loadings	Moderate Concerns firms Factor Loadings
	Coherence	0.52	0.67	0.96
Supply Chain concerns	Geographical proximity	0.80	0.67	0.43
	Competition	0.62	0.74	0.82
	Design Effectiveness	0.73	0.83	0.80
Supply Chain	Quality and Services	0.80	0.61	0.75
Competence	Operations and Distribution	0.77	0.90	0.81
Supply chain	Strategic planning and lean	0.61	0.80	0.77
Practices	Close partnership	0.86	0.69	0.77
Supply Chain	Lead Time and Inventory	0.87	0.99	0.89
Performance	Responsiveness	0.82	0.48	0.79
Organizational	Financial Performance	0.89	0.80	0.93
Performance	Marketing Performance	0.90	0.91	0.90

competition and geographical proximity using K-mean cluster analysis. Table 5 portrays the final cluster centers.

It can be inferred from the above table that manufacturing units may be grouped into three segments. The first group is labeled as "low supply chain concerned group", as their average level of supply chain concerns is low when compared to the other two groups. The second group can be designated as "high supply chain concerned group", because they have the highest mean value and rank first among all supply chain concerns factors. The third group can be christened as "moderate supply chain concerned group" as the mean value of this group in respect of supply chain concerns is around the three which is in the central point of the five-point scale.

It can be inferred from the above table that a shade above one-third of the manufacturing enterprises constitute the "highly supply chain concerned group" and the "low supply chain concerned units" while a shade less than one-third of them constitute the "Moderate supply chain concerned group". Based on the above segmented three clusters of supply chain concerns firms was used to tested to find out the causal linkage of supply chain management and organization performance of manufacturing industries.

MEASUREMENT MODEL ANALYSIS

Measurement Model or confirmatory factor analysis (CFA) which is employed to identify the items of each construct or variable and also evaluate reliability and validity of each construct

RELIABILITY AND VALIDITY OF CONSTRUCTS

The first criterion checked in our measurement is internal consistency reliability. The traditional criterion for internal consistency is Cronbach's alpha, which provides an estimate for the reliability based on the indicator inter correlations. Table 8 provides Cronbach's alpha and composite reliability used to examine the reliability of the constructs of low, moderate and high supply chain concerns firms. Cronbach's alpha and composite reliability for constructs demonstrated a value of at least 0.60, which is the generally agreed upon lower limit for reliability (Hair et al., 2013). Therefore, our measurement demonstrates that the measurement model is internally consistent and reliable. In assessing the validity, two types are examined: convergent validity and discriminant validity. Convergent validity signifies that a set of items represent one and the same construct, Hair et al (2013) suggested the average variance extracted (AVE) of at least 0.5 and factor loading of the indicators with respect to each construct is around 0.5 indicates sufficient convergent validity, meaning that a latent variable is able to explain more than half of the variance of its items on average.

Table 7: Factor loading of indicators for low, high and moderate concerns firms

Table 7 and 8 presents the factor loading and AVE measurements of each constructs of low, moderate and high supply chain concerns firms – all of which exceeded 0.5, demonstrating strong support for convergent validity. A suggested criterion for assessing discriminant validity

Table 8: Reliability and Validity analysis for Low, High and Moderate Supply Chain Concerns Firms

	Low Supply chain Concerns firms				High Supply chain Concerns firms				Moderate Supply chain Concerns firms			
	AVE	Composite reliability	R square	Cronbach's alpha	AVE	Composite reliability	R square	Cronbach's alpha	AVE	Composite reliability	R square	Cronbach's alpha
Supply Chain concerns	0.58	0.81		0.65	0.67	0.80	0.57	0.55	0.63			0.68
Supply Chain Competence	0.45	0.68		0.68	0.54	0.78	0.59	0.62	0.83			0.70
Supply chain Practices	0.79	0.88		0.74	0.64	0.84	0.71	0.62	0.83			0.69
Supply Chain Performance	0.71	0.83	0.13	0.60	0.60	0.73	0.09	0.61	0.71	0.83	0.59	0.60
Organizational Performance	0.71	0.82	0.26	0.60	0.73	0.84	0.26	0.64	0.84	0.91	0.49	0.81

Table 9: Discriminate Validity for Low, High and Moderate Supply Chain Concerns Firms

Constructs	Low Supply chain Concerns firms						High Supply chain Concerns firms						Moderate Supply chain Concerns firms					
	AVE	1	2	3	4	5	AVE	1	2	3	4	5	AVE	1	2	3	4	5
Supply Chain Competence	0.59	0.77					0.54	0.74					0.62	0.79				
Supply Chain concerns	0.45	-0.13	0.67				0.67	0.26	0.82				0.55	-0.47	0.74			
Organizational Performance	0.80	0.20	0.29	0.89			0.73	0.41	0.19	0.85			0.84	0.57	-0.35	0.92		
Supply Chain Performance	0.71	0.31	0.09	0.45	0.84		0.60	0.18	0.26	0.31	0.77		0.71	0.61	-0.37	0.61	0.84	
Supply chain Practices	0.70	0.52	-0.2	0.06	0.24	0.84	0.64	0.37	0.46	0.33	0.23	0.80	0.62	0.52	-0.3	0.63	0.72	0.79

regarding constructs is verified when the square roots of AVE for each individual construct are greater than the correlation between a construct and any other construct. Table 9 lists the correlations between constructs with square root of the AVE on the diagonal of low, moderate

and high supply chain concerns firms. All of the diagonal values exceed the inter construct correlations; hence, the test for discriminant validity is acceptable. Therefore, we conclude that constructs have sufficient construct validity.

Figure 2: Structural analysis results for low supply chain concerns firms

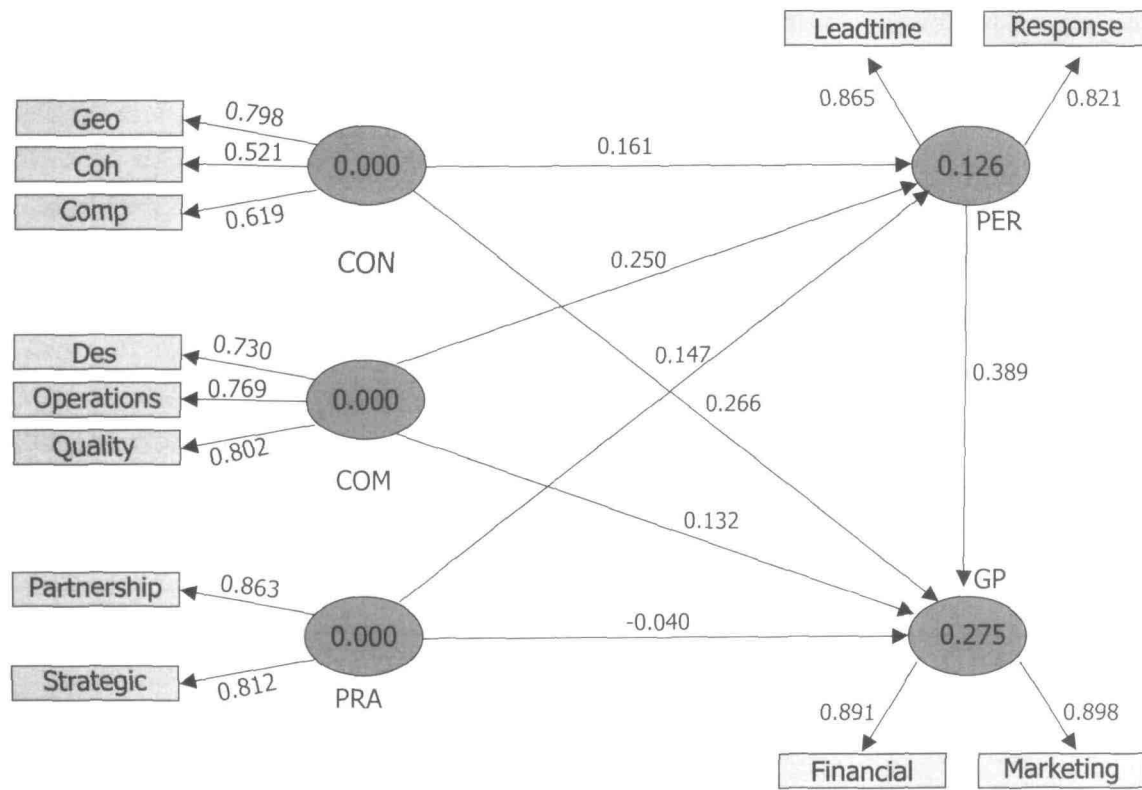


Figure 3: Structural analysis results for high supply chain concerns firms

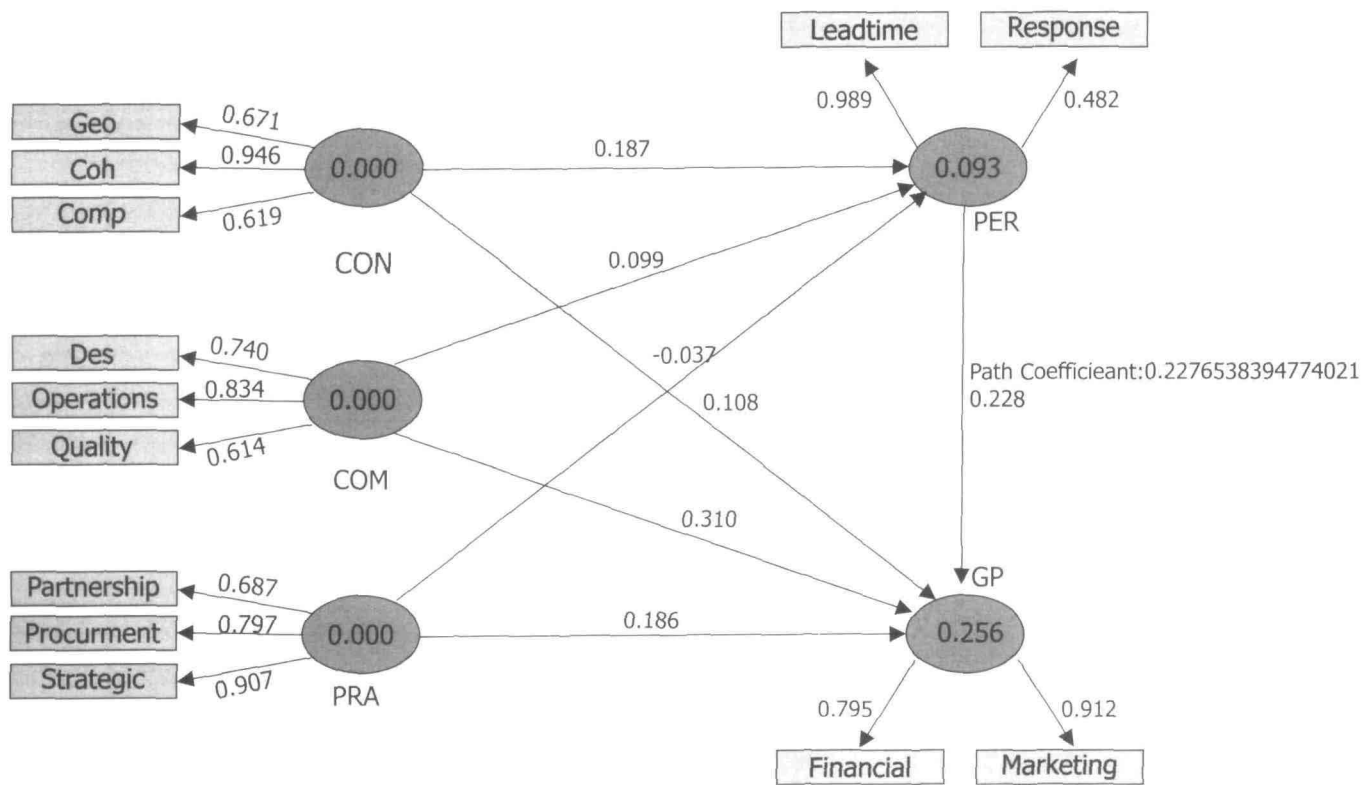


Figure 4: Structural analysis results for moderate supply chain concerns firms

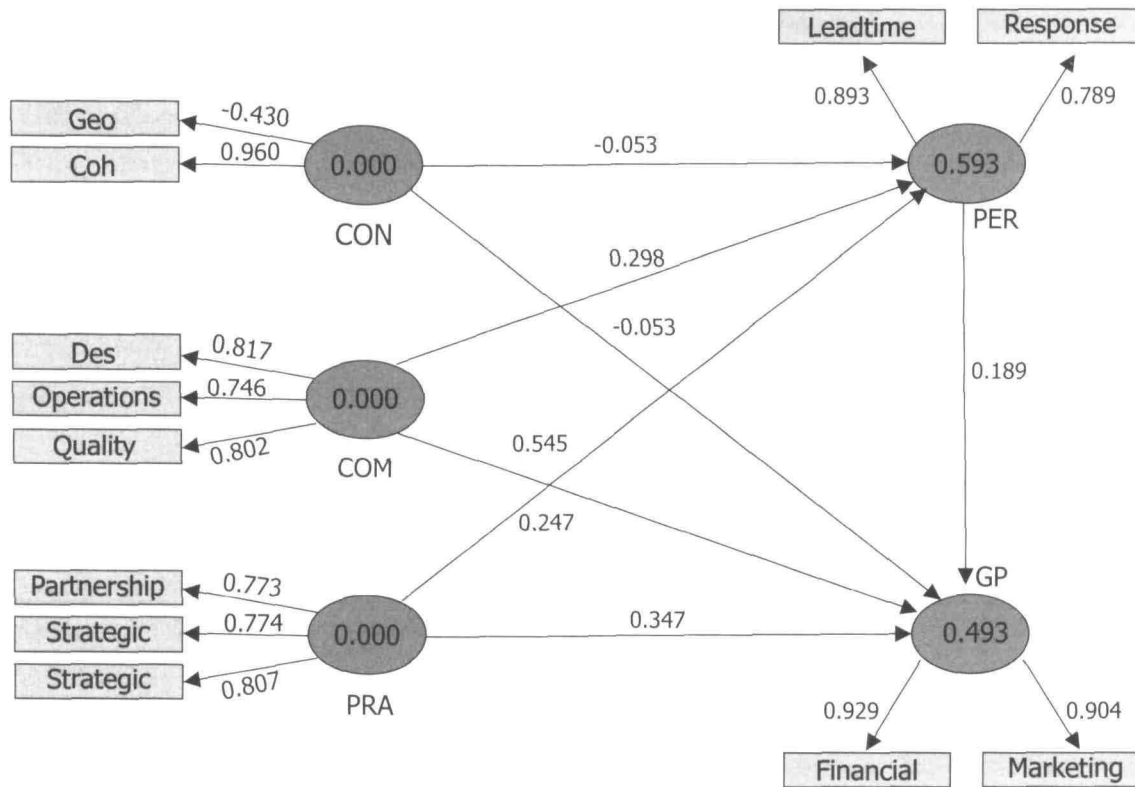


Table 10: Path analysis results of low, high and moderate supply chain concerns firms

Path	Low concerns firm		High concerns firm		Moderate concerns firm	
	Beta coefficient(β)	t-Value	Beta coefficient(β)	t-Value	Beta coefficient(β)	t-Value
COM -> OP	0.13	1.14	0.31	2.64	0.25	2.79
COM -> PER	0.25	2.04	0.099	0.68	0.29	3.96
CON -> OP	0.27	1.93	-0.04	0.25	-0.05	0.52
CON -> PER	0.16	1.21	0.19	1.23	-0.05	0.69
PER -> OP	0.39	3.01	0.23	2.17	0.19	1.27
PRA -> OP	-0.04	0.38	0.19	1.80	0.35	3.32
PRA -> PER	0.15	1.35	0.11	0.74	0.55	7.77

*p < 0.01, **p < 0.05

Note: CON-Supply Chain Concerns, COM-Supply Chain Competence, PRA-Supply Chain Practices, PER-Supply Chain Performance, OP-Organizational Performance, H-Hypothesis.

STRUCTURAL MODEL ANALYSIS

Structural model or path analysis, which is employed to examine the causal relationship among constructs, since the validity and reliability results of the data have been dealt in detail in the previous section, this section shall confine to the causal relationships among latent constructs.

PATH ANALYSIS

The individual path coefficients of the PLS structural model can be interpreted as standardized β coefficients of ordinary least squares regressions. The result of the structural model analysis is shown in Figure 2, 3 and 4 and Table 10 depicts the causal linkage among supply chain management and organizational performance of low, moderate and high supply chain concerns firms. Each of the three segments of manufacturing firms was portrayed in the following part.

Causal Model for Low Supply Chain Concerns Manufacturing Firms.

First set, the (H1) relationship between supply chain concerns and supply chain performance ($\beta=0.16$, non-significant) and (H3) between supply chain practices and supply chain performance ($\beta=0.15$, non-significant), but the (H2) relationship between supply chain competence and supply chain performance ($\beta=0.25$, $p < 0.05$) was found significant relationship. Second set, the (H6) relationship between supply chain practices and organizational performance is ($\beta=-0.04$, non-significant), between (H5) supply chain competence and organizational performance is ($\beta=0.13$, non-significant) and between (H4) supply chain concerns and organizational performance ($\beta=0.27$, non-significant) was also not supported and Third path relationship between (H7) supply chain performance and organizational performance ($\beta=0.39$, $p < 0.01$) was supported. i.e., in low supply chain concerns firm model, there is positive impact of supply chain performance on organizational performance.

First set, the (H1) relationship between supply chain concerns and supply chain performance ($\beta=0.19$, non-significant), (H2) between supply chain competence and supply chain performance ($\beta=0.099$, non-significant) and (H3) between supply chain practices and supply chain performance H3- ($\beta=0.11$, non-significant) was not found significant relationship. Second set, the (H4) relationship between supply chain concerns and organizational performance is ($\beta=-0.04$, non-significant) and (H6) between supply chain practices and organizational performance is ($\beta=0.19$, non-significant) was not supported. However, the (H5) relationship between supply chain competence and organizational performance ($\beta=0.31$, $p < 0.01$) was found significant relationship. Third path relationship between (H7) supply chain performance and organizational performance ($\beta=0.23$, $p < 0.05$) was supported. i.e., in high supply chain concerns firm model, there is positive impact of supply chain performance on organizational performance.

First set, the (H2) relationship between supply chain competence and supply chain performance is ($\beta=-0.29$, $p < 0.01$) and (H3) between supply chain practices and supply chain performance is ($\beta=0.56$, $p < 0.01$) was supported. However, the (H1) relationship between supply chain concerns and supply chain performance H1 ($\beta=-0.05$, non-significant) was not supported. Second set, the (H4) relationship between supply chain concerns and organizational performance is ($\beta=-0.05$, non-significant) is not supported. However, the (H5) relationship between supply chain competence and organizational performance ($\beta=0.25$, $p < 0.01$) and (H6) between supply chain practices and organizational performance is ($\beta=0.35$, $p < 0.01$) was supported. Third path the (H7) relationship between supply chain performance and organizational performance ($\beta=0.19$, non-significant) was not supported. Yet, in moderate supply chain concerns firm model, the relationship between supply chain performance and organizational performance was not accepted.

The results of the path analysis of low, high and moderate supply chain concerns firms from the study relating to the testing of the hypotheses is displayed in the following table.

Seven causal relationship models were proposed and tested empirically using the PLS-SEM model and the results also verified the hypotheses based on low, high and moderate supply chain concerns firms are as follows: first set of proposed relationships, H1- the path between the supply chain concerns and supply chain performance has no relationship in the all low, high and moderate supply chain concerns firms. H2- the path between the supply chain competence and supply chain performance has positive relationship in low and moderate oriented supply chain concerns and H3- the path between the supply chain practices and supply chain performance has positive relationship in moderate oriented supply chain concerns. Second set of proposed relationships, H4- the path between the supply chain concern and organizational performance has no relationship in the all low, high and moderate supply chain concerns firms, H5- the path between the supply chain competence and organizational performance has relationship in high and moderate supply chain concerns firms and H6- the path between the supply chain practices and organizational performance has relationship in moderate supply chain concerns firms. Result of third proposed relationships, H7- the path between the supply chain performance and organizational performance has relationship in low and high supply chain concerns firms.



CONCLUSION AND IMPLICATION

The overall purpose of this study is to demonstrate the effect of supply chain management on organizational performance. We examined the relationships among the three dimensions of supply chain management and its impact on supply chain performance and organizational performance by moderating variable of supply chain concerns. Low and high supply chain concerns firms should give more emphasis on supply chain competence and for moderate supply chain concerns firms should give more emphasis on supply chain competence and practices of the firm. 26 percentage of variance in organizational performance of low supply chain concerns firm are depended by critical components of supply chain, 49 percentage of variance in organizational performance of moderate supply chain concerns firm are explained by critical components of supply chain and 26 percentage of variance in organizational performance of high supply chain concerns firm are explained by critical components of supply chain. This study has endeavored to analyze the differences existing among the manufacturing enterprises with different characteristics regarding of low, high and moderate level of supply chain concerns of the firm. The manufacturing enterprises have been categorized based on their manufacturing characteristics into clusters to better understand their respective nature and features. Understanding the causal linkages among the dimensions of supply chain management and its impact on supply chain performance and organizational performance of manufacturing undertakings with respect to supply chain concerns factor will be of immense utility to the policy-makers and practitioners of manufacturing firms.

LIMITATION AND FURTHER STUDY

This study has some limitations. First, this study is based on various industries. In the future, it would be interesting to focus on a specific industry and analyze its entire supply chain network by collecting data from supplier, manufacturer, wholesaler and retailer. Second, data used to test our research model empirically was limited to only firms in Union Territory of Puducherry, India. The executive may be specialized in only a single field and the use of a single respondent may lead to generation of inaccurate information. Hence, future research shall focus on multiple respondents from each manufacturing firm using the instrument developed in the study. This will lead to a better investigation of the discrepancies in perception among executives within the same firm and the likely effect of such discrepancies on the overall performance of the firms.

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APPENDIX

The research instrument/questionnaire used to collect primary data from executives of manufacturing industries of Union Territory of Puducherry with respect to different dimensions

SUPPLY CHAIN CONCERNS: Rate the following supply chain issues that prevent your organization from achieving the full potential of supply chain management?



Please mark your response by rounding off the number

Very Low	Low	Moderate	High	Very High
1	2	3	4	5

1	Lack of sophisticated information system	1	2	3	4	5
2	Lack of ability in managing Supply chain inventories	1	2	3	4	5
3	Lack of cooperation among supply chain members	1	2	3	4	5
4	Lack of trust among supply chain members	1	2	3	4	5
5	Lack of interest among your suppliers or customers	1	2	3	4	5
6	Competition from other supply chains	1	2	3	4	5
7	Your firm's lack of leverage within your supply chain	1	2	3	4	5
8	Your suppliers' geographical distance	1	2	3	4	5
9	Your customers' geographical distance	1	2	3	4	5

SUPPLY CHAIN COMPETENCE: Rate the following supply chain competencies of your organization? Please mark your response by rounding off the number

Please mark your response by rounding off the number

Very Low	Low	Moderate	High	Very High
1	2	3	4	5

1	The ability to fill orders with improved accuracy	1	2	3	4	5
2	The ability to forecasting sales with greater accuracy	1	2	3	4	5
3	The ability to issue notice on shipping delays in advance	1	2	3	4	5
4	The ability to respond to a request in a timely manner	1	2	3	4	5
5	The ability to make high quality products	1	2	3	4	5
6	The ability to deliver high-quality services	1	2	3	4	5
7	The ability to respond to the needs of key customers	1	2	3	4	5
8	The ability to work with key suppliers	1	2	3	4	5
9	The ability to manage supply chain inventory	1	2	3	4	5
10	The ability to meet a delivery on promised date	1	2	3	4	5
11	The ability to enhance supply chain's position in terms of integrity	1	2	3	4	5
12	The ability to enhance supply chain's position in terms of social responsibility	1	2	3	4	5
13	The ability to design low-pollution production process	1	2	3	4	5
14	The ability to design low-pollution delivering process	1	2	3	4	5

SUPPLY CHAIN MANAGEMENT PRACTICES:

To what extent the following Supply Chain Management (SCM) practices were implemented in your organization?

Please mark your response by rounding off the number

Not At All Implemented	Some What Implemented	Half Way Implemented	Mostly Implemented	Fully Implemented
1	2	3	4	5

1	Close partnership with suppliers	1	2	3	4	5
2	Close partnership with customers	1	2	3	4	5
3	Just in time (JIT) supply	1	2	3	4	5
4	Strategic planning	1	2	3	4	5
5	Supply chain bench marking	1	2	3	4	5
6	Many suppliers	1	2	3	4	5
7	Holding safety stock	1	2	3	4	5
8	Subcontracting	1	2	3	4	5
9	E-procurement	1	2	3	4	5
10	Outsourcing	1	2	3	4	5
11	Third Party Logistics (3PL)	1	2	3	4	5
12	Few suppliers	1	2	3	4	5

SUPPLY CHAIN PERFORMANCE:

Rate the following supply chain performance of your organization over the past 3 year?

Please mark your response by rounding off the number

Very Low	Low	Moderate	High	Very High
1	2	3	4	5

1	Improvement in Lead time	1	2	3	4	5
2	Improvement in inventory turns	1	2	3	4	5
3	Improvement in level of inventory write off	1	2	3	4	5
4	Improvement in Time to market (Product development cycle)	1	2	3	4	5
5	Improvement of defect rate	1	2	3	4	5
6	Improvement in order item fill rate	1	2	3	4	5
7	Improvement in stock out situation	1	2	3	4	5
8	Improvement in set-up times	1	2	3	4	5

ORGANIZATIONAL PERFORMANCE:

What is the level of your firm's performance on each of the following dimensions compared to your major Industry competitors?

Please mark your response by rounding off the number

Very Low	Low	Moderate	High	Very High
1	2	3	4	5

1	Market share	1	2	3	4	5
2	Sales growth	1	2	3	4	5
3	Profit margin	1	2	3	4	5
4	Overall product quality	1	2	3	4	5
5	Overall competitive position	1	2	3	4	5
6	Average selling price	1	2	3	4	5
7	Return on investment.	1	2	3	4	5
8	Return on sales	1	2	3	4	5