The Impact of Supply Chain Management Components on Supply Chain Performance and Organizational Performance : Measuring Moderating Effects of Supply Chain Practices Clusters

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ABSTRACT

The purpose of this paper is to investigate how supply chain management components and supply chain performance affect organizational performance by measuring moderating effects of supply chain practices clusters of manufacturing firms. This study was conducted in the Union Territory of Puducherry, India. A three-phase statistical analysis which comprised phase one (supply chain practices clustering), phase two (convergent validity, reliability, and discriminant validity), and phase three (path analysis) was used to analyze the data. The results from this paper have shown that the critical SCM components will interact with supply chain performance to influence organizational performance. These findings provide important insights for managers to understand the disposition of the firm to better leverage critical supply chain by exploiting relationships with performance metrics. The paper is among the first empirical works that specifically investigate the relationships between SCM and Performance; thus this paper fills an important gap in the supply chain literature.

Introduction

Liberalisation of our country's economy has offered various challenges and opportunities to our firms. The firms, which were enjoying the protection of covens of the Indian license raj system prior to liberalization, are now subject to cut-throat competition from both the local and global players. The frontiers of market for the firms are far expanding and the business environment is changing at a rapid pace. This has inculcated a spirit of competitiveness among the Indian firms. These firms, though enjoy the privilege of operating at the global level, are subject to various challenges, which bring in numerous problems which are intrinsic and typical to the Indian context. Though the firms are subject to problems which are indianised in nature, Indianised solutions to these problems are far from being realized. One important challenge confronting the Indian firms relates to Supply Chain Management (SCM), and the nature, scope, problems and opportunities associated with the SCM with an Indianised context (Janat Shah, 2009). The nature, scope, opportunities and challenges of SCM relevant to Indian scenario constitute the motivation of the proposed research work. The globalised scenario has led to the evolution of sophisticated technologies which has led to innovative business practices. This has warranted much stronger collaborations between the

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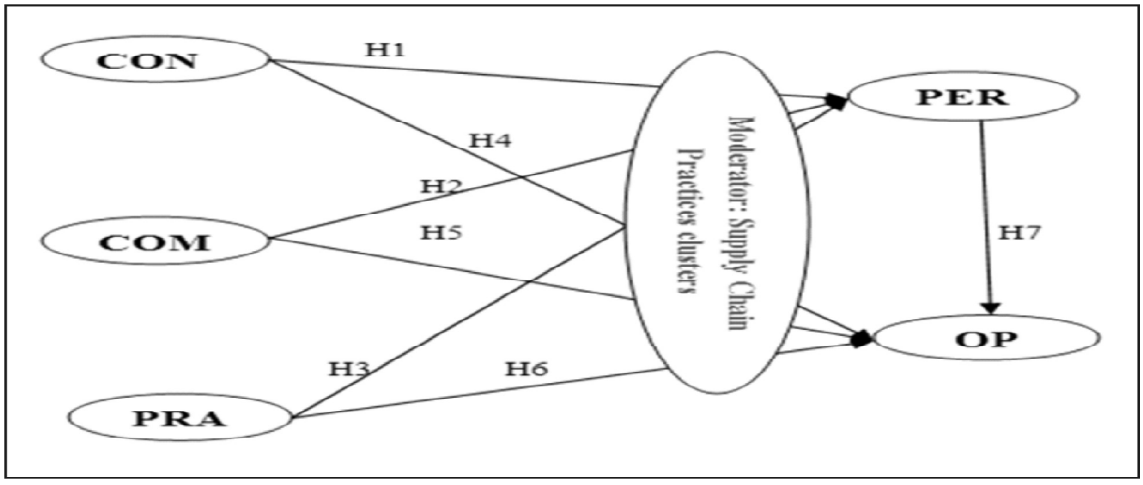
suppliers, manufacturers and the third party logistics providers. Consequently, SCM has evolved itself into an effective tool, immensely contributing to the perpetual success of the industries.

Suppliers in the current scenario are not merely deemed as silent vendors, catering to the needs of their customers as and when such need arises. Instead, present day suppliers have taken the role of being strategic partners with their client companies, having a strategic alliance with such companies. Consequentially, the long term competencies of such companies have witnessed a drastic enhancement. Such a prototype change in pattern has caused a drastic modification in the mind frame of the Indian industrialists. This has consequentially resulted in the formation of a knowledge chasm. This phenomenon merits detailed and in depth research to derive a well coordinated and integrated approach involving the entities of supply chain. This research paper attempts to analysis the impact of supply chain management components on supply chain performance and organizational performance: measuring moderating effects of supply chain practices clusters of manufacturing firms, Based on the survey data collected from executives of manufacturing industries, the following sections were discussed the literature review, research methodology employed in this research paper, results and discussion from the statistical analysis and final section is conclusion and implications of this research work.

Theoretical background and conceptual model

We will now provide some theoretical grounds on the construction of the framework. A clear theoretical logic is that organizational performance depends on the proper management of both intangible and tangible resources. SCM components and supply chain performance deals with the tangible and intangible resources, The combined effect of SCM components and supply chain performance thus forms the building blocks of managerial decisions and actions that determine the long-run performance of an organization. Hence, it is reasonable to conceptualize the framework. We therefore propose that SCM components and supply chain performance play important roles in contributing to firm organizational performance. We further propose that supply chain practices cluster have playing any role of moderating effects on these proposed relationships.

The conceptual framework underlying this study is shown in Figure 1



Ballou (2007) has outline the developments in the logistics and supply chain management (SCM) research by listed out notable events, views of the subject experts and assess the nature of SCM. Finding depicts that nature of the logistics and supply chain has bringing new challenges and opportunities to researchers and practitioners of SCM and scope for SCM research is wider and Chen and Paulraj(2004) have classify and summaries different supply chain factors to evaluated the importance of SCM constructs through critically reviewed around 400 research articles and summarized the work from various SCM related disciplines and conclude that reliable and valid instruments that can be applied in diverse contexts to assess the concept and to test different theoretical models and that pave the way for theory building and development in the area of supply chain management and Gripsrud et al (2006) have explored and discuss the theoretical framework of distribution system via literature review and concluded that to combine the area of business logistics and marketing channel because they focus on same functions of supply chain.

Hsu et al (2007) have studied SCM practice intervene the relationship of operations capability and firm performance by survey instrument used for data collection and hypotheses tested using SEM and Finding depicts that there is direct impact of capability and SCM practices on firm performance and Jabbour et al (2011 have empirical study on measuring the supply chain management practices through primary data collected from 107 Brazilian industries. SEM was applied to verify factors' reliability and validity and tested the proposed conceptual framework. Results depict that reduced four construct of supply chain practices with good validity and reliability and having positive association among supply chain dimensions and Kannan and Tan (2004) have find out the linkage among total quality management, and supply chain practices and its effect on organizational performance by primary data collected using a questionnaire and tested with the sample of 556 manufacturing industries operating in United State. Finding shows the linkage among quality management, supply chain management practices and organizational performance are vary with operational, tactical and strategic level in the organization.

Tan (2002) examined, in his research work, the effect of organizational performances on organizational performance using perceptual data. Tan et al (1998) have studied the impact of quality of supply chain management on performance of manufacturing firms. They have collected data about performance of the manufacturing enterprises from executives of each of the enterprise in comparison with the performance of their competitors. This research proposes to utilize the research variables used by them to measure the organizational performance of manufacturing undertakings in the UT of Puducherry.

Research methodology

This section describes in length, the methodology applied by the researcher in conducting the proposed research work. This section provides details about the research and sampling design used for the study.

Survey instrument and data collection

A set of questionnaires was developed to measure the relevant constructs of the framework. The contents of the developed questionnaires were based on the previous review of literature. The

questionnaires were not exactly imitations or replications from past work; modifications were added to suit the objective of this study. The modifications were done in the questionnaires were initially reviewed by a sample of academicians, researcher and industry with relevant expertise, to obtain feedback on the comprehensiveness, clarity, validity and readability of the scales and instructions. Based on the feedback, a modified survey instrument was done. The resulting questionnaires were sent to 255 respondents consisting manufacturing executives of Union Territory of Puducherry, India.

The measures and Statistical analysis

For each construct, respondents were asked to indicate their level of agreement using a five-point scale ranging from 1 to 5. We conducted a three-phase statistical analysis First, we used k-mean cluster analysis to segment the manufacturing firms based on the supply chain practices into three clusters namely moderate, high and partnership practices. Second and third phase, we used Smartpls 3.0 to performance confirmatory factor and path analysis to test the moderating effects between the independent variables and the dependent variable based on the supply chain practices clusters.

Results and discussions

The data analysis testing the proposed relationships illustrated in Fig. 1 was conducted at three stages. In the first stage, k-mean cluster analysis was performed to determine the segmentation of manufacturing firms based on supply chain practices, Second stage involved testing of the measurement models for each construct validity and reliability and in the final stage, we measured the path model and tested the relationships between the path constructs. These stages were discussed in more detail in the following subsections.

Segmentation of Supply Chain Practices

Based on the similarities of manufacturing units regarding the three factors of procurement practices, strategic planning and lean practices and close partnership practices, they may be segmented into clusters using Cluster Analysis.

The final cluster centers have been displayed in Table 1.

Table 1 : Final Cluster Centers

Supply Chain Practices	Cluster		
	1	2	3
Procurement Practices	2.83(II)	1.95(III)	3.67(I)
Strategic Planning and Lean Practices	2.91(II)	2.87(III)	4.11(I)
Close Partnership Practices	2.66(III)	4.02(II)	4.12(I)
Average	2.8	2.95	3.97

It can be observed from the above table that manufacturing units can be classified into three clusters. The first cluster may be designated as "moderate practices group" as the mean values of firms constituting this cluster in respect of supply chain practices is moderate when compared with the other two groups. The second cluster is labeled as "partnership practices group" because the mean values in respect of the units constituting this cluster is high in respect of the "close partnership practices factor", while the mean in respect of the other two practices factors are very low. The third cluster may be labeled as "High Supply Chain Practices Group" as the units constituting this cluster enjoy high mean that is around the four mark, which is quite high in the five point scale.

as a testimony to the fact that these three distinct clusters could be explained with the help of these supply chain practices factors. A brief description about these three clusters is discussed in the forthcoming paragraphs.

Moderate Supply Chain Practices Units

The supply chain practices level of the units constituting this group is average regarding all the three supply chain practices of procurement practices, strategic planning and lean practices and close partnership practices. Mean values in respect of these three factors hover around the three mark in the five point scale, suggesting that

Table 2 : ANOVA

Supply Chain Practices	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
Procurement	55.942	2	0.419	252	133.497	0.000
Strategic Planning and Lean	42.136	2	0.460	252	91.567	0.000
Close Partnership	61.686	2	0.323	252	190.947	0.000

The next issue is to assess whether the three supply chain practices factors play a significant role in classifying manufacturing units in UT of Puducherry into three clusters. For this purpose, ANOVA values have been ascertained and shown in Table 2.

It can be inferred from the above table that all the three Supply Chain Practices Factors play a significant role in bifurcating manufacturing units into three clusters. The mean scores of these three clusters significantly differ and this serves

the standard of supply chain practices of the units constituting this cluster is moderate. These units have moderate procurement practices and strategic planning and lean practices and hence have occupied the moderate level in the overall situation pertaining to supply chain practices. About 39% of manufacturing units surveyed (101 out of the total 255) possess an average standard as far as supply chain practices is concerned and hence these units constitute this group.

Partnership Practices Units

The second cluster of manufacturing units with respect to supply chain practices factors has been designated as "partnership practices units". Mean values in respect of units constituting this group regarding Partnership practices factor is quite high whereas their mean regarding the other two supply chain practices factors of procurement practices and strategic planning and lean practices. 27% of the manufacturing units surveyed constitute this cluster.

High Supply Chain Practices Units

The mean values in respect of the units constituting this group regarding the three supply chain practices factors are 3.97. As the mean value hover around the four mark in the five point scale, the units constituting this group may be designated as "High supply chain practices group". Almost 34 percent of the manufacturing units surveyed constitute this segment.

Number of manufacturing firms constituting each cluster are displayed in the following Table 3.

Table 3 : Number of Cases in each Cluster 3

Cluster	1	101	39%
	2	68	27%
	3	86	34%
	Valid	255	100%

It can be inferred from the above table that almost three-quarter of manufacturing units surveyed (73%) possess high and moderate standards as far as supply chain practices are concerned.

Confirmatory Factor and Path Analysis

A two-step model-building approach was used, in which the measurement models (or confirmatory factor models) were tested prior to testing the structural model. Confirmatory factor analysis was conducted on the five dimensions for three clusters. The factor loadings results indicated a significant strength of measurement between the items and the associated constructs.

Table 4 : Factor loading of indicators for low, high and moderate concerns firms

Constructs	Indicators	Partnership Practices firms Factor Loadings	High practices firms Factor Loadings	Moderate Practicesfirms Factor Loadings
Supply Chain concerns	Coherence	0.81	0.47	0.47
	Geographical proximity	0.83	0.98	0.83
	Competition	0.71	0.45	0.51
Supply Chain Practices	Design Effectiveness	0.87	0.70	0.77
	Quality and Services	0.79	0.82	0.51
	Operations & Distribution	-	0.80	0.80
Supply chain Practices	Strategic planning and lean	-	0.70	0.81
	Close partnership	0.71	0.66	0.69
	Procurement	0.92	0.83	-
Supply Chain Performance	Lead Time and Inventory	0.89	0.91	0.94
	Responsiveness	0.75	0.83	0.53
Organizational Performance	Financial Performance	0.92	0.92	0.91
	Marketing Performance	0.84	0.91	0.83

Table 5 : Reliability and Validity analysis for Partnership, High and Moderate Supply Chain Practices Firms

Constructs	Partnership Practices firms				High Supply chain Practices firms				Moderate Supply chain Practices 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	0.68	0.82		0.65	0.59	0.81		0.66	0.55	0.74		0.62
Supply Chain competence	0.62	0.83		0.68	0.56	0.69		0.72	0.58	0.63		0.61
Organizational Practices	0.78	0.87		0.72	0.82	0.90		0.79	0.75	0.86		0.68
Supply Chain Performance	0.68	0.81	0.14	0.63	0.75	0.86	0.11	0.68	0.57	0.72	0.15	0.63
Organizational performance	0.68	0.80	0.37	0.65	0.53	0.77	0.41	0.56	0.56	0.72	0.22	0.64

Table 6 : Discriminate Validity for Partnership, High and Moderate Supply Chain Practices Firms

Constructs	Partnership Practices firms						High Supply chain Practices firms						Moderate Supply chain Practices firms					
	AVE	1	2	3	4	5	AVE	1	2	3	4	5	AVE	1	2	3	4	5
Supply Chain competence	0.68	**0.82**					0.59	**0.77**					0.55	**0.72**				
Supply Chain concerns	0.62	0.02	**0.78**				0.56	0.16	**0.74**				0.58	0.15	**0.84**			
Organizational Performance	0.78	0.15	0.37	**0.88**			0.82	0.46	0.34	**0.90**			0.75	0.30	0.31	**0.86**		
Supply Chain Performance	0.68	0.27	0.22	0.46	**0.82**		0.75	0.19	0.24	0.47	**0.86**		0.57	0.31	0.14	0.32	**0.75**	
Supply Chain Practices	0.68	0.02	0.07	0.27	0.05	**0.8**	0.53	0.25	0.44	0.31	0.28	**0.72**	0.56	0.36	0.17	0.27	0.3	**0.74**

The reliabilities of SCM components, supply chain performance and organizational performance were assessed with composite reliability and average variance extracted be used in addition to the Cronbach's α. The values for composite reliability, average variance extracted and Cronbach's á for each construct are reported in Table 4. The values of Cronbach's a for all constructs are greater than 0.70; the composite reliabilities for all constructs exceed the required value of 0.60; and the average variances extracted for all constructs exceed the threshold level of 0.50. Together, these statistics suggest that all constructs are sufficiently reliable (Bollen, 1989).

To test for convergent and discriminant validities of the measurement models, the followings results were analyzed. Note that three models yielded values for average variance extracted in excess of 0.50 (Table 4), thus suggesting excellent convergent validity (Shock et al., 2004). All the correlation coefficients are significant and less than 0.5, thus discriminant validity can be assumed. In addition, there is also evidence that the constructs exhibit discriminant validity based on the average variances extracted for each of the six constructs which are greater than squared correlation value.

Causal Model for moderate supply chain practices manufacturing firms

In model 1, we used supply chain practices moderate the relationship between of SCM on the organizational performance. The model was statistically significant in which SCM components accounted for 13.7 percent of the variance in supply chain performance and SCM components with supply chain performance accounted for 37.8 percent of the variance in organizational performance in the partnership practices clusters.

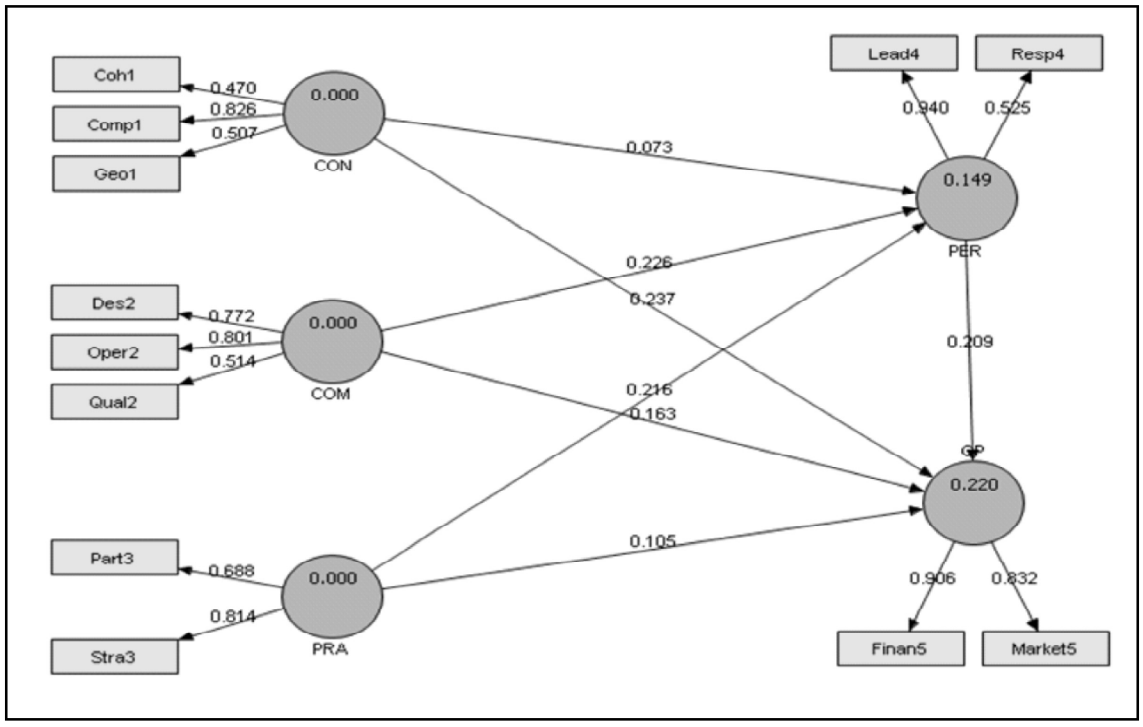


Figure 2 : Structural analysis results for moderate supply chain practices firms

The regression coefficients for supply chain concerns (β=0.07; p > 0.05) and supply chain practices (β=0.22; p > 0.05) on supply chain performance was not statistically significant. The relationship between supply chain competence and supply chain performance (β=0.23; p< 0.05) were statistically significant. The results implied that a supply chain performance is positively related to supply chain competence of the moderate supply chain practices firm.

The regression coefficients for supply chain concerns (β=0.24; p > 0.05), supply chain competence (β=0.16; p > 0.05) and supply chain practices (β=0.10; p > 0.05) were not statistically significant. The results implied that organizational performance is not related to SCM components of moderate supply chain practices manufacturing firms.

The regression coefficients for supply chain performance (β=0.21; p > 0.05) were not statistically significant. The results implied that organizational performance is not related to supply chain performance.

Causal Model for High supply chain practices manufacturing firms

In model 2, High supply chain practices cluster would moderate the relationship between of SCM on the organizational performance. The model was statistically significant in which SCM components accounted for 14.9 percent of the variance in supply chain performance and SCM components with supply chain performance accounted for 22 percent of the variance in organizational performance in the moderate level supply chain practices clusters.

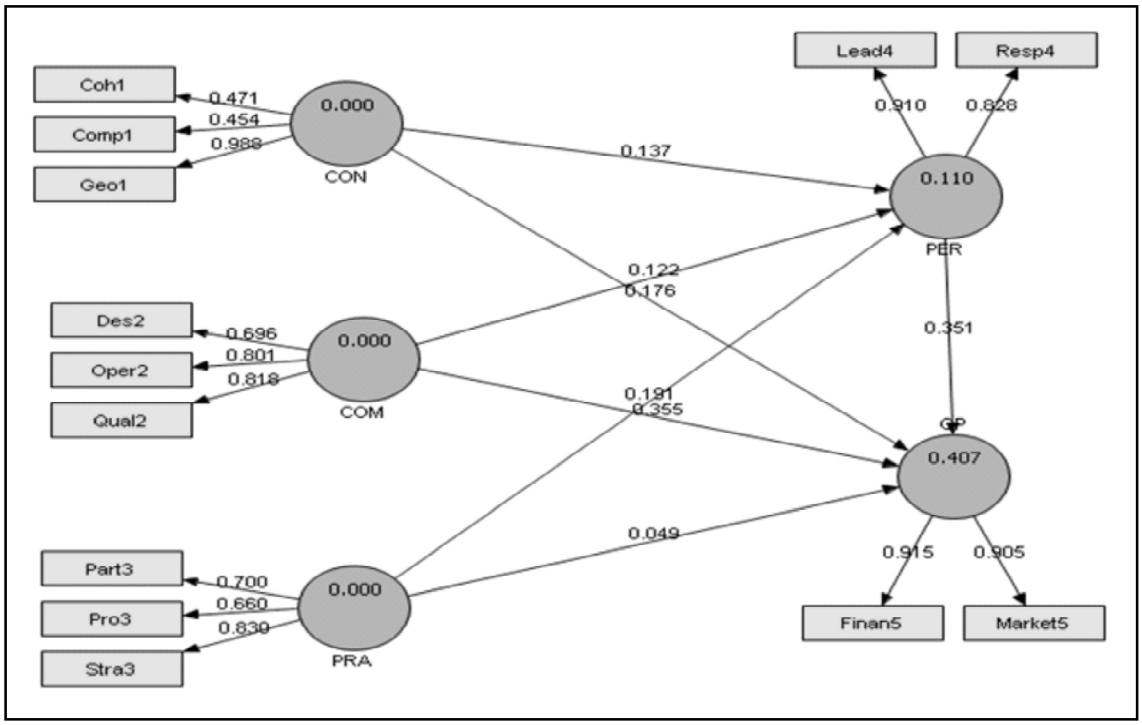


Figure 3 : Structural analysis results for high supply chain practices firms

The regression coefficients for supply chain concerns (β=0.14; p > 0.05), supply chain practices (β=0.19; p > 0.05) and supply chain competence (β=0.12; p>0.05) was not statistically significant. The results implied that a supply chain performance is not related to supply chain components of the high supply chain practices firm.

The regression coefficients for supply chain concerns (β=0.18; p > 0.05) and supply chain practices (β=0.05; p > 0.05) on organizational performance was not statistically significant. The relationship between supply chain competence and organizational performance (β=0.35; p< 0.05) were statistically significant. The results implied that organizational performance is positively related to supply chain competence of the high supply chain practices firm.

The regression coefficients for supply chain performance (β=0.35; p < 0.05) were statistically significant. The results implied that organizational performance is positively related to supply chain performance.

Causal Model for Partnership supply chain practices manufacturing firms

In model 3, Partnership chain practices cluster would moderate the relationship between of SCM on the organizational performance. The model was statistically significant in which SCM components accounted for 11 percent of the variance in supply chain performance and SCM components with supply chain performance accounted for 40.7 percent of the variance in organizational performance in the moderate level supply chain practices clusters.

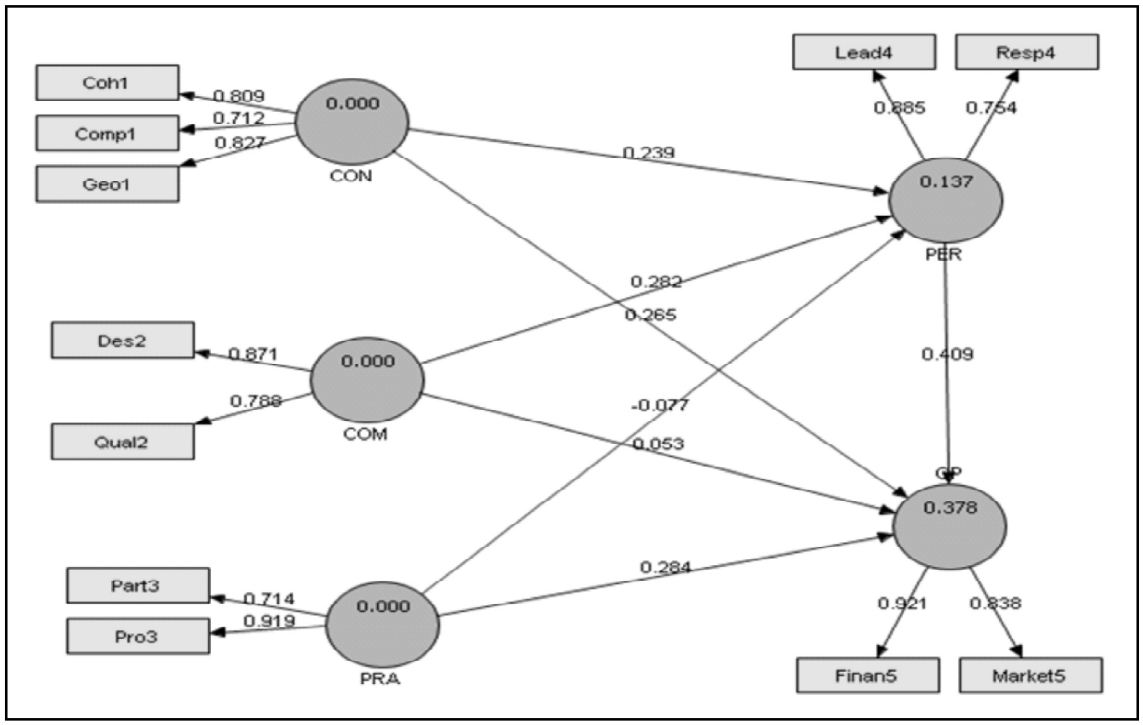


Figure 2 : Structural analysis results for high supply chain practices firms

The regression coefficients for supply chain concerns (β=0.24; p < 0.05) and supply chain competence (β=0.28; p < 0.05) was statistically significant. The results implied that a supply chain performance is positively related to supply chain concerns and competence of the partnership supply chain practices firm. The regression coefficients for supply chain practices (β=-0.08; p > 0.05) was not statistically significant. The results implied that a supply chain performance is not related to supply chain practices.

The regression coefficients for supply chain concerns (β=0.26; p < 0.05) and supply chain practices (β=0.26; p < 0.05) was statistically significant. The results implied that organizational performance is positively related to supply chain concerns and practices of the partnership supply chain practices firm. The regression coefficients for supply chain competence (β=-0.05; p > 0.05) was not statistically significant. The results implied that organizational performance is not related to supply chain competence of partnership based manufacturing firms.

The regression coefficients for supply chain performance (β=0.41; p < 0.05) were statistically significant. The results implied that organizational performance is highly and positively related to supply chain performance.

Table 7 : Path analysis results of Partnership, high and moderate supply chain Practices firms

Path	Partnership practices firm		High practices firm		Moderate practices firm	
	Beta coefficient(β)	t-Value	Beta coefficient(β)	t-Value	Beta coefficient(β)	t-Value
COM -> OP	0.05	0.48	0.35	4.25*	0.16	1.22
COM -> PER	0.28	3.01*	0.12	1.10	0.23	1.98**
CON -> OP	0.26	3.02*	0.18	1.39	0.24	1.89
CON -> PER	0.24	2.10**	0.14	0.99	0.07	0.50
PER -> OP	0.41	4.16*	0.35	3.65*	0.21	1.39
PRA -> OP	0.28	4.49*	0.05	0.51	0.10	0.84
PRA -> PER	-0.08	0.57	0.19	1.68	0.22	1.73

***p* <0 .01, ***p* < 0.05**

Conclusion

With a greater emphasis on SCM components and supply chain performance, there is a growing need to investigate the relationships between these two approaches towards organizational performance. For the purpose of investigating these relationships, a comprehensive, valid and reliable instrument for assessing the key attributes was developed. The instrument was tested using a three-phase statistical analysis which comprised phase one (convergent validity, reliability and discriminant validity), phase two (moderating effects analysis) and phase three (path analysis). This study contributes to the management theory and literature by providing empirical evidence regarding the impact of SCM components and supply chain performance on organizational performance. This is considered as a vital contribution since after all, the ultimate aim of management is to improve organizational performance.

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